How French dairy farmers adapt their labour? Relationships between workforce and farm management

Nathalie Hostiou, Sylvie Cournut

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Scientific Programme EAAP - 2008

Sunday 24 August 8.30 – 12.30	Sunday 24 August 14.00 – 18.00	Monday 25 August 8.30 – 12.30	Monday 25 August 14.00 – 18.00
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Session 2 Optimal intensity of livestock farming systems in different regions Chair: A. Bernués (ES)	Session 6 Functional food of animal origin Chair: C. Wenk (AT)	Session 11 Udder health programs Chair: H. Seegers (FR)	Session 16 Animal Genetics Chair: V. Ducrocq (FR)
Session 3 Managing conflicts between farming and wildlife Chair: M. Marie (FR)	Session 7 Male fertility and genetic traits Chair: A. Ricard (FR), L. Bodin (FR)	Session 12 Nutrition of the high yielding cow Chair: M. Crovetto (IT)	Session 17 Livestock Farming Systems Chair: S. Ingrand (FR)
Session 4 Genomic selection and bio-informatics Chair: A. Maki-Tanila (FI)	Session 8 Animal genetic resources Chair: G. Gandini (IT)	Session 13 Assessment of Sustainability in Livestock Farming Systems Chair: A. van der Zijpp (NL)	Session 18 Animal Nutrition Chair: J.E. Lindberg (SE)
Session 9 Good farming practices in cattle husbandry Chair: V. Juskiene (LT), G. Keane (IE)		Session 14 Workshop - Piglet castration and its alternatives Chair: M. Bonneau (FR)	Session 19 Animal Management and Health Chair: C. Fourichon (FR)
		Session 15 Genetics. Free communications Chair: H. Simianer (DE)	Session 20 Animal Physiology Chair: M. Vestergaard (DK)
			Session 21 Cattle Production Chair: J.F. Hocquette (FR)
			Session 22 Horse Production Chair: A. Santos (PT)
			Session 23 Pig Production Chair: P. Knap (DE)
			Session 24 Sheep and Goat Production Chair: M. Schneeberger (CH)

Bold - Sessions contributing to the theme of the meeting: **Efficient and environmentally friendly livestock farming**

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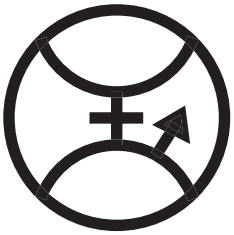

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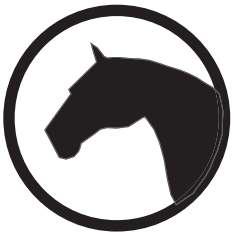

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Session 37. Horse production in Lithuania + horse tour

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Physiological monitoring of individuals and groups of pigs

F.R. Dunshea[1,2], T. Banhazzi[2], I. Mccauley[2], R.J. Van Barneveld[2], A. Grasso[2], M. Tull[2], D. Broek[2] and B.P. Mullan[2], [1]The University of Melbourne, Faculty of Land and Food Resources, Royal Parade, Parkville, Victoria 3030, Australia, [2]Pork Co-operative Research Centre, P.O. Box 466, Willaston, South Australia 5118, Australia

A primary driver of all livestock nutrition and diet formulation is feed intake and yet it is one of the most difficult parameters to accurately measure in individual animals on a routine basis under commercial conditions. This is becoming increasingly so as many pig production systems are now based around large groups (up to 2000) on deep litter in "Eco-shelters" with only one or a few cuts. When it is also considered that many processors place tight constraints around carcass weight and composition, precise knowledge about performance of individuals and groups is critical as is the ability to draft and classify pigs quickly and accurately. With this in mind the Pork Co-operative Research Centre (http://porkcrc.com.au/) established a research program to develop tools for practical and continuous measurement of feed intake and wastage in individual pigs and in groups of pigs for the prediction of performance, disease and reproductive status. Being able to monitor feed intake allows the accurate delivery of nutrients to match the requirements of individuals or groups. Techniques that are showing promise include tracer technology to label feed and feed wastage, radio frequency identification to identify when pigs enter a feeder and video capture to determine weight and composition.

Can very high physiological demands of highly productive pigs be met without affecting their health and welfare?

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During the past decades, production levels of pigs have increased considerably thanks to genetic selection and improvement of housing, feed composition and strategy, health status and farm management. Animals must cope with high physiological demands that may be difficult to meet. Aims of the present paper are to review the physiological challenges that pigs are facing, to identify possible consequences on health and welfare as well as ways of detecting problems. High prolific sows have elevated foetal demands for nutrients and space that are not fully met as shown by increased number of light piglets that have difficulties to adapt successfully to the neonatal life. Lactating sows with high milk production have high nutrient requirements leading to intense catabolism that may affect their health and welfare and the next reproductive cycle. At weaning, piglets are submitted to abrupt changes in the food supply, the housing and the social environment. Efficient adaptations of the digestive tract and of the behaviour are critical for their health and welfare. Physiological demands to support these adaptations and risks of failure are inversely proportional to the age of the pigs. During fattening, nutrient requirements are intense in modern pigs that have high daily weight gain, feed conversion and lean percentage. Leg weakness, disease and stress susceptibility as well as undesirable behaviours such as tail biting could be related to the performances but causes of these problems are not really established.

Use of early diagnostics and precision management tools to limit subclinical diseases in intensive dairy farming systems

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As a consequence of changed price relations and structural development in the dairy industry, the average herd size has increased rapidly in many countries, and e.g. in Denmark it is now above 100 cows. This structural development is expected to continue and the large dairy farms should be considered as enterprises rather than traditional farms. In these larger units the farmer or farm staff has to look after an increasing number of animals for disease, reproduction, production and welfare. This, together with the high labour cost or lack of qualified staff, consumer and society demands on product quality, animal welfare, and concerns about the environmental effects of livestock production, calls for automated precision management. Such automated precision management should combine advanced technologies and biological knowledge to organize dairy production in ways that result in low disease incidence and severity, minimize impact on the environment, result in the requested product quality, and secure optimal production and reproduction efficiency in order to be interesting and profitable for the dairy farmer. This review will focus on physiological limits or problems of the high yielding dairy cow and present examples of new opportunities in monitoring and early diagnostics as well as challenges for future disease prevention and management of individual dairy cows.

Identifying priorities among physiological functions: interactions between growth, pregnancy and lactation in dairy goat

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By strongly soliciting female's biology, intensive livestock farming systems can lead to competition among physiological functions. This competition is mainly based on priority rules among growth, pregnancy and lactation. This study aimed at investigating these priority rules in dairy goats. Measurements of body weight (BW), milk yield (MY), litter size and litter weight from 426 pregnancy-lactation cycles were analysed with GLM procedures. Our results reinforce the effect of maturity on pregnancy parameters with primiparous goats having lower litter size and weight than adults. Our results also show: i) a negative effect of prolificacy on BW gain due to growth and anabolism during gestation (-0.4 kg/kg of litter); ii) a delayed effect of prolificacy on BW loss and milk production during early lactation (+ 0.9 kg of BW loss between one and two kids born; + 218.5 g of MY/d per kid born); iii) a negative effect of milk production on reconstitution (- 11g/d of average daily gain per kg of MY/d) and a positive effect of BW loss (+ 2 g/d of average daily gain per kg of BW loss). This study highlights the interactions among growth, pregnancy and lactation and their effects on goat responses. It also emphasizes the need to consider a given productive response as an integrated part of a whole productive life in order to increase our understanding of the physiological limits.

Estimation of dairy cows ability to tolerate once-daily milking

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A trial was conducted to determine whether plasma lactose level could be used as an indicator to assess the ability of dairy cows to tolerate once-daily milking (ODM), i.e. with low milk yield loss and full recovery. Five blocks over 2 years comprising 86 (Holstein x Normande) dairy cows in 2nd lactation were used. The trial consisted of 3 successive periods: one week with twice daily milking (TDM1), 3 weeks with ODM and 2 weeks with twice daily milking (TDM2). Blood samples were collected 1 h before morning milking on d -3, 0, 1, 3, 7, 21, 23, and 28, d 0 being the last TDM1 day. After testing data for normality, logarithmic transformation of lactose data was performed. Milk yield during TDM1 was 31.0+4.8 kg/d, decreased by 8.8+2.7 kg/d with ODM, and increased again by 4.3+2.4 kg/d during TDM2. No correlation between control plasma lactose level and milk yield loss or recovery was observed. In contrast, plasma lactose level on d 1 was slightly correlated with milk yield loss (r=0.21; P=0.05) and more strongly with milk yield increase on TDM2 (r=-0.40; P=0.001). During TDM2, dairy cows with high lactose plasma level on d 1 (>350 mg/L), recovered less milk yield than others (-2 kg/d). As a result, plasma lactose level on d 1 of ODM could be used to identify cows having lower milk recovery when switched back from ODM to TDM.

Effect of milking interval on alveolar and cisternal compartments in the udder of dairy sheep

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Manchega (MN, n = 12; 1.1 L/d) and Lacaune (LC, n = 12; 2.3 L/d) ewes at mid-lactation (70±3 d) were used to evaluate the short-term effects of milking interval (4, 8, 12, 16, 20 and 24 h). Cisternal milk was milked using an oxytocin receptor antagonist, and alveolar milk was milked after injection of oxytocin. Cisternal area was measured by ultrasonography. Cisternal milk (MN, 316 mL; LC, 888 mL) and alveolar milk (MN, 218 mL; LC, 338 mL) differed by breed (P<0.001). Alveolar milk increased linearly up to 16 h in MN and 20 h in LC, and remained constant thereafter. Cisternal milk accumulated linearly up to 24 h in both breeds, showing the ability of the cistern to dilate as a result of milk transfer from alveoli. Correlation between cisternal area and cisternal milk was highest at 8 h (MN, r = 0.70; LC, r = 0.56), which was conditioned by probe depth. Milk fat content varied markedly with milking interval and breed, increasing in alveolar milk (MN, 8.6 to 9.6% at 16 h; LC, 7.3 to 8.9% at 20 h; P<0.05) and decreasing until 24 h in cisternal milk (MN, 8.2 to 5.7%; LC, 7.3 to 8.9%; P<0.05). Milk protein content increased in alveolar but was steady in cisternal milk. Milk lactose only varied in the 24-h milking interval in MN, decreasing as a result of tight junction leakiness (4.70 to 4.20%, P<0.001). In conclusion, results show that cisterns play an important role in accommodating secreted milk when milking intervals are extended up to 24 h.

Subacute ruminal acidosis (SARA): animal welfare and feeding behaviour

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SARA is a frequent digestive pathology in intensively-fed ruminants with important consequences on production and animal welfare. We questioned whether ruminants can perceive SARA and adjust their feeding behaviour to counteract it. We tested 3 possible adaptations: a decrease in ingestion, a decrease in the proportion of acidogenic feeds ingested, or a more sparsely ingestion during the day. 11 castrated sheep were equipped with ruminal cannulae and received a ration made of wheat (acidogenic) and alfalfa hay (non acidogenic). In a switch-over experiment with 2 23d periods, the feeds were distributed at 8 AM and 4 PM in limited quantities (60% wheat, 40% hay, total equal to 80% of the DM of hay spontaneously eaten) or *ad libitum*. Ruminal pH, instantaneous intake and chewing were continuously recorded. Data were analyzed as repeated measures. Sheep were considered in SARA when ruminal pH was below 5.5 for more than 33% of the day. When they received the *ad libitum* diet, sheep that underwent SARA on one day reduced their ingestion the next day ($p<0.01$), in particular the amount of wheat ($p<0.05$). No modification of the distribution of ingestion was observed. This reduction was also observed when sheep received the limited diet but only for the 8 h following a period of SARA. When they were in SARA, sheep spent more time standing with their head raised ($p < 0.01$). In conclusion, sheep seem to perceive when SARA occurs and react to it by limiting their intake of acidogenic food.

Physical and biochemical characteristics of semen from rams treated with recombinant bovine somatotropin (rbST)

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To study the effect of prepubertal injection of rbST on physical and biochemical characteristics of rams' semen, a total of twenty four Rahmani lambs were used. The lambs had an initial body weight of 30.9±1.0 kg (5-6 months old) and were fed a complete mixed ration containing 2,615 Kcal ME/kg DM according to NRC (1985). The lambs were divided into two similar experimental groups according to rbST treatment (0 or 100 mg rbST/14 days). Blood was collected fortnightly, while semen was collected twice weekly after the last injection of rbST. The concentration of blood plasma IGF-1 was highest ($P<0.05$) in rbST treated rams (776 vs. 579 ng/ml). However, the concentration of blood plasma testosterone was lowest ($P<0.05$) in rbST treated rams (2.71 vs. 5.62 ng/ml). The treatment of rbST slightly improved the advanced motility (80.1 vs. 79.2%), total sperm output (3.3 vs. 3.2 $x10^9$/ejaculate) and total output of live sperm (2.8 vs. 2.7 $x10^9$/ejaculate). It was concluded that the rbST treatment possibly improve the semen characteristics of Rahmani rams.

Session 02 Theatre 1

To adapt the stocking rate aiming at the feeding self-sufficiency: a way to secure the economic results for suckler cattle farms

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Grass is the main feed resource for beef suckler herds in France. However its quality and quantity depend on weather conditions. To face feed supply shortage, farmers can buy more feedstuffs or they can reduce the number of animals carrying out a forced sale. The evolution of economic and technical variables of a panel of 74 farms with Charolais suckling cattle over the 2000-2005 period shows that the 2003 drought had no effect on the farm product, but the feeding costs of the herds increased a lot (+25%). The farm income per worker of these holdings decreased by almost 10% despite exceptional subsidies. Among the technical determinants of the bovine gross margin, the global feeding self-sufficiency at the farm level (total net energy produced on the farm / total net energy needs for the herd) had, in 2003, as much weight as the meat productivity. The feeding self-sufficiency itself is strongly negatively correlated with the stocking rate. The most self-sufficient farmers (and therefore with a low stocking rate) in 2003, appear to have their income systematically higher than the less self-sufficient ones over the 6 years. We also observed a better stability of their income. These observations are even more significant for the organic farming systems. For the low-input farming systems, the feeding self-sufficiency and hence the stocking rate, are part of the major determinants of the farm income.

Session 02 Theatre 2

Contribution of livestock farms diversity to ensure sustainability of small ruminant systems in Mediterranean region

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The aim of this presentation is to analyse how diversity of farming systems (including intensity of farming) is important to consider for ensuring a global sustainability of small ruminant farming in Mediterranean areas. In our context, managing complementarity at local scale between diverse farming systems is of particular interest to meet consumer expectation for quality products and to increase contribution of these systems in management of natural resources. We will focus on two case studies: one deal with dairy goats farming and concerned all producers (30) delivering milk on a dairy cooperative producing PDO cheese ‘Pelardon”. The other deals with sheep farming and concerned all sheep farms (90) involved in management of rangelands on the territory of Luberon regional park. We characterised farms in these situations through size, general planning for production, level of animal production, ability in combining rangelands and cultivated areas to provide forages. A large diversity is identified and this diversity is favourably linked with the management of milk supply and with environment conservation. We will discuss these results in terms of evaluation of farming practices considering farms as included in a whole. On a methodological aspect, from this point of view, the objective is not to produce an optimal and definitive ideal farming system, but to enrich the decision-making process by imagining a set of possible options and evaluating them

Opportunities and threats of mega farms

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Societal commotion forced the Dutch parliament to pay attention to mega pig and poultry farms. Literature review and expert interviews were used to gain insight in the development of mega farms. Identified environmental issues were emissions of NH_3, smell and dust, concentration of nutrients, transportation, logistical consequences of location. Societal issues were animal welfare, animal health, public health, working conditions, landscape quality and societal perception of mega farms. A SWOT analysis was performed to detect blank spots in knowledge related to issues concerning mega farms. It also was used to find possible threats and opportunities for the development of mega farms in the Netherlands. Identified blank spots were 1) assessment of an economically optimal size for farms as it seems that efficiency does not automatically increase with farm size. 2) an integral environmental assessment to prevent pollution swapping, e.g., preventing emissions with air filters can replace emission with an increased energy use. 3) assessment of animal welfare risks that are related to decreased human-animal interactions. 4) citizens perception of mega farms. Opportunities for mega farms were designing landscape solutions to prevent overbuilding of the rural landscape and planning of location, taking increased transport and required infrastructure into account. Other issues could not be classified as opportunities or threats due to the blank spots in knowledge.

Diversified dairy production systems: an advantage for farms' reproduction and sustainable development of European territories

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The dairy cow sector was often analyzed from the point of view of the production, its economic profitability and its links to the industry. From a broader point of view, livestock farms participate in the rural and regional development through various, more or less intensive, production systems, which occupy the space differently and have evolved in various ways through time. The conservation of the diversity of these systems is the key factor in guaranteeing the best possible preservation of the dairy breeding sector in a given territory. The aim of this paper is to deal with the issue of the reproduction of dairy cow farms on the European scale. First of all, it presents the principal milk production areas in EU. Then, it criticizes the general logic and the principal factors that determine farms' reproduction and it proposes a first typology of situations and associated factors. Finally, it put forward an analysis of correspondences between situations and possible evolutions of production systems within different production areas and it formulates some propositions that can promote efficiently the reproduction and conservation of this diversity.

Q-porkchains: tools for assessing sustainability of pigmeat production systems

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Pigmeat production systems face three major farm-level challenges: increasing social rejection of the current intensive systems due to environmental and animal welfare shortcomings; lack of economic competitiveness on the world market; and loss of diversity due to pressures on small-scale systems adapted to local conditions. The Q-PORKCHAINS project addresses these issues by surveying the range of existing systems within Europe and evaluating these against sustainability benchmarks. As a precursor to this activity, a review of tools for the assessment of sustainability of pigmeat production systems has been carried out. Relevant dimensions of sustainability were identified as the ability to meet the needs of different stakeholders in society regarding: animal health, animal welfare, environmental impact, economic sustainability, genetic resources, human working conditions, meat quality, meat safety, and societal conformity. For each of these themes, a review of existing tools was carried out from scientific literature and practice. SWOT analyses resulted in nomination of the best currently available tool in each theme for the pigmeat production context. This suite of tools will now be applied to evaluation of different systems within the EU, to give a quantitative estimation of their strengths and weaknesses.

Impacts of compact calvings and once-a-day milking in grassland based systems.

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A sustainable dairy production system relies on decreasing the production costs and improving the farmer's working conditions. Two technical solutions to reach those targets were tested during 3 years within a grass based system : compact calvings to close the milking parlour during one month and once-a-day (OAD) milking. Except in 2003 we managed to limit the amount of stored forages to 2 t of DM per cow per year for the spring calvers. A close calving pattern based on a 3 months period appeared to be more repeatable than a 2 months system. Technical and economical results did not significantly differ between spring and autumn calvings. High genetic merit cows can afford to be milked only OAD during the whole lactation. Both solutions were very effective to decrease working time and improve work organisation on the farm.

Optimal production intensity adjustments in French suckler farms: a dynamic recursive bioeconomic model

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Suckler cow farming systems can be characterized by their production intensity i.e. by the quantity of animal live weight produced per unit of capital –labour, area or animal-. These production intensity decisions result from strategic (investments etc.) and from tactical decisions. We focus in this paper on tactical adjustments of production intensity to temporary changes of average crop and forage production and price levels and of average animal price levels. Objective is to assess economic gain of optimal marginal production intensity adjustments compared to a fixed management in different farming systems. A recursive dynamic farm bioeconomic model is developed and calibrated to correspond to two typical French suckler cow farms. Monthly decisions related to the management of forage and crop produce, of herd composition and size, and, of animal's live weight are optimized according to a discounted utility function of farm gross margin over a 6 years planning horizon. First results are that optimal intensity adjustments to a 30% temporary variation of annual crop and forage production correspond to moderate variations of stocking rate and of kg of animals sold per livestock unit for the farm raising young bulls and selling cereals. These adjustments little modify total gross margin but smooth it over year by decreasing the maximal loss per year. Other results are in progress.

Q porkchains: developing tools to standardise the assessment of sustainability in pigmeat production systems - environment

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Within the EU Q-PorkChains project, the aim of this work was to identify the best adapted tool for assessing environmental sustainability of pig farms in various conventional and alternative production systems. Many tools have been developed, with different objectives and target groups. They take into account a number of different "environmental objectives" addressing issues at local or more global level. Most tools provide indicators which may concern production practices (means-based), emissions to the environment (effect-based) or the state of the system. The object studied can be the farm or the product and the indicators may be expressed per kg product or per ha of land. Among the different tools, the life cycle assessment framework appears the most appropriate for our objectives. The first reason is that we intend to evaluate different pork production systems and LCA-based methods are the only ones which consider the whole production chain and not only the farm itself. Moreover, with this method it is easy to aggregate the environmental evaluations of the pig production and the meat processing sectors. Moreover, LCA analysis allows taking into account local and global impacts, and indicators are values that can be expressed either per ha or per kg. This is important in the case of pig farms which are often highly dependent on imported feed, produced locally or abroad, and may export large amounts of manure to neighbours farms or at longer distance.

Q porkchains: developing tools to standardise the assessment of sustainability in pigmeat production systems - human working conditions

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The Q Porkchains project has developed a standardised set of tools for assessment, under practical conditions, of sustainability of different pigmeat production systems. The human working conditions tool encompassed three components, health and safety at work (incorporating the aerial environment and personal injuries), demands of the job (including the degree of automation and the number of animals under the care of one person) and job satisfaction. The initial review of literature for this tool concluded that there was no single "tool" currently available that would adequately assess all three components. Therefore, under the Q Porkchains project, a tool will be developed that will assess the suitability of the aerial environment indirectly through a human health based questionnaire, a checklist of tasks to assess degree of automation and a job satisfaction questionnaire. It was decided that assessing the aerial environment through the direct measurement of airborne particles and/or pathogens was not practical for this project as, to build up an accurate picture of exposure, multiple measurements would have to be made across a number of days, buildings and activities. With regards to the job satisfaction questionnaire, it will be necessary to validate the tool to ensure that it is applicable to the different production systems and the differing social values found in the countries to be assessed.

Q porkchains: developing tools to standardise the assessment of sustainability in pigmeat production systems - animal welfare

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The Q Porkchains project has developed a standardised set of tools for assessment, under practical conditions, of sustainability of different pigmeat production systems. The scope of the Animal Welfare tool encompassed assessment of the adequacy to meet health, physiological and behavioural needs of the animals on farm. The initial review of literature for this tool considered possible options including: the animal needs index (Bartussek 2001), a decision support tool (Bracke et al. 2001), qualitative assessment (Wemelsfelder et al. 2001), the behaviour observation tool of Broom (1986), various farm assurance schemes (Main et al. 2001), the Bristol Welfare Assurance Programme (Main et al. 2004) and the Welfare Quality programme (developed under FP 6). The most appropriate tool for Q Porkchains was identified as Welfare Quality, as it integrates animal-based measures involving the environment, pig health and behaviour along with qualititative assessment. Weaknesses highlighted within this tool were a lack of physiological measures of animal welfare, the need for trained assessors, the labour intensive assessment and the biosecurity restrictions associated with required on-farm access. To overcome the latter weakness, an alternative questionniare based tool will be developed for use when on farm access is restricted (e.g during disease outbreaks).

Q porkchains: developing tools to standardise the assessment of sustainability in pigmeat production systems – economic sustainability

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The Q Porkchains project has developed a standardised set of tools for assessment, under practical conditions, of sustainability of different pigmeat production systems. The scope of the economic tool encompassed assessment of viability, efficiency and transferability of pig farms through some indicators. The initial review of literature for this tool considered possible options including: The IDEA method (Briquel et al. 2001), The Sustainability Diagnosis (RAD, 2002), The Territorial Observatory of farm uses and productions systems (Vinatier 2007). The most appropriate tool for Q Porkchains was identified as IDEA, as it is a comprehensible, reproducible and pragmatic tool already validated in the field, and used as a reference for sustainability assessment on farm. Weaknesses highlighted within this tool were due to the fact that IDEA is not an exclusively economic and specific tool for pig production but a more global tool for sustainability assessment on farm. The economic sustainability assessment is only one of the 3-scales of IDEA that also encompasses environmental and sociological ones. As it is not a tool specific to pig production, experts must estimate if indicators and benchmarks are appropriate. Economic assessment remains delicate through countries as economic references and levels are variable, and it will be necessary to establish comparisons by group, which have to be determined.

Q porkchains: developing tools to standardise the assessment of sustainability in pig meat production systems – animal health

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Within the EU-project Q Porkchains (QPC) a standardised set of tools for assessment of sustainability of different pig meat production systems under practical conditions is being developed. Initial review of literature on Animal Health tools identified two main categories: (1) laboratory analytical tools (including several diagnostic tools as well as monitoring and surveillance tools), and (2) combined health assessment tools (decision support tools, disease prevention tools or information technology tools). For the assessment of animal health, a combination of existing tools is suggested to be the most appropriate strategy to monitor and maintain the pig health status at farm level. Within QPC, pig health status assessment by determining acute phase proteins (APP), including haptoglobin (Hp) and pig major acute phase protein (Pig-MAP) at different stages of production, in combination with checklists, including health management records, vaccination program, medication and treatment records as well as disease outbreak and mortality data has been chosen. Weaknesses highlighted within this tool are the lack of an exact cut off value, especially for Hp, and the lack of a rapid test for the APP which would make it much easier to implement measurement at farm level under practical conditions. Nevertheless, the combination of APP and checklists seems to be the most suitable tool for improving animal health in the pig production chain.

Q porkchains: developing tools to standardise the assessment of sustainability in pig meat production systems – meat safety

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The Q Porkchains project has developed a standardised set of tools for assessment, under practical conditions, of sustainability of different pig meat production systems. The scope of the Meat Safety tool encompassed two categories: (1) single tools (e.g. laboratory analytical, monitoring, and statistical/safety risk tools) and (2) an integrated application (health management scheme and quality management systems). The Hazard Analysis and Critical Control Point Concept (HACCP) was identified as the most appropriate tool for Q Porkchains, as it is a preventive system to ensure food safety and aims at identification and control of potential hazards at all stages in pig production. Identification of hazards, associated risk factors, and critical control points (CCPs), and a description of an on-farm monitoring network for CCPs are required for assessment of Meat Safety at farm level. Weaknesses highlighted within this tool were a presence of farm level hazards with no obvious signs of infection, a relative complexity of developing HACCP systems at small and mixed farm levels, range of expertise needed to undertake hazard assessment of widely differing farm situations, and cost for developing and maintaining HACCP systems at the farm or grower level. Development of modules, which correspond to the HACCP principles of a successful concept implementation, will be an approach for overcoming the identified weaknesses.

Q porkchains: developing tools to standardise the assessment of sustainability in pigmeat production systems – societal conformity

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The Q Porkchains project (QPC) has developed a standardised set of tools for assessment, under practical conditions, of sustainability of different pigmeat production systems. The Societal Conformity (SC) tool aims to assess the degree to which a production system meets requirements and expectations of society. This sustainability theme has two dimensions: A) the society side - expression of the societal view on the conformity of the production system, and B) the production chain side - initiatives by the production system to reduce non-conformity / societal unease. SC is primarily determined by sustainability aspects addressed in the other QPC tools (environment, welfare etc.), but the present tool quantifies the resulting (subjective) overall judgement by incorporation of the human elements (emotions, subjective evaluations) that are not covered by the technical nature of the other tools. Meta-analysis of public surveys is the most appropriate tool to quantify the societal side of SC as it measures expressed opinions. The farm level side of SC is best met for QPC by assessing practices that are above legal standards, assessed by an inventory of use of assurance systems, as this assesses responsive behaviour. The prime weakness of the proposed tool is the national orientation of most surveys and of most QA schemes. This reduces application for across-Europe comparisons, but does allow comparisons between contrasting systems within regions.

Q porkchains: developing tools to standardise the assessment of sustainability in pigmeat production systems – meat quality

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The Q Porkchains project has developed a standardised set of tools for assessment, under practical conditions, of sustainability of different pigmeat production systems. The scope of the Meat Quality tool was to assess carcass and meat quality at slaughter. Many tools for the measurement of meat quality in pigs exist in the literature. In order to design a realistic tool based on some objective measurements, the definitive one included only aspects able to be performed by abattoirs and easily collected on line. Tools were classified into a basic and an advanced level, depending on the easiness of measurements. The first category included the determination of lean content in carcasses and the ultimate pH and electrical conductivity in loin. This basic tool would give information on carcass grading and it also would enable detection of problems of PSE and DFD. The advanced tool included measurement of the drip loss, in order to assess the muscle water holding capacity, the objective measurement of colour, the intramuscular fat percentage and carcass weight. Security measures, frequency of sampling, the equipment necessary for recording and its correct maintenance, time needed to measure and the importance of correct training of the operator were described in the elaboration of the tool. The main weaknesses of the basic tool were that an adequate training of the operator and an accurate methodology are necessary to avoid wrong measures.

Q porkchains: developing tools to standardise the assessment of sustainability in pigmeat production systems – genetic resources

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The Q Porkchains project has developed a standardised set of tools for assessment, under practical conditions, of sustainability of different pigmeat production systems. The scope of the Genetic resources tool encompassed assessment of possible consequences of breeding programmes on biological diversity, quality of products, acceptability of production, environmental impact of production, social conformity of production and economy of production. Of the ten reviewed tools, only the “Checklist for sustainable breeding schemes” presented by Wolliams et al (2005) covered most of these aspects without being too complicated for practical use. Pig breeding has a hierarchical structure and a large part of the breeding work is not performed at the farm level. Thus, the Genetic resources tool should be used to describe the entire population and how it fits into the studied production system. Questions on “social conformity of production” should be added to the checklist. A weakness highlighted was that small local populations may not belong to any breeding scheme at all. An other weakness was that the answers will include much information that a breeding organisation may not want to share with anyone outside the company. The breeding organisation must be well informed about the project so that the checklist can be used in cooperation with the organisation.

Problems and experience with predators in sheep and goat production in Slovenia

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In Slovene animal production an increase has been shown only in the population of sheep and goats in the last 30 years. The number of animals has risen from 30,000 to 160,000, mostly in the areas with limited production conditions such as the Karst and the Alpine regions. At the same time, some wild predator species like bears, wolves, lynxes and birds like ravens have been taken care of. The mentioned predators were highly endangered species some 30 years ago, because they were regarded as harmful species and therefore a target for extermination. Such trend had been previously practised in most Mid European countries. Slovenia has started the prevention measures for bears back in 1935 and for the other predators after the year 1990. However, the increased number of sheep and goats on the one hand, and better protection of endangered predator species on the other caused most conflicts and damages, primarily in small ruminants. Therefore, Slovenia introduced a number of measures both for the management of large wild animals, and for the protection of property (animals) and people that manage their farms and households in the areas where the predators are present. It is pointed out that the cooperation of all parties interested in management plans, action plans and implementation of measures regarding this collaboration is very important. The paper also presents damages caused by separate species and their frequency in time and place.

The importance of Turkish livestock guarding dogs in sheep husbandry

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The objective of this study was to determine effectiveness of Turkish Livestock Guarding Dogs for reducing wolf predation on domestic sheep.Three hundred sixty-eight Turkish sheep producers were surveyed during the years 2005 and 2006. The producers included 138 who were using Kangal Dogs, 65 who were using Akbaş Dogs, 89 who were using crossbred dogs, and 76 who were not using livestock guard dogs. The effects of breed, age and sex of dog on sheep losses caused by wolves were investigated. Moreover, whether bonding the dog with the sheep affected performance, whether the dog injured sheep, and relationships between herd size, number of dogs/herd, and number of sheep/dog versus predation rates were examined. Differences in sheep losses between dog breeds were not statistically significant. However, the proportion of dogs that injured sheep was higher in the crossbred dogs than Kangal and Akbaş dogs ($P<0.05$). Producers who used bonding had a greater advantage regarding both sheep losses and the number of injuries than producers who did not use bonding ($P<0.01$). There was a significant correlation between herd size and the number of dogs in the flock ($P<0.01$). Sex and age of dogs did not affect sheep losses. Data indicated that the use of livestock guarding dogs reduced wolf predation by 89% when flocks with guardian dogs were compared to those without guardian dogs. It is concluded that Turkish Livestock Guarding Dogs are an effective method to manage predation in Turkey.

Session 03 Theatre 3

Livestock production systems management and stray dogs attacks in and nearby protected areas

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The incidence and the damage done by stray dog's attacks in sheep have economical impact in Portugal. We pretend identify livestock management conditions that help to prevent stray dog's attacks. The results are based on inquiries relative to 29.641 ha and 50.094 ruminants. Main results: -The percentage of milk or meat farms with attacks didn't differ (61 & 68%); different levels of attacks were observed in milking and non-milking flocks in the milk farms. Specific management conditions exist in the milking flock that originates a higher flock protection (human proximity, infrastructure, night protection); -Livestock guardian dog (LGD) presence is dissuasive. Farms without LGD had more attacks (82 vs 18%); -Also livestock grazing system affects the incidence of attacks: zero-grazing without attack; semi-transhumance with one accidental attack; 20% of flocks in pendulation and 78% of flocks in permanent grazing (continuous or rotational) have been attacked. Special attention should be done to non-milking and meat flocks in order to assume specific protections solutions to reduce the damage (e-fence at night and LGD). The LGD presence gives good results, but should be complemented with other dissuasion mechanisms. The actual methods of stray dogs population control (shooting, poison and sliding knots) affects wildlife and are especially negative nearby protected areas. LIFE-COEX 04NAT/IT/000144.

Session 03 Theatre 4

What means adapting to wolf reappearance for sheep farmers in French Southern Alps

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Wolves are coming back in southern French Alps since several years. In two valleys of the Mercantour national park, they are present since 15 years. Sheep farmers have to adapt their farming systems to this presence. We realised enquiries among the sheep farmers i) to describe the strategies they adopt to protect flocks ii) to pinpoint the organisational effects that these strategies have on the pastoral system. We studied immediate and mid term effects of this presence on sheep farming systems. Sheep farms maintained on this area but due to a lack of alternatives for sheep farmers. On mid term, this carries out interrogation about maintenance of sheep farming. Our surveys also underline specific difficulties for some farming styles to adapt to these new context of production. So on mid term the diversity of farming system will be redefined. On short term, the adoption of the protection plan is a major disruption of the pastoral system. Gathering flocks into a night park in particular is negatively considered regarding local know how of farmers. The results emphasize the difficulties in conciliating the organisational flexibility needed by the pastoral ovine system with the rigidity of norms defined for the protection plan. The obligation for farmers to conform to such a plan has for consequence a loss of mastery concerning interactions between flock and grazed territory. We underline the need to overwhelm these contradictions to ensure a positive contribution of sheep farming in biodiversity conservation policies in pastoral landscape.

Public debates around the reinforcing of the brown bear population in the Pyrenees

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For numerous decades, the population of Pyrenean brown bears was declining, till a point where it was clear that the local population had no more future through its own reproductive capability. French government decided in 2005 to carry out an ambitious plan for reinforcing the population by the importation of 5 bears from Slovenia every year during 5 years. "Accompanying measures" were also planed, mainly dedicated to people in close relation with bear. They were discussed within a large public consultation with possibility of amendments. The Mission Agrobiosciences was appointed by the government for conceiving and carrying out a major part of the consultation. Three panels of 70 persons each, representative of the diversity of the Pyrenean population, were invited to discuss together in a conversational framework by groups of 10 persons during two hours, according to a "conversation guide". People generally consider it should have been preferable to put in public debate the reinforcing bear population before the governmental decision. In contrast to the opinion largely favourable, sheep mountain farmers expressed a strong and radical opposition. They are economically menaced and they feel misunderstood from the society. They contest the efficiency of the accompanying measures, namely the introduction of shepherd dogs inside the flocks, and they ask parks… for the bears and not for the sheep to protect them from the bear attacks.

Ethical aspects of conflicts arising from wildlife and farming cohabitation

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Large predators (bears, wolves, lynxes, or birds of prey) are still endemic in some European countries, or reappear as a result of spontaneous migrations or active reintroduction, and of their protection under the Bern Convention. Their presence has repercussions on wildlife as well as on human activities. On one hand, large predators contribute to the balance of the ecosystem, and may enhance the attractiveness of the region. On the other hand, they may be perceived as direct threats by the population, as competitors by the hunters, or as predators by the farmers. This situation results in conflicts between the different stakeholders, which are generally not solved by the technical measures (defence dogs, electric fences, shepherding) which may be implemented. From examples involving large carnivores taken in different parts of Europe (Spain and Portugal, Pyrenees, Alps, or Scandinavia), we examine the underlying values supported by the different stakeholders (breeders, rural population, hunters, ecologists, urban population, authorities), as well as the interests of livestock, predators and ecosystem, with the support of the Ben Mepham's ethical matrix method taking into account utilitarianism, deontology and justice. The different conceptions of the world supported by the different parties, i.e. theocentrism, anthropocentrism, zoocentrism or ecocentrism are also investigated. We finally explore how these conflicts could be resolved on the basis of the discussion ethics propounded by Habermas.

Sheep production and stray dogs attacks in Beira Interior – Portugal

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Livestock production in extensive and semi extensive systems (mainly with sheep) is faced with a high level of attacks/predation done by stray dogs, wolves or other carnivores. In the region, sheep predation by stray dogs is recognised; foxes and Egyptian mongooses also attack lambs. The incidence of attacks on livestock animals was evaluated in Beira Interior, Portugal, based on inquiries (n=156) with the last actualisation in 2007. Results show that: -In 63% of the inquired farms, with 78% of the inquired area and 76% of the total livestock, at least one attack had ben observed or attributed to the responsibility of stray dogs; -The average area and flock in farms with attacks are higher than in farms without attacks; -Incidence of dead and injured sheep: 3/inquire/year and 4,8/farm with attack/year. The legal mechanisms of dogs capture aren't efficient. As a reaction, farmers use the shooting as a control method. Other methods aren't referred, but it is possible to verify the presence of dead Livestock Guardian Dogs by poison and sliding knots. These defence methods acts not only in dogs, but as well in wild carnivore species and scavengers, limiting or blocking the hypothesis of territorial reoccupation by wolf in a region considered as a natural expansion area. EU project LIFE-COEX 04NAT/IT/000144.

Recent developments on functional and translational genomics in animal breeding: technology, experimental design, and data mining issues.

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High throughput genomic technologies, such as DNA chips for gene expression profiling and dense SNP panel genotyping, are powerful tools to further our understanding of the genetics mechanisms governing variation of complex traits, and to develop more efficient strategies for the genetic improvement of livestock and aquaculture species. The use of such technologies however poses many challenges from an experimental design and data mining perspectives. For example, transcriptional profiling studies require careful choice of animals, tissues and time points, as well as an efficient pairing strategy of mRNA samples in competitive hybridization assays. Moreover, the analysis of such experiments requires statistical tools tailored to deal with data sets of unprecedented complexity and dimensionality. Similar statistical issues arise on the application of SNP genotyping chips, for example on the identification of QTL, and on the estimation of genomic value of candidates to selection. In this presentation I will briefly review the main array platforms for expression profiling and SNP genotyping, and will discuss some statistical design and data mining issues related to the use of such technologies in functional genomics and animal breeding, such as genetical genomics studies and whole genome enabled animal selection. Especial attention will be devoted to dimension reduction techniques and non-parametric approaches targeting non-additive genetic effects.

Session 04 Theatre 2

Genomic selection: procedures and methods

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Genomic selection is based on breeding values predicted from a large number of marker haplotype effects across the whole genome. Marker haplotype effects are estimated by genome-wide breeding value estimation (GWBVE). GWBVE uses a reference dataset, that contains known marker genotypes and known phenotypic performance from typically > 1000 animals. Total breeding values for juvenile selection candidates that have no phenotypic records but known marker genotypes, are predicted as the sum of the estimates corresponding to their marker haplotypes. The main challenge in GWBVE is to estimate tens or hundreds of thousands of marker haplotype effects from a limited number of phenotypic records. Important assumptions in GWBVE involve haplotype definition (represented by alleles of one or more marker loci), the relation (linkage disequilibrium; LD) between the marker haplotypes and the underlying QTLs, and the distribution of the (underlying) QTL effects. One of the potential key issues that will determine the success of genomic selection, is the 'expiry date' of estimated marker haplotype effects. Since existing LD between marker and QTL alleles may break down in future generations, the question here is: after how many generations is the accuracy of marker haplotype too low to guarantee accurate genomic selection of young selection candidates? Answers to this question will have a major impact on the outline of breeding programs that apply genomic selection.

Session 04 Theatre 3

Genome-wide prediction of breeding values including polygenic effects

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High-throughput genotyping and availability of dense marker information have made prediction of genome-wide breeding values (GW-EBV) possible. Several models have been suggested to utilize marker information in prediction of GW-EBV. The aim of this study was to investigate the effect of including a polygenic effect into a Bayesian model for the estimation of GW-EBV. Our hypothesis was that this would increase the accuracy and reduce the bias. As a measure of bias we calculated the regression of GW-EBV on true breeding values, which is one for unbiased GW-EBV. Especially the accuracy is important as the polygenic effect may account for the residual genetic variance that is not explained by the markers. Marker densities from 1Ne/M to 8Ne/M were evaluated, where Ne is the effective population size and M is the genome size in Morgan. The accuracy for the highest marker density was 0.88, and decreased with decreasing marker density. Compared to excluding the polygenic effect, the accuracy was not significantly higher. The effect of the polygenic effect on the bias varied with marker densities.

Application of mixed models to the expression microarray data for the identification of genes responsible for the intramuscular fat content in pigs

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The goal of the study was to identify genes or gene functions responsible for differences in the contents of intramuscular fat (IMF). 14 microarrays, each representing DNA of a pigs with low and a pig with high IMF level, were available for the analysis. Those arrays contain 22,668 genes. GO annotations could be assigned for 14,534 of the genes and altogether 5,193 different GO terms were assigned. 73.98% of the genes are Homo sapiens homologues, 10.99% - Sus scrofa homologues, 10.82% are predicted genes, and the rest are gene homologous to other species. Array normalisation has been carried out by the R packages limma and marray. Mmixed models were applied for the analysis with the fixed effects comprising array, IMF level and gene function, the random effects referring to (i) an additive polygenic effect of an animal with a covariance represented by a standard polygenic relationship matrix constructed from the pedigree information, (ii) a gene/gene function effect with a covariance represented by GO annotation similarities, and (iii) a residual with a diagonal covariance matrix with the reciprocal of spot quality as diagonal elements.

Validation of genomic predictions in pigs using medium-dense marker coverage

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SNP marker genotypes were obtained using a 6K Illumina porcine bead chip on 127 boars. After edits deleting monomorphic markers and markers with minor allele frequencies <5% 3851 markers were available for analysis. Breeding values (EBVs) on boars were predicted based on growth records of progeny. Two Genomic Prediction (GP) models were used to fit and predict EBVs based on the simultaneous estimation of marker association for all SNPs. Models used were a Bayesian Hierarchical Variance Model (HVM) where SNP variances originate from one common distribution, and a Bayesian Variable Selection Model (VSM) where SNP variances originate from a mixture of two distributions. Model hyper parameters were estimated on the whole data, and a ten-fold cross validation was performed to check the ability of these models to predict EBVs left out of the data. The models fitted 78% (HVM) and 77% (VSM) of variance in the EBVs and reached a correlation to predict EBVs left out of the data of 0.51 (HVM) and 0.50 (VSM). There was an indication of some overfit because correlations improved 2% points by setting hyper parameters below their estimated values. The obtained correlations can be considered a lower bound because the data set was small, so SNP effects were inaccurate, and because only a medium-dense marker coverage was used. It was concluded that GP models are effective in real data to predict genetic levels of unmeasured animals.

Genomic selection of purebreds for crossbred performance using a model with breed-specific SNP effects

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Performance of purebred parents can be a poor predictor of performance of their crossbreds descendants. However, in crossbred populations linkage disequilibrium is not restricted to markers that are tightly linked to the QTL and the effects of SNPs may be breed specific. Both these problems can be addressed by using a model with breed-specific SNP effects. To investigate this idea, we compared models with breed-specific and across-breed effects of SNP alleles to predict purebred breeding values using F1 data. Two scenarios were considered, where two pure breeds were assumed to originate from a common population either 550 or 1050 generations ago. In both cases these breeds were used to generate an F1 with 1000 individuals. Trait phenotypic values controlled by 20 segregating additive QTL and with a heritability of 0.30 were simulated for the F1 individuals. Further, 2000 segregating markers on a chromosome of 1.5 Morgans were simulated in the F1s and purebreds separated by eight generations. A Bayesian method (Bayes-B) was used to estimate the SNP effects. With breed-specific effects of SNP alleles in the model, accuracy was similar (0.75 vs 0.73) for the first scenario but higher (0.71 vs 0.61) for the second. This suggests that when the purebred populations are distantly related including breed-specific effects of SNP alleles can give better results for genomic selection.

Reproducing kernel Hilbert spaces regression on SNPs for genomic selection: an application to broiler mortality

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Genome-wide studies and genomic selection have become topical in animal breeding recently. Questions and challenges to be addressed include choice of method of prediction of genetic values, and use of either all available SNPs or of a filtered group of markers. This work assessed predictive ability and goodness of fit of three different methods applied to late mortality of chicks, a low (0.02) heritability trait; the data were mean mortality rates of over 200 sire families from a commercial line, as well as SNP information on sires. The methods were: Bayesian genetic evaluation ("BLUP") without genomic information; Bayesian regression (BR) using 1000 SNPs randomly distributed over the genome, and reproducing kernel Hilbert spaces regression (RKHS) on 24 SNPs pre-selected with a machine learning procedure. Residual variance was lowest for RKHS, suggesting that this model captured more genetic variation. Also, RKHS regression had a better fit to the data, and 25% and 100% higher predictive ability than "BLUP" and BR, as measured by the correlation between prediction and observed phenotype.

A mixture genetic model for whole genome analysis

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Co-segregation information, in addition to Linkage Disequilibrium (LD) information, can improve whole genome selection. Linear models have been proposed for this purpose, but accommodating dominance and epistasis with linear models is not straightforward, especially for crossbreds. A mixture genetic model is favorable in this respect, but for whole genome analyses exact inference is computationally too demanding. Thus, we propose an approximate 2-step approach as follows: 1) marker and pedigree data are used to estimate probabilities for both ordered marker genotypes of founders and for descent of QTL-alleles of non-founders for possible QTL positions, and 2) trait phenotypes and estimates of step 1 are used to infer QTL parameters at these positions. A QTL fine mapping scenario was considered to test this approach. The simulated data set had 1000 individuals from 5 generations, where each individual had 20 SNP-genotypes within a 1 cM region and a phenotype for an additive trait controlled by 1 QTL with h2= 0.05. The QTL was in LD with SNPs. MCMC-sampling was used to implement step 1 and 2 of the approach. Results showed that QTL location frequencies agreed well with the pattern of LD between the QTL and SNPs in the genomic region. Moreover, distributions of individual QTL genotypes and the QTL effect were also estimated well such that the correlations between true and estimated genotypic values were higher than 0.9 for all generations.

Economic evaluation of genomic selection

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A deterministic approach mainly based on the gene flow method was used for the modelling of a conventional progeny testing program (CPTP) and different variants of genomic breeding programs (GBP) in dairy cattle. As a novel idea, the modeling of the GBP accounts for the proportion of farmers waiting for daughter records of genotyped young bulls. The ultimate evaluation criteria was discounted profit reflecting discounted returns minus discounted costs per cow in a balanced breeding goal of production and functionality. Technical and biological coefficients for the modeling were in analogy to one German breeding organization. The CPTP for 50 test bulls per year within a population of 100,000 cows served as a base scenario. Scenarios of GBPs considered the variation of costs for genotyping, selection intensities of cow sires, the proportion of farmers waiting for daughter records of genotyped young bulls, and changes in accuracies of estimated genomic breeding values (gEBV). A distinct economic advantage given that accuracies of gEBVs are above 0.70 was found for all versions of GBPs in the range of factor 1.44 to 2.76 mainly due to the essential reduction in generation intervals. Existent GBPs can be improved through the complete abdication of any forms of progeny testing. Costs for genotyping were negligible when focusing on a population wide perspective.

Accuracies of different types of MAS-EBV in the French MAS program

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The Marker Assisted Selection program based on linkage equilibrium applied in France since 2001 was shown to increase EBV accuracy. Availability of thousand of SNP allows to take advantage of LD in MAS evaluation, which should lead to further improvement of MAS-EBV. Several methods using SNP were shown to enhance breeding value accuracy. This study aims at comparing accuracies obtained with several types of MAS-EBV based on simulated and real data. A batch of 500 real young Holstein bulls that entered the MAS program was used. Genetic and phenotypic values based on the other available information before progeny testing were simulated. Based on 100 replicates, MAS-EBV using SNP haplotypes are better correlated with DYD after progeny testing than polygenic EBV. Expected gains of correlation for dairy traits range from +0.14 to +0.20. Furthermore, these young bulls recently got their first official EBV based on progeny. Correlations between DYD and MAS EBV based on LE model were from +0.02 to +0.06 higher than with polygenic EBV. These bulls are being genotyped for 60 000 SNP, thus new comparisons of correlations between DYD and improved MAS will be presented.

Incorporation of genotype effects into national animal model evaluations when only a small fraction of the population has been genotyped

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The method of Israel and Weller (1998) to estimate QTL effects when only a small fraction of the population was genotyped, was investigated by simulation. QTL effect was underestimated in all cases, but bias was greater for extreme allelic frequencies, and increased with the number of generations included in the simulations. Apparently, as the fraction of animals with inferred genotypes increases, the genotype probabilities tend to "mimic" the effect of relationships. Unbiased estimates of quantitative trait locus effects were derived by a modified "cow model" without inclusion of the relationship matrix on simulated data, even though only a small fraction of the population was genotyped. This method yielded empirically unbiased estimates for the effects of the genes DGAT1 and ABCG2 on milk production traits in the Israeli Holstein population. Based on these results, an efficient algorithm for marker assisted selection in dairy cattle was proposed. Quantitative trait loci effects are estimated and subtracted from the cows records. Genetic evaluations are then computed for the adjusted records. Animals are then selected based on the sum of their polygenic genetic evaluations and QTL effects.

A new type of genetic map: locus ordering based on pair-wise linkage disequilibrium

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Hundreds or even thousands of individuals can now be genotyped for hundreds of thousands of single nucleotide polymorphisms (SNPs.) It would be very useful if it were possible to create a locus-order map of SNPs solely from SNP-genotype data. Here, we create a Locus-Order map solely from pair-wise estimates of linkage DisEquilibrium – a LODE map – obtained from SNP-genotypes of unrelated individuals. We apply the procedure to bovine and human samples. The success depends on the level of linkage disequilibrium in a population. The procedure works very well for a cattle population (Holstein Friesian) and well for an isolated human population (Kuusamo, Finland). A LODE map can be created in species without the need to establish a set of mapping families. LODE maps are useful for SNP marker positioning, for analysis of genome structure, and can be used as a framework for genome assembly, once sufficient sequence data are available. Even for well-mapped species, a LODE map can be useful for resolving ambiguities in locus order.

Effects of GH gene polymorphism on carcass traits and hormone levels in Japanese Black cattle

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Effects of growth hormone (GH) gene polymorphism on carcass traits and hormone levels were analyzed in Japanese Black cattle with Leu-Thr (allele A), Val-Thr (allele B), and Val-Met (allele C) on codon 127 and 172, respectively. Muscle and adipose tissues (n=135) were grouped by GH genotype and sex for carcass traits analysis while 10-month old heifers were measured for GH (n=136), IGF-1 (n=141), and insulin (n=134) levels. Effects of GH alleles in steers were slight. Yet, heifers with allele A had higher carcass weight, daily carcass gain, rib eye area (REA), rib thickness (RT), subcutaneous fat thickness, and BMS. Allele B gave greater REA and RT. Allele C gave higher C18:1, MUFA, USFA percentages and MUFA/SFA and USFA/SFA ratios, and lower C16:0 and SFA percentages and melting point. Heifers with genotype AA and BB tended to have greater responses of GH release to GHRH injection compared with those with genotype CC. The basal GH level was highest in genotype CC, although basal insulin tended to be highest in genotype AA. To conclude, the effects of GH gene polymorphism on carcass traits were more apparent in heifers and hormone levels were varied among genotypes.

Allele and haplotype polymorphism of the myostatin gene (MSTN) microsatellite containing region in Latvian Blue and Latvian Brown cattle breeds

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Microsatellite containing region of intron I of the myostatin (MSTN) gene of 12 animals from each Latvian Blue and Latvian Brown cattle breeds was sequenced to extend data on the microsatellite (MS) and single nucleotide polymorphism (SNP) and to study loci and haplotype diversity within and between breeds. Only one previously unknown rare SNP was identified in Latvian Brown breed. The presence of two haplotypes defined by the microsatellite (MS) sequence motif was revealed in homozygote and heterozygote state in each breed analyzed. High level of MS length polymorphism was identified within each haplotype and evaluated as MS intrahaplotype variability. Spectrum of the fragment sizes was shown as haplotype specific, defined as interhaplotype variability and supposed could be used in MSTN gene haplotype determination in Latvian Blue and Latvian Brown cattle breeds. Eventual functional significance of MSTN intron I polymorphisms was evaluated on the transcription factor binding sites (TFBSs) and miRNA target.

Refining bioinformatic methods to locate functional DNA in the bovine genome

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Searching for functional sequence in the 3 billion bases which comprise the Bovine Genome is a huge task. Previous work showed that use of the Neutral Indel Model (NIM) identified 250,000 indel purified segments (IPS). These IPS contained ~4% of the genome and 64% of bovine exonic DNA, which was located in 85.5% of the predicted genes. This was achieved without any prior information on the function of the DNA being identified. Investigation of the remaining 36% of exonic DNA not located in the IPS suggested that much of it is in genes undergoing rapid selection and so not being highly conserved, as required by the NIM method. These genes were also found to readily accept indels without disruption to their function. Rapidly evolving genes could be located by comparing two closely related species and looking for aligned sequence which differs between the two species. In order to test this approach the human and bovine genomes were aligned using the NIM and then the short (<160bp) human IPS were compared with chimpanzee genome and segments with a low percentage identity (PID) found. These segments comprised <1% of the human genome yet contained 23% of the exonic DNA so far unaccounted for by the NIM. These new segments were then aligned with the bovine genome and 21% of unaccounted for bovine exonic DNA was found. This refinement of the NIM method was able to add to the functional DNA located but further refinement is required in order to completely identify all functional DNA in the bovine genome.

Association study of the PRL gene polymorphisms with milk performance traits in Latvian Brown cattle breed

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Bovine prolactine gene (PRL) was mapped on chromosome 23 and seems to be a potential quantitative trait locus of milk performance. Gene consists of 5 exons encoding the 199-amino-acid mature protein. Several single nucleotide polymorphisms of coding region (cSNP) have been evaluated previously as potential markers of milk performance traits. Allele frequency and genotype distribution of the exon IV RsaI site (A7490→G) was shown as associated with milk yield and fat content in Black-and-White cows. The aim of this genotyping study was to evaluate the allele's frequencies and genotype distributions of the two polymorphic loci including cSNP of A7490→G of the exon IV and promoter region microsatellite (MS) of the PRL gene in Latvian Brown (LB) cattle breed. The frequency of alleles was estimated in 100 LB cows. MS locus was presented by common allele of 160 bp, rarer of 155 bp and rare alleles of 156 bp and 159 bp. The frequencies of common genotypes were 0.72 for 160/160 and 0.23 for 155/160. Alleles G and A were detected as common and rare cSNPs at position 7490 of exon IV (allele frequencies were 0.925 and 0.075 correspondingly). The general linear model was applied to analyze allele and genotype association with milk performance traits. Data will be presented in the talk.

Changes in muscle gene expression in relation to beef tenderness and growth potential in young Charolais bulls

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Muscle biology is affected by muscle development, and also contributes to beef sensory quality. We analysed the transcriptome of Longissimus thoracis muscle from 15- and 19-month-old Charolais bull calves divergently selected for high (H) or low (L) muscle growth and which produce beef with different tenderness scores. A negative relationship between the expression of the DNAJA1 gene (which encodes a chaperone protein of the "heat shock" protein family) and beef tenderness after 14 days of ageing was identified. The expression level of other stress related proteins (especially HSPB1, which encodes Hsp27) were positively correlated with shear force. These proteins, which have an anti-apoptotic function, may potentially slow down the processes of cellular death and consequently meat ageing, having a negative impact on tenderness. Many genes were also differentially expressed between H and L animals at 15 (n=1500) and 19 months (n=851) of age. These genes were associated with muscle mass in the carcass independently of fat deposition and meat quality. About two thirds of the genes involved in glycolysis in H animals were up-regulated at both ages in H animals. In conclusion, new markers of beef tenderness were identified, and gene expression changes which occur with increased muscle growth potential are likely to be dissociated from fat deposition and meat quality.

Marker-assisted selection reduces true inbreeding in dairy cattle breeding programmes

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The objective of this study was to examine the effect of marker-assisted selection (MAS) on the rate of inbreeding in a dairy cattle breeding scheme. We examined inbreeding estimated from the pedigree (F) and true inbreeding at a QTL (IBD) when applying MAS, gene-assisted selection (GAS) and BLUP selection using stochastic simulation. A breeding scheme with selection for a low heritability (h^2=0.04) trait resembling a sex-limited health trait, one QTL and four highly polymorphic markers were considered. The markers were in LD with the QTL, which was biallelic with an initial frequency and a gene substitution effect of the favourable allele of 0.1 and 0.236. The results showed that after approx. ten years of either MAS or GAS the QTL had reached fixation and the total genetic gain was 17 and 18% higher, respectively, than BLUP. At the same time IBD and F was reduced by 6 and 36% compared to BLUP when applying MAS, and 17 and 43% when applying GAS. Selection using markers decreases the likelihood of co-selecting related animals compared to BLUP and, as a result, leads to a decrease in the rate of inbreeding. Additional results of simulations with varying heritabilities, QTL frequencies and effects will be presented as will the degree of within family selection and the founder representation.

Livestock, greenhouse gases and impact on environment

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Growing populations and incomes, along with changing food preferences are rapidly increasing demand for livestock products. While growing, the livestock production is undergoing a complex process of technical and geographical change. Livestock's land use includes grazing land and cropland dedicated to the production of feed and fodder. Considering emissions along the entire commodity chain, livestock contributes about 18% to the global warming effect; and about 9% of total carbon dioxide emissions, 37% of methane, and 65% of nitrous oxide. The latter will substantially increase over the coming decades, as the pasture land is currently at maximum expanse in most regions; future expansion will be increasingly crop-based. There are a variety of emission reduction options that can be applied at reasonable costs: a) carbon sequestration on extensively used grazing land; b) reduction of methane emissions from low input ruminant production; c) reduction of methane and nitrous oxide emissions from animal waste, through energy recovery and improved waste management.

Livestocks' Long Shadow put in perspective

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Recent publications and communications have emphasized the importance of animal production to feed the worlds' growing population. Moreover, clear statements have been communicated about the environmental pollution caused by increased animal production. Most important pollution issues include: global warming through emissions of methane and nitrous oxide, enrichment with nutrients of vulnerable ecosystems, soil, water and air pollution, and deforestation. Animal production by definition comes with losses. However, knowledge and technologies concerning mitigation options and strategies are abundantly available at least within the scientific community. One of the most promising strategies is to increase the productivity per animal, instead of focusing at an increase in animal numbers. This 'beginning of pipe' solutions are to be preferred above measures further in the production chain or 'end of pipe' technologies. There is a great need to disclose scientific knowledge and technologies for use in practice. Besides industries and science, also primary extension service and education are critical success factors to allow knowledge and technologies to successfully penetrate in practice. The paper will discuss the major environmental issues related to increasing animal production, and also ways forward to abate environmental pollution. It may put publications like Livestocks' Long Shadow in a different and more optimistic perspective.

Livestock impact on the environment: the US view

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The number of livestock units on modern US operations has sharply increased over the last 30 years while the number of operations has dropped in half resulting in a dramatic increase in the amount and geographic concentration of manure. Improper management of manure at these facilities can result in adverse impacts to both surface and ground water quality and to air quality. The primary concerns for surface water are ammonia (aquatic toxicity), organic matter (depletion of dissolved oxygen), and nutrients such as nitrates and phosphorus. Coliform bacteria and other pathogens are a concern if there is human contact with the manure residuals and animals. The primary concerns for groundwater are salts and nitrates. Although improper storage of manure can adversely impact groundwater, the greatest management concern to avoid nitrate loading of groundwater is proper application of manure to cropland. Many operations in the US do not have sufficient cropland available to apply the manure at agronomic rates. Air emissions of concern from livestock operations include ammonia, the greenhouse gases, volatile organic compounds, as well as hydrogen sulfide and particulate matter. Until recently, agricultural sources were exempt from most local air and water pollution control and permitting requirements. These regulatory exemptions are currently being lifted in many parts of the United States causing livestock industries to focus on ways to limit their impact to the environment.

Development of a software to calculate pollutant emissions, resources consumptions and best available techniques effects on emissions and consumptions from Spanish farms

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This paper describes the development of a software, supported and coordinated by the MAPA, whose objective consists in calculating the pollutant emissions into the air and water and energy consumption from Spanish farms.The structure includes all the information related to the farm that may have an effect on pollutant emissions or resources consumption from Spanish farms (location, animal census, facilities design, slurry and manure storage, and application system). The data base used to obtain the emission calculations was the same as that used in the National Emission Inventory (2003). Information regarding manure production was obtained from the Spanish legislation. To calculate pollutant emission in the productive process, the application uses a mass-balance system. The results obtained with this software are: nitrogen balance, NH3, CH4 and N2O emissions, and water consumptions, farm environmental situation report, and improvement proposals. Farmers and technicians can achieve further information about the best available techniques effect on emissions and consumptions in order to improve the environmental situation of their farms.

Livestock systems, farming styles and grasslands maintenance in Alpine areas: an on farm survey in the Belluno province, North-eastern Italy

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Changes in landscape and biodiversity in Alpine areas are strongly related to farmland abandonment. This study aims at describing the local variability of livestock production systems and farming styles, in terms of economic and environmental sustainability in the Belluno province, North-eastern Italy. The province (3676 km^2, 1323 m a.s.l. mean elevation, SD=610) offers a variety of climatic and morphological conditions and hence agricultural systems. Using a multivariate approach, based on data obtained from Official Censuses of Agriculture and Population and from Breeders Association, the 69 municipalities of the province were clustered in 3 livestock farming systems (“intensified”, “traditional”, “abandoned”). Ninety farms were selected within the systems and surveyed for structural, technical and economic characteristics as well as for nitrogen output; managed land was mapped using a GIS. Seven farming styles were identified: farmhouses, intensive beef cattle, intensive dairy cattle, traditional dairy cattle, extensive cattle and small ruminants (large and small farms). Farming styles showed a variety of strategies to enhance economic viability and revealed great differences in nitrogen output and ability to grasslands maintenance. Policies of public support that do not consider this variability in livestock systems and farming styles would be unable to balance farm income with environmental sustainability.

The effect of genetic improvement on emission from livestock systems

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Substantial genetic improvement has been achieved over recent years for a number of traits in many commercial populations of livestock. Little is know however about the effect these changes have had on emissions per unit of production, particularly emissions of methane and gaseous nitrogenous compounds. In this study, phenotypic values for average commercial broilers, layer hens, pigs and dairy cattle in the UK in 2007 were first determined through consultation with industry representatives. Genetic trends were then used to predict phenotypes for animals that were available 20 years ago and 15 years in the future if current genetic trends were maintained. The values derived were then applied in a Life Cycle Assessment model to determine relative emission levels per unit of production. The genetic improvement achieved over the last 20 years in broilers, layers, pigs and dairy cattle has resulted in a reduction in emission per unit product in all cases. Genetic changes achieved in pigs have resulted in reductions in methane, nitrous oxide and ammonia emissions of around 0.75% per year, around 1% a year in broilers and dairy cattle, whilst reductions of around 1.5% a year have been achieved for layers. It seems reasonable to assume that these rates of improvement will continue to be achieved over the next few years, and may even increase as molecular genetic tools get increasingly used.

Dispersion of bacterial emissions from broiler houses

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The air of animal houses contains large amounts of bio-aerosols which can carry viruses, bacteria, fungi, endotoxins and allergens that present a health risk for the animals and humans working in this atmosphere. Little is known about the dispersion of bio-aerosols in the environment and their effects on residents living in the neighbourhood. Measurements of airborne bacteria were carried out inside of broiler barns and in different distances down-wind the building and at a control point using impingement (AGI 30). The travel distance of the micro-organisms in the ambient air is highly influenced by the prevailing meteorological conditions (e.g. wind speed, direction, turbulence), the strength of the source (emission amounts) and the tenacity of the micro-organisms in an airborne state. Bacteria (predominantly staphylococci) were found in concentrations of several 1000/m³ about 500m down-wind a barn and were identified by PCR as originating from that specific source. The dispersion data were nicely fitting to a Gaussian dispersion model. Staphylococci seem to be useful indicator bacteria to estimate the travel distance of airborne bacteria from broiler houses and can help to define “safe distances” between animal houses and between animal houses and residential areas.

Assessment of effects of methane inhibitors in ruminants

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Methane (CH_4) is considered as a very important greenhouse gas with a warming potential of about 23 x CO_2. About one third of the global CH_4 comes from the digestive tract of ruminants. Therefore research activities are initiated to reduce the CH_4 – emission from the rumen. The effect of various feed additives such as phytogenic substances (e.g. tannins, saponins, extracts from onions or garlic), plants or parts from plants, propionate precursors (e.g. fumaric acid, acrylic acid) or other chemicals (e.g. halogenic derivates) on CH_4 production was tested mostly in in vitro studies (e.g. Rusitec). For our understanding in vitro studiesare insufficient to assess the CH_4 inhibiting potential of additives, because feed intake, adaptation processes of the rumen microbes as well as animal performance, animal health and the quality/safety of food of animal origin are not considered. Therefore we propose the following three stages for assessing the CH_4 inhibition potential in ruminants: 1. In vitro screening of various substances 2. Studies in target animals (28 – 56 d) with the most efficient substances on their effects on feed intake, rumen fermentation incl. CH_4 – emission 3. Long- term studies (one lactation period, total growing period etc.) in target animals to measure animal performance (feed intake, yields, feed conversion), animal health and quality/safety of milk/meat; measuring CH_4 emission and parameters of rumen fermentation during the experiment (adaptation of microbes).

Are there environmental benefits from feeding pigs with peas?

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Currently the protein supply of pigs is mainly covered with soya bean meal from overseas. We assessed the environmental impact of replacing soya bean meal with European grain legumes in the feed for pig production in Catalonia (ES) and North Rhine-Westphalia (DE) using life cycle assessment (LCA). There were no overall advantages from the feed alternative containing European grain legumes. For example in Catalonia, eutrophication potential was higher due to high NO_3-losses in connection with the cultivation of peas. However, energy demand from transport was reduced by 16% to 19%, and in the case where the feed was produced locally, the reduction amounted to 80%. Conclusively, the use of grain legumes produced in Europe decreased the environmental impact from transport, especially when using locally produced feed, and from land transformation compared with imported soya beans. However, the results are even more influenced by the choice of the replacing feed ingredients. These factors should be considered in formulating the feedstuffs. Measures have primarily to be taken to reduce the environmental burden of the feedstuff production, but also optimising animal husbandry and manure management should be aimed for.

Reduction of phosphorus excretion optimizing dairy cows' supplementation

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Phosphorus excretion in cattle farms is raising importance as criterion of environmentally sustainable livestock farming, so a study was carried on in several commercial farms in North-West of Italy to evaluate P excretion by the P balance method, the adoptable strategies to reduce P excretion, so as the possible relationship between P intake and cows' fertility. In 15 dairy cows' herds (1790 heads) feeds consumption, mineral supplementation, cows live weight, cows production (weight gains, born calves and milk production) and reproductive indexes (delivery-conception period, number of birth per year, number of insemination per conception) were recorded. Feeds samples were collected and analysed. P requirements, intake, absorption and excretion were calculated. The lactating and dry cows' mean requirements were respectively 79.96 ± 8.39 and 36.08 ± 0.97 g/d, but the P intake for the same groups were respectively 96.50 ± 20.11 (+ 22%) and 43.68 ± 10.48 g/d (+ 21%). The estimated P excretion was 22.07 ± 2.99 kg/head/year and 2.37 ± 0.28 g/year/kg of milk. The reduction of P intake is possible considering the amount of purchased P in the diet: 49% and 32% respectively for the lactating and dry cows. No statistical correlations were found between P intake and reproductive indexes. This gives the possibility to reduce the amounts of P imported into dairy cattle units as purchased feedstuff and supplementation, with the aim to achieve a P balance equals zero and a reduction of P excretion.

Occupational exposure to airborne micro-organisms and endotoxins in four housing systems for laying hens

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With the move to alternative housing systems for laying hens in the EU (1999/74/EC), in order to improve animal welfare, new systems have been introduced which allow the birds more free movement than in the former battery cages. However, little is known about the air pollution in these systems and the possible health effects on the people working in these atmospheres. Airborne micro-organisms and endotoxins were monthly measured during the course of a year using impingement (AGI 30) in four different housing systems: a floor keeping system (F), a usual aviary (A), a floor keeping system with outdoor-access (FO) and a furnished cage system (C). The concentrations of mesophilic bacteria ranged from 1.9×10^4 (C) to 6.7×10^6 (F) CFU/ m³. Staphylococci showed a very similar range from 1.3×10^4 (C) to 6.1×10^6 (F) CFU/ m³. The quantitative distribution of haemolysing streptococci, enterococci, actinomycetes and moulds among the 4 systems followed the same order but in much lower concentrations. Highest concentrations of endotoxins were regularly found in (F) (about 4000 EU/m³), followed by (A), (FO) and (C) (about 1000 EU/m³). The results indicate an urgent need for improving the work environment of farm workers e.g. by breathing masks in order to prevent negative health effects.

Nitrogen impact in grazing dairy farms

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The milk production, based on a annual rotation grazing system, is the pillar of the economy of the Azorean primary sector. In the last few decades a trend for a system of more intensive Dairy cattle production sector has been verified; this system uses larger stocking rates and productions. This intensification leads to risks with harmful effect for the environment. With this work we study, in 15 milk farms of Terceira Island, the problematic of the outputs of nitrogen and the urea in milk. It was also studied the kinetic of the ruminal degradation of the dry matter and the crude protein of pastures with 4 different levels of protein (14.9; 19.1; 22.9 and 26.9%). Three levels of nitrogen fertilization were used: low – Less than 40 units, medium - between 40 and 75 units and high- more than 75 units. The stocking rates were 1.7, 1.8 and 2.0 cows/ha and productions per cow/year of 5492, 6289 and 6336 kg for the low, medium and high levels, respectively. The results of CP in pastures were 20.3, 24.3 and 25.1%. Significant differences was observed ($p<0.05$) between the results of milk urea for the high level of fertilization (29.0%), in relation to the medium level (23.1%) and de low level (21.8%). In this study it was concluded that the nitrogen fertilizations leads to a higher values of pasture CP and milk urea, however there was no significant difference among the amounts of nitrates and ammonia in the soil.

Monitoring of heterogenous substances in milk and in cow-barn environment

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The objective of study was to monitor residues of heavy metals (Hg, Cd, Pb) in milk, feed ration, water, and separate of faeces in dairy farm. Milk samples were analysed as daily mixed samples of whole herd and as a samples from different stages of lactation too. Every component of feeding ration was analysed – straw, alfa-alfa hay, grass hay, corn silage, alpha-alpha silage, draft, waste brad, and supplement concentrates. The analyses of pure separate of faeces, separate of faeces mixed with sawdust, and well water were made too. Hg was determined in analysed samples of corn silage 2 times in excess level, 5 times in acceptable level and in remaining cases under limit value. Under limit value of Hg contents were found in milk and well water samples too. Two samples of feed ration were in non-detectable level and other samples were under limit value in case of Cd determination from feed rations, milk and well water together. Pb was detected in non-detectable values in all analyses (feed, milk, water). The analyses of Hg content were performed in AMA 254 equipment (Advanced Merkury Analyse) and Pb and Cd content analyses were performed with usage of AAS (Atomic Absorption Spectrophotometry).

Meteorological variables can be used to predict nitrogen volatilisation from dairy cow manure during housing and short-term storage

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Nitrogen volatilisation losses (Nvol) from dairy cow manure were measured between excretion and the end of short-term storage in buried-uncovered tanks and related to environmental, animal and structural factors. Nvol were measured in four free-stall barns, whose alleys were scraped twice per day, of lactating dairy cows in Sardinia (Italy) for 12 months between 2006 and 2007. Nvol were calculated as N excreted minus N residual in manure. N excreted was equal to "N in feed – N in milk" and N residual in manure was calculated as "volume x N concentration" of the manure produced within each tank filling cycle (n=47). Mean N excretion was 418 ± 54.1 g/d (mean ± SD) per cow. Mean storage length was 19.8 ± 11.8 d and mean air temperature (T_m) varied from 8.1 to 28.1 °C. In the studied area, measured Nvol were, as annual mean, 43.3% of N excreted and were not significantly affected by farms. Nvol were positively ($P<0.01$) correlated with T_m ($r = 0.76$), global radiation per unit of surface ($r = 0.60$) and storage length per unit of tank surface ($r = 0.24$). Rain decreased Nvol in hot seasons ($P<0.01$). Nvol were negatively ($P<0.01$) associated with relative humidity ($r = -0.76$), milk yield ($r = -0.37$), milk N ($r = -0.42$) and N utilization efficiency ($r = -0.68$). T_m alone explained most of the variability and can be used to predict Nvol (Nvol, % of N excreted = 1.39 x T_m + 18.51; $R^2 = 0.58$) in the temperature range considered.

Survey of the protein balance in diets for dairy buffalo herds

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The aim of the work was to study the feeding systems commonly used in dairy buffalo herds and optimize the balance of the diets in order to minimize the nitrogen excretion. In 98 buffalo herds, located in the centre and south of Italy, protein and energy levels of foodstuff administered to lactating buffaloes were analysed, as well as milk performance traits. The considered parameters were: herd size, farm extension, dry matter average daily intake (kg/head), crude protein (CP kg/head/d) and energy level (Milk FU/kg DM) of the diets, milk yield (kg/head/d) and composition (protein and fat %), lactation length. The ratio n°of animals/ha (D) ranged from 0.6 to 6.7 (mean 3.1±1.8). In each herd, the difference (ΔCP) between the CP content of the administered diets and the requirements of the lactating buffaloes, calculated on the basis of the daily milk production, was assumed as index of balance of the diets. So a threshold value of CP required for milk production was established and the herds were divided in 3 groups according to the estimated ΔCP: a) 34.7% showed balanced diets (ΔCP ranging from -100 to +100g/d; |mean|=48.5±31.2g/d) D=2.5±2.6 b) 23.5% showed lack of protein (ΔCP ranging from -961 to -101g/d; mean=-417.0±242.1g/d) D=3.5±2.8 c) 41.8% showed protein excess (ΔCP ranging from +101 to +2292g/d; mean=470.6±468.8g/d) D=3.3±2.8 A substantial protein excess was evident in 41.8% of the herds.

Analysis of seasons of ammonia nitrogen, dust emission and microbiological air pollution in duck houses

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The aim of work was to determine the emission of ammonia nitrogen, the pollution of environment by dust and micro organisms, to evaluate the conversion of alimentary stuff into the weight adding and the remaining in manure. The birds were kept inside in groups for 450-700 on littered floor. Mature birds had the seasonal possibility to go outside to barnyard. It was determined that the total number of bacteria in air of poultry houses where ducks were kept on littered floor was 89066±16050. It did not depend on season. Statistically reliable direct correlations were determined between the number of conditional animals (1 AU = 500 kg of alive weight) in the premises and E. coli, the amount of spores of mould fungi in the air of duck houses (respectively $r = 0,58$, $P < 0,05$ and $r = 0,68$, $P < 0,01$). The concentration of spores of mould mushrooms in air was less when the relative humidity of premises was higher ($r = - 0,75$, $P < 0,05$).When feeding ducks by combined full - rate feed, mature ducks assimilated 16,47% of nitrogen from feed for the production of eggs and weight adding; the ducks breaded for meat assimilated 22,35%of nitrogen AU^{-1}. High correlation dependence on the intensity of ammonia emission in the duck house and air temperature in the premises was identified ($r = 0, 89$, $P< 0,005$).

Intensity of microbiological changes in composted fur animal manure and their relationship to ambient thermal conditions

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The aim of the study was to determine the intensity of microbiological changes in composted rabbit and mink manure with organic additives and their relationship to ambient thermal conditions. A total of 3 replicates (each 6 months long) were carried out in the spring-summer and autumn periods for each species (rabbits and mink). In replicate I, internal temperature of the mixtures increased in the initial stage of composting. The highest increase in the temperature of composted mixtures was found in groups 4 and 7 (28 °C). In most mixtures, the maximum temperature was 26 °C. These values are evidence of the mesophilic stage. In replicate II, the increase in internal temperature in the initial state of composting was proportionate to ambient temperature. In the later period, the mixtures in groups 9 and 10 increased rapidly to reach a thermal maximum of 49 °C and 53 °C. This shows that thermophilic microflora became active. An initial thermophilic stage occurred in replicate III and the internal temperature of mixture 9 reached 45 °C. It is recommended that the composting of mink and rabbit excrements should be lengthened to enable the activation of thermophilic microflora and to eliminate pathogens from the mixtures.

Emission of harmful gaseous components and reduction in biogenic potential of composted chicken manure

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The aim of the experiment was to improve the fertilizing properties of manure and to reduce its biogenic potential using composting based on mineral and organic additives. Another objective was to determine the emission rate of NH3, CO2 and CH4 released during manure composting with additives. We investigated thirteen types of composting mixtures, produced using mineral and organic modifiers and based on chicken excrements collected from caged Isa Brown layers that received DJ feed. Gas emission measurements showed that most NH3 formed in the compost mixture containing manure, peat and earthworms (485 g). Most CO2 was released by a mixture containing manure and peat without modifiers (3750 g). The emission rate of CH4 was minimal, which is understandable given the aerobic conditions that prevailed in the containers for most of the maturation period. The highest reduction in nitrogen concentration was obtained for the compost mixture containing manure, straw and Humokarbowit. Ammonia emission accounted for 40% of this reduction. In terms of the changes in phosphorus content, the highest reduction was found for manure with Biosan (98.6%) and for manure with sawdust and Biosan (73.9%). The high rate of ammonia emission is not tantamount to a considerable reduction in nitrogen content. It is possible to considerably reduce the biogenic potential of manure while keeping the rate of ammonia emission low.

Substituting soya bean meal with faba beans: what are the environmental impacts in milk production?

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A case study on the milk production in Devon and Cornwall (UK) was performed in order to assess the environmental impacts of substituting soya bean meal from overseas by European faba beans and peas in the concentrate feed of dairy cows. We used the life cycle assessment (LCA) methodology, which is a system approach including all processes and production steps up to the farm gate. Even though 70% of the dairy cow feed is forage feed, it is the cropping, processing and transport of the concentrate feed's ingredients that account for most of the environmental impact, i.e. from 30% to 98% according to the impact category. The alternative feeding system using European grain legumes required less energy (-9%), had similar results for eutrophication and acidification potential and had a tendency towards favourable results for ecotoxicity (-3% to -18%) compared with the soya bean meal feeding system. As concentrate feeds contribute largely to the environmental impacts of milk production, an environmental feed optimisation would help to select environment-friendly feedstuff and to minimize overall environmental impacts of milk production. The choice of the appropriate feed ingredients is decisive for the results of the production system.

Environmental impacts of introducing European grain legumes into broiler and laying hen feed in Brittany (France)

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Today, more than 75% of the protein rich feeds for animal production in the EU are imported, mainly as soya beans or soya bean meal from overseas. Two case studies, situated in Brittany, have been performed to assess the environmental impact of introducing European grain legumes into broiler and laying hen feed using the life cycle assessment (LCA) methodology. In addition, a feed alternative, containing higher amounts of synthetic amino acids (SAA), was studied for broilers. The use of soya bean meal in broiler feed led to negative effects on energy demand (+6%) and global warming potential (+12%) due to transport and land transformation. The main advantages for the SAA alternative were on global warming potential (-9%) and ecotoxicity (-29% to -36%). For egg production, the alternative containing European grain legumes had positive effects on the resource-driven impacts (-5% to -9%), similar effects on the nutrient-driven impacts and negative effects on terrestrial ecotoxicity (+24%), due to lambda-cyhalothrin use in pea cultivation. The case studies showed that replacing soya bean meal by peas and faba beans in chicken feed did not bring an overall environmental advantage. Since the nutritional properties are different, the whole feed formula had to be changed. By including environmental criteria in the optimisation models, an overall improvement could probably be achieved.

Comparison of the mass balance method with the N to P ratio marker method to estimate nitrogen volatilisation in dairy cow barns

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Estimates of N volatilisation (Nvol) carried out with the well-established but laborious mass balance method (MB) and with the simpler N:P ratio (N:P) method were compared. The Nvol was determined from the moment of excretion to end of short-term manure storage, done in buried-uncovered tanks, in 4 dairy cow free-stall barns of Sardinia for one year. With the MB method, Nvol was calculated as excreted N minus the N residual in the manure, estimated by measuring the total volume and N content of the manure produced within each tank filling cycle. With the N:P ratio method, Nvol was estimated based on the difference between the estimated N to P ratio (N:P) of fresh excreta and the measured N:P in stored manure. The mean storage length was equal to 19.8±11.8 d. Nvol was affected ($P<0.01$) by seasons but not by farms. It was correlated ($P<0.01$) positively to air temperature and THI, and negatively to relative humidity, N utilization efficiency, milk yield, and manure N content. The correlations were higher when the MB method rather than the N:P method was used. Estimates of Nvol by the two methods studied did not differ among farms, classes of temperature or seasons (mean of the 4 farms: 44.5% vs. 43.3%, for the MB and the N:P methods, respectively; $P>0.1$). Overall, the N:P method was sufficiently precise and accurate and should be preferred, since it is less laborious than the MB method, for applied measurements.

Antibacterial activity of 4 essential oils in a broth dilution test

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Recently essential oil sprays were recommended as a new approach to reduce airborne micro-organisms in animal houses. The antibacterial activity of such oils from *Mentha arvensis* (Mea), *Malaleuca alternifolia* (Ma), *Cymbopogon citrarus* (Cc), *Zingibe officinales* (Zo) was tested on 2 Gram+ (*S. aureus*, *E. faecium*), 3 Gram- (*Ps. aeruginosa*, *E. coli*, *P. mirabilis*) species and the yeast *C. albicans* using a broth dilution method. Standard bacterial broth cultures were mixed with different concentrations of essential oils in steps from 0.5; to 50% in order to determine the lowest effective antibacterial concentration. The oils showed a very wide spectrum of antibacterial activity. Concentrations of 0.5% of Ma reduced total bacterial counts of *E. coli* and *P. mirabilis* to below 1%. 5% inactivated *Ps. aeruginosa* and *E. faecium*, for *Staph. aureus* 8% were necessary. High antibacterial activity was also revealed for Cc with bactericidal concentrations of 0.8% (*E. coli*); 0.5% (*P. mirabilis*) 2.0% (*E. faecium*); 5% (*Ps. aeruginosa*) and 8% (*S. aureus*). *C. albicans* is highly sensitive for Ma (0.5%), Cc (0.5%) and Mea (0.8%). It seems that essential oil-water mixtures may be a promising alternative to air disinfection. More experiments are necessary to verify the effectiveness and to assess occupational and animal health aspects.

Global market review of functional foods: forecasts to 2010

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Todays market for functional food is enormous. Currently estimatesconsider that the strictly defined functional food & drinks market ofdeveloped countries represented $16.1 billion and broadly-defined was$36.2 billion (Leatherhead, 2005). 3 main categories of these foodsexist - Supplements or pills, Food with added functional ingredients andFood or milk produced from animals improved by the way in which theseanimals have been raised or fed. Materials commonly used includeProbiotics. Immunobiotics, Nucleotides, Selenium Yeast, Chelates,Prebiotics, Omega-3, Herbal and Plant extracts, Essential oils. Thehealth benefits of such foods for the consumer is the subject of mediaand scientific speculation, and the regulatory environment is not welldefined but the price premium which such products command must beappreciated by agriculture and used to attain more value-added inmarketing food and milk products.

Functional food from animal origin: Refinement of nutrition or a padding for the market?
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According to FUFOSE (1998) food can be regarded as "functional" if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects in a way which is relevant to either an improved state of health and wellbeing and / or the reduction of risk of disease. In Europe, an official definition of functional food (FF) does not yet exist. The responsible EU organizations have collected the possible claims for FF and will develop a positive list until 2010. Food from animal origin (milk, meat, eggs) can be regarded as a normal part of the European standard diet. Therefore as such it cannot be regarded as FF although it contributes, depending on the amount eaten, significantly to the supply of many essential nutrients (amino acids, fatty acids, vitamins, minerals). In recent studies a mean meat supply of 130 g/d contributed only to 9% of energy intake, but to 28% of protein and 18% of fat intake. For available iron and zinc the corresponding values amounted between 10 – 30% and 32 – 56%, respectively and for selenium even 37 – 63%. The contribution of the vitamins B1 and B2 was lower and amounted to 25% and 10%. The losses during cooking are not considered in these calculations. On the one hand it is possible to change the nutrient content of food from animal origin in order to reduce undesired properties like total fat content or the amount of saturated fatty acids. On the other hand selected nutrients can be enriched thus improving health state or wellbeing.

Utilizing functional feed ingredients for food-producing animals
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Consumers expect their meat, milk and eggs to be free of microbial and chemical hazards, and to come from healthy animals. The challenge of keeping populations of animals healthy is exacerbated by strategic reductions in the use of antibiotics, which are powerful prophylactic and therapeutic agents. The most important health technologies concern animal management (e.g. all-in/all-out animal flow), biosecurity, sanitation and vaccines. However, it is increasingly clear that certain feed ingredients (functional feeds) or other feed technologies can make important contributions to maintaining animal health. The industry now has available a rich supply of such functional feeds. Most of these functional feeds appear to provide their benefits through either modifying the microbial populations of the digestive tract or influencing the immune system. A few examples of the functional feeds used around the world are mannan oligosaccharides (e.g. Bio-Mos), spray-dried animal plasma, milk products, zinc oxide, acids, probiotics, competitive exclusion cultures, immune egg products and essential oils. The potential roles of various types of dietary fiber are controversial. All of these issues must be considered in the context of the core responsibility of agriculture, which is to provide enough high-quality food to properly nourish all of the people of the world, and to do so with the earth's finite resources. Functional feeds can contribute to meeting that responsibility.

Utilizing functional feed ingredients for pre-harvest food safety strategies

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The success of an animal operation is dependent on optimal functioning and health of the animal's intestinal tract. Intestinal health influence growth performance of animals. In addition, poor intestinal health is associated with animal infectious diseases and enteric foodborne pathogen colonization. The increased concern toward food safety has resulted in a strong push to reduce the occurrence of foodborne pathogens at the farm level and, therefore the development of new pre-harvest food safety measures. The intestinal microflora is an integral part of the digestive system of all animals. Like all living organisms, they have nutritional and environmental requirements. Since bacterial species differ from each other in relation to their substrate preferences and growth requirements, the chemical composition and structure of the digesta (consequently the diet) largely determines the species distribution of the microbial community in the gastrointestinal tract. Several strategies have been proposed as a mean to manage intestinal health through diet formulation. Novel nutrition based strategies have evolved to successfully reduce pathogens in meat, milk and eggs based on immunobiotics, functional oligosaccharides, probiotics, organic acids, enzymes and competitive exclusion cultures. The addition of these materials to the diet allows increase of animal productivity and welfare, and decrease the potential for contamination of animal products for human consumption.

Antioxidants and Se: functional feeds for farm animals?

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Hippocrates' observations on the relationship between health and food choices initiated discussions about the factors determining our health many centuries ago. The effect of nutrition on human health has received substantial attention, and even 'traditional' medicinal philosophies that state that diet and nutrients play only limited roles in human health is being revised. In most developed countries nutritional practices have changed the focus from combating nutrient deficiencies to addressing nutrient requirements for maintaining good health throughout life. From the many food ingredients commonly present in our diet, natural antioxidants are considered particularly important. Antioxidant protection is vital for either prevention or substantial reductions in the damage caused by free radicals and products of their metabolism. Food provides a major source of natural antioxidants for humans, including vitamin E, carotenoids, flavonoids and selenium (Se). It was shown that optimal doses and forms of natural antioxidants in farm animal and poultry diets have a double benefit: maintaining optimal animal health and high meat and egg quality for human consumption. Se-eggs are perfectly suited for the category of functional foods. A single egg can deliver 50% RDA in Se and since most of European countries are Se-deficient, this could have additional benefits, beyond those provided by normal eggs. Indeed, Se-enriched eggs are produced commercially in more than 25 countries worldwide.

Comparison of using organic and inorganic selenium supplements for producing selenium enriched milk and cheese in dairy goats

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Four concentrates supplemented with different Se sources (SS, sodium selenite; SP, Sel-Plex® CNCM I-3060) and Se contents (control, 0.039; SS, 0.418; SP-1, 0.423; SP-2, 0.548 mg/kg DM), were fed to 28 Murciano-Granadina dairy goats (7 goats/group) for 120 d during lactation. Ration consisted of concentrate (0.72 kg DM/d) and a forage mixture ad libitum (65% fescue hay and 35% alfalfa pellets) poor in Se (0.087 mg/kg DM). Feed intake and FCM-3.5% yield did not vary between goat groups. Supplementation of dietary Se dramatically increased ($P < 0.001$) the Se content in milk (control, 9.2; SS, 13.8; SP-1, 19.5; SP-2, 39.7 ng/g) and cheese (control, 61.0; SS, 99.5; SP-1, 159.5; SP-2, 367.5 ng/g). Passage from feed to milk and cheese was related to casein and keratin contents and was more efficient, for the same Se daily dose, when the selenized yeast form (SP) was used. Se speciation indicated dramatic increases in selenomethionine and selenocysteine contents, which were greater in milk and cheese of SP diets ($P < 0.001$). In conclusion, organic Se was more effective than inorganic Se for increasing Se content in milk and cheese of dairy goats, indicating a greater bioavailability of Se from selenized Saccharomyces cerevisiae CNCM I-3060 and the possibility of producing Se enriched goat milk and cheeses as functional foods.

Long-chain PUFA from animals: do they have a role in human nutrition?

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Certain polyunsaturated fatty acids (PUFA), particularly conjugated linoleic acids (CLA) and n-3 PUFA, are considered to have significant positive impacts on human health. Therefore, these PUFA are nowadays often used as indicators for physiological food quality. However, for CLA, most available data for their anti-carcinogenic effect and for effects on lipid metabolism, counteracting diabetes and obesity, are obtained from animal models or tissue cultures, and evidence for these effects in humans is still lacking (Silveira et al., 2007). For the important role of long-chain n-3 PUFA in the prevention of cardiovascular diseases, but also in the development of the central nervous system, high evidence is given (Sinclair et al., 2002). The interesting fatty acids in this respect are C20:5n-3 and C22:6n-3. Animal products, however, provide mostly C18:3n-3. Whether C18:3n-3 is elongated in human metabolism to the necessary degree, is not yet clear, but cannot be totally rejected (Burdge and Calder, 2005). Since the green parts of plants contain high amounts of C18:3n-3, a shift of the animals' diet from grain and corn to leafy forages as well as the use of certain oilseeds, may cause considerable increases of n-3 PUFA in meat, eggs, and milk of different species. In monogastrics, particularly in rodents, this increase can include C20:5n-3 and C22:6n-3. In ruminants, the microbial biohydrogenation of PUFA in the foregut is limiting. The topic still provides questions for challenging research.

Food of animal origin as "Functional Food" - potentials and limitations using the example of iodine

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Foods of animal origin contain energy, amino acids and many further essential nutrients and contribute substantially to optimal human nutrition. The concentration of many trace elements such as iodine (I), selenium (Se) and of fat soluble vitamins in food of animal origin may be influenced by feed supplementation. Such foods can be considered as "Functional Food". Therefore animal nutrition may substantially contribute to avoiding deficiencies in human nutrition. On the other hand the Tolerable Upper Intake Level (UL) of some nutrients (e.g. I, Se) is only three to five times higher than the human requirements. Such nutrients belong to the risk category "High". Hence for reasons of consumer protection animal nutritionists have to consider the UL of some nutrients, belonging to the risk category "High" and characterized by high transfer rates from feed into food of animal origin; e.g. iodine transfer from feed into eggs and milk amounted to 10-30%. Food safety in this connection means to contribute to human demand, but to avoid excesses of some nutrients. It seems to be nearly impossible to label the nutrient content of milk, meat and eggs for consumer information. Therefore animal nutritionists have to reevaluate the ULs of nutrients of the risk category "High" in feed and to consider their content in food of animal origin and the intake by humans to assess the human exposure.

Angiotensin I converting enzyme-inhibitory peptides in Asiago d'Allevo cheese

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Asiago d'Allevo (AA) is an Italian PDO cheese produced with raw skimmed milk and ripened from 6 to 18 months. This study aimed at evaluating the Angiotensin-I-converting enzyme (ACE)-inhibitory activity (IA) of water-soluble extracts (WSEs) from AA cheeses. The samples analysed were obtained from milk produced by cows fed with a total mixed ration or alpine pasture plus concentrate and ripened for 6, 12 or 18 months. WSEs were ultrafiltrated onto 10000 Da cut-off membrane and subsequently onto 3000 Da cut-off to obtain small peptides which probably make a considerable contribution to ACE-IA. This bioactivity was determined with a rapid in vitro enzymatic test. Values of ACE-inhibition were submitted to ANOVA considering also the peptide concentration tested as covariate. Preliminary results showed no differences among ripening groups while the concentration of peptides resulted statistically significant ($P<0.05$). In addition, the interaction between ripening and feeding system was also statistically significant. This finding suggests that alpine grazing condition influences microbial enzymes activity and the derived biopeptides. Furthermore gastro-intestinal digestion will be simulated in order to evaluate whether digestive enzymes generate peptides with high ACE-IA.

Transfer of iodine from animal feed into pork and milk

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Millions of people worldwide still suffer from iodine (I) deficiency. Besides salt iodination, I is added to animal feed to concentrate it in food of animal origin (milk, eggs, meat). Otherwise an excessive I intake of men should be avoided. Objective of the studies was to evaluate the I content of pork, other edible pig fractions and milk at various feed I supplementations. Seventy rearing pigs, divided into 5 groups, were fed diets supplemented with 0, 0.5, 1, 2 and 5mg I per kg diet. I was determined in muscle/fat, innards/blood and in the thyroid of four pigs of each group. In the second experiment 32 dairy cows were divided into 4 groups. Two groups received feed with rapeseed meal, the others without. In each case half of the animals received feed supplemented with I in the form of KI the other half as $Ca(IO_3)_2$. In consecutive periods of 21 days each I supplementations of 0, 0.5, 1, 2, 3 and 5mg/kg DM were tested. The highest tested I supplementation increased the average I content in the muscle/fat fraction up to 17.1µg/kg and in milk up to of 1522 µg/kg in cows fed without rapeseed meal and up to 671µg/kg in cows with rapeseed in the ration. The I content of pork, and consequently its contribution to human I supply (~1%), is very low, even at high supplementation of feed while the milk I concentration increases intensively with rising I content of feed and even may lead to exceeding the Upper Levels in human nutrition.

Selenium status in Ukraine: food for thoughts

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Selenium is shown to be an essential component of at least 25 selenoproteins participating in regulation of many physiological processes in human body. However, in many European countries Se deficiency is a common cause of concern and finding a solution for this global problem is of great importance for health professionals and scientists. In this relation Ukrainian situation is very complex. From the analysis of available data and our own research it is clear that Se status of Ukrainian population is suboptimal and needs to be improved. Indeed Se level in feed ingredients produced in Ukraine is quite low being in most cases below 0.1 ppm. Similarly, the level of selenium in plasma of volunteers living in the Kiev area of Ukraine (55 - 81 ng /ml) was also low reflecting Se inadequacy in the diet of Ukrainian population. There are several ways of solving this problem, including usage of Se supplements. However, it seems reasonable to suggest that production of Se-enriched food, including Se-eggs, Se-meat and Se-milk, could be a valuable option for Ukraine. Indeed, this technology is already tested and first Se-eggs and Se-chicken products are sold in Ukrainian supermarkets and it is just a matter of time when consumers accept this approach and these products will find their way from niche market to main stream.

Changes in the nutrient composition of meat between 1990 and 2006 in Switzerland

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The knowledge of the nutrient composition is a basic requirement for the correct evaluation of the nutritive value of meat and its assessment of the suitability in human nutrition. In public, meat and meat products are often recognized as rich in fat and other undesired substances like cholesterol, saturated fatty acids or medical residues. A regular survey of the composition of meat is therefore necessary. Changes in the nutrient composition can be expected because of the genetic and feeding improvements as well as different trimmimg habits. In 1990 Mannhart and Wenk developed a Swiss Meat composition table. After 15 years Gerber et al (2006) revised the existing table and expanded the number of meat cuts as well as analyzed nutrients. In total 420 samples were considered and 23 parameters analyzed. The most evident changes in the nutrient composition of meat are found for the fat content and the fatty acid profile comparing data from 1990 with current data. Fat reducing techniques have allowed a substantial reduction of fat among the muscle fibres (intramuscular), laid down between the muscles (intermuscular), under the skin (subcutaneous) and in the body cavities (visceral).. Lean meat shows in most cases a favorable fatty acid composition. Already moderate meat consumption contributes substantially to cover the requirement of essential nutrients.

Grazing lucerne improved the nutritional value of in meat from yearling bulls

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In Mediterranean countries calves are mainly fed intensive diets, but alternative systems have to be sought because consumers demand healthier products. Lucerne could be used in calves' diets but it might affect the fatty acid (FA) profile and sensory attributes. Three diets were tested in calves (initial weight, 224 kg) until slaughter at 450 kg. Seven calves were fed concentrates ad libitum (CON), 7 calves grazed in lucerne paddocks +2 kg/d barley (LUC) and 7 calves had the same management as LUC calves for 3 months and they were finished on concentrates for 2 months (LUC+CON). The day after slaughter, 1 steak of the LD. muscle was removed for FA analysis and another steak, aged for 6 days, for an 8-member panel test. There were no differences in Saturated FA (SFA) but Monounsaturated FA was greater in LUC+CON and CON calves than in LUC calves (34.1, 35.7 and 30.3%, respectively). LUC calves had greater Polyunsaturated FA (PUFA) than their counterparts (13.3, 8.2 and 7.1, respectively). Consequently, LUC calves presented the greatest PUFA:SFA. Moreover, n6:n3 ratio was greater in CON calves, intermediate in LUC+CON calves and lesser in LUC calves (12.7, 5.2 and 1.7, respectively). There were no differences in the sensory analyses among management strategies. In conclusion, lucerne grazing would be an interesting alternative as it improved beef nutritional value without affecting sensory attributes. Finishing calves for 2 months diluted most of the differences.

Ass's milk composition of Littoral-Dinaric breeds

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Littoral-Dinaric donkey is one of three autochthonous donkey breeds in Croatia, preserved mainly in mountainous hilly villages of Dalmatian Zagora. It belongs to the group of endangered breeds. By the size of its frame it belongs to the smallest donkey breeds in the world. Tendency is to find efficient model of autochthonous genotypes use in quality food production. The knowledge of the qualitative characteristics of ass's milk is important for the nutritional evaluation in human feeding and for sustainable breed protection. The object of this study was to determine qualitative characteristics of milk production of Littoral-Dinaric ass's. The study was carried out on fifteen asses of Littoral-Dinaric breed. Asses were manually milked, three hours after separations of foals. Average milk yield was 169.07 mL/ milking. Average ass's milk composition is: total solids 8.81%, milk fat 0.38%, protein 1.65% and lactose 6.07%. Average contents of somatic cells are 46 000/mL and average numbers of microorganisms are 5 700 /mL. These results confirm the biological value of the ass's milk. As an alternative food, ass's milk could in fact satisfy the dietetic or healthy requirements.

Pasture intake and cereal-based feed restriction improve the lipid nutritional value of chicken meat

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Pastures are assumed to be good sources of α-linolenic acid (ALA), although low intake levels of fresh forages in free-range chicken limit changes in meat quality. The effects of restricting the intake of a cereal-based feed on the consumption of a leguminous-based pasture and on the meat fatty acid profile were evaluated. RedBro Cou Nu ´ RedBro M broilers were fed on a cereal-based feed at different intake restriction levels (100%, 75% or 50% of the ad libitum intake), in portable floorless pens located on a Trifolium subterraneum pasture. Control birds were maintained in identical conditions but had no access to pasture. Restriction of feed intake increased the relative leguminous pasture intake (1.6% to 4.9% of the total DM intake). The pasture consumption affected significantly the meat fatty acid profile. Although pasture intake did not influence the contents in LA (linolenic acid) of poultry meat, the levels of n-3 PUFA in breast meat ($P<0.001$), were significantly higher in animals consuming pasture. Overall the data suggest an important deposition of ALA and the conversion of ALA to its derivatives in pastured broilers subjected to a cereal-based feed restriction which contributes to more favorable n-6/n-3 ratio.

Sensory evaluation of cooked and cold smoked meat of male hybrids from Lithuanian indigenous wattle pig and wild boar intercross

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There is a growing interest in the production and marketing of wild boar meat. The population of wild boar is limited, and some meat may be derived from wild boar and domestic pig crosses. The surgical castration of wild boar is unacceptable, therefore, the castration of their hybrids with domestic pigs is under consideration. The objective of this study was to examine the eating quality of fresh and smoked meat of entire and castrated males obtained from indigenous Lithuanian wattle pig and wild boar intercross. The samples of fresh *M. longissimus* dorsi cooked in boiling water at water and meat ratio 3:1 with 1 sodium chloride addition of 1% meat weight and samples of *M. semimembranosus*, injected with 10% sodium chloride brine to a quantity of about 10% of the sample weight and cold smoked $<35^0$C for 3 days. A total of 10 panel sessions were convened with 3-5 samples being evaluated at each session. The average number of panellists attending each session was 8. The taste panel study showed higher acceptability of pork from castrates than that from entire boars. Samples of salted cold smoked meat from castrates had higher scores in odour and flavour ($P < 0.01$) but lower in tenderness ($P < 0.01$) and juiciness ($P < 0.001$). In the consumer panel study joints from castrated males had higher scores for odour ($P < 0.001$) and flavour ($P < 0.05$), but the lean / fat ratio ($P < 0.001$) and the visual appearance ($P < 0.05$) were judged to be poorer than those of entire boars.

Antibacterial activity and acceptability of plant extracts in minced meat

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Microbiological tests showed that extract from coriander, celery, garlic, marjoram inhibit the growth of test cultures. Effectiveness of celery extract was higher in comparison with other extracts. The results showed that grampositive bacteria were more sensitive to extracts of celery, parsley, coriander, tarragon and lemon balm than gramnegative bacteria. The possibility to stabilize a number of coliforms in meat mince was also evaluated. The extracts of plants did not have significant influence on the number of coliforms during cold storage. The test with ginger showed that it was contaminated with microorganisms which increased total number of bacteria in mince, and it did not have any preservative effect during storage. Caraway extract inhibited growth of all test cultures, but its influence was not strong, zones of inhibition were not wide. Differences between sensitivity of salmonella were determined. S. typhimurium and S. agona had smallest sensitivity to caraway extract. Count of bacteria and coliform bacteria had growth in all samples with coriander or caraway extracts. In case with higher amount of extracts growth rate was slower. Consumer focus group had evaluated acceptability of cooked minced meat samples with plant extracts. Samples with 0,2% of coriander extracts were evaluated as most acceptable but samples with 1% were not acceptable for consumer at all. Consumer test results showed that increase in concentration of coriander extract in meat gives lower acceptability of samples.

New insights into stallion fertility through horse genomics

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Implementation of artificial insemination (AI) in horse industry increased the impact of reproduction performance and the need for good semen quality and semen freezability. Stallion fertility is composed of complex traits including spermatogenesis, sperm maturation and fertilization of the egg. Heritabilities for male fertility measured as pregnancy rate per estrus were low to moderate. AI-management factors significantly contributed to the pregnancy rate per estrus. In all these different steps for a successful fertilization, a number of several proteins are involved which can be considered as candidates for male fertility. Seminal plasma proteins have been characterized in the male horse, particularly spermadhesins and CRISPs. An E208K mutation in CRISP3 was associated with stallion fertility at insemination. With the availability of the horse genome sequence (EquCab 2.1), the presence and structure of genes as well as their expression levels can be investigated and compared to other mammals. Further insights into sex determination, spermatogenesis and male infertility may be expected from the identification of Y-specific genes. Furthermore, we searched the most important candidate genes known in mouse and human for DNA polymorphisms in the horse and tested them for association with stallion fertility parameters from AI and semen evaluation protocols. These analyses should help to discover genetic mechanisms critical for the genetic variation in male fertility traits and sex development.

Male fecundancy in small ruminants: environmental and genetic effects

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Male fecundancy, and semen production, are affected by environment, management, physiological status and genetic effects. Photoperiod and nutrition status have effects on male reproduction in small ruminants and variations of these effects exist between breeds. A genetic variability was identified for ram semen production traits (volume, concentration, mass motility) and for male fecundancy. Heritability estimates were moderate for semen production traits (0.1 to 0.3) but very low for fecundancy (< 0.05); all these parameters were comparable to those of other mammalian species. The weak value of heritability for male fecundancy limits selection by conventional quantitative methods; Marker Assisted Selection (MAS) is then particularly indicated to improve selection of this trait. QTLs (Quantitative Trait Loci) related to testicular size and semen production were identified in other domestic species (bovine and porcine) but no genomic data are available today in small ruminants. However, the exponential development of genomic tools associated with the comparison of genomes between species through a phylogenomic approach could rapidly permit to find genomic markers in small ruminants. They will present a major interest for selection of semen production but overall for selection of male fecundancy.

Effects of different genetic components on reproductive performance in Finnhorses and Standardbred trotters

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The bases of the study were the Finnish mating records of Finnhorses (FH, n=32731) and Standardbred trotters (SB, n=33679) from the years 1991 to 2005 as documented by Suomen Hippos, the Finnish Trotting and Breeding Association. The foaling outcome was applied as a dichotomous variable, with the value of 1 when a foal was born and 0 in other cases. The expected foal was chosen as the studied individual, since it reflected both the maternal and paternal aspects of fertility. Mixed linear models were built using REML-based VCE6 program package. Fixed factors included age group of stallion, breeding type (on-site insemination, transported semen, frozen semen, natural mating), year and month of service, inbreeding level of the expected foal and the combination factor of a mare's age group and type (maiden, barren, rested, foaled). Random effects were additive genetic effect of the expected foal, and maternal and sire effects. There were major differences in foaling success between the FH and the SB, as the population means were 66.3% and 72.6% respectively. There appeared to be more genetic variation in the FH, with the estimated heritabilities in preliminary analyses ranging from 5.4% to 9.7%, as compared to the SB with 3.4% to 3.9%. The magnitude of maternal and sire effects varied with the breeds and models used.

Male, female and non sex specific effects on artificial insemination result in French dairy sheep

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Environmental and genetic factors affecting the insemination results were analysed on data recorded during 5 years in 5 French Artificial Insemination (AI) centres. Analyses within centre-breed were performed using a linear model which jointly estimates male fecundancy and female fertility. After selection, the environmental male effects were motility and concentration of the semen. The environmental female effects were age, synchronisation on the previous year (0/1), total number of synchronisations during the female reproductive life, time interval between previous lambing and insemination, already dry or still lactating (0/1) when inseminated, and milk quantity produced during the previous year expressed as quartiles intra herd*year. The non sex specific effects were the inseminator, the interaction herd*year nested within inseminator considered as random effects and the interaction year*season considered as a fixed effect. The main variation factors of AI success were relative to non sex specific effects and to female effects. Heritability estimates varied between breeds from 0.001 to 0.005 for male fecundancy and from 0.040 to 0.078 for female fertility. Repeatability estimates varied from 0.007 to 0.015 for male fecundancy and from 0.104 to 0.136 for female fertility.

The influence of the genotype on the quantitative traits of bovine semen

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Bovine semen quality traits are often influenced by various ambient factors, and the conception rate of beef cattle depends on semen quality. The number of live spermatozoa and the breed are also considered to be the factors of great importance for the conception rate of cows and heifers. It is often stated that semen quality traits of beef bulls are worse than those of dairy bulls. It is expedient to evaluate the quality of bovine semen of the main beef breeds bred in Lithuania (Charollais, Limousin, Simmental, etc.) and to determine the dependency of quality parameters of fresh and frozen semen on the genotype of bulls. Neither the genotype no the season have any influence on the main qualitative traits and the amount of defective fresh and cryopreserved semen of beef and dairy bulls provided the animal have good feeding and housing conditions. Carollais bulls had the highest ejaculate volume (7.97 cm^3) but the lowest sperm concentration in fresh semen ($2.49\times10^9/cm^3$). The highest sperm concentration ($1.39\times10^9/cm^3$) was determined in the fresh semen of Simmental bulls. The best postthaw sperm motility (40.9%) was found in the Limousine semen, yet the best survival 5 h after thawing was determined for the Salers x Aberdeen Angus semen. Though the postthaw motility of the latter spermatozoa was the lowest (38.5%). However, these traits are interdependent with regard to individual genotype.

Determination of optimum stallion semen freezing regimes

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Semen cryopreservation opens new possibilities for the development of breeding work and preservation of the gene pool in horse breeding. Therefore, the improvement of semen deep-freezing and thawing regimes is important for further studies of stallion semen cryopreservation processes. The semen was frozen in two ways: in convectional liquid nitrogen vapour stream on a metal perforated shield, fitted in biostorage KS-40 equipment and in Minicool AS-25. Three freezing regimes characterized by super cooling temperature of the free water in the semen were realized using the Minicool AS-25 equipment. The results from the study indicated that the quality of frozen semen of most stallions was invariable regarding freezing methods and regimes. Thus, semen can be frozen by convection flow of nitrogen vapour using common equipment and lower amounts of freezing agent. Optimum freezing regimes should be sought for cryopreservation of stallion semen known as “unstable freezing”. These regimes could be ensured by using the equipment suited to the reproduction of the identical freezing regime for every specific stallion semen. During the experiment there was only one stallion identified as having optimum semen freezing regime, yet the experiment showed that in order to reach optimum conditions, a freezing parameter changing gradient could be determined in stallion semen cryopreservation.

Exposure to 10% water soluble lubricants is detrimental for stallion sperm motility after storage

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Semen from 4 fertile stallions (4 ejaculates each) was diluted in skim milk extender with 0%, 5% or 10% lubricant (paraffine oil and 5 water soluble "non spermicidal" lubricants commercially available in France) and stored for 48h at 4 °C. Motility was measured after storage using computer-assisted semen analysis. Percentages of rapid spermatozoa (mean ± SD) after 48h are presented below. * indicate significant differences (p<0,05) compared to control without lubricant. Osmotic pressures (OP) of media before semen dilution are also indicated: control (31 ± 17) OP=288; 10% tap water (34 ± 21) 256; 5% paraffine oil (29 ± 17) 287; 10% paraffine oil (31 ± 17) 286; 5% Virbac (27 ± 20) 306; 10% Virbac (19 ± 17*) 358; 5% Priority Care (25 ± 14*) 335; 10% Priority Care (16 ± 13*) 389; 5% Bovivet (16 ± 12*) 284; 10% Bovivet (11 ± 13*) 286; 5% Quinogel (30 ± 18) 554; 10% Quinogel (18 ± 12*) 859; 5% Equiland (28 ± 18*) 575; 10% EquilandÒ (21 ± 15*) 814. Paraffine oil and water did not modify motility, compared to control. Water soluble lubricants at 10% significantly decreased motility. At 5%, Priority Care and Bovivet significantly decreased motility. Toxicity of water soluble lubricants can be related to hyperosmolarity, but also to other mechanisms, since no relation was observed between osmolarity and motility. When water soluble lubricants are used during the process of semen collection or artificial insemination, care must be taken to minimise contact between semen and lubricant.

Double freezing for future sperm banking

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The objective was to Compare double freezing (DF) to conventional single freezing (SF) method for its utilization in breeding programs, creating economic cryobanking. Ejaculates collected from 4 Israeli, 6-7 years old, Holstein bulls were split into two portions. One part was frozen in straws and the other in large volume, thawed and refrozen in straws. Samples were evaluated for viability and acrosome integrity by fluorescent staining. Motility, upon thawing and following 3h incubation at 37ºC, was evaluated by light microscopy. Artificial insemination was conducted in 3610 Israeli Holstein heifers and cows with approximately equal numbers in the two treatment groups. Logistic regression was used to analyze results. Freezing in large volume did not differ from freezing in straws and DF was significantly lower than SF. Bulls responded differently to the two freezing methods. Conception outcome was influenced by freezing method, inseminator and bull. Conception rate was higher in the SF group than DF (33% vs. 28.1; P<0.001), it ranged between 17.9 and 46.4% among inseminators and between 26.5 to 37.3% among bulls (P<0.001). Parity influenced conception rate between freezing methods only in pluriparous cows. Conception rate was affected by freezing method, bull, inseminator and parity. We found that acceptable conception rate can be achieved with the DF method and that there is positive correlation between laboratory evaluation and field results. Future study will evaluate the double freezing technique with sex sorted semen.

Session 08 Theatre 1

Measuring farm animal genetic diversity using neutral markers and detecting those under selection

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The use of molecular markers has revolutionised the way in which genetic diversity is measured and prioritised in farm animal conservation. Here I will review the major recent advances in the field, including developments on the analysis and interpretation of marker data to infer quite complex demographic trajectories involving genetic drift, selection and admixture. I will demonstrate that inferring the relationships among breeds for conservation prioritisation, as well as attaching notional unqiueness indices to those breeds is fraught with pitfalls and needs to be carried out carefully and interpreted with caution. I will illustrate these points using a test case involving the Dexter cattle in the British Isles.

Session 08 Theatre 2

A method to determine variation in genetic diversity across the genome using dense-marker maps

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Conservation of genetic diversity in livestock breeds is important amongst other reasons because genetic variation is necessary to adapt to future changes. In order to safeguard genetic diversity for future purposes, genetic variance present in current populations has to be evaluated. Up to now average diversity across the genome, i.e. average kinships or heterozygosity, is used to evaluate genetic diversity. Genetic diversity in adaptive traits or production traits may, however, not be equally distributed across the genome, and therefore average kinship may not evaluate genetic diversity in specific traits correctly. Using dense marker maps and methods from genomic selection we developed a method to determine genetic diversity within and across traits. We simulated traits both randomly and non-randomly distributed over the whole genome, including pedigree and molecular marker information. Results will be compared with average variation over the whole genome.

Differences in feed balance and feed efficiency between an old native and a modern dairy cattle breed

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Possible differences in gross and net feed balance and feed efficiency between two cattle breeds were studied. The "old" Black Sided Trønderfe and Nordlandsfe (STN) breed has hardly been selected for production traits the last decades due to a small population (800) while and the modern Norwegian Red (NR) breed (230 000) has been bred according to a modern breeding programme with genetic improvements in milk, growth, health and fertility. The study was done on lactating cows in three indoor feeding periods; ten cows in each breed group, fed roughage ad-lib and an adjusted level of concentrates. Feed intake, milk yield and -quality were recorded every week, and live weight was recorded every month. The gross energy balance was defined as energy intake subtracted by energy in produced milk, while the gross energy efficiency was computed by dividing energy in produced milk by energy intake. At the net energy level it was adjusted for energy loss or release from body tissue gain or loss. The results show that in spite of the large difference in production level, there were no breed differences in energy balance, neither at the gross nor at the net level. However, the NR was significantly more efficient when comparing gross feed efficiency, but there were no breed differences in net feed efficiency.

Evaluation of genetic diversity in Dutch MRY and FH cattle breeds and the FH gene bank collection by means of pedigree analysis

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The genetic diversity and population size of the Meuse-Rhine-Yssel (MRY) and Dutch Friesian (FH) cattle breeds, including FH gene bank collection were investigated using pedigree data. A reduction in purebred population size of >99% of both breeds took place within the last three decades associated with introgression of the Holstein Friesian breed. The average inbreeding coefficient (F) and founder genome equivalence (f_g) were calculated for 1970 to 2005. For the purebreds born in 2005 the F was 2.68% for MRY and 4.48% for FH, and the f_g of 14.5 and 18.6, respectively. Its particular breeding structure may have increased the f_g of the FH population, while heavy utilization of few bulls has decreased f_g of the MRY population. It was concluded that both populations have strongly decreased in size and genetic diversity, indicated by f_g, over time. Finally optimal contributions were calculated to evaluate genetic diversity of FH in the gene bank. Without gene bank material, the f_g of the next FH generation could theoretically be maximized to 43.9 with optimal genetic contributions. When gene bank material was included, the optimal f_g was 65.2, indicating that the gene bank covers a large part of the total FH within breed diversity.

Estimation of carcass composition and fat depots by means of subcutaneous adipocyte area and body and tail measurements in fat-tailed Akkaraman lambs

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As a major carcass tissue, body fat depots play an important role in deciding the optimum slaughter weight and grading of the carcass and meat quality. In this respect, a total of 40 male Akkaraman lambs were slaughtered and dissected to define the partitioning of fat among body depots after recording the body and tail measurements and taking the adipose tissue samples. The mean cold carcass weight was found to be 19.8 kg with a composition of 48.90% muscle, 30.32% fat, 19.56% bone and 1.22% waste. The carcass dressing percentage was determined to be 48.44%. Tail fat, subcutaneous fat and intermuscular fat were the major depots of carcass with overall means of 15.29%, 10.15% and 4.88% respectively. Heart girth found to have the highest correlation coefficient (r=0.91) with total body fat while tail circumference had the highest relation (r=0.72) with it among the tail measurements. Correlation coefficients were also high between the adipocyte area and cold carcass (r=0.84), total body fat (r=0.84)and carcass fat (r=0.86) values. It is concluded that carcass and total body fat could be estimated precisely by establishing the regression equations based on the adipocyte area and the external measurements of the body and tail in Akkaraman lambs.

Genetic variability of the Skyros pony breed and its relationship with other Greek and foreign horse breeds

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On the basis of phenotypes and genotypes, seven native breeds were identified in Greece. The Skyros pony is the most distinctive of these breeds. Using blood group and microsatellite loci, the aim of this study was to assess the genetic diversity of Skyros breed, using also available genealogical information, and to investigate its relationships with the other Greek and foreign horse breeds. Results showed that the Skyros breed presented similar level of genetic diversity to other European breeds. Comparisons between DNA-based and pedigree-based results showed that the loss of genetic diversity has probably occurred before the beginning of breed registration. However, the relatively high levels of heterozygosity and Polymorphism Information Content values indicated still sufficient residual genetic variability that could be useful for planning future breeding strategies for the breed conservation. Relationship study showed no association between genetic variation of native Greek breeds and population size or degree of geographic isolation. Compared to other domestic breeds, most of the Greek breed showed closest relationships with Middle Eastern breeds, while the Skyros breeds clustered surprisingly with Lithuanian horses.

Genetic management of small populations: from theory to practice

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Theoretical and practical aspects of the genetic management of small populations are reviewed. Several methods have been proposed to derive the critical effective population size. Although none of them provides 'the answer', the consensus seems to be around 50 animals per generation. Selection and mating methods that control the rate of inbreeding are reviewed together with methods that minimise the inbreeding. The possibility to temporarily use some genetics from a related breed to alleviate the inbreeding is considered. Prolonging the generation interval can be a very important method to increase effective population size and reduce genetic drift. Live conservation schemes are generally preferred above cryo-conservation, however live and cryoconservation can be combined where cryoconservation is used as a backup for the live scheme and where it is used to increase effective population size in small populations. Breed conservation schemes aim at the conservation of within and across breed genetic diversity, and the weights given to both these components of diversity are discussed.

Rotational mating programs for conservation of genetic diversity

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Within breeds the risk of high inbreeding rates and loss of diversity can be high. When exchange of animals between different herds is organised according to a rotational mating scheme inbreeding rates can be restricted. We evaluated the effectiveness of several schemes, such as breeding circles and maximum avoidance of inbreeding, both analytically and by simulation. Breeding circles where each year the same donor-recipient herd combination is used proved both efficient and practical. For example in a rare sheep breed inbreeding rates can be reduced from >0.75% per year with current practices to on average 0.16% per year when using a breeding circle. With a breeding circle variation in inbreeding rates across herds and over time are reduced. Moreover, a breeding circle is easy to implement and operate. Combining a breeding circle with optimal contribution selection can further reduce inbreeding rates. Using these results guidelines are given on when to use which inbreeding restriction method.

LD-based estimation of effective population size for two African cattle breeds

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For livestock breeds in the developing world herd book and demographic information is often lacking and effective population size can not be estimated accurately. As dense marker information is becoming increasingly available, the application of LD-based methods for the estimation of effective population size might offer new perspectives. The evaluation of methods based on genome-wide SNP data is subject of the presented study. In an international collaboration genome-wide SNP data from two indigenous African cattle breeds and one indigenous Swiss breed will be evaluated. Samples of the two African breeds (22 and 17 individuals) were genotyped within the bovine HapMap consortium. These genotypes (chromosomes 2, 4 and 9) are evaluated here. Different levels of LD were found for the two breeds. Effective population size was estimated based on r^2. A decreasing population trend was found for both breeds, however with large standard deviations. The inclusion of additional chromosomes and samples is expected to lead to a more robust estimation.

What future for the rare French goat breeds ? Some answers thanks to a pedigree analysis on three breeds

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In France, the goat is one of the species with the least diversity of breeds. Only ten breeds are recognized (versus more than forty in cattle and sixty in sheep), and two of them represent over 99% of the total French goat population. In this article, we propose first to describe how conservation programs were implemented in the goat species. The key mark of the French programs is their pragmatic side. We also give a first assessment of the genetic variability of three rare breeds, namely the Poitevine, Provence and Fossés breeds, which were chosen as test cases because their demography and dynamic represent various and interesting situations. Our purpose was to check if simple management rules are efficient to maintain a low inbreeding level. The genetic variability of the breeds was estimated via pedigree analysis. Some results illustrated that low number of females per male or using males from new bloodlines have a positive impact on genetic variability and, on the contrary, drastic demographic bottlenecks have a negative impact. More interesting, we showed that in the case of small ruminants, where both the sex ratio and the generation interval are generally small, straightforward management rules at the population level are enough to maintain a slow rate of inbreeding, at least on a short/mid term level. These results are preliminary and simulation models should be implemented in order to check and refine our conclusions.

Marker-based estimation of effective population size from one-generation population samples

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Effective population size N_e is a parameter of central importance in decision-making for and design of conservation strategies. However, N_e is notoriously difficult to estimate and both pedigree-based and demographic approaches lack robustness. Estimation of N_e from chromosome segment homozygosity (CSH) based on marker genotypes in one generation population samples was applied to 2 commercial and 3 experimental chicken strains, in which 75 individuals were genotyped for 30 microsatellites in 6 segments. Marker-based estimates of N_e are substantially lower than the pedigree-based values (7 to 10 generations). This is due to a substantial excess of observed over expected CSH. It is argued, that historic events (e.g. bottlenecks) may have a sustaining effect on the genetic constitution of the lines, which may not be detectable from recent pedigree information. Based on the empirical results we derive the amount of molecular information required for a sufficient statistical resolution. Approximately 7500 SNPs are necessary to discriminate between two populations differing in N_e by 20%, (5% error probability, 90% power, 2-sided test). Since molecular tools providing this amount of information are within reach, the marker-based assessment of effective population size will be a useful option in the near future.

Design and implementation of an information system for national genebanks management

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A long-term storage of genetic materials is essential in each country. In order to manage a large number of samples from different species in animal agriculture, a general data model must be considered and implemented. This paper presents an approach for the development of a sample management information system at the country level. Designed as client/server architecture, our information system is a platform independent web application based on open source software packages. As a result, the developed information system provides for information management of national genebanks. It allows users to record the origin of genetic material, keep track of samples along with the storage places, and make analyses reports. The software is freely available under the Open Source GNU public license.

Genetics of coat colour among horse breeds from Romania

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Hair color clearly plays a critical role in horse artificial selection. No colour in horses appears to be confined to a single breed, implying that the mutations producing the color variants occurred early in the domestication timeframe. Among breeds from Romania in which nearly all horses can be described by the basic colours alone are Lipizzan (grey), Gidran, Romanian Draft Horse (chestnut) and Nonius (black or bay). Breeds that extend the basic color set to include color dilution genes comprise Romanian Sport Horse, Arabian, Trotter and Hucul. Our objective was to develop simple methods to examine the four coat colours loci among Romanian horse breeds. We used the PCR-RFLP technique to analyze Chestnut, Tobiano and Cream loci. Amplification of the loci was realized by PCR and amplicons were digestedwith restriction endonuclease Taq I, Msp I and Tsp509 I. Restricted products were analyzed by electrophoresis in agarose gel stained with ethidium bromide. Genetic test for Agouti locus was made using the genotyping technique. Amplification was carried out with labeled primers and the size of PCR products was estimated by capillary electrophoresis. Those tests based on molecular techniques will allow a good artificial selection in breed societies focus on breeding horses with an exact color or pattern.

Investigations concerning the morphological traits of the Carabash sheep compared to Tsigai sheep

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The Carabash sheep has been mistaken for a long time in Romania for the buckled Tsigai sheep. It was actually saved by the peasants from the cross with Merino sheep and it was noticed by the zootechny specialists only during the recent 15-20 years. Besides some outer traits, it is noticed by the high milk yield and by the precocity of its lambs. The purpose of the research is to clarify how much is the Carabash sheep a breed specialised for milk production (main purpose) and for the production of suckling lambs for slaughter (secondary purpose), distinct from Tsigai sheep. The investigation studied 313 Carabash sheep reared by several private peasants. The analysed data show clearly that Carabash sheep ar hypermetric, all their body dimensions are larger than those of the Tsigai sheep, which is an eumetric breed. The body conformation analysed using the relative dimensions (% of the height) show that the Carabash sheep are taller when standing, have a longer trunk, their hind part is taller and the thorax perimeter is also larger than that of the Tsigai sheep. All these arguments argue for a dolicomorphous conformation of the Carabash sheep, compared to the Tsigai sheep which have a mesomorphous conformation. The preliminary conclusion supports the hypothesis that the Carabash sheep are a distinct breed from Tsigai sheep.

Session 08 Poster 15

Breeding and typological analysis of Old Kladruby horses in the Czech Republic

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The Old Kladruby Horse is one of the oldest horses breed and the only original Czech autochtonous horse breed. They are breeded in one of the oldest breeding stud in Europe in Kladruby nad Labem, which was established by Roman Emperor Rudolf II Habsbursky in 1579. These mighty type horses with refined mechanics of movement were used in ceremonial services by the Vienna court. They were hitched to heavy state carriages. After transformation of Austro-Hungarian monarchy in 1918 the black horses almost disappeared. A unique process of regeneration was made thanks to prof. Bilek there. At this time this breed is genetic source and National cultural "monument" of the Czech Republic. Until this time all investigations and researches have been made on the horses, which have been breeded at the national breeding stud in Kladruby nad Labem (NBSK). The horses of other breeders in the Country Studs (CS) were compared in investigation to NBSK and all breed individuals from Country Studs who were registrated in Stud Book in 2007. There were 60 stallions and 46 mares of both colours. These outcomes show that black mares (NBSK) are higher (+3 cm) at withers height measured by staff and +0.6 cm cannon bone circumstance compared to CS. NBSK gray mares have again +0.8 cm cannon bone circumstance (CBS) compared to CS. At stallions there are major differences only at gray stallions NBSK +1.5 cm (HWS) and +0.5 cm (CBS) compared to country breed Old Kladruby Horses.

Session 08 Poster 16

The genetic characteristics of the preserved Lithuanian horse breed Žemaitukai

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The horse breed Žemaitukai that originated genetically directly from the wild horse tarpan has been preserved by the Lithuanians.The Žemaitukai are considered an important part of ethnic cultural heritage.The breed is recognized as watched internationally. From 1996 to 2007, 232 blood samples were collected from Žemaitukai horses for testing at the Blood Typing Laboratory of the LVA Institute of Animal Science. Conventional blood typing methods were used for blood group determination. Blood protein polymorphism was determined using a standard protein electrophoresis method in the polyacrilamide gel (PAGE), allelic frequency q and p was also calculated. The study indicated that the following genetic systems and alleles are most characteristic of the present day Žemaitukai horse population: allele A^{ad} (q=0.3772) in EAA system, allele A^{dghm} (q=0.3707) in EAD system and allele Q^{c} (q=0.3190) in EAQ system. The highest number of identified alleles (10) was found in the transferrin (TF) genetic system of blood protein. The most typical alleles in this system are DF (p=0.3793), DD (p=0.1552), FF (p=0.1379). The most typical alleles in albumin (AL) system are AA (p=0.6466) and AB (p=0.3405). Alleles FI (p=0.3578), II (p=0.3190) and IS (p=0.1724) were most typical in the esterase (ES) system. The Žemaitukai horses are not only different from other Lithuanian breeds but also have a very rare among world horse breeds allele T in the ES system.

Lithuanian pig genetic resources and their conservation

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Lithuanian pig genetic resources include Lithuanian indigenous wattle and Lithuanian White pigs. Nowadays, there are two populations of Lithuanian White pigs: improved open population using Large White boars and minimal closed population for the conservation of the original Lithuanian White old genotype. The activities for conservation of these breeds were launched respectively in 1994 and 1999, and thus complete their extinction has been prevented. Both these breeds are considered as critical – maintained. Effective population size Ne of Lithuanian indigenous wattle and Lithuanian White pigs is respectively 32.6 and 33.3. Despite the relatively low number of founders at the beginning of conservation, the use of planned breeding scheme demonstrates quite efficient genetic management but the population sizes of the conserved breeds did not increase because these pigs, after implementation of the carcass grading system in the abattoirs, are not economically compatible. Carcass quality of the pigs from the open Lithuanian White population is higher in comparison with the pigs of the old genotype and indigenous wattle pigs. Therefore, these pigs are only in the conservation herds with the specific care. Small farmers show some interest to grow these pigs as slaughter pigs for their own needs but they do not show any interest to form herds for conservation. Small EU subsidies (65€) in comparison with high costs for maintenance and low income promote neither keeping of the sows and, especially, the boars, nor their purebred breeding.

Effect of litter size, parity and somatic cell count on milk yield and quality of two Italian local goat breeds

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The effect of some factors on milk yield and quality of two Italian local goat breeds was investigated. The research was conducted on 880 animals (33 farms), out of which 567 from Bianca Monticellana and 313 from Grigia Ciociara. Three individual milk records were carried out at beginning, middle and end of lactation. At each record milk yield was measured and the composition of the milk analysed. The results show that milk yield and composition of these two local goat breeds do not differ (0.82 kg; fat 4.83%, protein 3.61%). Moreover, milk yield in goats with twin-birth is higher (0.85 vs 0.75 kg; $P \leq 0.01$) but milk composition is similar to that of goats with single birth. Parity has a significant influence because it is responsible for lower milk yield (0.75 kg; $P \leq 0.05$) and SCC (809,000/ml; $P \leq 0.05$) but better composition (fat 5.07%; $P \leq 0.05$) and clotting properties (clotting time 13.77 min, curd firmness 43.02 mm; $P \leq 0.05$) in primiparous goats. If SCC exceeds 1,500,000/ml, the milk yield drops significantly compared to SCC samples lower than 400,000/ml (0.70 vs 0.86 l; $P \leq 0.05$). In high SCC samples clotting and curd firming time gets longer (15.83 vs 13.68 min; 3.34 vs 2.71; $P \leq 0.05$); curd firmness is unchanged (42,11 vs 42,54 mm), even if the time necessary to reach the ideal firmness become longer. This is a good result considering that the SCC increases in pluriparous goats and that cheese yield is mainly affected by curd firmness.

NRAMP1 gene in goat: nucleotide sequencing and polymorphism analysis

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NRAMP1 gene is an important intracellular bacterial resistance candidate and in cattle and water buffalo its polymorphism at the 3'UTR region was associated with natural resistance against some diseases. The aim was to investigate nucleotide sequence and polymorphism of NRAMP1 gene in the goat. Primers were designed from the bovine sequence (GenBank: BTU12862). Three fragments were PCR-amplified from goat genomic DNA, corresponding to exons 2 and 10 (codifying structural domains) and exon 15, containing the 3'UTR. PCR products of 200 goats belonging to five breeds (Sarda, Saanen, Nubian, Maltese, Alpine) were analysed by SSCP (single strand conformation polymorphism). Exon 2 sequence analysis (BioEdit software) revealed some nucleotide changes in goat, when compared to the bovine sequence: C11T, C12A, G20C, A67G. The sequence of goat exon 10 showed differences from bovine: G16A, C40A, A55G, C66A, A72C. Exon 15 sequence analysis revealed the presence of a $(GT)_{16}$ repetition. Alignment of the first 210 nucleotides of goat and bovine exon 15 revealed the following differences: C63T, A80G, A94G, G115A, A143G, G151A, G152C, T165C, A199G. The SSCP analysis of exons 2 and 10 revealed the absence of variations, while analysis of exon 15 showed different conformational patterns, which may be due to the polymorphism of the detected microsatellite. This data may be useful in the evaluation and possible utilisation of NRAMP1 in resistance to intracellular infections in goat.

Phylogenetic analysis of Sarda goat inferred from mitochondrial DNA

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The aim of this research was to investigate mitochondrial DNA (mtDNA) genetic variability of Sarda goat and its relationships with the other breeds. The mtDNA sequences of 19 Sarda goats, 6 of crossbred (Maltese x Sarda) and 50 of five breeds (Alpine, Maltese, Nubian, Saanen, Arbi) were studied. A 778 bp D-Loop mtDNA fragment was amplified by PCR and the products were sequenced. The obtained sequences (between positions 15746-16450) were aligned with the complete sequence of C. hircus mtDNA (GenBank: AF533441) by ClustalX software. Using the software MEGA v4.0 were identified 53 haplotypes. Haplotype diversity (hd), nucleotide diversity (p), average number of nucleotide differences (k) were calculated using DnaSP v4.2. The different breeds analysed displayed a moderate haplotype diversity. The Sarda goat showed a high nucleotide diversity. In order to evaluate which of the goat mitochondrial haplogroups the Sarda breed belonged to, all 75 mtDNA sequences that we examined were analysed with 197 published sequences. A neighbour-joining tree of 272 goats was constructed using Kimura 2-parameter distance model with 1000 bootstrap replications by MEGA v4.0. All sequences belong to haplogroup A, the most represented in the world for the number of haplotypes. These results may be useful to improve the knowledge of the genetic structure of Sarda goats for its improvement.

Walachian sheep in the Czech Republic

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In the territory of the former Czechoslovakia the original Walachian sheep were widely replaced by Improved Walachian in the second half of 20th century. Only very small population have survived untill recently. In 90-ties the Swiss foundation Pro Specie Rara set up survival project for Walachian sheep in the Beskydy region. In 2000 the breed was included into national programme of gene resources preservation. The number of animals in the gene reserve had risen from 2 rams and 45 ewes (2000) to 10 rams and 204 ewes (2007). All animals in the gene reserve are involved in performance rocording scheme. Averages for daily gains of lambs and prolificacy were 198 g/day and 153,7% in the year 2007. Allelic frequencies of PrP gene in the population are: 58% ARR, 1% AHQ, 23% ARQ and 18% VRQ in females and 77% ARR, 14% ARQ and 9% VRQ in males. Semen of 15 Valachian rams have been collected and conserved. Programme of regeneration of black-wooled variety of Walachian sheep have been started.

Influence of inbreeding on the milk production performance of Lithuanian dairy cattle population

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The objective of this study was to determine the influence of inbreeding levels on the breeding value of the milk production traits in Lithuanian dairy cattle population. Researches have been carried out in Lithuanian Veterinary Academy and Agri-Information and Rural Business Centre. Milk recording data during the period between 01.10.1996 and 01.07.2007 were used. Total 265 884 records of data basis for genetic evaluation of dairy cattle were analysed. The cows and bulls were divided into 5 classes depending on the level of inbreeding. According to the results of the study, the increase of inbreeding coefficient to 3.125% resulted in an increase of the breeding value of bulls according to milk production performance from 5.0 to 19.1% ($p<0.001$). The best effect of the inbreeding was obtained on the breeding value of the milk protein. Breeding values of bulls with inbreeding coefficient 6.25% were in 2.4–15.0% ($p<0.001$) better than autbreeded bulls. Correlation between breeding value of bulls and level of inbreeding was significantly positive ($p<0.05$). The dependence of production traits of recorded cows on the level of inbreeding showed increasing breeding values with the increasing of inbreeding coefficient to 3.125% in all breeds of country ($p<0.001$). The inbreeding level 12.5% and over of cows represented economic losses from 5.5 to 19.3% ($p<0.001$) of milk production.

The determination of DNA fingerprinting in Turkish fat-tailed sheep breeds by using RAPD-PCR method

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The objectives of research were to investigate the genetic structure of 125 individual of 8 Turkish fat-tailed sheep breeds based on RAPD (Random Amplified Polymorphic DNA) markers. A total of 210 amplified bands were scored from the 12 RAPD primers, with a mean of 18 amplified polymorphic bands per primer, and 100% polymorphic bands was found. The results showed that the level of genetic diversity within and between populations was very high. The mean effective number of alleles per locus (n_e) was 1,6256, the average heterozygosity (H) was 0,3636, the mean expected gene diversity (h_j) was 0,1784, Shannon's index of phenotypic diversity (H_0) was 0,5408, and the proportion of polymorphic loci (P_{poly}) was 100 at the fat-tailed sheep breeds based on RAPD markers. Total genetic diversity (H_T) was 0,3654, and the genetic diversity within populations (H_S) was 0,1784. The average coefficient of population differentiation (G_{ST}) was 0,5117 which can be interpreted to mean 49% total genetic variation was within populations and 51% was among populations. The molecular phylogenetic tree (UPGMA) represented molecular phylogenetic tree (UPGMA) represented that 8 populations were divided into five clusters.

Genetic variation and population structure of two Tsigai sheep types in Serbia

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In Serbia, there are two types of Tsigai sheep, Old and New type. While the New type has become popular among farmers, the population size of the Old type is rapidly decreasing. The objective of this work was to evaluate genetic variation, genetic differentiation and population structure of the Tsigai sheep types based on 23 microsatellites. Genetic variability parameters (mean number of alleles per locus, mean observed and expected heterozygosities) were calculated using POPGENE v1.21. The New type showed a higher variability (7.5, 0.66 and 0.70, respectively) than the Old type (6.7, 0.64 and 0.69, respectively). Coefficients of inbreeding in populations (*f*) were calculated by FSTAT v2.9.1. Positive and significantly different values from zero ($P<0.001$) were obtained for both types (0.086 in Old and 0.072 in New). Wilcoxon sing-rank test incorporated in BOTTLENEK were used to evaluate the presence of recent genetic bottlenecks. The test did not show loss of alleles in Old type while heterozygosity deficiency compared to the number of alleles was present in the New type. We conclude that high level of variability was present in both Tsigai types. According to the bottleneck testing, the New type showed an excess of alleles suggesting the influence of gene flow from some other breed. The Old type appears to have remained pure but since the census size has decreased rapidly it is necessery to conserve it.

Developing a scoring system for the Heritage sheep breeds

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In the frame of the HERITAGESHEEP project funded under the EU Regulation 870/04, 42 heritage sheep breeds from France, Greece, Netherlands, Slovenia and UK were explored. Heritage sheep breeds are geographically concentrated, environmentally adapted, genetically distinct and commercially farmed to economically support the local communities. Among the project objectives was to identify the potential threats to the genetic resources of heritage sheep and develop a scoring system that can be applied to each breed for prioritisation of risk. The survey was conducted through a questionnaire, divided into three parts; the first included information on the total population numbers and the population trends, the second referred to the potential threats, which include social, political, disease and environmental pressures, and the scope of the third part was to determine the value of the breed to the region where it is raised, through its contribution to the environment, adaptation and grazing habits.

Heat tolerance in sheep: physiological and blood parameters

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This study evaluated the effect of the climate on physiological and blood parameters in sheep with different coat colours in Central Brazil. Thirty Santa Ines adult, non lactating, non pregnant females were used, ten with a brown coat, ten black coated and ten white coated, as well as ten Bergamasca and ten of mixed breed. Two sample collections were taken (at 6am and 2pm) on three days. Sweating rate, heart and breathing rates, complete hemogram, rectal and skin temperatures were measured. There were significant differences between animals due to skin type, time (morning or afternoon) and day of collection. The white coated animals showed lower heart (HR), breathing (BR) and rectal temperature (RT) and afternoon parameters were higher than those in the morning. Few interactions between these factors were significant. Correlations between HR, BR, RT, sweating rate and skin temperature were medium and positive. Sweating rate had low negative correlations with blood traits. Correlations between physiological and blood traits were in general negative and medium. Packed Cell Volume (PCV), total plasma proteins, red blood cell count and hemoglobin concentration had high positive correlations between each trait. The highest correlations with Mean Corpuscular Volume were with Mean Corpuscular Hemoglobin Concentration (-0.61) and PCV (0.40). The first two autovectors explained 49% of trait variation. White coated Santa Ines animals were shown to be better adapted and wool sheep worse to climatic conditions in Central Brazil.

Genetic factors of Infection by gastrointestinal worms in sheep flocks in the federal district, Brazil

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Three sheep farms were used in the Federal District, Central Brazil, to study the occurrence of parasites in the feces. A total of 1798 collections were taken over the period of a year. A total of 1205 were taken in Santa Inês breed (SI) in all three farms, 323 in Bergamasca (Berg), 54 in Ile de France, 49 in Ile x SI, 103 in Morada Nova (MN) and 64 in Texel x SI, these last 5 groups being on a single farm. The animals were drenched soon after weaning and feces collected every three weeks to calculate Faecal Egg Count (FEC), at least on two occasions on each animal. In some cases, blood was collected to determine packed cell volume (PCV) at feces collection. Fixed effects included farm, breed/genetic group within farm, animal age (months), birth type (simple, twin) and sex. (Co) variance components were estimated for Santa Ines sheep using restricted maximum likelihood under an animal model. Worm loads were affected by month and farm showing that climate and management are important sources of variation for the parasites studied. While age and birth type did not affect infection level, genetic group was important showing that breeding strategies can help control these parasites. Heritabilities varied between 0.07 for Strongyloides to 0.30 for Moniezia. Permanent environment and maternal effects were close to zero.

Stochastic modeling of genetic improvement of Pinzgau cattle using complex selection index

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Selection on complex selection index is essential because covering all desirable traits for dual purpose cattle. In Slovakia cattle is selected only on milk production index. Especially for endangered Pinzgau cattle breed, while it can not be competitive to other cattle breeds in milk production only, selection on complex index is important, giving more possibilities in future breeding. Aim was to model possible impact of selection on complex selection index including live weight in age of 210 days, milk production and functional length of production life on genetic improvement of estimated breeding values. Alternative breeding scheme with increased use of young bulls was used to estimate possible genetic improvement of Pinzgau cattle. Stochastic simulation was used to model breeding process: selection of animals as parents of next generation, production of offspring, testing and estimation of breeding values. Decrease of variance components: heritability, correlations and variance due to Bulmer equilibrium in population per year and genetic trends of breeding values per generation for future 10 generations were estimated.

Molecular tests for milk quality in Romanian sheep and goats

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The casein and β-lactoglobulin polymorphisms are important and well known due to their effects on quantitative traits and technological properties of milk. The aim of this study was to analyze using PCR-RFLP and sequencing techniques the genotype distribution of β-lactoglobulin and α-s1-casein in Karakul sheep and different goat breeds. DNA amplification was carried out by PCR and the amplicons were digestedwith restriction endonuclease RsaI and MboII. Restricted products were analyzed by electrophoresis in agarose gel stained with ethidium bromide. The determined genotypes were confirmed by sequencing. Both in sheep and goat the β-lactoglobulin A allele (AA) yields three bands of 66, 37, and 17 bp, the B allele (BB) gives two fragments of 103 and 17bp, and heterozygote (AB) have all four fragments. The genotypes detected were AB (57%) and AA (43%). In case of α-s1-casein the different restriction enzyme patterns are: nonA homozygous yield two bands 306 and 66bp, A/A individuals yields three fragments 160, 146 and 66bp and heterozygous nonA/A all four fragments. The most frequent genotype obtained in our breeds was the non-A homozygous genotype. Our results show that the Romanian sheep and goats presents a high degree of variability, which opens interesting prospects for future selection programs, especially marker assisted selection between different genotypes of milk and cheese characteristics and also for preservation strategies.

Three local cattle breeds from Tuscany (Italy): genetic diversity and similarity

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The aim of this research was to evaluate the genetic diversity of three local cattle breeds reared in Tuscany (Italy) by molecular markers. A total of 149 animals (63 Calvana, CAL; 23 Pontremolese, PON; and 43 Garfagnina, GAR) were genetically characterized by using 22 STR markers. Genetic similarities were calculated by performing all possible pair-wise comparisons between the individual multilocus genotypes. F-statistics, molecular coancestry and inbreeding coefficients and kinship distances were obtained using MolKin v.2.0. A high genetic differentiation between breeds was observed (F_{ST} = 0.172 for CAL/PON, 0.166 for PON/GAR and 0.131 for CAL/GAR; P<0.001). Between-breeds genetic similarity was 0.250 for CAL/PON and PON/GAR and 0.252 for CAL/GAR. Within-breed genetic similarity was 0.378, 0.420 and 0.374 for CAL, PON and GAR respectively. The lower kinship distance (D_k) was observed within the Pontremolese breed (0.500 vs 0.530 in CAL and 0.557 in GAR) while the mean coancestry value (f_{ij}) and the inbreeding coefficient (F) were higher in PON than in the other breeds (0.278 vs 0.268 in CAL and 0.258 in GAR for f_{ij}; 0.667 vs 0.596 in CAL and 0.516 in GAR for F). Molecular data corroborate the evidence, supported by demographic information, that all the three breeds, and particularly the more genetically distant Pontremolese breed, have suffered a severe erosion of the genetic variability.

The Leccese local sheep breed from Apulia (Italy): a questionnaire survey

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Leccese is a local sheep breed from Apulia, raised mainly for milk production. The population has suffered a dramatic bottleneck during the past three decades due to main changes in rural production systems. Today the breed counts about two thousand animals. In order to establish a successful conservation plan, an economically sustainable valorisation of the breed has to be considered. A questionnaire survey to examine structure and management of farms rearing Leccese sheep breed has been undertaken in the provinces of Lecce, Taranto and Brindisi. A total of 10 farms have been identified, only half of them being registered to the Genealogical Book. Fragmentation and reproductive isolation among farms, lack of labourers to be employed as herdsmen and massive presence of non pure-bred Leccese animals are the main weakness points. On the contrary, main strength points are the eco-sustainable pasture-based production system, higher resistance to local parasites of Leccese compared with non autochthonous milk breeds, widespread know-how in traditional and artisan cheese-making techniques and high quality of both dairy and lamb meat products. All these data suggest the need to adopt instruments, like traditional denominations and farmer consortia, as strategic tools to protect and promote the niche market penetration of both the local single-breed Leccese cheese and the light lamb meat.

Characterization of MTNR1A gene polymorphism in Sarda breed sheep

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The melatonin receptor 1a gene (MTNR1A) is polymorphic in many sheep breeds and appears to influence a number of seasonal reproductive responses. The objectives of the study were to obtain the sequence of the MTNR1A gene in Sarda breed sheep and to evidence if polymorphisms are present even in this breed. For the study 220 adult ewes, of an average age of 3,2±1,5 years, coming from several areas of Sardinia, were used. From each animal a blood sample was taken for DNA extraction to utilize for PCR. Amplification product was digested using two restriction enzymes, MnlI and RsaI, for polymorphism identification. Five samples of each genotype were sequenced to confirm the exact position of nucleotide substitution and to verify the presence of other correlated mutations. Furthermore, allele and genotype frequencies and Hardy-Weinberg equilibrium were calculated. Results point out the presence of two polymorphic site in the Sarda sheep, in positions 605 (C→T) and 612 (G→A). For the mutation in position 605, C allele showed a frequency of 67% while T allele 33%; genotypic distribution resulted: CC 54%, CT 26% and TT 20%. For the mutation in position 612, G allele showed a frequency of 78% vs 22% of the A allele; genotypic distribution: resulted GG 68%, GA 21% and AA 11%. Population was in Hardy-Weinberg equilibrium. Data show the presence in Sarda breed sheep of the same polymorphic sites found in other breeds.

Introducing the Karayaka sheep breed with its traits and influencing factors

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Karayaka is one of the indigenous breed reared in the middle and east Black Sea region of Turkey. Karayaka sheep, numbering about 1.300.000 are highly adapted to the harsh environment of the area. Being a non-fat tailed sheep in a harsh environment makes the breed more interesting. This study was planned to express the detailed traits of Karayaka sheep reared in Tokat province, also influencing factors on the traits were evaluated. While year effect was significant on 8 week weight, scanning weight, fat depth and muscle area, all the evaluated traits including birth weight and muscle depth were significantly affected by season ($P< 0.05$). Dam age was significant on birth weight ($P< 0.05$). Birth weight and 8 week weight were significantly affected by sex and birth type. Sex effect has been appeared on muscle depth while birth type effect has been detected on scanning weight ($P< 0.05$). While the strongest phenotypic correlation coefficient was detected between muscle depth and muscle area, the weakest ones were found between birth weight and scanning traits.

Polymorphisms in the promoter region of the LGB gene in Sarda goat

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In goats, two single nucleotide polymorphisms (SNPs) have been found in the promoter region of the b-lactoglobulin gene (LGB), located at -341 (T→C) and -60 (C→T) positions. The aim of this research was to assess allele frequencies of the described SNPs in Sarda goats, their haplotype distribution and to evaluate the correlation between genotype and milk yield. Blood samples were collected from 220 lactating Sarda goats and genotyped by PCR-RFLP. All the animals were measured daily milk yield. The data were analysed by GenePop software for Hardy-Weinberg (HW) equilibrium and allele frequencies, while the EH software was used to asses haplotype distribution. In order to highlight correlations between LGB genotype and milk yield analysis of variance was performed. The population was in HW equilibrium for both the SNPs. Allele frequencies at -341 nt were: T=0.86, C=0.14, while the most frequent genotype was TT (74.42%) and the least frequent was CC (2.66%). Allele frequencies at -60 nt were: C=0.80, T=0.20, the most frequent genotype was CC=65.78%; the least frequent genotype was TT (5.98%). Three of the inferred haplotypes showed a frequency >0.05, the most frequent was -341T/-60C (0.66), while the -341T/-60T haplotype had a frequency of 0.20 and the -341C/-60C = 0.14. The estimated frequencies of these haplotypes were similar to the expected, indicating linkage equilibrium. Statistical analysis did not show significant differences for milk yield between genotypes.

Session 09 Theatre 1

Good farming practices, policies and some examples in the field

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So called "Good farming practices", often associated with quality assurance schemes, are widely advocated. EU CAP policy is a major stimulator of this. CAP direct payments to farmers (EU Pillar I budget) are linked to the Cross-Compliance conditions: farmers have to fullfill a whole set of proper farm management practices. These conditions are becoming increasingly a part of Pilar II budget, being the budget for Rural Development Programs. The practices concern: animal welfare, hygiene, medicine use, environment (mineral and pesticide use), and landscape(cultural heritage, erosion prevention). These conditions are laid down in the various EU directives. Ecological farming has stricter rules for some of the subjects. In this contribution, special attention will be given to the efforts to increase the transparancy and efficiency of use of medicines in the cattle sector. A model will be described to realise this. This model is applied in pilot studies in The Netherlands. All partners in the dairy chain cooperate to realise this. However, several obstacles still lie ahead, such as automation and awareness raising. Another example concerns an animal welfare issue: the housing system for cattle in combination with free movement and / or grazing or not. In this context, ecological farming represents a special case. The situations in some case countries are examined.

Session 09 Theatre 2

Good farming practices for control of infectious diseases in cattle: farmers motivations and compliance to qualification programmes

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The control of endemic infectious diseases can be improved by collective control programmes. Such programmes assume that farmers will follow science-based recommendations and adopt good farming practices in biosecurity and surveillance. This is not evident. Understanding the reasons why farmers do or do not implement proper control measures to limit the burden of infectious diseases is important to support the definition of effective action plans. The objective of the study was to address motivations and compliance with a qualification programme for bovine viral diarrhoea. The study targeted farms where the virus had been identified and who had received a proposal to enter a qualification programme. Farmers interviews were conducted in 20 farms, focusing on implementation of control actions, risk perception, motivation and obstacles to comply to recommendations. Results highlight the interrelations between practices, perception of the future of the farm, professional network and knowledge on the disease. Motivations of the farmers can include perception of risk, perception of the past or potential impact of the disease as well as understanding the recommendations of, and trust in, the farm advisors.

Grazing cattle on re-wetted areas: a long-term observation on the endoparasitic burden

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The aim of the study is to gather information on the year-round egg and larval contamination of pastures and to determine effects of the grazing system on the prevalence of endoparasites. The study was conducted on six farms located on a peninsula on the German North-Sea Coast. The cattle were stabled from November to April. During the summer season, they were kept on pastures included in a nature protection program differentiating between three states of re-wetting. Manure-samples from randomly selected animals were analysed with routine diagnostic methods for the occurrence of *Eimeria* spp. and worm eggs. Samples were taken three times per year: before turning out, in the middle of grazing season and at the end of grazing. After diagnostic and plausibility checks a total of 692 samples were suitable for use. The overall prevalence was 0.42 for *Eimeria* spp. and 0.29 for nematodes. No eggs of the liver fluke were found. Statistical analyses were carried out with a generalized linear model including as fixed effects: wetting status, farm,year and if it is the first summer on the pasture for the animal. The sums of the daily mean temperatures and the rainfall from the previous 50 days were included as covariates. The estimated LS-means for the prevalence of both *Eimeria* spp. and nematode eggs showed significant differences between low re-wetted (0.22 for *Eimeria* spp. and 0.05 for nematode eggs) and medium re-wetted pastures (0.52 for *Eimeria* spp. and 0.42 for nematode eggs).

Effect of an energy restriction in double-muscled cows on feed efficiency

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Two experiments (E1 and E2), using 20 and 13 Belgian Blue double-muscled (BBDM) cows, were conducted to investigate the effect of a quantitative energy restriction on feed efficiency. Cows were housed in tie stalls, divided in 2 groups and fed a restricted amount of maize silage, 0.5 kg daily of a premix and a fixed amount of urea. E1 consisted of two periods of 112 days. Cows were fed either 100 or 70% of their energy requirements during the first period (P1), and 100 or 130% during the 2nd period (P2). Weight change (ΔW) during P1, P2 and P1+P2 averaged -4.0, 9.1 and 5.1 kg for group 1, and –63.8, 82.8 and 19.0 kg, respectively, for group 2. Extra ΔW of group 2 was realized with a slightly lower net energy intake of 179.5 MJ. E2 consisted of a restriction period of 140 d (P1), where cows were fed at 100 or 80% of their energy requirements, followed by a 70-day re-alimentation period (P2), where maize silage was fed to appetite. Respective ΔW during P1, P2 and P1+P2 averaged -4.4, 83.8 and 79.4 kg (group1), and -45.5, 88.5 and 43.0 kg (group2). Total ΔW was higher for group 1 than for group 2 ($P=0.026$). Mean daily energy intake averaged 37, 64 and 46 MJ for group 1 vs. 29, 59 and 39 MJ for group 2. Intake was lower for group 2 than for group 1 during P1 ($P<0.001$) as well as during P1+P2 ($P=0.016$). However, feed efficiency was worse for group 2 than for group 1 during P1+P2 ($P=0.046$) so that energy restriction seems not appropriate for BBDM cows.

An evaluation of over-wintering feeding strategies prior to finishing at pasture for cull dairy cows

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An experiment was conducted to evaluate the finishing of cull dairy cows. Fifty-six spring calving Holstein-Friesian non-pregnant cull dairy cows were randomly assigned to a four treatment experiment. The experiment was split into two periods; wintering period (PI) and spring finishing period (PII). The treatments (P1) were; control (C), slaughtered on day 1; 75% grass silage and 25% straw (GS+SW); ad libitum grass silage (GS); and grass silage plus 6 kg concentrate dry matter (DM)/cow daily and milked twice daily (MGS+6C). Subsequently, cows were assembled as one herd and offered *ad libitum* herbage on a daily basis (PII). All cows were finished to pre-defined carcass specification: carcass weight > 272 kgs, fat score 3 and carcass conformation class P+ or O. Individual DM intake, live weight, body condition score, carcass classification and grazing management were measured. Total feed utilized (DM) was 2.0, 1.9 and 2.5 tonnes/cow for the GS+SW, GS and MGS+6C treatments, respectively. Cows on the GS treatment (115 days) finished on average 115, 33 and 38 days earlier than those on the C, GS+SW and MGS+6C treatments. In conclusion, once the finishing criteria are achieved, there are no differences in carcass characteristics, and daily gain and days to slaughter are affected by over-wintering strategies for cows finished at pasture.

Farming systems and goog farming practices in cattle husbandry in France: the impact of a Charter of Good Practices

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The aim of this paper is to promote an understanding of the main environmental and social issues in cattle husbandry in France, and of schemes which aim to improve farmer practices. The main farming systems of cattle production (dairy and beef) in France are described. For each system the environmental or social issues are emphasised, and the implementation of the European and national regulations, as well as the cross compliance systems, are described. Finally a professional quality scheme, the Charter of Good Practices in Cattle Farming, which aims to improve farming practices and their traceability is highlighted. The paper also presents the content of the Charter and then proposes an evaluation of its impact. The resources devoted to the Charter allowed 125 000 farmers to be involved in the scheme (but proportionately less of smaller farms were involved). The level of management of each practice is more difficult to quantify. According to the evaluations and external monitoring which were carried out, the traceability of animal food, and documentation of veterinary and environmental practices, constitute the practices where the improvements were both the most important and where progress still needs to be made. Nevertheless, the Charter constitutes an efficient way of helping farmers to comply with cross compliance and hygiene regulations.

What are good farming practices? some stockbreeders' points of view

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Our team ("Transformations in livestock farming systems", part of the UMR METAFORT lab) carries out research into the way farms with herbivores adapt or could adapt to the challenges of sustainability and multifunctionality. The situations studied in partnership with professional bodies cover sheep and cattle systems (milk or meat) in grassland and mountain areas in the centre of France. Questions relate to the extensification of production, to sectors (development of quality marks), to territorial dynamics (conditions for the sustainability of part time livestock farms) and to the improvement of livestock farmers' working conditions. In the present work, we give some results from different studies conducted over the last 10-15 years concerning beef cattle systems, to show how the understanding of the diversity in farmers practices needs to take into account the farmer himself (his plans, decisions and practices), the herd (the animal production entity, its stock number dynamics and its production) and the resources (feed, work). We choose some examples of practices categories, such as batching management, animal marketing, breeding, and management of information, to illustrate how farmers argue different "ways to do" as good practices. These results lead us to ask about the best way to renew tools to support changes implemented by livestock farmers in so many different situations.

The implementation of good management practices on Lithuanian dairy-beef cattle husbandry through international programme and projects

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Favourable conditions for grass cultivation, old traditions of agricultural production and the ability to train farmers in new techniques create good conditions for the development of dairy-beef cattle husbandry in Lithuania. However, feeds should contain a high level of energy and other macro and micro nutrients, and should be of high hygienic quality to ensure food safety over the entire chain from primary production of the feeds to the consumer of the food. With the coming into effect of REGULATION (EC) 183/2005, farmers producing feeds and feeding food-producing animals "shall take measures and adopt procedures to keep the risk of biological, chemical and physical contamination of feed as low as reasonably achievable". Many Lithuanian farmers lack entrepreneurial skills, as well as knowledge on how to integrate forage production of high quality into the total milk production system, and how to manage stable milk production throughout the year. It is necessary and it is the responsibility of every person involved in food and feed production to prevent risk of biological, chemical and physical contamination in the food chain. This paper reports on three development projects that sought to increase animal production through grassland improvement, the production of high-quality forage and cereals, and the strengthening of control systems for feedstuff in pursuance of EC legislation.

Effect of housing and rearing system on longevity of dairy cows by breed

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Standards of good farming practice are based on present knowledge of agriculture and technology and have the aim of ensuring maintenance of agricultural land, food safety, animal welfare and protection of the environment. Housing and rearing systems of cattle influence all aspects of good farming practice and are directly related to longevity. Our study aims to compare different farming systems, natural conditions of farming, and involvement in environmental programmes on performance and welfare/animal health status of dairy cows in Slovenia. The study is based on data from an inventory of dairy farms, data from milk recording and data on the implementation of environmental measures. The analysis includes nearly 5.000 dairy farms. Results show that 70% of dairy cows are still housed in tie-stalls with only 30% in loose housing. One third of farms practice grazing during the summer. Two thirds of farms are located in hilly and mountain areas and most of these are involved in environmental measures. Farms with a sustainable farming system have less health and fertility problems with their cows and therefore have greater longevity of herds. Production life time of Holstein-Friesian cows was nearly 6 months shorter than for Brown cows. However, the highest life time production was on farms with HF cows (26.000 kg of milk compared to 19.000 kg for Simmental breed). The best results for longevity were on farms practicing grazing during the summer.

Comparison of grazing management systems for calves and yearling steers

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In dairy beef systems calves and yearlings are managed together at pasture in a leader/follower grazing arrangement. In this study, leader/follower (L), separate (S) and mixed (M) grazing systems were compared. The S calves and yearlings had separate paddocks while the M calves and yearlings grazed together. Yearlings and calves were turned out to pasture on March 19 and May 14, respectively and the treatments ended on September 23. The yearlings were then finished indoors and slaughtered the following spring. The calves were housed for the winter on a moderate plane of nutrition and were subsequently turned out to pasture for a second grazing season. Mean live weight gains of the calves for L, M and S during the grazing treatments were 964, 685 and 573 (s.e. 28.8, $P<0.001$) g/day, respectively. Corresponding values for the yearlings were 891, 948 and 1075 (s.e. 35.5, $P<0.01$) g/day. There was no compensatory growth the following winter in either the calves or yearlings. Slaughter weights and carcass weights for the yearlings when finished for L, M and S were 642, 661 and 678 (s.e. 9.4, $P<0.05$) kg, and 345, 357 and 366 (s.e. 5.6, $P< 0.05$) kg, respectively. There was some compensatory growth in the second grazing season. It is concluded that L benefited the calves but restricted the yearlings while S had the opposite effect. The challenge now is to devise grazing systems to achieve the L calf performance and the S yearling performance.

Structural characterization of livestock systems in Andalusian Dehesa

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On a sample of 175 extensive farms from Andalusian Dehesa, three production systems were identified by means of multivariate analysis. Most of the farms (54%) were included in the denominated Conservationist System, that corresponds to small, beef cattle or ovine-cattle farms with low intensification levels where the stocking rate is adjusted to carrying capacity, and only seasonal supplementation is used. The second category of farms (16%) included in the system named Sierra, are small sized, have small ruminants as the major animal species, and the level of technology is low. Finally, the Productivity system (30% of farms studied), comprises mostly large bovine farms with higher technology and supplementation levels, and stocking rates higher than the carrying capacity of the Dehesa. The three established farm types can be useful for technical and economic modelling of these extensive systems in the context of actual and future viability.

Comparison of beef biochemical composition of cattle breeds in Latvia

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Each breed and cross breed has different production and meat quality indices. The aim of our investigation was to compare the biochemical composition of beef from crosses of cattle breeds developed in Latvia. The cattle were reared on farms in the Cesis region. Welfare requirements on these farms ensured free suckling cows, non restricted feed and water supplies, sufficient pastures and walk areas, and provision of organic origin feed. Crosses of Latvian Brown (LB) breed cows with Aberdeen Angus (AB) or Hereford (HE) breed bulls were used. A total of 88 meat samples were chemically analysed for dry matter, crude protein, crude fat, fatty acids, amino acids and cholesterol. Results showed that meat samples from LBxAB had higher protein (19.19%), fat (1.98%, $p<0.1$) and cholesterol (74.54mg%, $p<0.05$) contents than meat samples from LBxHE which had corresponding contents of 18.60%, 0.98% and 66.66mg%. The composition of fatty acids did not differ significantly. Histidine (2.6-7.2 gkg^{-1}), asparagine (12.8-28.8 gkg^{-1}), alanine (12.9-18.6 gkg^{-1}) and tyrosine (3.6-5.8 gkg^{-1}) were most variable amino acids. Meat samples from LBxHE had a higher histidine (0.50 gkg^{-1}) content but less glutamine (2.63 gkg^{-1}) than meat samples from LBxAB (0.39 gkg^{-1} and 2.93 gkg^{-1} respectively).

Cows adaptation for a voluntary milking robot system

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The aim of the study was to analyze a new cow management and milking system and its influence on productivity traits. On the first day of the new management conditions cows went to the milking robot only once, moreover most of them had to be goaded there. By the fourth day several cows went to the milking robot three or even four times. On the first research day, 12.36 minutes were required to milk one cow, but within the next few days the average milking time essentially decreased and corresponded to the desired one. On the first day in the new management conditions the average milk yield per cow was lower (7.8 kg) than the supervisory control milk yield in June (28.3 kg). On the second day, the average milk yield per cow increased (18.7 kg). However, it was still 9.6 kg or 39% lower than on the day of supervisory control in June ($p<0.05$). On the third and the fourth days, the average milk yield per cow continued to increase gradually (19.0 and 22.2 kg, respectively). The results obtained indicate that by the fifth day the average milk yield in the research group had reached 26.6 kg and was only fractionally (-1.7 kg) different from that of the supervisory control. After evaluating the results it may be concluded that the cows in the new management system had good adaptation ability, as milk yield was normal by the fifth day after the change of the technology.

Performance and carcass characteristic of Brahman crossbred and Charolais crossbred cattle in Northern Thailand

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The objective of this study was to assess animal performance and carcass characteristics of commercial beef breeds in Northern Thailand. In total, 34 Brahman (BC) and Charolais crossbred cattle (CC) were used. They were kept in groups under practical farm conditions and were randomly selected for slaughter at 500, 550 and 600 kg body weight. The CC animals had higher average daily gains and better body muscle scores compared with BC. However, BC had higher heights at withers and heights at pelvis. Genotype and slaughter weight had significant effects on carcass characteristics. The CC had significantly higher warm carcass percentages, better carcass conformation and less carcass fat. Carcasses from CC had greater loin eye area and received higher marbling scores. With increasing slaughter weights (up to 600 kg) loin eye area, carcass length and carcass leg length increased significantly. The results indicate that CC is of higher economic value because of better performance and carcass traits. A slaughter weight of 600 kg resulted in better live body and carcass shapes and a larger loin eye area than slaughter weights of 500 and 550 kg.

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Microclimate assessment in the insulated and ununsulated barns for beef cattle

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The purpose of the present study was to evaluate the microclimate in beef cattle barns and investigate dependencies between some microclimatic indices. The study showed that there were different levels of microbial pollution in various cattle barns. The highest concentration of microorganisms was in the air of small (80 places) insulated beef cattle barns: total bacterial count was 11.47m CFU m^{-3}, the E. coli count was 1.73m CFU m^{-3}, and moulds count was 0.66m CFU m^{-3}. The lowest concentration of microorganisms was in the air of uninsulated dairy barns: total bacterial count was 4.81m CFU m^{-3}, and moulds count was 0.10m CFU m^{-3}. The concentration of microorganisms in the air of cattle barns was strongly related to animal density and dust concentration in the air. Concentration of ammonia and carbon dioxide mostly depended on air velocity in the cattle barns.

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Occurrence of spore forming bacteria in cows' feed and raw milk

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The objective of the current study was to investigate the incidence of spore forming bacteria from the genera Clostridium and Bacillus in feed and raw milk samples. For bacteriological examination, different feed samples and individual cows' milk samples were taken in 4 dairy farms in Riga region. Samples were inoculated on different complex and selective culture media. In total, 47 animal feed samples and 134 bulk tank milk samples were investigated. The acquired data were analysed using analysis of variance. Spore forming microorganisms from the genus Bacillus were isolated from 62% (n=47) of feed samples including 59% (n=17) fodder, 80% (n=10) silage, 78% (n=9) hay and haylage, and 58% grain, grass and brewer's grain samples. Microorganisms from the genus Clostridium were isolated from 79% (n=47) of feed samples; 55% (n=47) of samples were contaminated with vegetative cells and 49% (n=47) had spores. Microorganisms from the genera Bacillus and Clostridium were isolated from 28% (n=134) and 43% (n=21) milk samples, respectively. The results showed that feed and raw milk are contaminated with spore forming microorganisms which are risk factors for qualitative milk products obtaining in dairy farms.

Session 10 Theatre 1

The interface between bioenergetic status and the reproductive axis in lactating dairy cows

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Reproductive success in all mammals is dependent on adequate energy availability. In response to genetic selection for milk yield, dairy cows are capable of producing many times more milk than necessary to support a calf. This increase in milk yield has been achieved by a concomitant increase in feed intake, but in early lactation, the rate of increase in energy requirements outpaces the increase in energy intake. The cow enters negative energy balance (NEB) and responds by mobilising body reserves to meet mammary energy requirements. Anabolic hormones are depressed and catabolic hormones are elevated, and return to normal when a more favourable bioenergetic situation ensues. Lactation receives a high priority in the hierarchy of physiological processes, and other physiological processes including reproduction are accorded low priority; consequently anoestrus can extend for months and conception rates following insemination are unsatisfactorily low (<40%). In the high yielding cow in NEB or in the aftermath of a prolonged period of NEB, should this be viewed as a reproductive disorder, or a normal physiological response to avoid another energy demanding pregnancy and lactation? Compelling evidence now exists that cows can be genetically predisposed to suboptimal reproductive performance, and many countries have included traits related to daughter fertility in sire evaluation programmes.

Session 10 Theatre 2

Breeding for improved dairy cow reproductive performance

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Cow welfare along with profitability in production are important issues in sustainable animal breeding programmes. Along with an intensive selection for increased milk yield, Holstein reproductive performance has declined in part due to an unfavourable genetic relationship. The Nordic countries have traditionally recorded and performed genetic evaluation for a broad range of functional traits including reproduction. This may explain the largely unchanged genetic trend for reproduction traits in the Scandinavian Red breeds. In recent years many other countries have also implemented genetic evaluation for these traits. Thus, the relative emphasis of dairy cattle breeding objectives has gradually shifted from production to functional traits such as reproduction. Improved ways of recording traits, e.g. physiological measures, early indicator traits, assisted reproductive techniques and increased knowledge of genes and their regulation may improve the genetic selection strategies and have large impact on present and future genetic evaluation programmes. Extensive data bases with phenotypic recordings of traits for individuals and their pedigree are a prerequisite. Genetic markers for the reproductive traits are accumulating and genomic selection may increasingly be used and built into the breeding programmes along with presently used progeny testing schemes.

Effect of homogeneous climatic zones on fertility traits in the Italian Holstein cattle breed

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Weather conditions are known to have effects on performance and well-being of livestock animals. The Italian Biometeriological Institute identified six homogeneous climatic zones. These were defined based on level of Temperature-Humidity Index (THI) in the summer period (June-August). The aim of this study was to examine the effect of different weather conditions on reproductive performances in the Italian Holstein cattle population. For this study we used four fertility traits including angularity (ANGO), calving interval (CI), nonreturn rate at 56 d (NR56), and days to first service (DTFS). Data consisted of 2813325 reproductive record and a fixed effect model for each trait was used. Fixed effect included age of cow, stage, month of calving-year of calving, month of insemination-year of insemination and zone. Furthermore to each model the breeding value of the trait was added as covariate. THI zones were significants on all traits. The R-square ranged from 0.07 to 0.24. Interesting was the effect of the zone for the NR56 trait that decreased linearly from zone one to six by 12%. These results show that it might be important to include weather information in the genetic evaluation model for the Italian Holstein cattle breed; a broader project is in progress to better investigate this matter.

Effects of dam size and nutrition during pregnancy on the milking ability of offspring

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This study investigated effects of dam size and nutrition level during pregnancy on milk production in two-year-old ewe offspring. Seventy-five first parity, twin-bearing/rearing-ewes, born to either 'heavy' or 'light' dams, which were fed either at ad libitum or maintenance from days 21 to 140 of pregnancy, were milked using the oxytocin method. Milking commenced five to seven days after lambing, followed by milking weekly for seven weeks. Lactation curves for daily milk yield for each ewe were modelled using a third order Legendre polynomial. Parameters of the lactation curve were calculated for each ewe, including accumulated milk yield, peak yield and two measures of persistency. Parameters were analysed using PROC MIXED in SAS. Ewes born to 'heavy' and maintenance fed dams had greater lactation yields (132.5 ± 2.34 kg and 132.2 ± 2.83 kg, respectively) than ewes born to 'light' and ad libitum fed dams 125.7 ± 3.03 kg 125.9 ± 2.58 kg, respectively) ($P<0.10$). No differences were found among dam size and nutrition treatments for peak milk yield and two measures of persistency. These results indicate that the lactation yield of the offspring could be affected by dam size and nutrition during pregnancy; further studies will investigate the effect of lactation on lamb growth.

Genetic correlation between female fertility and milk yield in Lacaune sheep

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A total of 416 670 lactations corresponding to 189 101 ewes issued from 3603 sires and distributed across 1978 flock-year groups was used to estimate genetic and environmental parameters of standardised milk yield (SMY_T), Artificial Insemination success in lamb (AIS_1) and in adult (AIS_T). Parameters were estimated with a multiple trait sire model, using the ASREML software. Heritabilities for SMY_T, AIS_1 and AIS_T were 0.27, 0.04 and 0.05, respectively. These results were in accordance with the literature. The genetic correlation between AIS_1 and AIS_T was 0.55 indicating that AI result is not the same trait in lamb and in adult ewe. The genetic correlation between milk yield and lamb AI result was not significantly different from 0. The genetic correlation between milk yield and AI result in adult ewe (-0.23) was in the range of antagonistic correlations reported in dairy cattle. Consequently these result show that selection for milk yield may induce an indirect decrease in fertility. Nevertheless, no decrease of AI result has been observed in this species. This is the first time that correlation between milk yield and fertility after insemination is reported in sheep and further investigations are needed to confirm this result.

Survival analysis of interval from first to last insemination.

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Survival analysis methods were used to estimate the risk of conception through the interval from first to last insemination in a Spanish Holstein population. Non parametric and semiparametric analyses were first performed to explore the possibility of using parametric approaches and to test the significance of effects of age at first insemination, herd and year (HY), year and season (YS) of insemination, production level (milk, fat and protein), somatic cell count (SCC) and service sire (SS). A Weibull distribution seemed adequate and all effects showed a significant contribution to the risk of 'failure' (failure= pregnancy). Models including milk yield provided larger likelihood values than models including fat or protein yields. Several Weibull analyses were performed to obtain estimates of variances for HY, SS and the additive genetic effect of sire, including milk yield as production trait and the rest of the above mentioned factors. A time trend was observed when analysing the YS effect. No large differences in relative risk were observed for most of the milk production classes, except for the lowest class, which showed a lower risk of failure. On the contrary, higher levels of SCC yielded lower relative risk of pregnancy. Estimated HY, SS and genetic sire variances were of similar magnitude

Genetic evaluation for days-open in Danish Holstein using different models

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The objective of this study was to evaluate models for genetic evaluation for days-open. Data including 476,000 first-parity records of Danish Holstein cows were analyzed using four alternative sire models which handle censored records in different ways. The first model was a conventional linear model (LM) where censored records were treated as real records but added a penalty of 21 d. The second was a bivariate threshold-linear model (TLM) with a threshold model for censor status (0, 1) and a linear model for days-open. The third model was a right truncated Gaussian model (CLM). The fourth model was a Weibull proportional hazard model (SM). The four models were evaluated by comparing predicted BV from two subsets, and the prediction ability using a cross-validation. Estimate of heritability was about 0.068 from model LM, TLM and CLM. On the other hand, model SM produced a much higher estimate of heritability. The correlation between predicted BV from different models was close to unit, except for model SM. Based on the criteria mentioned above, no significant difference could be found between model LM, TLM and CLM. Out of the expectation, model SM gave a relatively poor performance in genetic evaluation of days-open. It could be mainly due to the fact that our data did not really follow Weibull distribution.

A new fertility index in Norwegian Red

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Fertility, as the cow's ability to conceive, has been included in the breeding goal of the Norwegian Red since 1972. The trait used in genetic evaluation has been non-return at 56 days post calving (NR56) for heifers, and since 2001 for first lactation cows in addition. A sire model has been used. The phenotypic level of NR56 is high in Norway with an average in 2007 of 0.77, 0.69, 0.71, 0.71 and 0.71 for heifers and 1st to 4th lactation cows, respectively. A new fertility-index has now been developed in order to include information on later lactation, in addition to information on the cows' ability to recycle. A multiple trait animal model is used including interval from calving to 1st insemination (IntCIns) for 1st -4th lactation. For NR56 a three traits multiple animal model is used, including information on heifers and 1st -4th lactation cows. The estimated genetic correlations between 2nd, 3rd and 4th lactation is very high (> 0.98) for both NR56 and IntCIns, and information from these three lactations are therefore treated as repeated observations, in order to increase the size of the herd-year classes. Positive genetic trends were calculated for NR56. The genetic improvements were largest for heifers, showing an increase in NR56 of 3% units from 1980 to 2005. The IntCIns has slightly increased in the same time period by 0.5 days for 1st lactation cows, and were unchanged for 2nd -4th lactation cows. The results also show that genetic improvement in both fertility and production can be achieved, by including both trait groups in the total merit index.

Session 10 Poster 9

Effectiveness of automatic determination of insemination time after synchronization of ovulation in beef heifers, compared to estrus detection by visual observation

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Objective: to determine the efficiency (E), accuracy (A) and timing of determining insemination time (IT) by automatic activity monitoring (AAM), compared to visual observations of estrus (VO), in PG treated beef heifers. Methods: 209, 13-15 mo. old, Fleckvieh crossbred beef heifers were used in 2 trials. General activity (GA), using "Heatime" system (SCR Eng., Israel), and walking activity (WA), using "Afiact" system (S.A.E Inc., Israel), were monitored in the 1st and 2nd trial, respectively. VO on all heifers were conducted 4x daily. The heifers in each trial were randomly assigned to 1 of 2 groups based on IT determination method, i.e., AAM or VO. 2 PGs were injected 11 days apart. A 4d period of 1 AI/day a.m. started 48h after the 2nd PG. Ovulation (O) was evident from observed estrus or P_4<1.2 ng/ml plasma on the 4th AI day. Automatic alerts or VO coinciding with O were considered "correct detections" (CD). E is CD as % of total Os and A is CD as % of total alerts. Results: % E and A of GA monitoring vs. VO, were 91 and 84^a vs. 93 and 100^b ($p<0.05$). % E and A of WA monitoring vs. VO, were 92 and 78^a vs. 96 and 96^b ($p<0.05$). 82 or 13% of GA alerts and 85 or 9% of WA alerts, coincided or followed their respective VOs. General conclusion: AAM is an efficient and accurate method for IT determination in beef heifers.

Session 10 Poster 10

Evaluation of a reproductive management based on the synchronization of estrous cycles in dairy heifers

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Objective: to quantify and compare reproductive performance (RP) of heifers on a synchronized reproductive management (SRM), with that of control heifers on a conventional reproductive management (CRM). Methods: 468, 13-14 mo. old Israeli-Holstein heifers were studied over a 3 years period. Clusters of heifers were formed at 3 wk intervals, at 2 weeks before 1st planned AI. The heifers of each cluster were allotted into 1 of 2 treatment groups with equal age distribution. The treatments were: 1. SRM - heifers were treated, before 1st AI, by 2 PG injections, 12 d apart, followed by a 6 d AI period (AIP). Heifers in estrus between AIPs were inseminated too. 2. CRM - AIs were performed continuously 6 d a week. In both groups, visual observations of estrus (VO) were conducted 4x daily. AIs were performed once daily a.m., following observed estrus. Heifers that returned to estrus after AI were re-inseminated. Results: 97% of SRM heifers were 1st inseminated during an AIP. 10% of SRM AIs were performed between AIPs. Mean age at 1st AI, mean interval from 1st AI to conception, conception rate at 1st AI, conception rate from all AIs and pregnancy rate at 30 d following 1st AI, were respectively, 424 d, 10 d, 76%, 65% and 88% in SRM vs. 428 d, 19 d ($p<0.05$), 63%($p<0.005$), 56% ($p<0.02$) and 78% ($p<0.005$), in CRM. General conclusion: Synchronized reproductive management improve RP of dairy heifers, and reduce the amount of labor spent on VO and AI in a conventional reproductive management.

Influence of growth hormone gene polymorphism to cattle reproduction traits

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Growth hormone influence animal growth, development, reproduction traits, production. The aim of this study was to identify growth hormone gene polymorphism in cattle by PCR-RFLP method and it's influence to bull's reproduction traits. Digestion with restriction enzyme of 282 bp growth hormone gene region produced two fragments for alleles A and B. After investigation of 33 bulls was found, that A allele has 0,682 frequency and B allele – 0,318 frequency. 54,5% of tested animal group has AA genotype, 27,3% has AB genotype and 18,2% - BB genotype. In pursuance of measure GH gene influence to reproduction traits, was structured sequent phenotypic trait database – sperm capacity; sperm concentration; sperm mobility. Bulls with GH gene BB genotype had better sperm index, than AA or AB genotype, but statistically important impact was established only to sperm mobility.

Udder health in the Netherlands: from science to practice

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An increasing average Bulk Milk Somatic Cell Count in the years 2000-2004 in The Netherlands urged for actions. The dairy industry and the farmers organizations, together with the Dutch Dairy Board decided to start a national project on udder health, called the UGCN (Dutch Udder Health Centre). In 2005 UGCN was founded and was asked to execute a five year program, aiming at a reduction of the clinical mastitis incidence from the estimated 25 cases per 100 cows per year, to 15. Approximately half of the UGCN work is research, the other half is implementation of knowledge in the daily practice of dairy farmers. Research projects within the program can be qualified as 'applied research', and are divided in three themes: Bacteria, Cow and Farmer. Regarding implementation of knowledge, we found in a pilot study that dairy farmers consider their own veterinarian as their most important source of knowledge on udder health. Thus, UGCN focused on this group for communication to dairy farmers, using study groups. Additionally other means were used, such as the internet, (electronic) news letters, lectures, articles in farmers journals, and 'open door days' at commercial farms. Within the campaign strategy we also try to reach farmers not motivated to improve udder health. The challenge of this project is to realize a quantified improved udder health by integrating both aspects, research and knowledge transfer.

Improvements in the Dutch udder health index

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Genetic selection for improved udder health in the Netherlands is currently based on indirect traits, of which lactation-average somatic cell count (SCC) is the most important one. However, a lactation average does not take into account the dynamics of SCC in response to infection. Several alternative SCC-traits were defined in this study, subdivided in 3 groups: averages of SCC over different periods, traits derived from the proportion of test-day SCC above 150,000 cells/ml, and patterns of peaks in SCC. This study examines which combination of alternative SCC-traits can best be used to improve udder health. The estimated genetic correlations of the alternative SCC-traits in parity 1, 2 and 3 are used to find the optimal combination with selection index calculations. The breeding goal was to reduce both clinical and subclinical mastitis with an equal weight of 0.50. An index with 5 alternative SCC-traits resulted in an accuracy of 0.94. This is an improvement of 21% compared with the current Dutch udder health index, which achieves an accuracy of 0.74 for young unproven bulls. The Dutch udder health index can therefore be improved by considering (1) average SCC in early lactation (5-150 days), (2) average SCC in late lactation (151-400 days), (3) absence or presence of a test-day SCC above 150,000 cells/ml, (4) proportion of test-day SCC above 150,000 cells/ml and (5) number of patterns of peaks in SCC in the udder health index instead of the traits currently used.

Breeding for mastitis resistance: scc-based selection in sheep and first results from a divergent selection experiment

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Selection is an attractive alternative to prophylactic management for control of mastitis in dairy ruminants. Accordingly, many countries have implemented somatic cell count (SCC)-based selection programmes to improve resistance to mastitis. The long term effect and efficacy of sole-SCC selection however is questionable. This paper first summarizes the state of art of SCC-based selection in French dairy sheep. In the second part, we report a divergent selection experiment in dairy sheep that aimed at evaluating the consequences of such a selection. Using dams and progeny-tested rams selected for extreme breeding values for SCC, we managed to create two groups of High and Low SCC ewes with a strong divergence in SCC of about 3 sg. First lactation data gave strong evidences that Low SCC ewes showed significantly higher resistance to natural mammary infections (IMI) than High SCC ewes. Further considerations on udder morphology and milk emission characteristics of those animals are in progress. Additionally, a subset of representative animals from each line was successively challenged with two different bacteria species. Experimental mastitis was more severe in the High than in the Low SCC group. Altogether, results provided good evidence that SCC-based selection leads to improved resistance to IMI in dairy sheep.

Economics of selective antibiotic dry-cow treatment

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Blanket antibiotic dry-cow treatment has become challenged. However, no practical cow-level selection rules taking into account the specific epidemiological context of a given herd are available. A dynamic stochastic simulation model was used to assess selection rules (based on SSC thresholds) for cows left untreated, subjected to antibiotics or treated with teat sealer. Simulated initial epidemiological conditions in a 50-cow herd covered a range of variation in type of pathogens, prevalence at drying-off, and risk of new infections. On mid term horizons (<3 years), moving to selective antibiotic treatment instead of systematic treatment was almost financially neutral, but the number of antibiotic treatments was reduced from 30 to 70%. Some economic benefit was only gained in specific low prevalence (bulk-tank SCC <150,000) and low risk situations. Detrimental effects on gross margin were observed for herds with bulk-tank SCC >300,000 cells/ml. However, on long term horizons (>3 years), detrimental evolution was usually observed, justifying sometimes a return to blanket therapy. For options including the teat sealer use, neutral economic effects were mostly found, but also some very positive economic effects for specific high prevalence and high risk situations (especially with large involvement of environmental pathogens).

Production loss caused by elevated levels of somatic cell counts in different stages of lactation

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Subclinical mastitis causes substantial economic losses for dairy farmers. The main component of the economic loss is lost production. The objective of this study was to quantify the production losses arising from elevated levels of somatic cell counts (SCC) in different stages of lactation. Weekly production records, collected at a research herd between 1989 and 2004, were available. The dataset contained 36 117 observations from 1 155 lactations of Swedish Holstein and Swedish Red cows. The effect of SCC, nested within different stages of lactation, on test-day yields was modeled using a repeated-measures mixed model. A random regression was included to model the shape of the lactation curve. The regression describing the milk loss associated with increasing levels of SCC was significantly different in different lactation stages. When SCC increased from 50 000 cells/ml to 500 000 cells/ml, daily milk yield decreased by 0.9 to 2.0 kg in primiparous cows and by 1.4 to 3.6 kg in multiparous cows, depending on stage of lactation. The average 305-day yield loss in cows with subclinical mastitis was estimated at 286 and 573 kg of milk in primiparous and multiparous cows, respectively, corresponding to 3.5 and 6.8% of the yield in healthy cows.

Farm management factors influencing bulk milk somatic cell count in Irish dairy herds

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The relationship between bulk tank somatic cell count (SCC) and herd management and infrastructure was examined using data from 398 randomly selected, yet representative, Irish dairy farms, where the basal diet was grazed grass. Median bulk tank SCC was 282,887 cells/ml ranging from 82,209 to 773,028 cells/ml. Two questionnaires were administered through face-to-face contact with each farmer. Herd factors associated with bulk tank SCC were determined using linear models with annual somatic cell score (arithmetic mean of natural logarithm of bulk tank SCC) included as the dependent variable. All herd factors were individually analysed in separate regression models and a multiple regression model was subsequently developed. Management practices associated with low milk SCC ($P<0.05$) included the use of dry cow therapy, participation in a milk recording scheme and the use of teat disinfection post-milking. There was an association ($P<0.05$) between low SCC and an increased level of hygiene and frequency of cleaning of the holding yard, passageways and cubicles. Herd management factors associated with bulk tank SCC in Irish grazing herds are generally in agreement with most previous studies from confinement systems of milk production.

Genetic analyses of pathogen-specific mastitis

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To quantify genetic variation for incidence of pathogen-specific mastitis, field data on bacterial diagnoses of mainly subclinical mastitis, collected 1993-2004, were used. After including only daughters of sires with ≥20 progeny in the data set, it comprised 21,834 cows with 38,607 diagnoses. Variance components were estimated for incidence of the six most frequent pathogens (*S. aureus* 35%, coagulase negative staphylococci (CNS) 29%, *Str. uberis* 13%, *Str. dysgalactiae* 11%, *E. coli* 4%, other streptococci 2%). Pathogen data were scored as a categorical trait with 1 (present) or 0 (absent) for each pathogen at each observation. Genetic variation for pathogen-specific mastitis was generally higher compared to corresponding literature estimates on general resistance to clinical mastitis. Estimated genetic variation on the liability scale for acquired infections ranged from 0.006 (*E. coli*) to 0.047 (CNS). To examine whether haplotypes of a previously identified QTL with effect on mastitis resistance had different effects on specific mastitis pathogens, data on 114 genotyped bulls with ≥5 daughters with bacteriological data were analysed. Although there were no haplotype substitution effects on the resistance to any of the 6 mastitis pathogens, two of the haplotypes differed regarding the risk of acquiring a *Str. dysgalactiae* infection.

Effect of mammary health on composition and clotting properties in buffalo milk

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The changes in concentration of main constituents and cheesemaking properties of buffalo milk in relation to mammary health status were investigated. The study was performed on 30 lactating Mediterranean buffaloes. Three classes of SCC were defined, low: ≤200,000 cells/ml; medium: 200-400,000 cells/ml; high: >400,000 cells/ml. The same approach was applied to NAGase, low: ≤50 units; medium: 50-100 units; high: >100 units. Milk yield and lactose content decreased sensitively when SCC was higher than 400.000/ml and NAGase was higher than 100 units. The increase of fat, protein and casein content observed in higher SCC samples can be attributed to the concentration effect caused by diminished milk yield. The concentration effect appears to be macroscopically more consistent than the reduction of synthesis of milk components caused by epithelium damaging. High level of SCC and NAG was associated with an increase of pH, R and K20 and a decrease of A30 values. A2R values, measuring curd firmness at two time the clotting time, were similar in different classes of SCC and NAG and that the disadvantage could be represented by an higher cheese-making time in higher SCC samples. In conclusion if SCC exceed 400,000/ml milk yield considerably diminishes and the clotting ability shows just a time lengthening to reach the ideal firmness of curd.

Relationship between innate immune system components and somatic cells count of Latvian Brown cows

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Mastitis is the most common disease in dairy cows mainly due to reduced milk production and changes in milk quality. The immune response to an incoming infection into the udder is of utmost importance for the health of the dairy cow. Neutrophils, monocytes in blood - macrophages in tissue and enzyme lysozyme mediate the innate immune response and lymphocytes, which subset in to different type T- and B cells compose the specific immune response. The objective of this study was to analyze heritability of immune system component and its relationship with somatic cell count in milk, as well to get answer could be used the immune system component for the selection of cattle. In the study were included 1st lactation 30 LB cows from four genetic groups. A nested design is used for experiments. The milk samples were analyzed 3 times during lactation for somatic cell count, lysozyme, neutrophils, macrophages T- and B cells. Heritability of somatic cell count and immune system components were estimated using general linear model. Heritability of somatic cell count and immune system component were low ranging from 0.1 to 0.18. No significant relationship was found when somatic cell count in milk was till 150t.ml^{-1}. Moderate phenotypic correlations exited between somatic cell count and neutrophils, somatic cell count and macrophages (r_p=0.50, 0.61), when somatic cell count in milk was above 150t.ml^{-1}.

Factor affecting somatic cell counts (SCC) of sheep milk in various Awassi populations

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Some 2 000 heads are belonging to purebred and crossbred Awassi sheep in the flock of the Corporation: Awassi 5.7; F_1 38.1; R_1 28.7; R_2 21.2; R_3 4.9; R_4 1.4%. The crossbreeding program was dominantly started on the base of commercial Hungarian Merino. The sheep were mated once a year and the lambing started late January. During the last two years 20% of the total population were mated in spring time, and the lambing was started late September. The lambs were artificially reared since their birth. The colostrums milked out from the ewes and offered to the lambs during the first 5-6 days after the lambing. After it the ewes were milked twice a day, morning and evening, when individual milk samples were taken. Parallel the milk sampling, the udder characteristics of each ewe were determined. During the first two-three month of lactation a third milking was introduced to the system at midday, since 2004. The samples were examined by official raw milk laboratory determining the fat, protein, lactose, and somatic cell content using Milkoscan 600 and Fossomatic equipments. Data received were processed using Microsoft Excel 7.0 and SPSS 9.0 for Windows programmes. According to the results received, the genotype, part of the day, the period of lactation, the udder type, size and the teat size had significant effects on the level of SCC, however, the effects were different.

The four "c"s of nutrtional management; Creating Consistency, Coping with Challenge

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The farmer's objective is to produce high quality milk efficiently and consistently. The cow has the same objective, but must balance it with challenges posed by parturition, rebreeding, environment and competition. Despite advances in dairy cow nutrition, some fundamental problems remain. The modern cow is sub-fertile, attempts to stimulate hyperphagia in early lactation having failed. Breeding goals have changed, with emphasis given to longevity. Lameness and mastitis incidence has increased, and global warming is introducing 'new'diseases. Technology has advanced, cows are milked automatically and monitored more closely. How are nutritionists to respond? Perhaps, by better understanding the cow's overall requirements, both at any given point in her life and also across her life as a whole, and by responding to her overall physiological needs, not just those of her rumen and digestive system. Taking the first of these problems as an example, recent work at Nottingham has identified nutritional regimes that modify the GH:IGF axis so as to improve fertility, but we still do not understand why the cow is genetically programmed to mobilize body reserves, nor have we defined the relationship (if any) between deposition and subsequent mobilization. This paper will explore ways in which nutritional management might evolve, enabling the cow to achieve consistency, by which I mean physiological consistency, including coping with challenge.

Diet-health relationship in the transition period: consequences on energy balance and efficiency

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Dairy cows, in their transition period, suffer quite often for the negative effects of diseases on feed intake and utilization, while it is well known that unsuitable diets in dry period and early lactation can be partly responsible of metabolic and/or infectious diseases. The disease stress is a more or less serious condition, due to pro-inflammatory cytokine release; it causes some anorexia, a stronger depletion of energy and nutrients, a diversion of liver synthesis from usual to acute phase proteins, an oxidative stress, some hormonal changes etc.. This modifies the relationship between actual diet, its intake and its efficiency; therefore, the performance of cows are impaired: milk yield is lower than expected, but BCS losses are higher suggesting a stronger negative energy balance, despite the actual diet could be considered as satisfactory. Furthermore, these animals tend to be more susceptible to new diseases (metritis, mastitis, lamenesses etc.), less fertile and therefore with a shorter longevity. This means that, particularly in the transition period, a proper dry matter intake is affected by health conditions and not only by the supplied diets. Nevertheless the diet of dry period, as well as those of previous and new lactation, can be responsible of unsatisfactory health conditions at calving time with the above consequences. All these aspects, besides any other cause of inflammation, must be considered to enhance the transition period response of dairy cows.

Effects of rumen protected choline during transition phase on haematology of dairy cows

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This paper reports the effects of supplementation of rumen protected choline (RPC) to transition cows on haematological features. Twenty-two Italian Friesian cows were randomly assigned by expected calving date, parity, and previous milk yield to either be supplemented with RPC from d –21 relative to expected parturition until 35 DIM, or to consume basal diet only (CON). Treatment with RPC was obtained adding 50 g of RPC top dressed product (Sta-Chol$^{\hat{a}}$, Ascor Chimici, Italy, with 50% choline as choline chloride) per cow, just after TMR distribution. Jugular blood samples were collected weekly, until the 10th wk of lactation. Pre and postpartum data were analyzed separately, by a randomized block design, with diet supplementation and week of trial as main factors, with cow repeated in time. Cows fed RPC had lower total leukocyte count ($P<0.001$), neutrophil count ($P<0.05$), and lymphocyte count ($P<0.001$) than CON cows throughout their first 10 weeks of lactation. There were no differences between treatments on erythrocyte-related variables, both before and after calving. Supplementation of transition cow diet with RPC affected the number of circulating leukocyte in early lactation, but further research is necessary to better understand the implications of these effects on transition cow health.

Practical aspects of energy nutrition of high producing dairy cows

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Net energy is usually considered the nutrient most likely to limit milk production in high yielding dairy cows. To formulate cost-effective, productive, and healthy diets for high producing cows, energy systems must accurately assess the energy values of feedstuffs when fed in different diets at different intakes and accurately estimate energy requirements for different types of cows. Most energy systems in use today are reasonably accurate in estimating energy requirements but some adjustments might be needed to the maintenance requirement and to account for increased activity of cows. Accurately estimating the net energy concentration of diets is much more difficult. The net energy concentration of a diet is a function of its enthalpy, digestibility, and efficiency of use (i.e., conversion of digestible to metabolizable to net energy). Enthalpy is a function of the concentrations of nutrients and usually does not vary greatly among complete diets. Digestibility is a function of chemical and physical characteristics of individual feeds, interactions between dietary ingredients (and nutrient fractions), and interactions between diet composition and dry matter intake. Efficiency of energy use is mostly a function of source of energy (e.g., starch, fiber, fat, protein). This paper will discuss energy requirements of dairy cows and how they may need to be adjusted when formulating diets for high yielding cows. Methods to estimate energy values of feeds and mixed diets will also be discussed.

Can high-yielding dairy cows reduce the contribution of ruminants to greenhouse gases emissions?

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The increase in milk yield per cow results in a decrease in methane (CH_4) emission per kg milk produced. The increase in milk potential by itself has not been proved to modify methane production but high-yielding cows receive a high proportion of concentrates in their diet and have a higher intake and rate of passage of digesta out of the rumen, all factors that reduce methanogenesis. However, the intensive feeding system necessary to meet their genetic potential could produce more other greenhouse gases (GHG) than extensive management. When using the life cycle assessment method that considers all GHG, under different European production systems there is no clear effect of cow productivity on total emissions at the farm level, but this approach requires further research. For a given production system, however, any strategy that depresses rumen CH_4 will contribute to reduce total GHG emissions. Several technologies are currently being investigated but most of them are in development and are not yet applicable. At present, a practical way to reduce methanogenesis is the addition of fatty acids. Medium-chain fatty acids are efficient although they may impair the nutritional value of milk. Polyunsaturated fatty acids, especially those rich in linolenic acid are very efficacious, and can decrease CH_4 by up to 30%. These fatty acids also contribute to the nutritional quality of milk and farmers could adopt their use provided it does not result in a decrease in milk performances.

Potato meal as an alternative to fish and soybean meal to complement grazing dairy cow's feeding

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This experiment was carried out in a dairy farm of Terceira Island. At the initial phase of lactation 21 cows were divided in 3 groups according to their weight, lactation days and calving number. Our main goal was to compare potato and soybean protein in the diet of dairy grazing cows as potential replacements for fish meal (banned in animal feeding since January 2001). The only factor of variation was the quality and the degradability of protein sources. After calving, animals for each group were identified, and affected to the following treatments: soybean, fish meal and potato. A significant increase ($p<0.05$) was observed in the milk production for the treatment using the potato protein, when compared to the other two treatments (29.5, 31.7 and 33.9 kg/day for soybean, fish meal and potato respectively). For milk protein content, the highest value ($p<0.05$) was observed in the treatment with soybean (3.55, 3.50 and 3.35%). For urea nitrogen in milk (15.6, 13.4 and 15.5 mg/100ml), the treatment using fish showed significantly lower levels ($p<0.05$). Results clearly demonstrate a significant increase of milk production ($p<0.05$), and significant differences towards fish ($p<0.05$) for cows fed with the potato supplement. This work strongly suggests that the amino acid content and/or the degradability of protein in the rumen are useless for milk production and its content in protein in high producing cows.

Effect of a modified glucomannan fraction from yeast cell wall extract (Mycosorb®) on milk production in dairy herds in south Italy

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The objective of this study was to evaluate the effect of a modified glucomannan fraction from yeast cell wall extract (Mycosorb®, Alltech Inc.) on milk quality (SCC, % fat & protein) and quantity. The study was conducted on 2 dairy farms where visual observations indicated the presence of mycotoxin contaminated forage. The total milk production and milk composition was recorded for the total trial period. The trial was done on a "before and after" basis with production figures being compared before and after the inclusion of Mycosorb Farm Pak. FARM 1: The total milk production and milk composition was recorded for 5 months: first 2 month without Mycosorb and consecutive 3 months with Mycosorb in the diet. Mycosorb inclusion increased milk yield by 1.5 l/h/d while stage of lactation remained identical and somatic cell count (SCC) was reduced (529 vs 196, x1000 cells/ml). FARM 2: The total milk production and milk composition was recorded for 12 months: 3 months without Mycosorb followed by 6 months with Mycosorb in the diet and then again 3 months without Mycosorb. With Mycosorb in the diet, SCC decreased (430 vs 288, x1000 cells/ml) and increased again (288 vs 598, x1000 cells/ml) after the removal of Mycosorb. Mycosorb inclusion increased milk yield by 2 l/h/d without change in stage of lactation at herd level. The inclusion of Mycosorb into the diet can be used to alleviate mycotoxins negative impact on productive performance and milk composition.

Dairy stewardship alliance: sustainability indicators for farmers

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Sustainable dairy farming practices enhance the natural environment while ensuring profitability and improving the quality of life for farm families and their communities. The Dairy Stewardship Alliance is developing a self-assessment for dairy farmers which will promote a broader use of sustainable agriculture practices. The purposes of this research are to develop an on-farm self-assessment of sustainability indicators; to increase education on sustainable practices; and to improve sustainability on farms. The self assessment is composed of ten modules that include clearly defined environmental, economic and social indicators ranging from practices in animal husbandry to energy conservation, farm financials, nutrient and soil health management. Farmers requested assistance to better understand state and federal regulations. Farmers participated in field-testing, which led to the development of a thorough baseline assessment of the ten modules. This report clarifies the indicators developed, methods used, and the results developed in order to move forward with complete implementation of an on-line self assessment. Farms participating in the research improve practices in areas of animal husbandry, biodiversity, community health, energy efficiency, farm financials, nutrient management, pest management, soil health management, and water management of sustainability indicators.

'Sterk met Melk': a pilot project for sustainable dairy farming in Flanders

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Putting the theoretical concept of sustainability into practice often proves to be very difficult. To effectively address this 'sustainability paradox' between intention and action in Flemish agriculture, the indicator-based Monitoring Tool for Integrated Farm Sustainability (MOTIFS) is developed. MOTIFS is a graphical tool, allowing a comprehensive overview and mutual comparison of indicators for different economic, ecological and social sustainability themes. A selection of sustainability themes extracted from MOTIFS is studied on 20 dairy farms in Flanders, to monitor sustainability and stimulate communication and exchange of knowledge between farmers. These 20 farms participate in a Leader+ project called 'Sterk met Melk (Strong with Milk), 2006-2008'. For each sustainability theme, on-farm data is collected, indicators are calculated and the results are discussed with each farmer individually. Also, communication sessions are organised in which the participating farmers discuss their 'MOTIFS-results'. In this way, sustainability becomes tangible and farmers are motivated to adjust their farm management.

Assessment of sustainability: approaches in egg and dairy production systems in the Netherlands

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Welfare is a major problem of the battery cage system. Sustainable alternatives are needed. Dairy production is dependent on large inputs of concentrates from off farm sources. How does this input and others effect the sustainability of the dairy production system? In both situations the boundaries of the system have been defined first, ending at the farm gate. A comparison has been made for the economic, ecological and societal issues. For the egg production systems 13 indicators were selected. Data were collected on 61 poultry farms representing four housing systems. Important differences between housing systems for layers occur in welfare, environmental and economic indicators. Between farm variation was large implying potential for improvement. Twenty one organic and conventional dairy production systems were compared for environmental impact using Life Cycle Assessment (LCA). LCA results were expressed per kg FPCM. From 119 conventional dairy farms LCA and net farm income data were used. Purchased concentrates are an environmental hotspot for both systems. Dairy production systems with high net farm incomes had a low total land use, energy use on farm, total climate change, but a high total eutrophication and acidification. All studies show that farmers can improve performance on and off farm and for different sustainability indicators.

Collaborative elaboration of a sustainability assessment method for small ruminant farming systems in the Mediterranean area

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Sustainability assessment methods based on indicators have generally been elaborated and used in a context of mixed farming and temperate climates. Even if they are claimed to be generic, they may not apply in specific contexts, as for small ruminant systems of the Mediterranean area. In such a case, the importance of pastoral management, the difficulty to precisely evaluate parameters such as food intake, feeds nutritional values, nitrogen balance, the environmental conditions (temperatures, hydrology), or the socio-economical context lead to the search for adapted evaluation methods. For this purpose, a Delphi survey has been launched inside a group of experts (from research, development or administration) in different fields (animal and plant production, pastoralism, soil, economy, sociology) from countries of the Mediterranean rims in order to identify by consensus sustainability-linked objectives, the best representative variables and derived indicators, their relative importance, and references relative to the main types of small ruminants farming systems.

A modelling approach to assess trade-offs between ecological and productive outcomes in livestock farming system

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The impact of cattle trampling on grassland birds is all the more important since bird nest during months with highest grass growth. Therefore management prescriptions aim at limiting stocking rate during spring. However it is still unclear to what extent these thresholds on stocking rate reduce productive performance. Based on a model linking grazing strategies and dynamics of two bird species we developed a cost effectiveness approach to assess ecological and productive outcomes of environmental friendly policies for a large range of stocking rate constraints (SRC). The absence of SRC over 15 years led bird populations close to extinction for both species while ensured optimal productive performance. Moderate level of SRC limited productive performance by 15% and avoided bird extinction with unequal outcomes for each species (respectively 37% and 62% of initial population size). Highest levels of SRC reduced productive performance by 25% with minor decline of wader populations. These good performances on both economic and ecological viewpoints can be explained by deferred grazing. A maximal economic performance seems to be sorely compatible with ecological outcomes. These results could be used to design management compensations based on the level of constraints imposed on the livestock farming system.

Modelling local dynamics of contrasted livestock farming systems in reference to pressures for change and their possible impacts on natural and social environment

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Global and local changes give rise to important pressures on livestock farming systems all over the world. In grass-based and pastoral husbandry conditions, related change in livestock farms and production systems entail large alterations in land-use systems. In the framework of the French Research Programme for Sustainable Development of Agriculture (ANR-ADD), a group of researchers from INRA, CIRAD, and CEMAGREF is developing research activities to assess the pressures for change on local livestock farming systems in various regions in the world and their possible impacts on land use, the natural resource and the landscape (TRANS project). In order to develop methods and tools to help livestock husbandry stakeholders to face challenges for sustainable development raised by fast change and uncertainty, a common framework approach is applied in 8 case studies in South America, Africa and France. It is based on participatory building with local stakeholders of a multi-agent systems model for analysis of prospective scenarios for change. We present the first results of the case studies with regard to the integrated modelling of local LFS as encapsulating natural and social systems, similarities/differences in local LFS dynamics and pressures for change, and preliminary conclusions as regards their sustainable development.

Flexibility of LFS is a condition of their sustainability

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The content and meaning of the three classical pilars used to define sustainability, i.e. social, economic and environmental, may change in the future according to political considerations. We assume that flexibility is a crucial property of LFS to fit this frame throughout time and to give to farmers the possibility to cope with uncertainty. But flexibility has no simple and unique definition according to authors and disciplines: management sciences and ecology. By making a review in thoses disciplines, we propose a frame to analyze LFS for their abiltiy to "reach new goals from several start point, in a short piece of time". We precise the difference we make between flexibility and resilience, the former including the latter. We precise also how to increase the level of flexibility of the system either by increasing its ability to control the environment (offensive behaviour) or to decrease the controlability of the system by its environment (defensive behaviour). We give some examples as illustrations in beef cattle farming systems.

Livestock farming, long term and uncertainties: what are the paths to last?

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Because of the unpredictability of the markets, of the agricultural policies, and of the climate, farmers need to think of their farming systems' dynamics in a context of uncertainty about the future. A study was conducted in dairy and beef systems either in France or Uruguay. It aims at characterizing and qualifying the diversity of the paths used to last. The data is based on family–farm trajectories of 35 farms and the analysis framework refers to the adaptive cycle of complex systems by Holling. Three axes of differentiation were established. The first distinguishes action principles guided either by system optimisation or by system flexibility. The second axis opposes "staying small" to "getting bigger to last". The third axis refers to the diversification of activities and distinguishes i) diversification that helps to preserve the livestock activity from hazards from ii) entrepreneurial diversification with several large agricultural production lines. We discuss the diversity of the paths and their determinants, notably with the consideration of the regional factor. We question what the "assessment of sustainability of livestock farming systems" could mean when considering "the paths to last" constructed by farmers.

Assessing economic and technical impacts of weather events on French suckler cow farms dynamics: a dynamic recursive farm model

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Numerous amenities are associated to suckler cow farms. However their reliance on rather extensive forage production makes them sensitive to weather variability. This study focuses on tactical adjustments to seasonal weather conditions and on their incurred costs and benefits over time. To answer this question, we build an original dynamic recursive bioeconomic farm model integrating detailed technical and biological constraints and coupled with biological sub-models. This model optimizes monthly and annual decisions related to feed supply and herd management. We analyse how the system dynamically react to the realisation of a catastrophic, low or high forage production he has not anticipated. We then propose an application of this model to a typical French suckler cow farm which sells young bulls and cereals. The main results are the following. In case of a very low forage production, the simulated farmer sells fewer cereals in order to substitute them to forage products and to a lesser extent modifies animal sales and animal live weight. In addition, our results highlight that profit loss or benefits are not proportional to annual production and above all that a catastrophic forage production year is not compensated by a very good one. Eventually, this framework could be extended to other sources of variability to analyse farm sustainability in a changing environment.

Adaptation strategies of sheep farming systems to availability of different resources: case studies

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The decrease in agricultural activities in Sierra de Guara Natural Park in recent decades has led to changes in intensity of land use and to environmental degradation. Therefore, after a previous description of pasture utilization by livestock in this area, eight sheep farms were selected for a study of the relationships between farming systems and land use at the farm level. They were representative cases obtained from a previous typology based on criteria of technical management, reproductive intensification and pasture use, where four groups of farming systems were identified: intensive farms, extensive farms with low dynamism and continuity, extensive farms with high dynamism and continuity, and agricultural farms. After a detailed description of the system, derived from information collected periodically throughout a year, a SWOT analysis was carried out to identify the main factors involved in farm continuity and sustainability of land use. These were: a) workforce availability, critical for the design of reproductive and feeding management; b) diversification of economic activities, allowing for higher flexibility; and c) farmer dynamism, determining his ability to adapt to changing conditions. According to these factors, many combinations of reproductive intensification and land use were identified, where farmers developed different strategies to cope with the constraints of their farming systems.

Attitudes, practices and state of the art regarding piglet castration in Europe: the pigcas project

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PIGCAS (http://w3.rennes.inra.fr/pigcas/index.htm) is a Specific Support Action supported by the EU (2007-2008). National contact people were identified in 24 European countries, who conducted interviews of stakeholders to collect information on the practice of piglet castration and on their attitudes towards surgical castration without or with anaesthesia, immunocastration, raising entire males and sperm sexing. A seminar was held in Noordwijk (Netherlands) in November 2007 to inform stakeholders about the results and facilitate the mutual knowledge of attitudes between the various categories of stakeholders. The collected information was used during the first semester of 2008, together with other resources, to evaluate the available information from various perspectives (attitudes, practice, welfare, pork quality, resource efficiency and economy). For that purpose an integration seminar was organised in Monells (Spain) in March 2008, which was attended by a large part of the relevant European scientific community. An integrated report, containing information for future EU policy, will be delivered at the end of 2008.

Practice on castration of piglets in Europe

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Within working package 2 in the PIGCAS project, the extent of the practice of piglet castration and how it is performed was monitored in 24 European countries. In most of them, castration is performed on 80-100% of the male pigs in both conventional and non-conventional production. The exceptions are UK and Ireland where castration is not performed, and some of the southern countries, where a lower percentage of the male pigs is castrated. The mean age at castration is 3-7 days after birth. However, age at, and procedures for, castration differ widely both within and between countries. In most countries, castration is performed almost exclusively by farmers, but in some of them most castrations are performed by vets. Overall, anaesthesia is used very seldom. Norway is at present, the only country where anaesthesia is mandatory by law, but the use seems to be increasing in several countries. Local anaesthesia with lidocain is most common. Complications due to castration do not seem to be common in any country. Castration practices are similar in conventional and organic systems, but differ markedly for some extensive systems.

Stakeholders' attitudes about surgical castration and alternatives

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Within the PIGCAS project, the attitudes of stakeholders towards piglet castration and alternatives, was investigated in 24 European countries. A total of 472 answers were collected from Pig producers, Slaughterhouses, Consumers, Animal welfare NGOs, Veterinarians and Administration. Use of anaesthesia prior to castration was accepted more unanimously than castration without anaesthesia or immunocastration. NGOs differ widely from other stakeholders in putting more emphasis on animal welfare and less on costs and eating quality, in clearly rejecting surgical castration without anaesthesia and readily accepting entire male pig production. The attitudes of main stream producers are the most opposed to those of animal welfare NGOs. In a majority of countries, representing two thirds of the EU production, they would prefer keeping surgical castration without anaesthesia followed by the use of anaesthesia. In other countries like UK, the Netherlands, Greece and in a less extent Portugal, Ireland and Finland, stakeholders (including pig producers) were more in favour of non castration practices and of keeping the natural state of pigs.

A synthesis of current knowledge on surgical castration of pigs and its alternatives

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The EU PIGCAS project has carried out a review of the available research and other information on surgical castration and its alternatives. The production of an updated synthesis of the state of knowledge makes it possible to identify future priorities for research to alleviate stakeholder concerns regarding the current practice. The review was conducted according to five themes: Attitudes of stakeholders and public, Current practice, Animal welfare, Pigmeat quality, Resource efficiency and economy. The currently most prevalent practice of surgical castration without anaesthesia or analgesia was compared, from each of these perspectives, with other possible alternatives: surgical castration with pain relief (anaesthesia, analgesia), alternative castration methods (e.g. chemical castration, immunocastration), meat production from entire male pigs, future technologies (e.g. sperm sorting, genetic modification). The review highlighted the advantages and disadvantages of each option, with none consistently scoring highest when the options were ranked within each theme for most favourable outcome. Research needs to more objectively establish each ranking were identified, and the weighting given to each perspective will then determine the most desirable future policy within the EU.

Ban on castration of boars in the Netherlands: modeling economic consequences of options

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As a result of social criticism on castration, the Netherlands intend to start fattening boars. An economic chain- and import/export model has been developed to estimate economic consequences. The total added value of the pig chain will significantly reduce, and general estimates suggest a decline in the added value giving only partial compensation for labor and capital. There remains no room for profit (compensation for risk). A second model is currently in development in order to calculate the chain costs and revenues of various options to decrease and to detect boar taint (at the slaughter line). Measures are breeding, immunocastration and management (e.g. feeding, housing). The model can find an 'optimal' mix of these measures, considering assumptions made and uncertainty. Non-linear programming in combination with Monte Carlo simulation are applied in this model. Knowledge will be implemented incrementally in the model.

An integrated genomics approach to unravel the genetic basis of variability in boar taint

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As part of the EU-project SABRE, a consortium from five countries has started a research program to apply functional and structural genomics to identify the genetic basis of boar taint. The main compounds causing boar taint, skatole and androstenone, are measured in different commercial breeds. Behaviour, carcass and meat quality are monitored in related crossbred finishers. A total genome scan is being performed on 500 sib pairs with high and low skatole levels using a 6K SNP panel. Statistical analyses will cover linkage and linkage disequilibrium approaches. Liver, testis, and muscle tissue from 60 high and low skatole animals have been analysed at the RNA-level using a 20K cDNA array and an oligo-array. Also at the protein level, many proteins are differentially expressed between the two groups and overlap considerably with the genes identified at the mRNA-level. Results of the genome scan and the expression analyses will be integrated to select the most promising regions for validation and fine mapping in the different pig lines. Finally, large-scale association studies encompassing > 4.000 animals across breeds will be performed to estimate the effect of candidate SNPs. Their relationship with reproductive, behaviour, carcass, and meat quality traits will be examined.

Association of boar taint candidate gene polymorphisms with androstenone, skatole and phenotypes related to reproduction

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Boar taint is an off-odour and off-flavour in pig carcasses primarily due to high levels of 16-androstene steroids and/or skatole. Both androstenone and skatole have been shown correlated with levels of other sex steroids, like testosterone, estrone sulphate and estradiol, in addition to the length of glandula bulbo urethralis. Detection of single nucleotide polymorphisms (SNPs) is important to identify genetic markers for selection purposes. The aim of this study was to find associations between SNPs from candidate genes potentially affecting boar taint and adipose tissue levels of androstenone, skatole and indole, plasma levels of androstenone, testosterone, estradiol and estrone sulphate and the length of glandula bulbo urethralis in the two breeds Duroc and Norwegian Landrace. Genotyping was done in 1102 Duroc boars and 1726 Norwegian Landrace boars. Statistical analyses detected several SNPs in association with one or more of the traits.

Evaluation of growth performance, carcass characteristics, and meat quality of barrows, immunocastrated pigs and entire males

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The goals of the study were to compare performance, carcass and meat quality as well as to evaluate boar taint in the LM of barrows (B), immunocastrated pigs (IC), and entire males (EM). 36 pigs were blocked by BW (3 littermates/blocks) and assigned to B, IC and EM. From weaning to 107 kg BW, all pigs were group-penned and had ad libitum access to standard diets. The 2 IMPROVAC injections were applied to the IC at an average BW of 22 and 74 kg. Because ADG did not ($P>0.05$) differ between IC, EM and B (0.92, 0.88, 0.93 kg/d) but IC and EM consumed less ($P<0.05$) feed than B (191, 185, 202 kg). IC and EM were more ($P<0.01$) efficient than B (G: F: 0.42, 0.41, 0.39 g/g). Carcass leanness was greatest ($P<0.05$) in EM (57.5%) followed by IC (56.3%) and B (54.5%). Androstenone concentrations were higher ($P<0.01$) in EM than IC and B (1.2, 0.2, 0.2 mg per g lipid of backfat) whereas skatole levels were higher ($P<0.05$) in both EM and IC than B (0.31, 0.08, 0.05 mg). Sensory scores by a trained panel for boar odor and flavor (from 1 = weak to 9 = strong) were lower ($P<0.01$) in the LM of B and IC than EM. B and EM had higher ($P<0.01$) shear force values in the LM compared to IC (3.7, 3.8, and 3.5 kg). Although carcasses of EM were leaner, the similar feed efficiency and especially the lower sensory scores for boar odor and flavor in the LM of IC, confirm that immunocastration might be the best alternative to avoid castration under anesthesia.

Consumer acceptance of the use of vaccination to control boar taint

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Introduction Improvac®, a vaccine to control boar taint, gives pig producers a powerful new tool. By providing an animal welfare and environmentally friendly alternative to physical castration, Improvac allows producers to benefit from the natural growth and carcass quality advantages associated with non-castrated male pigs while controlling boar taint. Improvac has been submitted for approval for use in the EU and in preparation for market release a survey of French, German and Netherlands consumers was conducted for Pfizer by a commercial market research company (LRW). Materials & Methods The survey was designed to understand and quantify the French, German and Netherlands consumers' attitude towards vaccination to control boar taint as an alternative to physical castration with anesthesia. 1000 consumers in each country, who were regular pork consumers primarily responsible for purchase and preparation of meat in their households, were surveyed. The consumers were not associated with pig production or the animal health industry. Results When asked about their preference for each method, 71% of consumers in France, 61% in Germany and 74% in the Netherlands preferred the vaccination approach. By comparison those preferring castration were less than 18% in all countries.

Efficacy of analgesia alone or in combination with local anaesthesia in reducing pain derived from surgical castration in piglets: preliminary results

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The aim of the present study is to test the efficacy of prolonged analgesia with a non steroidal anti-inflammatory drug alone or in combination with local anaesthesia for reducing pain at castration in piglets. A total of 119 piglets (Large x Landrace) x Piétrain piglets from 30 litters were assigned within litters to one of four treatments: no castration but handling (SHAM), local anaesthesia (10 mg of lidocaine/pig ~ 4 mg/kg live weight injected half subcutaneously into the scrotum and half into both testes) plus prolonged analgesia (7,5 mg of ketoprofen/pig ~ 3 mg/kg live weight injected intramuscularly) and surgical castration (KL), prolonged analgesia alone and castration (K), castration alone (CAST). Injections were realized 15 min before castration. For castration, piglets were restrained between the legs of the operator, the scrotum was incised with a scalpel on both sides of the scrotum and the spermatic cords were cut with the scalpel after testes extraction. Disinfection was applied thereafter. Treatments were applied at 5-7 days of age. Animals were observed de visu during surgery or handling and during the 30-min period following castration or handling, and by video for 2h30 thereafter. Behaviours were classified and registered using the description of Hay et al. (2004). A blood sample was drawn in the jugular vein for cortisol measurement at 35 min after castration or handling. Data are currently under analysis.

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Effect of anaesthesia and analgesia on physiology and vocalization of piglets during castration

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The castration of piglets meets increasing societal resistance because it is painful. Dutch stakeholders want to know if pain relief makes castration more acceptable. As part of a larger study, 160 piglets (3-5 days old) of 32 litters were randomly assigned to one of five castration treatments: CAST (without prior medication), LIDO (with anesthetic Lidocaine), MELO (with analgesic Meloxicam), L+M (LIDO + MELO) and SHAM (sham castration). During castration vocalizations were recorded. CAST showed the highest, loudest and longest calls, SHAM the least (e.g. Main frequency: 4464^{b}, 3894^{ab}, 4181^{ab}, 2770^{ab}, 3180^{a} Hz for CAST, LIDO, MELO, L+M and SHAM resp.). Blood samples were taken 15 min before castration (just prior to the administration of medication) and 20 min after castration. Cortisol increased in all treatments, with SHAM being the lowest (285^{a}, 237^{b}, 282^{a}, 246^{ab}, 129^{c} nmol/L, resp.). In conclusion, compared with conventional castration, Lidocaine reduces the vocal expression of pain during castration, as well as the increase in cortisol. Meloxicam has as a limited beneficial effect regarding vocalisations and no positive effect on any of the physiological parameters. Based on these data plus results in related studies, Dutch pork chain stakeholders agreed that anaesthetics should be used as a (temporary) measure until castration can be phased out completely.

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Attitude of farmers concerning alternatives for piglet castration

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Three Flemish pig farmer organisation representatives and 266 pig farmers were surveyed. 159 farmers returned questionnaires suitable for analyzing their attitude towards 5 strategies against boar taint: surgical castration with (SCA) and without anesthesia (SCN), immunocastration (IC), sperm sexing (SS) and raising entire males (EM). Preference for these strategies differed between farmers (SCN>SS>SCA>IC>EM) vs representatives (IC>SCN>SCA>SS=EM). The farmers' self-reported knowledge of the strategies was associated with their preference for SCA (negatively) and SS (positively). Herd size was correlated with their preference for SCN (negatively), SCA (negatively) and SS (positively). SCN was perceived by farmers as the best strategy concerning farm profitability, animal performance, and effectiveness (against boar taint) but as the worst for animal welfare and consumer acceptance. SCA was perceived as the worst strategy concerning labour. EM was viewed as the least profitable and effective strategy. SS was positively perceived for most aspects but particularly for labour, animal welfare, effectiveness and consumer acceptance. Farmers' preference for IC relative to SCN was for 41% explained by the perceived effectiveness of IC and its safety to the farmer. Increasing our understanding of farmers' perception will hopefully benefit communication about this intricate issue.

Early detection of boar taint by means of behavioural and physical predictors

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If the development of boar taint could be predicted at an early stage, preventive actions against these 'high risk' animals can be taken. This contribution presents some preliminary results regarding the early detection of boar taint by means of behavioural and physical predictors. Two experiments were conducted in which entire males were produced. The data were collected every fortnight from 9 weeks of age until slaughter. In experiment 1, the development of boar taint was compared for the three most common Belgian pig breeds (Pietrain, Large White and Belgian Landrace). The testes size of each boar was measured and skin lesions and hygiene status of these boars were quantified. For Belgian Landrace, hygiene status at the age of 13 weeks was correlated with skatole levels after slaughter. For Large White androstenone levels after slaughter were correlated with testis size at 13 weeks and skin lesions at 17 weeks of age. In experiment 2 data were collected and analysed on the passive behaviour of two groups of 8 hybrid boars. Time spent sitting was negatively correlated with boar taint. These preliminary results suggest that behavioural and physical parameters can possibly be used to predict the development of boar taint at an early age. More data will be analysed to confirm these preliminary results.

Social behaviour of entire male pigs versus barrows

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Three hypotheses were tested: (H1) castrating male piglets reduces sexual and agonistic behaviour post-weaning; (H2) age of castration affects these behavioural changes; (H3) the gender at which social interactions are directed is affected by castration. Male piglets of 24 litters were either castrated at day 3, at week 3, or not castrated. Litters were raised separately and aggressive and sexual interactions were analysed (week 5-21). Aggressive and sexual interactions tended to be more frequent in the control than the castration treatments, but only significantly so during week 5 for aggression ($P<0.001$) and week 21 for sexual behaviour ($P<0.01$). The gender of the receiver at which females directed social interactions was not affected by treatment. For interactions initiated by males treatment effects were found. In comparison with entire males, barrows directed a greater proportion of their aggression at females in week 5 ($P<0.05$) and this difference disappeared as they grew older. Barrows also directed a smaller proportion of their sexual interactions at females in week 21 ($P<0.05$). If castrating male pigs were to be banned we expect more problems with pre-pubertal aggressive and pubertal sexual behaviour among littermates such that their housing and management conditions may need to be adapted.

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Boar taint compounds and fattening performance of Large White boars

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Piglet castration without anesthesia will be banned in Switzerland at the latest 2011. Fattening of entire boars instead of castration with anesthesia or immunocastration could be an alternative in the future. But it is necessary to get extensive knowledge about fattening of boars (e.g. performance, meat quality, percentage with boar taint) before such a radical change in the production chain could be implemented. SUISAG runs a station test for dam line boars. A test group consists of 2-3 entire boars and a female or a castrate of the litter. About 400 Large White boars are tested per year and 90% are slaughtered. The best 10% of the boars are selected for AI service. Preliminary results of 692 entire boars, 117 castrated and 213 female sibs are available. Boars grow faster than their sisters but slower than their castrated brothers. Boars show a better feed conversion compared to their siblings. Boars are slightly leaner than their sisters but they are much leaner than their castrated brothers. Intramuscular fat content is considerably reduced for boars compared to castrates. Boar taint compounds are available for 166 entire boars at the moment. 28 boars exceeded the thresholds for androstenone (>1.0 ug/g) or skatole (>0.16 ug/g), increased androstenone being more frequent. Data collection is continuing and we will present the latest results. By the end of 2008 boar taint compounds and DNA samples are available for at least 400 boars for further genomic research.

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A diversified organic pork production: presentation of a concept based on seasonal outdoor rearing of very small entire males

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The risk of boar taint in entire males is supposed to increase with increased age and weight. Thus, a method to reduce this risk may be to slaughter the pigs at a low age and weight. This strategy is investigated as part of a new concept for organic pig production. It is hypothesised that organic pork has to differ markedly from conventional in order to overcome the heavy price competition. A seasonal outdoor rearing system based on production of small entire males, large female pigs and sows slaughtered after their first litter is believed to be a feasible strategy for producing organic pork with high credibility and superior eating quality. The study included a traditional breed, the Danish Black-Spotted. 17 gilts farrowed in April. Within the first week after birth all male pigs, except 2 male pigs per litter, were castrated. The piglets were weaned at 10 weeks of age in June/July but stayed in the paddocks with access to the farrowing hut. The entire male pigs were slaughtered in July at approximately 40 kg live weight. The female pigs were slaughtered in the beginning of November. Preliminary results showed e.g. a higher daily gain for entire males compared to castrated (390 vs. 332 g per day) and indicated higher content of skatole in the traditional breed compared to a more modern breed.

Sensory traits of boar's loins from two halothane genotypes (NN, nn) and three diet supplements (magnesium and/or tryptophan)

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Forty-nine boars with different Halothane genotype (NN:28; nn:21) were fed with three different diets (Control: with no supplement; Mg&Trp: with 0.4% Mg and 0.77% L-tryptophan and Trp: with 0.77% L-tryptophan) during the 5 days before slaughter. Pigs were stunned with 90% CO_2 and slaughtered in an experimental abattoir. Loin samples were taken at 24h post-mortem at the last rib level to assess the sensorial traits by 10 trained panellists, sensitive to androstenone (AND) and skatole (SKA). Data gathered by panellists were subjected to Generalized Procrustes Analysis (GPA). The first two dimensions explained 72.12% of the total variance accounted for (55.02 and 17.11%). First dimension was related to Hardness, Sweet odour and Metal flavour on one hand and SKA odour and flavour on the other. Second dimension was related to AND flavour and Sweet flavour. The resulting GPA distinguished between nn and NN genotypes, as they were oppositely located along the first dimension. NN pigs were more related to odour and flavour's SKA levels while nn pigs were more related to Hardness, Sweet odour and Metal flavour. Similar correlations were found among diets when considering only NN pigs. However, in nn ones, unlikely to Control and Trp, Mg&Trp pigs were related to AND levels explained by the second axis. To conclude, meat from NN and nn boars was sensory different, but there were not important sensory differences among meats from animals fed the different supplements studied.

Effects of housing of entire male pigs on performance, carcass characteristics and meat quality

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In a previous study, we reported that ADG of group-penned entire male pigs (EM) was lower than castrates (774 vs. 830 g/d) and ADFI was low (< 2 kg/d). The objective of this study was to compare growth performance, carcass characteristics and meat quality traits of the LM of group- (GP) and individually (IP) penned EM. After weaning, 24 EM were blocked by BW (2 littermates/block) and assigned to 2 housing conditions: GP and IP. From 27 to 107 kg BW, pigs had ad libitum access to standard diets. BW and individual feed intake were determined weekly. Data were analysed by the MIXED procedure of SAS. Means were separated with LSD ($P<0.05$). The ADG did not ($P>0.05$) differ among treatments. However, IP consumed more feed than GP (2.24 vs. 2.05 kg/d; $P<0.01$) and were less efficient (2.52 vs. 2.33 kg/kg; $P<0.01$). Carcasses of GP tended to have a higher percentage of valuable cuts compared to IP (57.4 vs. 56.4; $P=0.09$). Initial and ultimate pH as well as drip loss percentage of the LM did not ($P\geq0.16$) differ between GP and IP. Compared to IP, the LM of GP was redder (a*: 6.4 vs. 6.0; $P<0.05$) and more tender (shear force: 3.8 vs.4.1 kg; $P<0.01$). Androstenone, skatole and indole concentrations in the backfat did not ($P>0.05$) differ among treatments. The fact that IP consumed more feed than GP indicates that higher activity in the group-pen negatively affected feed intake but not ADG, thereby influencing feed efficiency and lean tissue accretion.

Effect of castration of male pigs on fat quality

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The objective of this study was to evaluate the effects of immunological and surgical castration on the fatty acid (FA) composition of the backfat. Pigs were blocked by BW into 12 blocks (3 littermates/blocks) and assigned to 3 experimental groups: barrows (B), immunocastrated (IC) and entire male pigs (EM). From 27 to 107 kg BW, pigs were group-penned and had ad labium access to standard diets. The two Improvac® injections were applied to the IC at an average BW of 22 and 74 kg. Fatty acid profiles of the backfat were determined by GC of the methyl esters and data are presented as % of total FA. Data were analysed on an individual basis by the MIXED procedure of SAS. Means were separated with LSD ($P<0.05$). Although B consumed more ($P<0.05$) feed than IC and EM (202, 185 and 191 kg), ADG was not affected ($P>0.05$). The lower efficiency of B compared to EM and IC resulted in higher ($P<0.01$) backfat accretion in B than EM and IC. The concentration of saturated FA in backfat increased ($P<0.01$) from EM to IC to B (39.5, 42.0, 43.8%) and, concomitantly, that of polyunsaturated FA decreased (17.7, 15.2, 13.6%; $P<0.01$). The differences resulted mainly from changes in the level of palmitic, stearic and linoleic acid. These results confirmed that with lower backfat accretion the unsaturation degree of backfat increases. These changes might affect fat firmness and oxidative stability and, thus, its suitability for meat processing.

Effect of immunocastration on performance and meat and carcass quality in pigs

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Animal welfare concerns are increasing the pressure on European pig producers to stop male piglet surgical castration. Immunocastration is a technique used to delay puberty, produce untainted meat and reduce aggression. This study aimed at evaluating the effect of immunocastration on performance and carcass and meat quality. Four treatments were compared: entire males (EM, n=36), immunocastratred males (IM, n=36) treated with Improvac® at week 11 and 21 of age, surgical castrated males (CM, n=24) and females (FE, n=24). Individual daily feed intake (DFI) was recorded in pigs housed by treatment in groups of 12 animals. Pigs were weighed every 3 weeks and back fat and loin depth ultrasonically measured from 74 to 176 days of age. Feed conversion ratio (FCR), daily weight gain (DWG) and protein and fat accretion were estimated. Standard carcass and meat quality evaluation parameters were recorded after slaughter at 180 days of age (ie % carcass lean content (LFOM) and pH45 and pH24). Throughout the entire grow period, IM males presented higher DWG and DFI than CM or EM ($p<0.001$) but had similar FCR to EM. These effects were specially remarkable after the second vaccination. IM presented higher backfat deposition/kg of body weight gain than EM ($p<0.001$) but similar to CM. LFOM was higher for IM compared to EM ($p<0.001$), but similar to CM. No effect of treatment was observed on pH45 or pH24. Therefore IM pigs presented some similar performance traits and better FCR compared to CM.

Carcass quality of ImprovacTM treated boars raised in Germany

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Active immunization against gonadotropin-releasing hormone (GnRH) is an alternative to surgical castration especially from a welfare point of view. The objective of this study was to valuate the effect of a GnRH-vaccine (Improvac^{TM}; Pfizer Inc.) on carcass quality under commercial German production conditions. Pigs (n=230) were randomly allocated to treatments (T1=surgically castrated; T2= Improvac^{TM} treated) within the first week of life. 96 animals per treatment group were raised in single-sex pens with 12 pigs in each. T2 animals received the first vaccination at allocation into the fattening unit and the second 6 or 4 weeks prior slaughter. Carcasses of the treatment groups differed significantly in favour of Improvac^{TM} treated animals (T1/T2: weight kg 94.7±8.8/97.7±8.0; lean meat % 54.3±3.5/56.6±2.6, size of loin muscle mm 57.3±5.2/59.1±4.2; back fat mm 17.9±3.9/15.6±3.0). Organoleptic anomalies, particularly pronounced sexual odour, as assessed in a blinded examination by a veterinary authority, were not detected in any of the carcasses. The results of the sensory test conducted by the University Leipzig did not differ between the treatment groups. Our results demonstrate the prevention of boar taint and the improvement of carcass quality by the use of Improvac^{TM} under commercial German pig fattening management.

An immunocastration vaccine decreases boar taint compounds for at least 8 weeks after the second vaccination

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Two hundred group-housed boars were vaccinated at 15 and 19 wk with either a placebo (C) or an immunocastration vaccine (Improvac®, I) and then slaughtered at various times after 2º vaccination (1, 2, 4, 6 and 8 wk) to determine the temporal response to immunocastration. Anti-GnRF titres were greatest at 1 wk post 2º injection and declined until at least 8 wk (titre=$1430e^{-0.382\ time}$, R^2=0.98). Immunocastration decreased plasma testosterone over the first 2 wk (5.6 v. 0.6 nM for C and I, respectively, P<0.001) and it was still lower at 8 wk (8.5 v. 2.0 nM, P<0.001). Testes continued to grow in the C boars but remained stable in the I boars over the 8 week (38 v. 1 g/wk, P<0.001). Carcass weight (4.88 v. 5.51 kg/wk, P<0.01) and P2 fat (0.54 v. 0.96 mm/wk, P<0.01) increased at a greater rate in the I boars. Immunocastration decreased fat androstenone over the first 2 wk (0.40 v. 0.17 µg/g, P<0.01) and it remained lower until at least 8 wk (1.12 v. 0.14 µg/g, P<0.01). Fat skatole was decreased by immunocastration at 4 (0.094 v. 0.036 µg/g, P<0.05), 6 (0.131 v. 0.069 µg/g, P<0.05) and 8 (0.096 v. 0.029 µg/g, P<0.05) wk. These data demonstrate that immunocastration can decrease boar taint compounds and improve carcass weight for between 4 and 8 wk post 2º injection.

Genetic parameters for androstenone and skatole levels in relation with meat quality in a French Large White pig population

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Boar taint is mainly caused by two components: skatole and androstenone. It is known that there is a genetic determinism in the skatole and androstenone levels, with moderate to high heritability values and a low to moderate genetic correlation between the levels of these two compounds. Genetic correlations with other traits of interest such as sexual maturity, growth rate and fatness have been estimated in few studies. Genetic correlations with meat quality traits such as ultimate pH or color have never been reported. In a INRA experimental farm (GEPA, Le Magneraud), we raised 450 French Large White entire males issued from 50 AI boars. Animals were slaughtered at 110 kg. They were measured for growth rate, carcass composition and meat quality traits. After slaughter, a backfat sample was removed from the neck for skatole and androstenone level measurements. Genetic correlations between all the traits were estimated.

Estimation of genetic parameters on compounds related to boar taint and sexual maturation in pigs

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A law against castration of male pigs has been proposed, and as a respond to this several projects have been introduced. For use in studies of both quantitative- and molecular genetics, compounds related to boar taint and/or reproduction traits were measured. This included androstenone (both in plasma (p) and back fat (f)), skatole (f), indol (f), estradiol (p), testosterone (p), and estronsulfate (p). Registrations used in this study are from a total of 1931 Norwegian Landrace boars from Norsvins boar-testing stations. All the data sets were Ln-transformed prior to the analysis in order to get the data more normally distributed. The data were analysed by animal model with the DMU software. The heritabilities estimated were 0.09, 0.57, 0.48, 0.39, 0.48, 0.53, 0.51 for ln(testosterone), ln(estron), ln(estradiol), ln(indole), ln(skatole), ln(androstenone(p)), and ln(androstenone(f), respectively. Correlations between all traits will also be presented.

***In vitro* inhibition of CYP2E1 by physiological concentrations of steroids**

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CYP2E1 and CYP2A are primarily responsible for skatole metabolism. Skatole levels increase at puberty, and it is believed that pubertal increase in testicular steroids interacts with skatole-metabolising enzymes either through an inhibition of their expression or activities. We have previously demonstrated that micromolar concentrations of androstenone (A) and 17β-oestradiol (E2) had a potential to alter CYP2E1 activities in porcine liver microsomes. In the present study the possibility of inhibition of CYP2E1 and CYP2A activities by physiological concentrations of A, E2 and testosterone (T) was investigated. Microsomes were isolated from the liver of 6 entire male and 5 female pigs. The activities of CYP2E1 and CYP2A were measured in the presence of A, E2 and T (2.75, 0.85 and 0.09 pmol in 50 µl of microsomes, respectively). Those amounts corresponded to physiological concentrations of steroids of 15 ng/ml of A, 0.5 ng/ml of E2, and 5 ng/ml of T. The percent of control enzymatic activity was calculated for each steroid. None of the investigated steroids modified CYP2A activity. The presence of A and E2 in the incubations with microsomes from male pigs reduced CYP2E1 activities to 71.9% (A) and 62.9% (E2). CYP2E1 activity in the incubations with female microsomes was also reduced in the presence of E2, although this reduction was lower compared to that in male microsomes (79.4%). The results provided further evidence on the important role of A and E2 in the regulation of skatole metabolism in male pigs.

Experiences with intravenous general anaesthesia for surgical castration of pigs

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Castration of male pigs without anaesthesia is the most common procedure across Europe to prevent boar taint. This practise is questioned increasingly by animal welfare science and consumers. At the Teaching and Research Farm general anaesthesia is used for several reasons: Reduced pain during castration and opportunity for students to learn injection techniques, general anaesthesia and castration of piglets. A mixture of Azaperon (2mg/kg) and Ketamin (25mg/kg) was administered either by intramuscular (i.m) or by intravenous (i.v.) injection into the ear vein. During a period of three years 1047 piglets (6-33d, median 18d) were castrated by students and data were gathered as treatment and productivity records. During the first 20 month all piglets (571) were castrated using i.m. injection, after that piglets (476) were treated i.v.. Animals were castrated by two vertical incisions, antibiotic spray and separated in boxes until they were completely awake (1-3 hours). Mortality was low (0.67%) – only 7 pigs died during or shortly after castration (0.88% i.m., 0.42% i.v.). None of the piglets was crushed by the mother. The practicality of this method was good considering the special requirements of a teaching and research farm. In a commercial context this method could be applied to small farms and special assurance schemes, where a veterinarian visits the farms routinely for injecting the animals, followed by castration by the farmer

Selection response from an experiment using a crossclassified mating design between direct and maternal genetic selection groups for piglet survival

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A two generation (GEN) selection experiment was carried out, in which selection was in the 1st GEN for maternal genetic effects and in the 2nd GEN for direct genetic effects of postnatal piglet survival (PSV). Data were recorded on 21,835 piglets for survival at birth (SVB), PSV, birth weight (BW) under outdoor conditions. Cumulated direct and maternal responses in PSV were 3.33, 1.23, 2.26% points in the 1st, 2nd, 3rd parity, respectively. In the 2nd and 3rd parity, crossclassified matings between direct and maternal high and control groups were carried out and revealed substantial interactions. For instance, direct response changed substantially depending on whether sires with high direct effects were mated to sows from the high or control group for maternal effects. This indicates the importance of maternal genetic ability to obtain a direct response in piglet survival. Correlated total response in SVB was always positive, whereas for BW was positive in the first two parities but negative in the 3rd parity. The latter may be due to an increase in average BW over parities from 1.50 to 1.72 kg.

Changing from recording ultimate pH to drip loss when improving breeding programs for quality traits in pigs

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The objective of this study was to estimate genetic parameters of EZ-DripLoss (EZ-DL) and pH in the glycolytic loin muscle Longissimus dorsi (LD), last rib, and pH in the glycolytic ham muscle Gluteus medius (GM) and the oxidative ham muscle Gluteus profundus (GP) in 2 Norwegian pig breeds. Data were collected on carcasses from the half-sib test. There were records on EZ-DL for 3448 Norsvin Landrace (L) and 2086 Duroc (D) carcasses collected in the period 2005-2008. pH was measured on 16263 L and 7323 D from 1998 to 2008. A multi-trait AI-REML animal model was applied using the DMU software. Fixed effects were sex, herd, slaughter day and storage day (2-9) as a 3rd degree regression. In L, heritability estimates (h^2) of EZ-DL in LD and pH in LD, GM and GP were .26, .18, .11 and .19, respectively. In D, the corresponding h^2 were .27, .26, .22 and .38, respectively. The genetic correlations between EZ-DL in LD and pH in LD, GM and GP were -.68, -.52 and -.07 for L, respectively. In D, the corresponding r_g were -.91, -.65 and -.49. Indirect selection on pH in LD was estimated to be 44% and 11% less efficient than direct selection on EZ-DL for L and D, respectively. EZ-DL and pH were both measured at the partial dissection line. EZ-DL is suitable for large-scale data recording, and due to the high economy value of EZ-DL, changing from pH to EZ-DL could be profitable, especially for L.

Gene array and real time PCR analysis of the adrenal sensitivity to ACTH in pig

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Variability in hypothalamic-pituitary-adrenal (HPA) axis activity has been shown to be influenced by genetic factors and related to important production traits. The aim of this study was to investigate molecular bases of genetic variability of the adrenal sensitivity to ACTH, a major source of variability, in Meishan (MS) and Large White (LW) pigs, MS showing higher basal cortisol levels and response to ACTH than LW. A pig cDNA microarray was used to identify changes in gene expression in basal conditions and in response to ACTH stimulation. Genotype and/or ACTH affected the expression of 211 genes. No change in the expression of known key regulator proteins of the ACTH signaling pathway or of steroidogenic enzymes was found. However, Mdh2, Sdha, Suclg2, genes involved in the tricarboxylic acid (TCA) pathway, were over-expressed in MS pigs, that may result in higher steroidogenic activity. Moreover, up-regulation of Star and Ldlr genes in MS and/or in response to ACTH suggest that differences in the adrenal function between MS and LW may also involve mechanisms requisite for cholesterol supply to steroidogenesis (BMC Genomics 2008, 9:101).

Mapping of QTL for feed intake traits in a back-cross between Large White and Piétrain pig breeds

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A pig experimental population has been set up at INRA to detect QTL for feed intake, taking advantage of the known differences in feed intake, feed efficiency and feeding behaviour between the Large White and the Piétrain breeds. A population of 717 backcross pigs was produced by mating 16 Large White x Piétrain boars to Large White dams.. A genome scan was conducted with 114 microsatellite markers spread on the 18 porcine autosomes, using interval mapping techniques and approximate likelihood ratio tests. Highly significant QTL ($P < 0.01$ at chromosome level) were detected for traits related to carcass composition and meat quality on chromosomes SSC 6, SSC 8, SSC 15 and SSC 17. For feed intake and feed efficiency, chromosome-wide significant ($P<0.05$) QTL were mapped on chromosomes SSC 6, SSC 8 and SSC 9. Estimated QTL effects ranged from 0.20 to 0.35 s_p. The QTL located on SSC6 corresponded at least partly to the halothane gene. Most chromosomal regions pointed out for carcass composition and meat quality traits had already been identified in other Piétrain crossbred populations, One noticeable exception is on SSC 8, where linked or pleitropic effects on feed intake and carcass quality had not been detected before.

Genomic imprinting significantly contributes to genetic variability of 19 traits in slaughter pigs

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Imprinted genes are involved in many aspects of development in mammals, plants and perhaps birds and may play a role in growth and carcass composition. In order to assess the relative importance of the imprinting variance a special model was applied, comprising two breeding values for each animal: the first corresponds to a paternal and the second to a maternal expression pattern of imprinted genes. The imprinting variance was estimated as the sum of the respective genetic variances minus twice the covariance. The null hypothesis of no imprinting was tested by a REML-likelihood-ratio test with two degrees of freedom. Slaughter data from appr. 20,000 pigs were analysed and included 33 phenotypes for growth, meat quality and carcass composition. All traits were recorded between 1997 and 2006 at a test station in Switzerland. The total number of ancestors in the pedigree was roughly 15,000. Genomic imprinting significantly contributed to the genetic variance of 19 traits, with estimated proportions between 5% and 19%. For two of these traits the paternal contribution to the imprinting variance was larger than the maternal while for all other traits the reverse was true.

Genetic parameters for specific and innate immune responses in polish rural chicken line and their cross with commercial layer hens

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Green-Legged Partridgelike (GP) is a native Polish breed of layers, created in 1870. GP is a multiple purpose type of hens. These chickens and their hybrids demonstrate high resistance to low temperatures and disease, and an ability to lay eggs under a variety of environmental conditions. To answer the question about genetic background of immune responses and potentially elevated level of immunity in GP breed, a F1 cross of GP with commercial White Leghorn was created and consecutive F2 generation was produced. Immune responses were measured as specific immune response for a Keyhole Lymphet Heamocyanin antigen (KLH) and non specific, innate immune responses for Lipopolysaccharide (LPS) and Lipoteichoic acid (LTA) binding. Estimated heritability was 0.10 for KLH and LPS, and 0.20 for LTA. There was a significant gender effect for a non specific immune response binding LPS. High genetic correlation (0.71) was estimated for LPS and LTA, what could suggest a similar path of innate immune responses for these two homotopes. Presented results confirm a genetic background of specific and innate immune responses in Green – Legged Partridgelike hens, White Leghorn chickens and their cross.

Session 15 Theatre 7

Estimation of genetic variation in residual variance in female and male broiler chickens

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Robustness of animals and uniformity of end product can be improved by exploiting genetic variation in residual variance in breeding programs. Residual variance (V_R) can be defined as environmental variance after accounting for all identifiable effects. The aims of this study were to estimate in broilers genetic variance in V_R of body weight by different methods and to estimate genetic correlations between mean body weight and V_R and between female and male V_R. The data sets comprised 26,972 female and 24,407 male body weight records. Estimates of the heritability of V_R were in the range of 0.033 – 0.088 based on variation in V_R among sire families. Lower heritabilities (0.012 - 0.037) were found when analyzing log-transformed squared residuals. Heritabilities were higher in females than in males. Genetic correlations between mean body weight and V_R were -0.41 and -0.45, respectively in females and males. The genetic correlation between female and male V_R was 0.11, indicating that female and male V_R are different traits. Results indicate good opportunities to simultaneously increase the mean and improve uniformity of body weight of broilers by selection.

Session 15 Theatre 8

A gene flow strategy for defining unknown parents groups in beef cattle genetic evaluations

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The definition of unknown parents groups (UPG) is usually based only on time periods and flows of foreign founders. A method to account for national flows of reproducers is proposed, which is particularly relevant for beef cattle populations. It assumes that unknown parents belong to the same phantom group when their progeny are bred in herds that are similar in terms of origin of their known reproducers. This method was applied to the French Charolaise population. It pointed out three main criteria to appreciate genetic differences: the birth period, the region and AI use of the herd. The robustness of the defined UPG was tested, under a sire model, in terms of numeric stability and consistency of the group effects. The impact of accounting for UPG in an animal model was evaluated on EBV for morphology traits: muscular and skeletal developments (MD and SD). For a given time period, female UPG and corresponding male UPG may have quite different genetic levels. Concerning MD, male UPG estimates were always larger than female ones: the genetic gap reached 0.75 σ_g. No major re-ranking was observed for EBVs across models with or without UPG for this first trait. Surprisingly, some female UPG estimates for SD were larger than male ones (+0.3 σ_g). On this latter trait, changes in ranking of cows EBVs modified the choice for the renewal of natural service bulls. Including UPG enlarged by 108% genetic origins on the maternal side, but it concentrates origins towards AI sires on the paternal side.

Genetic parameters for survival at birth in meat sheep breeds

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Lamb survival is a trait of high economic importance affecting sheep productivity. Therefore the main objective of this study was to estimate genetic parameters for survival at birth (SB) in Danish populations of Texel, Shropshire, Oxford Down and Suffolk. Data used in this study were collected from 1992 to 2006 by the Danish Agricultural Advisory Service. Survival at birth was recorded as the viability of lambs within 24 hours after birth. Estimation of (co)variance components was carried out using univariate animal models, applying logistic link functions. Direct and maternal additive genetic effects and common litter effects were included in the models. Direct heritabilities were 0.08, 0.08 and 0.06 for Texel, Shropshire and Oxford Down, respectively. Lower direct heritability of 0.02 was estimated for Suffolk. Maternal heritability estimates were similar for all breed and ranged from 0.08 to 0.11. Genetic correlations between direct and maternal effects of SB were positive for Oxford Down and Suffolk and negative for Texel and Shropshire. Our estimates showed that survival at birth of analyzed breeds is a heritable trait and is influenced by both genetic merits of the lamb and dam.

Dissection of Quantitative Trait Loci associated with growth-related traits in Scottish Blackface sheep.

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Live weights at birth and at 4-week intervals up to 24 weeks and genotype data for microsatellite markers on OAR 1-3, 5, 14, 18, 20, and 21, for 832 progeny from 9 half-sib families of Scottish Blackface sheep were used to map growth QTL. The Gompertz growth model was used to estimate model parameters and predict growth rates and live weights at weekly intervals, and maximum growth rate for each lamb. QTL were detected using an interval QTL mapping approach. Significant QTL for live weight tended to be preceded by equivalent QTL for growth rate. For example, a QTL for weight on OAR 20 was significant from weeks 6 to 16 (maximum at 12) with a corresponding growth rate QTL significant from 4 to 8 weeks (maximum at 6). An OAR 3 QTL was significant for weight from 0 to 4 weeks, and an OAR 18 QTL for growth rate was significant from 8 to 11 weeks, although the subsequent live weight QTL failed to reach significance. Significant QTL were also found on OAR 20 for maximum growth rate and on OAR 14 for age at maximum growth. Growth parameter estimation allowed the combination of information from multiple measurements into a few variables in a biologically meaningful manner, and the determination of significant growth QTL that could not be dissected from analyses of raw weight data. QTL associated with growth variables can be used to describe distinct parts of an animal's growth curve trajectory, possibly enabling manipulation of the trajectory.

Identification of SNPs and copy number variation in goat MC1R and ASIP genes: an association study with coat colour in a few Mediterranean goat breeds

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In several mammals mutations in MC1R (melanocortin 1 receptor) and ASIP (agouti signalling protein) genes affect coat colour. In this study we sequenced these genes in three Mediterranean goat breeds (Girgentana, Maltese and Derivata di Siria) with different coat colour patterns. From the obtained data emerged a very complex situation with the presence of several SNPs and a copy number variation (CNV). We found a nonsense mutation, three missense mutations and a silent mutation in the coding region of MC1R. These polymorphisms are organized in five haplotypes, whose frequencies may suggest that the null mutation could be associated with Girgentana red spots, but this association is not complete. ASIP sequences showed the presence of a CNV for this gene, one mutation in intron 3 and four SNPs in exon 4. The high variability at this locus confirms classical genetics studies that suggested the presence of more than 20 alleles in goats. Further studies are underway to evaluate the effects of MC1R and ASIP mutations on coat colour in several goat breeds.

Genetic variation and genetic trends in hip and elbow dysplasia in Swedish Rottweiler and Bernese Mountain Dog

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The aim of this study was to estimate genetic parameters and genetic trends for hip (HD) and elbow dysplasia (ED) in Swedish Rottweiler (RW) and Bernese Mountain Dog (BMD). Analyses were based on screening results of hip status for 14 693 RW and 8221 BMD and elbow status for 11 891 RW and 7963 BMD, as well as pedigree data for 16 614 RW and 9835 BMD, recorded by the Swedish Kennel Club. A mixed linear animal model was used to obtain components of (co)variance and breeding values. The model included fixed effects of sex, birth month, age at screening, a combined random effect of clinic and year of examination, and the random effect of animal. Estimated heritabilities for HD and ED ranged from 0.34 to 0.42. The genetic correlation between the traits was weak and positive for RW and not different from zero for BMD. The need to include genetic groups for phantom parents in the model was evaluated by comparison of models with and without genetic groups. F-statistics of the genetic group effects were not significant ($p>0.05$), implying that genetic groups were not needed in the model. Genetic trends indicated a genetic improvement in both traits. However, a faster genetic progress is expected if selection is based on predicted breeding values rather than phenotype. Based on the results, a statistical model for routine prediction of breeding values for HD and ED in Swedish dogs was suggested.

Genomic selection against canine hip dysplasia in German shepherd dogs using QTL-associated SNPs

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Canine hip dysplasia (CHD) is one of the most prevalent hereditary skeletal diseases in dogs with multifactorial origin and the involvement of major genes. Different linkage studies had been performed and revealed QTL for German shepherd dogs, Labrador retrievers and Portuguese water dogs. At the genome-wide level of significance, we identified nine QTL in German shepherd dogs and further ten chromosome-wide QTL. In these CHD-QTL, we developed about 180 single nucleotide polymorphisms (SNPs) in 65 different genes located within these CHD-QTLs. More than 100 SNPs were polymorphic in German shepherd dogs. This SNP markerset was completed with further publicly available SNPs in these QTL. We tested these SNPs for association with CHD in a case-control study design. Here, we included a group of 770 German shepherd dogs randomly sampled from the total German shepherd population (> 20,000) and with average coefficients of coancestry as low as possible among all registered German shepherd dogs. The study design was fully matched by sex and CHD-affection status. Only SNPs with significant odds ratios were retained in the final model and for these SNPs an increasing risk for CHD with an increasing number of cumulated CHD allelic effects was evident. Employing these SNPs for estimation of genomic breeding values, we could develop an efficient selection scheme for a rapid reduction of CHD in German shepherd dogs.

The 'Bracco Italiano' Genetic and Genealogical Study (BIGGS). -

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The Italian Bracco is one of the oldest pointing dog breed that has been used for hunting since the Renaissance period. Paintings of the 14th century show hunting scenes depicting dogs similar to the present day's Bracco. The breed has officially registered by the ENCI (the Italian Cynological Club) in 1949, when the definitive standard was established. The SABI (Società Amatori Bracco Italiano) is financing a research project aimed at investigating the demographic, genetic and genealogical structure of the breed. In the first phase of the project the complete electronic database of the breed was obtained. The total number of animals on record, born between 1970 and April 2007, was 20,499. The maximum number of traced generations was 14. Here, we show the main demographic parameters of this important breed, which highlights the trend of the inbreeding coefficient during this period. We wish to thank the President and the Board of Directors of the SABI for having actively promoted the present project among the Society's members.

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Genetic diversity analysis of Istrian Cattle assessed by microsatellite markers

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Istrian Cattle (IC) is a native Croatian cattle population, which belongs Bos primigenius type, mainly bred in peninsula Istra. The present study estimates genetic variability with 97 microsatellite markers in a representative sample of 51 animals of IC. A total of 632 alleles have been detected. The number of alleles ranged from 2 (ILSTS005, DIK2050, MAF46, BM6438) to 11 (BM3507, TGLA53, BM143, BMS4024) with average 6.52. High value of observed and expected heterozygosity (H_O=0.6, H_E=0.65) as well as PIC value (0.604) was determined. Departure from Hardy-Weinberg equilibrium showed 8 loci ($p<0.01$; exact test). For the purpose of measuring subdivision parameters of populations (F_{ST} and Nm values) we included another two autochthonous cattle breeds, Croatian Busha (CB) and Slavonian Syrmian Podolian Cattle (SSP) in this study. Only 7% of the total genetic variability could be attributed to differences among breeds (F_{ST}=0.07). IC shows relatively high effective number of migrants per generation (Nm=3.29). The Assignment test allocated 96% individuals according to their breed of origin, only two of 51 IC individuals were assigned incorrectly to CB breed. Results from this study will help design adequate breeding programmes and preservation plans for IC in a recent time.

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Extent of genetic admixtures in dairy cattle breeds by genetic markers in Estonia

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Genetic analysis to detect the admixture rates in Estonian dairy cattle was carried out. Markers for the analysis were microsatellites (25 loci) and lactoproteins (3 loci) with specified availability for marker assisted selection. A total of 122 unrelated cattle were sampled. Representative set of individuals from three breeds distinguishable by their population/economic status – endangered Estonian Native, prevalent Estonian Holstein, and Estonian Red were included in the study. Within-breed diversity estimates and relationships between the breeds to characterize the dairy population were used. Index of genotypic differentiation (F_{ST}), describing population subdivision into the breeds, and coancestry coefficient among breed pairs were computed. Individual clustering and admixture analysis were performed applying BAPS v. 4.14 program. Grouping of individuals into genetic clusters showed that the individual grouping did not follow the breed origin. 9.6% of individuals had significant ($p<0.05$) admixture proportion by microsatellites. Analysis of three genetic clusters by the lactoproteins revealed smaller proportion (1.6%) of admixed individuals.

Comparison of egg production between two quail strains and their reciprocal

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Hen day (H-D) and hen-housed (H-H) egg production compared in two quail strains and their reciprocal crosses in two separate trails. I. At the first trail in two hatches 180 Japanese quail (Coturnix Japanese) and 180 Range quail (Coturnix ypisilophorus) were reared in two different spaces [litter with sawdust (250×200×230 cm) and one-tier cage (50×50×70cm)]. The 130-day period production was measured from date of first egg for each female. Strain difference were not significant for H-D ($P>0.05$), but there were significant difference for H-H ($P<0.01$). Also H-D and H-H were significantly different by space of variations ($P<0.01$). Japanese quails with H-H 72.42±0.65 percent were significantly higher than Range quail with 62.68±1.07. П. At the second trail in two hatches 800 quails include four groups: 1- Japanese quails 2- Range quails 3- Hybrid 1 (R♂×C♀). 4- Hybrid 2 (C♂×R♀) were reared in four-tier cage from 28 days of age to experiment end. H-D and H-H of four groups were significantly different ($P<0.01$). Japanese quails with H-D 77.39±1.23 percent were the highest in four groups, but H-D between Japanese quail and hybrid 2 was not significantly different ($P>0.05$). Egg weights were obtained with sample 35 eggs which randomly were selected at 70th, 115th and 175th days of age production for Japanese quails, hybrid 1, hybrid 2 and Range quails 11.16±0.16, 10.92±0.17, 10.61±0.11 and 11.06±0.12 gram respectively.

Estimation of genetic parameters for growth of beef bulls in the performance-test stations

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Evaluated data for 10 breeds of beef cattle, collected by the Czech Association of Beef Cattle Breeders, consists of 20,277 records for birth weight (W0), 15,598 for weight at age 120 days (W120), 14,452 for weaning weight (WW), all recorded in field test, and 2,819 records for average daily gain (ADG) from age 7 to 11 mounts recorded in performance test stations. Genetic parameters were estimated using six multi-breed multi-trait animal models. Breeds were handled as phantom parents groups. All models for weights contained the fixed effects: herd-year-season (HYS), sex of calf and dam's age and random effects: direct genetics, maternal genetics and maternal permanent environment. Models for average daily gains contained the fixed effects: HYS, dam's age, herd level of calf's origin (reaction norm), linear and quadratic regression on age at the beginning of test and random effects: direct genetics and permanent environment of individual. The same models included moreover permanent environmental effect of animal or linear and quadratic regression on WW or both effects. Models were compared using Akaike's information criteria, Likelihood ratio test and residual variance. Within breed heritability was in all models for W0 around 0.24, for W120 around 0.17, for WW around 0.17 and for ADG around 0.29. All criteria favored the model with permanent environmental effect of animal.

Genetic parameters for milk protein composition of dairy cows

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The objective of this study was to estimate genetic parameters for the major milk proteins and milk production traits. From 1940 first parity Holstein-Friesian, one morning sample between February and March was collected. Each milk sample was analyzed for the relative protein concentration of the six major milk proteins using capillary zone electrophoresis. The intraherd heritabilities for the relative protein concentration of the major milk proteins were high and ranged between 0.25 for β-casein and 0.80 for β-lactoglobulin. The genetic variation was higher for summed whey fractions than for summed casein fractions. Genetic correlations among the relative protein concentrations of the major milk proteins were low, in general. α_{s1}-Casein was negatively correlated with κ-casein and α_{s2}-casein. The genetic correlation between α_{s2}-casein and β-casein was also negative. β-Lactoglobulin was strongly negative correlated with the summed casein fractions, and positively correlated with the summed whey fractions and casein index. This study shows that there are opportunities to change the milk protein composition of the dairy cow by selective breeding.

Predicted difference of breeding boars for reproduction: prediction with sire model

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Performance of breeding boars on reproduction was studied in the seedstock Large White herd of the University of Pannonia Georgikon Faculty of Agriculture at Keszthely. Data of 64 breeding boars mated to 1000 sows resulting 4190 farrowings were evaluated using Harvey's (1990) LSMLC program. Heritability, breeding value and rank of boars, genetic and environmental variance of gestation length, live born piglets, dead born piglets, litter weight at 1st day, average weight at 1st day, mortality in the first 21 days, 21 days piglets, litter weight at 21st day, average weight at 21st day, weaned pig were calculated. Year of farrowing, season of farrowing, number of farrowing, month of mating and age of sow at farrowing as fixed, while sire as a random effect was treated. The overall mean value of the examined traits were as follows: 115,8 days; 9.8 heads; 14.9%; 13.9 kg; 1.4 kg; 12.1%; 8.1 heads; 44.4 kg; 4.9 kg; 7.4 heads. The heritability of traits were between 0.03 and 0.27. The distance among the breeding boars was significantly. The effect of shire in the total variance was 17.69-65.92%. Our results show selection of good sires is very important in the course of breeding.

Refining region effect in test day model evaluation in Italy

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Test day records are used for official genetic evaluation in Italy since November 2004. The model used is a multiple trait, multiple lactation Test Day Random Regression with 4th order Legendre polynomials. Fixed effects included in the model are herd-test-day-parity and a combination of time, region, age, parity and season of calving. In evaluating stability of daughter bull contribution from different regions and provinces a significant effect was detected. This research is the first step toward an improved region definition in the Italian production system. Two models were compared: the official that considers four different production regions with a model assuming no differences across regions. Data for the August 2007 official genetic evaluation were used. A total of 73 millions test day records of around 5.5 millions cows were included. Residuals were analyzed in order to assess the differences across regions and provinces and use them as a starting point to test different strategies to group provinces within Italy in homogeneous areas by herd size, production level, environmental conditions. Variation of residuals across provinces was lower in the official compared to the one region model. The official model, compared to the model with one region only, already accounts for some of the differences and reduces the impact of region and province of production on variability of daughter contribution to bull proof by 75-80%.

Prediction of compatibility of different breeds of pigs in hybridization schemes by means of polylocus ISSR-PCR typing

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In an experiment the sows of Ukrainian Large White (ULW) breed were artificially inseminated with semen of boars of German origin: German Landrace (DL), Deutsches Edelschwein (DE) and Pietrain (Pi). The following crosses were produced: 1 – ULW♀ x DL♂; 2 – ULW♀ x DE♂; 3 – ULW♀ x Pi♂. Genetic analysis was made using 4 ISSR primers. The calculation was done using program GELSTAT. The backfat thickness (BF) of progenies was measured at their weight of 100 kg. In the presented study the average heterozygosity level (AHL) of maternal and paternal populations as well as their progenies was estimated. In the group of boars AHL was: DL - 0.764, DE - 0.704 and Pi - 0.684. The AHL of sows, inseminated with semen of DL was 0.806, DE - 0.673 and Pi - 0.806. The progenies of the 1st, 2nd and 3rd groups had the AHL - 0.650, 0.754 and 0.783 respectively. Based on results of genetic analysis the heterosis effect was expected to be obtained in the group 2 and 3. The backfat thickness measurement (BF) of pigs confirmed the expected productivity: the hybrids from 1st group had the highest level 30.09±0.97mm. The results of progenies from 2nd and 3rd crosses were 26.38±0.70mm and 25.39±0.46mm respectively. Thus, the method of polylocus ISSR-PCR typing could be used for heterosis prediction in pig breeding.

Identification and analysis of mutations in porcine cathepsin and cystatin genes: association with meat production and carcass traits in Italian heavy pigs

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In order to identify DNA markers associated with meat production and quality traits, several porcine genes encoding for lysosomal proteinases (cathepsin B, CTSB; cathepsin D, CTSD; cathepsin F, CTSF; cathepsin H,CTSH; cathepsin L, CTSL; cathepsin S, CTSS; and cathepsin Z, CTSZ) and for a cathepsin inhibitor (cystatin B, CSTB) were investigated. New single nucleotide polymorphisms were identified in CTSD, CSTH, CTSL, CTSS and CTSZ genes. Allele frequencies at these loci were investigated in different pig breeds. Markers in these loci, together with mutations we previously reported in CSTB, CTSB and CTSF genes, where genotyped in an Italian Large White sib-tested population for which meat quality parameters and estimated breeding values for several traits were determined. The results of association analysis showed that CTSF, CTSD, CTSH, CTSZ and CSTB significantly affect carcass and meat production and quality traits.

A genetic study of postnatal mortality in Danish Jersey heifer calves

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Postnatal mortality (PM) of heifers is an increasing problem in Danish Jersey. The aim of this study was to estimate genetic parameters for PM during the first 6 months after birth, calculate genetic trend for the trait and estimate breeding values of the most used Jersey sires. More than 260,000 heifer calves were included in the study. Survival traits were defined in the period from 24 h after birth to age 180 d. A linear model was used for estimation of genetic parameters, breeding values of sires and genetic trend. Fixed effects included in the model was herd-year class, month of birth, parity of mother, calving ease, size of the calf and whether the calf was transferred or not the first 6 months. Both a direct and a maternal genetic effect was included, however, the maternal genetic effect was not significant. Problems with PM were largest in the first period, with a mortality rate of 7.8% the first month after birth. Total mortality the first 180 d was 12.5%. Heritabilities of PM were quite low, ranging from 0.03 to 0.002. There was not clear genetic trend over the last 20 year but there exist considerable variation between sires. Regarding breeding values, the "best" and the "worst" sires differ about 8% in PM the first 180 d. Based on the results obtained in this study genetic selection for improved postnatal survival should be possible.

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Identification of mutations in the fat mass and obesity associated (FTO) gene and association with fat deposition traits in heavy pigs

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In humans, common variants in the fat mass and obesity associated (FTO) gene are associated with body mass index and obesity. We sequenced a few fragments of the porcine FTO gene in different pigs and identified 3 single nucleotide polymorphisms. Allele frequencies of the g.276T>G mutation was analysed in seven pig breeds. Then a selective genotyping approach was used to evaluate if this polymorphism was associated with fat deposition traits in pigs. To this extent, two extreme and divergent groups of Italian Large White pigs selected on the basis of back fat thickness estimated breeding values and two extreme and divergent groups of Italian Duroc pigs selected on the basis of visible intermuscular fat estimated breeding values were genotyped for the g.276T>G mutation. Fisher exact test (two tailed) was not significant comparing the allele frequencies of the two Italian Large White groups. This test was highly significant for the Italian Duroc FTO allele frequency distribution in the two extreme groups ($P<0.00001$, $P<0.001$ and $P<0.0001$, considering all animals or only two- or three-generations unrelated animals, respectively), suggesting an important role of the FTO gene on intermuscular and intramuscular fat deposition in this breed.

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Can mate selection help to cope with inbreeding in Polish Holstein-Friesian cattle?

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Although average inbreeding in Polish Holstein-Friesian cattle is relatively low, reaching 2,7% for the youngest animals, the annual rate of increase is very high and equals to 0,23%. Our goal was to investigate whether optimized mating on the herd level can reduce inbreeding without a reduction in genetic gain. The mate selection methodology was employed using 31 bulls and 2501 cows from 90 herds. Random mating in these herds led to 2.94% inbreeding. The optimization model maximized selection index of production traits and included threshold for the inbreeding level. Linear programming was involved in the optimization process. Inbreeding dropped to 1.75% and genetic progress was reduced by 0.25% when compared to the model ignoring inbreeding. The best results were obtained for the optimization model which included adjustment for inbreeding depression instead of threshold for the inbreeding level. The expected average inbreeding in offsprings was as low as 1,37% and the genetic gain was reduced by 2.5% when compared to the maximum possible for progenies of analyzed animals. Further studies including functional traits in the optimization model are recommended.

Effects of six QTL regions on growth, carcass composition and meat quality traits in French commercial pig populations: first results of the BIOMARK project

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The effects of QTL regions mapped in previous experimental pig crosses were investigated in a set of 16 large (50 to 150 offspring) sire families issued from 7 French commercial populations. The tests were conducted on porcine chromosomes 1 (2 regions), 2, 4, 6 and 7. QTL detections were performed on 30 growth, carcass composition and meat quality traits. Sires and their progeny were genotyped for 2 or 3 microsatellite markers per QTL region (16 markers in total). The data were analysed using a linear model including the fixed effects of contemporary group, sex and within sire-family haplotype or marker effect. A total of 890 haplotype/marker effects were significant at a 5% nominal level, which exceeded the expected number of false positive results. Significant effects of the 6 regions investigated were found on growth, carcass composition and meat quality traits, Allele substitution effects ranged from 0.1 to almost 1.4 standard deviation of the trait. Significant effects for a given marker x trait combination concerned 1 to 5 families. These results open possibilities for marker assisted selection of French commercial pig populations.

Genetic parameters of number of piglets born alive and relationships with on-farm performance traits in French Landrace and Large White pig breeds

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Genetic parameters of number of piglets born alive per litter recorded in first, second and third parity litters (NNVI1, NNVI2, NNVI3, respectively), as well as their genetic (r_g) and phenotypic correlations with age and average backfat thickness at 100 kg live weight measured on-farm on young candidates (A100 and L100, respectively) were estimated in Large White female line (LWf) and French Landrace (FL) pig breeds using REML methodology applied to a multiple trait animal model. The data consisted of 110,026 LWf and 82,496 FL litters, and 255,934 LWf and 194,270 FL records for A100 and L100. Heritability estimates for litter size at birth ranged from 0.10 ± 0.01 to 0.13 ± 0.01. NNVI2 and NNVI3 had close to 1 genetic correlations (r_g = 0.94 ± 0.03 in FL and 0.95 ± 0.02 in LWf). Both traits had somewhat lower genetic correlations with NNVI1 (r_g ≈ 0.70 ± 0.04), indicating that reproductive performance in first parity litters should be regarded as a different trait from reproductive performance in later parities. Low unfavourable genetic correlations between L100 and litter size at birth were estimated, with an increasing antagonism in later parities (e.g., 0.09 ± 0.02 and 0.20 ± 0.01, respectively, for LWf in first and third parity). A stronger genetic antagonism was found between A100 and the number of piglets born alive per litter (r_g ranged from 0.28 ± 0.03 to 0.32 ± 0.03).

Effect of some factors on weaning results of Charolais calves

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Weaning performance of 23 010 Charolais calves (10 696 male and 12 314 female) born between 1990 and 2005 from 10 098 cows mated with 149 sires were analysed. The aim of the study was to evaluate the effect of environmental factors on weaning traits. Breeding region, age of cows, year of birth, season of birth and sex of calves as fixed, while sire as a random effect was treated. Data were analysed with Harvey's (1990) Least Square Maximum Likelihood Computer Program. The overall mean value and standard error of weaning weight, preweaning daily gain and 205-day weight were 219±7.60 kg, 939±40.63 g/day and 227±8.58 kg, respectively. The results of the examination show that weaning weight, preweaning daily gain and 205-day weight increased with increasing dam's age as far as the six year age of cows. No significant difference between calves of 5-10 year old cows were found. As for the season effect the calves born in winter were heavier in weaning weight (224±7.61 kg) and preweaning daily gain (970±40.72 g/day) than those born in other seasons. In 205-day weight the autumn born calves were the heaviest (231±8.60 kg). Male calves were heavier than females significantly ($P<0.01$) (the difference was +12 kg, + 49 g/day and +14 kg).

Effect of breed on expression of Stearoyl-CoA desaturase protein in muscle and subcutaneous adipose tissue of beef cattle

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Stearoyl-CoA desaturase (SCD) is a major lipogenic enzyme. It catalyses two types of reaction: the tissue biosynthesis of health beneficial monounsaturated fatty acids (MUFA) and 9-cis, 11-trans conjugated linoleic acid (CLA). SCD distribution in cattle tissues remains unclear and it is unknown whether this distribution is breed specific. The aim of the present study was to investigate expression of the SCD protein in muscle and adipose tissue in five breeds of beef cattle: Longhorn, Beef Shorthorn, Charolais cross, Belted Galloway and Hereford. The animals were fed the same diet and slaughtered at the age of 28-29 months. SCD protein expression was analysed by Western blotting in the semimembranosus muscle and subcutaneous adipose tissue. The major findings of the study are: (i) there was a clear breed effect on SCD protein expression in adipose tissue. The highest enzyme expression was observed in the Longhorn breed, followed by Charolais cross, Hereford, Belted Galloway, with the lowest expression in Beef Shorthorn. (ii) The breed specific expression of the SCD protein in muscle followed the opposite pattern to that in adipose tissue. (iii) The effect of breed on SCD protein expression in muscle was less pronounced when compared to SCD expression in adipose tissue. The results suggest that the mechanism regulating SCD protein expression is tissue and breed specific.

Covariation between milk yield and maternally affected meat production traits in goats

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Multi-trait analyses were carried out to quantify the (co)variation in meat and milk production traits in Zaraibi goats. The data was obtained from a research station. There were birth weight records on 6610 kids, of which 5970 and 5237 had also pre- and post-weaning gain record, respectively. The kids were progeny of 115 bucks and 1387 does, which had altogether 3603 litter size and milk yield records in different parities and which were daughters of 109 sires and 721 dams. The maternal genetic component was important for the genetic variation of birth weight and pre-weaning gain. The genetic correlation between direct and maternal effects within these traits was favorable (0.30 and 0.43, respectively). Heritability (repeatability) for 90-d and total milk yield was 0.26 and 0.28 (0.29 and 0.39), respectively. The correlation between the milk yield and the maternal genetic effects for the pre-weaning gain was very high (0.90). Selection schemes aiming to improve meat (litter size and growth) and milk production simultaneously are feasible. The increased milk production serves also for the acceleration of early growth in kids.

Danish Holstein show inbreeding depression for fertility and calving traits

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The purpose of this study was to estimate inbreeding depression for fertility traits in heifers and cows, and direct and maternal calving traits in primiparous and multiparous cows of Danish Holstein. The data used for routine genetic evaluation in Danish Holstein was used after selection of data on animals with reasonably complete 5 generation pedigrees. Sire models as used in routine genetic evaluation were used with the addition of a regression on inbreeding coefficient of the heifer or cow. For calving traits a regression on inbreeding coefficient of the fetus was also added. All fertility traits showed significant inbreeding depression. The interval from first to last insemination increased 0.3 days (for heifers) and 0.4 days (for cows) per 1% inbreeding. The interval from calving to first insemination increased 0.1 days per 1% inbreeding. The age of heifers at first insemination increased 0.5 days per 1% inbreeding. Inbred bull calves were smaller at birth, but inbreeding did not affect the size of heifer calves. Inbred calves were born more easily, especially bull calves. However, this effect was reduced when the size of the calf was included as a fixed effect in the model. Inbred calves showed fewer stillbirths, especially bull calves. However, this effect was reduced when the size of the calf and the ease of the calving were included as a fixed effects in the model. Inbreeding in the dam did not seem to affect any of the calving traits.

Random regression analyses using B-splines to model growth from birth to 150 days of age of lambs of an Egyptian sheep breed (Rahmany)

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A total of 26698 weight records from 5851 Rahmany lambs was used to estimate direct, maternal and direct permanent environmental effects on growth from birth to 150 days of age. Changes in weight with age were modeled through B-splines of age at recording. Different combinations of linear, quadratic and cubic B-splines and up to six knots were carried out. Direct heritability increased from 0.79 at birth to 0.80 at 30 days of age, decreased up to 0.55 at 90 days of age, and then increased again up to 0.65 at 150 days of age. The ratio of direct permanent environmental variance to phenotypic variance increased from 0.11 at birth to 0.40 at 90 days age, and then decreased up to 0.29 at the end of the test period. Maternal genetic heritabilities decreased from 0.07 at birth to 0.003 at 30 days of age, increased to 0.03 at 60 days, then decreased up to 0.00 at the end of the test period (150 days). Generally, direct genetic, maternal genetic and permanent environmental correlations between different ages decreased as the interval between ages increased. In conclusion, estimates of direct heritability and the proportions of the direct permanent environmental effect were higher than most literature values.

Estimation of genetic parameters for milk traits using fixed regression models for Simmental and Black-and-White cattle in Croatia

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The objective of this study was to estimate the genetic parameters for daily milk yield (DMY), milk fat (FC) and protein content (PC) using test-day records of Simmental (SIM) and Black-and-White (BW) cattle in Croatia. Data consisted of 980442 in SIM and 596106 test-day yields in BW cattle. Pedigree included 111909 (SIM), and 74356 BW animals. Variance components were estimated by REML as implemented in the VCE-5 program package. Statistical model included parity, region and calving season as fixed class effects. Calving age was nested within parity as quadratic regression. Days in milk nested within parity was fitted in the model by Ali-Schaeffer lactation curve. Common environment of herd-test-day, direct additive genetic, and permanent environment effects were included in the model as random effects. For SIM cattle, the estimated heritabilities for DMY, FC and PC were 0.45 ± 0.01, 0.20 ± 0.01 and 0.30 ± 0.01, respectively. The corresponding heritability values were 0.32 ± 0.002 for DMY, 0.23 ± 0.001 for FC, and 0.25 ± 0.002 for PC in BW cattle. Permanent enviroment accounted for 3 to 23%, while common environment of herd-test-day effect explained between 11 and 22% of variability.

Genetic correlations between fertility and carcass traits in Merino Longwool sheep

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Genetic co(variance) components were estimated between fertility defined as litter size (LS) of 12,778 Merino Long Wool ewes and fattening and carcass traits measured on 2,998 male lambs of the same breed on performance station. Fattening and carcass traits included daily weight gain (DG), muscle depth (MD), fat depth (FD), and kidney fat (KF). LS was defined as a binary trait, (single or multiple births), and threshold-linear models in a Bayesian framework were applied. The impact of the amount of available energy on LS was investigated through a stratification of the fertility data of ewes in 3 different subsets, i.e. all matings, matings in August (= energy deficiency), and matings excluding those in August. The genetic correlation between LS and KF was 0.62 in the whole data set, increased to 0.85 when restricting the data to matings in August, and dropped to 0.35 when excluding the data from August. Genetic correlations between LS and FD for the entire data, August data, and the subset excluding August matings were 0.10, -0.18, and 0.48, respectively. Results indicated a change of the physiological mechanisms when energy supply in ewes is restricted. Heritabilities for the whole data were 0.05, 0.37, 0.24, 0.16, and 0.15 for LS, DG, MD, FD, and KF, respectively.

Traceability and genetic improvement in Pirenaica Cattle

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The aim of this study is to explore the potential use of the information generated by the Spanish traceability program SIMOGAN (National System of Identification and Registration the Movements of the Bovines) for animal breeding purposes. The traits included in the study were: cold carcass weight (CCW, n=18,211), conformation (CON, n=14,031) and fat cover (FC, n=11,952) according scale carcass classification and colour (COL, n=2,465) from the SIMOGAN database and weaning weight (WW, n=15,561) from CONASPI (Breeders Association). Posterior marginal estimates of genetic parameters were obtained using Bayesian inference, implemented via a Gibbs sampling scheme. Posterior marginal meansof heritabilities were 0.34, 0.28, 0.19, 0.23 and 0.38 for CCW, CON, FC, COL and WW, respectively. Moreover, posterior marginal means of genetic correlations between CCW-CON, CCW-WW and CON-FC, FC-WW were 0.30, 0.54, -0.35 and 0.23, respectively. These results indicate that exist enough genetic variability for CCW, CON, FC and COL, and the availability of records in potentially abundant at very low cost. However, the main inconvenience is that these traits cannot be registered on the selection candidates. Consequences of the current selection criteria (WW) and possible alternatives are discussed.

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Genetic distance between different breed groups of sheep

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The aim of the study was to determine genetic distance between different breeds of sheep. Samples of blood taken from a total of 165 ewes in three groups (55 Romanov, 55 Polish Merino and 55 F_1 Romanov ram x Merino ewe) were investigated. Analysis of microsatellite DNA sequences was performed based on markers recommended by the International Society for Animal Genetics (ISAG): D5S2 - INRA005 - INRA023 - MAF65 - McM527 - OarFCB20 - SPS113. The mean number of alleles was the highest (7.7) in Polish Merino, followed by Romanov (7.1) and F_1 crosses (6.1). The mean heterozygosity was 59% for Romanov, 50% for F_1 crosses and 41% for Polish Merino sheep. The greatest genetic similarity was found between Polish Merino and F_1 crosses (0.89). The greatest genetic distance was found between Polish Merino and Romanov sheep (0.43). The great genetic differences observed between these breeds show that they are considerably distinct.

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Variance components for genetic associative effects in pigs, a simulation study

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Associative effects in livestock have received a renewed interest because in some cases selection, based on performance of group-housed animals, was found to be suboptimal. Individual performances in grouped animals can be affected by social interactions (e.g. fighting or competition among penmates) and if present, should be included in the model for breeding value estimation. In the present research, we extended MTGSAM (a program implementing Gibbs sampling) for models including both genetic direct and genetic associative effects. We used simulated data to check the posterior mean of VC obtained from MTGSAM. Five generations of pigs were simulated for average daily gain, including a direct genetic effect, associative genetic effect and residuals accounting for the non-genetic effect. In each generation 25 sires are mated to 300 dams randomly. The litter size follows a normal distribution varying from 2 to 20. Three different methods were used to assign pigs to pens: assign pigs randomly; assign full sibs per pen; assign half of the pens with full sibs. Two different pen sizes namely 5, 10 and three different correlation between direct genetic effect and associative genetic effect: -0.5, 0, 0.5 were specified. Each set of simulation is run for 30 replications. Our interests were to investigate 1) the precision of the posterior means of VC; 2) the influence of relationships among penmates on the estimation of VC; 3) the effect of pen size on the estimation of VC.

Genetic variants of beta casein in Slovak Pinzgau cattle

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Proteins in bovine milk are common source of bioactive peptides. Beta casein (CSN2) is one of the major proteins and is itself of different kinds, depending on genetics make-up of cow. Variants A1 and A2 of CSN2 are common among many dairy cattle breeds. Epidemiological evidence claims that consumption of CSN2-A1 is associated with higher presence of hearth disease and diabetes etc. in people. The aim of this study was to estimate the allelic frequencies of CSN2 in Slovak Pinzgau cattle and to test whether CSN2 genotypes affect milk fat and protein content. A total 81 cows assumed to produce in the same environment were tested. The samples for DNA analysis were taken from tail hair bulb. ACRS-PCR technology was used for DNA testing. CSN2 allelic and genotypes frequencies were analysed and relationship between genotypes and milk fat and protein content in first lactation were tested using the SAS program. Frequencies of A1 and A2 allele of CSN2 were 0.48 and 0.52. Genotypes were A1A1= 10 cows (frequency 0.123), A1A2 = 58 (0.716), A2A2=13 (0.161). Least squares means for fat and protein content (%) were A1A1=3.96±0.126 and 3.47±0.060, A1A2=4.06±0.052 and 3.37±0.025, A2A2=3.78±0.110 and 3.35±0.053. The means for fat and protein content did not differ among the three CSN2 genotypes. Only fat content between A1A2 and A2A2 genotype were close to significant difference (P=0.078).

Genetic parameters for longitudinal feed intake and weight gain in Durocs

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The objective was to investigate the genetic parameters for daily feed intake (DFI) and daily gain (DG) with records obtained from electronic feeder stations. Data included DFI and DG from 81 to 167 d of age of 1,921 Duroc boars. The boars were housed in 112 pens, each equipped with one feeder, and allowed ad libitum feeding; most animals were tested only for 7-8 weeks. Because of large variation in daily records, weekly averages were used. Six traits were defined as DG and DFI during 81-109 (period 1), 110-138 (period 2), and 139-167 d of age (period 3). A six-trait model included age as a covariate with fixed effect of year-week and random effects of pen-year-week, litter, animal, and permanent environment. Estimates of heritability for respective periods were 10.3, 10.7, and 11.6% for DFI and 7.0, 5.0, and 7.2% for DG. For DFI, genetic correlations between periods 1-2 were 0.76, periods 2-3 were 0.61, and periods 1-3 were 0.08. For DG, the same correlations were 0.68, 0.72, and 0.33. The correlations between DFI and DG were [0.80, 0.61 0.49; 0.38, 0.52, 0.33; -0.24, -0.09, -0.27]. DG and DFI in extreme periods are different traits. Standard errors of correlations varied from 0.14 to 0.23. Negative correlations between DFI and DG may indicate compensatory growth, competition for feeders, or the data structure of few animals with records in periods 1 and 3.

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Copy number variation in bovine ß-defensin genes

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It has become apparent, that copy number variation (CNV) is an important source of structural genomic variation. In human defensin genes CNV occurs to a large extent and contributes significantly to the susceptibility to infectious and inflammatory diseases. In this study, we applied a quantitative real-time PCR (qRT-PCR) approach in order to detect CNV in bovine ß-defensin genes. Since these genes are positional and functional candidates for a QTL affecting somatic cell score on BTA27, the detection of CNV might be crucial to further research. We selected two extreme groups of 100 cows each with mean breeding values for mastitis susceptibility of -0.45 (s = 0.12) and 0.76 (s = 0.28) from an experimental dairy farm. The breeding values are routinely estimated for this farm including records on clinical mastitis. We performed qRT-PCR with genomic DNA and measured the relative amounts of template DNA for the two genes LAP and EBD in relation to the single copy glucagon gene. Though the differences between the groups of cows were not significant, the overall findings indicate the existence of CNV for the two genes. Since these first results appear to be promising, further investigations are indicated.

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Relationship between test day somatic cell score and conformation traits in Polish Holstein cattle

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Somatic cell score (SCS) is considered a reliable indicator of udder health. It has an antagonistic association with production traits but shows favorable genetic correlations with some type traits. The objective of this study was to estimate genetic relationships between daily SCS and conformation traits. A total of 21,957 first parity cows with records containing test day SCS, two descriptive and seven linearly scored conformation traits were included. Genetic parameters were estimated using a multiple animal model and Gibbs sampling. Genetic correlations between udder traits and test day SCS closest to date of type evaluation were favorable, i.e. -0.29 with overall udder score and -0.19 with udder support; the correlation with teat length was close to zero. Correlations were favorable between SCS and: feet and legs (-0.37), rear legs – side view (0.25), foot angle (-0.13) and rear legs – rear view (-0.10). The correlation (0.11) between rump width and SCS was low; the correlation between rump angle and SCS was near zero. The highest correlations were between SCS and two descriptive traits: overall udder score, and feet and legs. Among linearly scored traits, rear legs – rear view and udder support showed the strongest association with SCS. These conformation traits can be used as auxiliary traits in indirect selection for improvement of udder health.

Graphical representation of multiple trait index weights

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The graphical representation of multivariate distributions is well known in connection with models for high dimensional contingency tables, for Bayesian inference in expert systems, and for Bayesian frailty models. Graph theory is also important in the theory of Markov random fields, which are of considerable importance in statistical mechanics and, more recently in spatial statistics and image analysis. However, the graphical representation of multiple trait index weights has not been done. Interpreting index weights with many traits can be difficult. Interpretation is simplified if we can express the expectation of the selection response as a quadratic equation, which correspond to a pair of lines through the origin. A plot with these lines provides a way of examining the joint distribution of the index weights for any procedure in relation to the corresponding expected response. The purpose of this paper is to demonstrate the use of graphical techniques as a precise mathematical tool to represent index weights for two traits.

Heritability for traits obtained from slaughter data on Marchigiana, Chianina and Romagnola bulls

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This study was aimed to estimate heritability (h^2) for carcass traits, i.e. cold weight (W) and fleshiness score (FS), in Marchigiana (M), Chianina (C) and Romagnola (R) bulls slaughtered between 2004 and 2007. Data were obtained from the Italian beef cattle producers consortium and, after editing, 31647 records (10059 for M, 15499 for C and 6089 for R) were retained for further analysis. Records were classified on the basis of Herd-Year of slaughter (HY, 3977 total levels), farm fattening class (FC: same farm of birth or different farm), and sire (1547 total sires). The FS was expressed on a percentage scale using differences observed in market prices for distinct SEUROP scores. A Mixed model analysis was performed accounting for HY and sire as random effects, while FC was considered as fixed effect. Three separated analysis were carried out for each breed. The mean carcass W ranged from 433±55 kg for R to 478±65 kg for C, while the mean age at slaughter was 631±70 d for the three breeds, with small variation among M, C and R. In general, FC accounted for only moderate amount of variability on carcass W and FS, being significant only for W in the R breed. Carcass W resulted in medium high h^2 for all breeds, ranging from 0.29 in C and R to 0.40 in M, respectively. Lower h^2 were estimated for FS, with values that ranged from about 0.15 for both C and R to 0.32 in M, respectively.

Parentage verification of valle del belice dairy sheep using microsatellite markers

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The objectives of the present work were to evaluate polymorphism of microsatellite markers, develop a parentage test and estimate misidentification rate on Valle del Belice Sicilian dairy sheep breed. Polymorphism was evaluated from 184 randomly selected animals from 5 different flocks. A total of 21 microsatellite markers including CSRD247, ILST011, McM527, APO010, INRA132, DU194351, DU323541, FCB128, McM16, OarCP49, ILST087, DU223896, ILST005, TCRVB06, SPS113A, INRA063A, SPS115, DU206192, DU216028, BM827 and McM54 were amplified using three PCR reactions and fragment lengths determined in a single multiplex electrophoresis run. Markers were easily genotyped, very polymorphic and in Hardy-Weinberg equilibrium (except McM527 and ILST_005) thus suitable for paternity test. Statistical analysis was performed using Cervus 3.0. The mean number of alleles per locus = 9.29, expected heterozygosity = 0.749 and PIC= 0.70. The combined non-exclusion probability = 5.5 $x10^{-5}$, 5 $x10^{-8}$ and 3.2 $x10^{-13}$ for the first, second and the parent pair respectively. The paternity test was performed on 64 families generated with multiple sires mating. The results indicated errors in 20.3% and 28.7% of mothers and fathers respectively. In 8 cases, out of 15 maternal exclusions, the real mother was identified among the other females. Misidentification rate indicates the necessity of keeping more efficient control of genealogical records.

β-lactoglobulin gene promoter: new SNPs in sheep and goat

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β-lactoglobulin (β-lg) is the major whey protein in milk of ruminants and several non ruminant species, but it is lacking in rodents, lagomorphs and human. The aim of this work was sequencing the promoter region of β-lg gene in Sicilian sheep and goat dairy breeds, in order to identify polymorphisms. In these species, the promoter region was aligned using the sequences available on database. A common set of primers was designed to amplify and sequence a fragment of approximately 2.1 kb. Within this region, 12 single nucleotide polymorphisms (SNPs) were identified in goat breeds: 7 out of them were not yet reported in literature. Moreover, in sheep breeds 15 SNPs were newly identified. Using TRANSFAC database, binding sites for transcription factors (TFs) were found within the β-lg promoter region, in sheep and goat. Multiple binding sites to MPBFs, NF-1, C/EBP, and Sp1 are present within conserved regions, both in sheep and goat. Some SNPs found in the promoter region were detected within TFs sites in both species. Further studies are required to investigate the effect of these point mutations on binding affinity of TFs,their relationship with β-lg gene expression and milk production.

Fatty acid composition and lipogenic enzyme expression in semimembranosus muscle of Limousin and Aberdeen Angus cattle

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Intramuscular fat (IMF) is an important meat quality characteristic. The molecular mechanism controlling IMF formation in cattle remains unclear. The aim of this study was to investigate if the amount of IMF is related to the expression of key lipogenic enzymes. Experiments were conducted on 20 Aberdeen Angus and 20 Limousin steers, fed the same diet, and harvested at approximately 25 mo of age. The semimembranosus muscle was removed immediately post-mortem. IMF was determined by high resolution gas chromatography within 30 d. Enzyme expression was estimated by Western blotting for (i) acetyl-CoA carboxylase (ACC) and fatty acid synthase (FAS) involved in the formation of saturated fatty acids; (ii) stearoyl-CoA desaturase (SCD) involved in the biosynthesis of monounsaturated fatty acids; and (iii) delta6-desaturase (D6D) and delta5-desaturase (D5D) involved in the formation of polyunsaturated fatty acids. The main findings of the study are: (i) there were no significant between-breed variations in lipogenic enzyme expression; (ii) a positive relationship was found between FAS and ACC protein expression and IMF content; and (iii) no significant relationship was found between SCD, D6D, or D5D expression and IMF content. The results suggest that the lipogenic enzymes ACC and FAS are major contributors to IMF formation in beef cattle.

Polymorphisms of two indels at the PRNP gene in Polish Holstein-Friesian cattle

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Two regulatory polymorphisms in the Prion Protein (PRNP) gene are thought to be associated with resistance to classical BSE disease: a 23-bp region in the promoter that contains a binding site for the repressor protein RP58, and a 12-bp region in intron 1 that has a binding site for the transcription factor SP1. The aim of this study was to determine allele, genotype and haplotype frequencies in both PRNP polymorphic sites in groups of cattle differentiated by milk performance level. 837 animals were investigated: 186 sires used in artificial insemination (in years 2005-2007), 105 young bulls (at 3- month age), 96 cows qualified as sire – mothers, 450 cows from commercial herds. Allele frequencies for the examined populations in promoter polymorphisms were as follows: for indel 23 bp: del- 0.604, ins - 0.396; for 12 bp indel: del - 0.508, ins - 0.492. For both indels highly statistically significant differences ($P<0.01$) of allele and genotype frequencies were found. The highest differences were found in young bulls. In analyzed groups of animals – HW equilibrium status was sustained. For entire population under study, a tendency of decreasing of homozygotes (ins/ins and del/del) at the 23 bp indel site was observed ($\chi^2 = 5.54$; 2 df). Three of 4 haplotypes were identified in sires and 4 haplotypes in cows. In all groups of animals the most, haplotype del 23 bp-del 12 bp occurred most frequently.

Effect of different sampling methods on cattle mtDNA phylogenetic studies

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Low number of cattle breed phylogenetic studies contains exact information about the used sampling techniques. Due to the differences between natural populations and domestic breeds, different sampling methods are required. From the viewpoint of mitochondrial samples, representative samplings of a breed must contain as many samples of different mtDNA lines taken from founder cows as possible. It should also be stressed that neglecting to complete a complex investigation of pedigree can result in questionable values as far as the sample set is concerned. . The other weak point in phylogenetic sampling practices is due to the small number of samples, for once the pedigree structure is sufficiently known, the statistically acceptable minimal number of samples is dependent upon the number of founders. An extremely low number of studies containing data surrounding these questions is available to researchers at this point. In our work the results of phylogenetic researches of Hungarian Grey Cattle breed were used as a case study. Simulations were made to demonstrate the effect on sample representation of three common sampling method of mtDNA phylogenetic studies. Detailed analysis of the results has shown that the differences in representation value of the "random sampling", "pedigree sampling" and "founder sampling" are strongly significant.

What makes a good oral presentation?

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An oral presentation is an opportunity to communicate research results; it is worthwhile, therefore, to ensure to do it well. A good oral presentation is accurate, audience adapted, brief, and clear. The topic is well structured, main messages are conveyed, and audience interest is raised and maintained. In a good oral presentation, the speaker shows interest, keeps eye contact with the audience (room light on!), speaks to be heard and understood, and shows slides that can be seen clearly and that support the talk. Good slides are easy to understand quickly: they are not overloaded with text, the font size is a minimum 24-28 point, the background is not distracting, and there is good contrast between text and background. Photographs and other illustrations are used to enhance slides, and figures are used rather than tables. Animation is used with care, to enhance and not distract. The presenter speaks without a script, but may glance at slide printouts (reduced) with a few additional notes. Furthermore, the presenter keeps to the time allocated, having rehearsed thoroughly. This guideline is a summary of information provided at EAAP Workshops on Writing and Presenting Scientific Papers, and in the book by Malmfors, B., Garnsworthy, P.C. and Grossman, M., 2004, Writing and Presenting Scientific Papers, 2nd ed., Nottingham University Press.

European Master in Animal Breeding and Genetics (EM-ABG): an international training to face future challenges

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The European Master in Animal Breeding and Genetics (EM-ABG) is a two-year MSc program provided by six EU university groups with an active training and research program in the field of animal breeding and genetics. The EM-ABG is a response to the need of highly qualified graduates in the internationally operating area of breeding farm animals and fish. The EM-ABG is accepted by the European Union as an Erasmus Mundus MSc program for a five-year period and started in August 2007 with a group of 24 non-EU students. After an orientation period for all students in Wageningen, the students conduct the major part of their training at two of the participating universities. Students can chose from a broad range of subjects ranging from conservation of biodiversity to genomics. Successful students are awarded two nationally recognized masters degrees (double degree). The EM-ABG aims at training students who wish to contribute to the development of sustainable farm animal breeding. EM-ABG aims (1) to offer quality higher education with a distinct European added value -attractive both within the European Union and beyond its borders- and (2) to improve accessibility and enhance the profile and visibility of higher education in the European Union. More information on the program and on scholarships can be found at www.emabg.eu.

A new method to infer population genetic structure via the molecular coancestry matrix

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The inference of the hidden structure of a population is an essential issue in population genetics. Developed methods to assess genetic structure in a Bayesian statistical framework assume that markers are in Hardy-Weinberg and linkage equilibrium within subpopulations. In this study, a new method to infer the number of clusters and to assign individuals to the inferred populations is proposed. This approach does not assume Hardy-Weinberg nor linkage equilibrium. The implemented criterion is the maximisation of the averaged genetic distance between subpopulations calculated from the molecular coancestry matrix. This method is compared with two Bayesian approaches (STRUCTURE and BAPS) on simulated and real data. Simulation results showed that, in general, the proportion of correct assignments is high (up to 80%) whatever the evaluated method. A reduced number of molecular markers, Hardy-Weinberg or linkage disequilibrium situations reduce the accuracy of the Bayesian methods. In these scenarios, the new method exhibits a better performance than the Bayesian ones. The re-establishment of equilibriums with the randomisation of alleles, genotypes or haplotypes improves the precision of the Bayesian approaches. Results from a real human data set under the new method are congruent with the evaluated geographical regions.

Comparison of association mapping methods in cattle population

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Association mapping (AM) is based on direct marker effects and utilizes population wide linkage disequilibrium (LD) of markers with causative genes. AM is powerful and samples with minimal population structure or relatedness result in the greatest statistical power. Such random samples are not available in cattle due to strong selection and use of bulls across the globe. Methods developed for AM for random samples may not work efficiently in the cattle as LD extends over large area and deep familial relationships exist. This may lead to an excess of false positive results. In a simulation study we compared four AM methods. The first method uses single marker and haplotype associations but ignores genetic structure. The second combines linkage and LD information. The third is a mixed-model that takes account familial relationship and population structure. The fourth one is a Bayesian approach that fit multiple marker effects simultaneously. We simulated 100 half-sib families with 2000 individuals using the real Danish Holstein pedigree. Five chromosomes each of 100 cM with 1000 SNP markers were simulated. Fifteen simulated QTL explained half of the total genetic variance. There was one QTL explaining 10%, four QTL each with 5% and 10 QTL each explaining 2% of genetic variance. The methods were compared for their power and false discovery rates. The suitability of the methods in a cattle pedigreed population is discussed.

Comparison of accuracy of fine mapping methods on selected populations: a simulation study

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Mapping methods using Linkage Disequilibrium (LD) have been developed to refine location of Quantitative Trait Loci (QTL) previously identified using various levels of molecular information (single markers or haplotypes). Only some of them use pedigree information. They generally suppose absence of selection in the population history. To test the impact of this hypothesis, we simulated 100 separated generations for a 200 individual population with: (a) no selection (NS), (b) 80% of the individuals as potential parents of the following generation in the 20 last generations (Selection, S) or (c) 80% of the individuals as potential parents in generations 81 to 90, 50% of the individuals as potential parents in generations 91 to 100 (Double selection, DS). After 100 generations, a grand-daughter design was simulated, with two genetic map densities and bi- or multi-allelic markers. Five fine mapping methods were compared for their mapping accuracy. It was always lower under DS schemes. The more accurate method depended on the molecular information. Regression on single markers performed best with multi-allelic markers whereas the LDLA method was the most accurate with bi-allelic markers.

Impact of missing genotypes on the estimation of genetic parameters and breeding values in MA-BLUP models

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Practical implementations of marker assisted breeding value estimation (MA-BLUP) in dairy cattle are mostly based on approaches where only the genotyped animals and their close relatives are used in the MA-BLUP system. The genotyping of ancestors causes additional cost and is often difficult to accomplish. This raises the question how strongly MA-BLUP is affected by missing marker genotypes. In our simulation study we examine the impact of missing genotypes for two different proportions of non-genotyped animals and two different "depths" of pedigree. For each combination of non-genotyped animals and pedigree depth variance components and marker assisted breeding values (MABV) were estimated. MA-BLUP was based on pre-corrected phenotypes (daughter yield deviations for bulls, yield deviations for cows) estimated in polygenic animal models for the entire population. The results show that variance components are estimated less precisely the less animals are genotyped and the shorter the pedigree. The same holds for accuracies of MABV. In consequence there is a high risk of loosing the benefit of MA-BLUP. To ensure that marker assisted selection improves selection efficiency one should always aim at complete genotyping and use programs for genotype reconstruction.

Asymptotic distribution of the likelihood ratio test in QTL detection.

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Simulation or permutation are generally used to find correct rejection domain when testing the presence of a QTL in a genome region. In the case of backcross population, Lander and Botstein (1989) and Cierco (1996) proved, under the assumption of a dense map with all markers informative, that the likelihood ratio test (LRT) statistic under the null hypothesis is asymptotically (as the number of individuals tends to infinity) distributed as the square of an Ornstein-Uhlenbeck process on the chromosome. We generalized this result to a population with family structure. We obtained that the LRT is asymptotically distributed as the square of an Ornstein Uhlenbeck Chi Square process (OUCS). The previous results were extended to the case of a sparse map. When the tests are only performed on markers, the limit process defined by the test statistic is a Discrete Ornstein Uhlenbeck Chi Square process. When the tests are performed anywhere on the genome, the limit process is the sum of the square of independent gaussian processes with unit variance and covariance function equals to $\exp(-2d_{xy})$ where d_{xy} is the distance between the closest markers of positions x and y. This last result is obtained using the information of the closest marker of each position. As all these results are asymptotic, we tried to quantify, by simulation, the number of individuals required in each family to match the asymptotic hypothesis. Besides, we showed that these theoretical results decrease highly the CPU time needed to calculate the threshold.

Exploring biological relationships between calving traits in Holsteins with a Bayesian recursive model

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Recursive structural equation models (SEM) were used to investigate relationships between gestation length (GL), calving difficulty (CD) and stillbirth (SB) in primiparous US Holsteins. An acyclic model with recursive and heterogeneous effects from the GL phenotype to the liabilities to CD and SB, and from the liability to CD to that of SB was assumed. These SEM allow disentangling (and quantifying) causal effects from the correlations between traits. Data were GL, CD and SB records from 90,393 primiparous cows, mated to 567 service sires, distributed over 935 herd-calving year classes. Estimate of GL direct heritability was higher than that of maternal heritability (0.43 vs. 0.08). Corresponding estimates for CD (0.13 vs. 0.11) and SB (0.11 vs. 0.12) were similar. Genetic correlations between GL and two calving traits were low; liabilities to CD and SB were highly correlated, genetically. Genetic correlations between direct and maternal effects were negative and low for the three calving traits, suggesting that selection should consider both genetic effects. Genetic correlations between direct and maternal effects for different traits were close to 0. The model detected a linear causative effect of CD on SB and an intermediate optimum of GL with respect to these traits. Gestations of around 274 d of length (3 d shorter than the average) would lead to the lowest rates of CD and SB.

A multiple threshold model for subjective traits

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Selection programs of livestock made use of a wide variety of traits. Among them, phenotypic records for some traits are obtained by a subjective evaluation from a set of experts, like sensory, type, carcass or fat score traits. Data from subjective evaluation involves a categorization under an arbitrary predefined scale. The output of this process can lead to strong departures from the Gaussian distribution. As an example, we have studied conformation data from the Pirenaica Beef Cattle Breed evaluated at 6 different slaughterhouses. Three statistical models are compared: 1) A Gaussian Linear Models 2) An Ordered Category Threshold Model 3) A Slaughterhouse Specific Ordered Category Threshold Model. A Bayesian analysis trough a Gibbs sampler with a Data Augmentation step was performed. Models were compared with the Deviance Information Criteria and the third model was clearly selected as the more plausible, as the threshold estimates differed substantially between slaughterhouses. Moreover, the consequences on variance component estimation and ranking of selection candidates are presented.

German Simmentals show significantly imprinting variances on 16 traits of carcass composition

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A set of slaughter data from 66,500 German Simmental fattening bulls was analysed with respect to the relative importance of the genetic imprinting variance. Besides of live weight, slaughter weight, net daily gain and killing out percentage there were 22 traits describing carcass composition. The latter traits were recorded by automatic video-imaging devices and comprise weights of valuable cuts as well as fatness-scores. The number of ancestors in the pedigree was 365,000. The imprinting variance was derived from the variances of two random genetic effects and their covariance, where these two effects are breeding values under a paternal and maternal expression pattern, respectively. The null-hypothesis of no imprinting was tested via a REML-log-likelihood ratio test with two degrees of freedom. 16 traits showed a significant imprinting variance accounting from 7% up to 24% of the total additive genetic variance.

Possibilities of adaptation of mountain beef cattle systems to the changing socio-economic conditions

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Six mountain beef cattle farming systems in the Spanish Pyrenees, showing diverse trajectories of evolution in the past, were analysed from the point of view of their chances of adapting to different socio-economic scenarios. A Linear Programming Model for each farm type was developed representing the annual operation of the farm with an economic objective of maximizing Gross Margin. Four scenarios combining: i) CAP implementation (partial or total decoupling); ii) possibility of carrying out fattening activities; and iii) possibility of starting off-farm activities (part-time tourism) were considered in the analysis. Sensitivity analysis for the price of main inputs (cereals, weaned calves) and outputs (meat) was also carried out. Results revealed that under the current situation of partial decoupling herd sizes were maintained and fattening activities were profitable in pure economic terms, although this later activity was extremely sensitive to the rising price of cereals and therefore had an uncertain future. When introducing in the models the opportunity cost for labour (part-time tourism), most farms introduced this option, reducing herd numbers and fattening activities and changing land use (further reduction of sown meadow and increment of natural meadows). If total decoupling was considered this trend was strengthened.

Local breeds into technical and cultural stakes: the case of Oulmès cattle breed from Morocco

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Despite the role of biodiversity for sustainable development, numerous local breeds are still endangered. We assume that the future of a local breed needs to be embedded within a regional system where its value makes sense for local actors (not only breeders). In Morocco, local cattle breeds have been decreasing for 30 years as specialized dairy breeds are massively imported. In this work, we focus on Oulmès cattle breed, well-known for its hardiness and beef ability. We characterize livestock systems in the native area of the breed, and identify chains from farmers to consumers. Local actors such as breeders, fatteners and butchers are interviewed. Slaughterhouse data are gathered and analyzed. Sensory tests allow studying the influence of meat cooking (western steak vs tajine slow cooking). We show that breeders organize extensive suckling systems using the natural resources of pastureland and forests, and adjusting animal cycles with vegetal cycles. Oulmès breed is maintaining because of attachment of the breeders and disadvantaged area. Animals are mainly fattened and slaughtered outside of the breeding area as no identification of the meat is observed. Moreover, tasting sessions evidence typicality of this meat. Enhancing both technical culture of breeders and associated gastronomic culture may lead the local breed into local development, among tourist and environmental stakes.

How French dairy farmers adapt their labour? Relationships between workforce and farm management

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In France, the reduction of family labour, the development of a salaried workforce and associations between farmers attest to the adaptation of dairy farms to current socio-economic trends. The setting-up by farmers of solutions to adapt their workforce organisation will help to sustain farming without exclusive reliance on family labour, and meet new aims in terms of quality of life or improved productivity. This study focused on work, with the starting hypothesis that workforce group, structures and farm management are not independent of one another. It is based on one survey carried out among 458 dairy farmers in the Ségala region. Using factorial analysis, we identified six adaptation profiles which highlighted different combinations between the three ways in which farm operation can be adapted: the technical management of the dairy herd, changes in the workforce and improvement of buildings and equipment. Five dairy farm management systems were characterised, according to the importance of the dairy production, the use of the forage area and the distribution of the calving. Links between adaptation profiles and dairy farm management were described. The analysis shows the importance of the ways in which work-related requirements and balance between income and quality-of-life expectations are expressed. The diversity of the situations shows that there are different ways in which a system can be adapted to address work-related issues.

Understanding the reproductive performance of a dairy cattle herd by using both analytical and systemic approaches

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Our suggestion is to discuss the interest of mixing systemic and analytical approaches so as to get a good understanding of biotechnical problems in livestock farming systems. It is based on a case-study carried out within a system experiment. Two analyses aimed at explaining two years of impaired reproductive performance of a cattle dairy herd, and at suggesting ways of improvement. The first one was a statistical analysis (logistic regressions) to test the links between indicators of energy balance and reproductive performance. The second consisted in characterizing the decision makers' objectives and their feeding practices. On this basis, the cows were clustered into 32 groups according to date of calving, breed, parity and year of experiment. Reproductive performance and shapes of lactation curves were then compared within and between groups. This analysis revealed that: (i) cows which calved before turnout date had better reproductive performance than cows which calved after, (ii) feeding conditions that enhanced milk production at turnout were linked to poor reproductive performance, (iii) Montbéliarde lactation curves were smoother than Holstein cows' and their reproductive performance was better. Both analytical and systemic approaches were shown to be necessary to reach these three conclusions.

A framework to model the diversity of reproduction strategies in ruminant livestock farms: application to dairy herds

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Reproduction management is a key aspect of the operation of livestock farming systems. So it has to be formalised in modelling processes to design and assess systems. However, all around the world, livestock farmers have different ways of managing herd reproduction, not only according to the species but also to their technical projects (productivity level, reproduction rhythm, distribution of the production and herd dynamic). Few livestock farming system models are able to represent a wide range of reproduction strategies, from a reproduction spread out all over the year to more complex systems like three lambings in two years. We propose a generic representation framework which covers the diversity of reproduction management strategies, in suckler and dairy herds/flocks. It connects on the one hand, the biological functioning of animals in the short term and at lifetime scale and, on the other hand, the management of individuals, batches, batch breeding cycles and herd replacement. We apply this framework to two opposite dairy herd reproduction systems: with or without a concentrated calving distribution.

Are farmers like any other businessmen? Highlighting transformations in the professions of farmers in France

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The aim of this paper is to promote an understanding of the current transformations in the professions of farmer. A literature review and forty in-depth semi-structured interviews were carried out, in two regions of France. One hypothesis was that society values were of increasing importance for the farmers. This hypothesis was confirmed. Moreover, the diversity of models the farmers use to define their profession is highlighted. Besides the usual agricultural references, they focus on the 'entrepreneur' model or on a personal, individualized project. Farming increasingly appears to be a job like any other. Six profiles of farmers were created, by adding a more personal dimension through research into traditional or creative attitudes. The main transformations in the farming profession are threefold: farmers are getting more and more 'professional', with increasing value being placed on organisational, management and human resources skills; farmers increasingly take into account the expectations of society when defining their job; and they increasingly identify themselves as businessmen. Yet although farmers' identity really is evolving, it nevertheless remains highly diversified.

Technical-economic study of the sheep and goat farm system of the northwest of Dominican Republic

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With the aim of analyzing the current situation of the sheep and goat farm systems of the northwest region of Dominican Republic, from the economic and productive point of view, 94 farms have been sampled. By means of a study of transverse cut, information was collected of technical and economic aspects of the commercial developments, using the method of direct survey with the stock-breeder. These productive systems are characterized by a stocking rate of 110 hectares and 188 dams and an index of 1,35 commercial animals/goats. In economic terms the above mentioned systems present annual income around US$6.143 and expenses of US$5.146, where the break-even point is reached by a production of 254 commercial animals. Three subsystems have differed depending on the type of farms (goat, sheep and mixed). In this sense, the goat farms are characterized by greater income (US$10.619), low production costs (US$31/animal) and a productivity superior to the break-even point. On the other hand, the sheep farms present low income, low production costs (US$33/animal) and productivity lower than the threshold, placing them in zone of negative results. Finally, the mixed farms show average income levels, greater production costs (US$41/animal) and productivity similar to the threshold, managing to cover costs, without obtaining economic benefits.

Income transfers from a flat area-based payment in Ireland

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Cattle and cereal enterprises were most affected by the shift to the SFP scheme based on full decoupling of historic entitlement. A shift to a Flat Area Payment (FAP) system would have similar impacts. A random sample of over 1,100 Irish farms was used to estimate the inter-enterprise revenue transfers and related Family Farm Incomes (FFI) of a shift to a FAP system. There would be no overall SFP or income gain, but €64 million (m) would be redistributed between farms and farming systems. Cattle Rearing –sucklers- (€36m) and Mainly Sheep farms (€28m) would benefit with consequential increases in FFI of 16% and 11% respectively. Losses would arise for the Cattle Other system -fatteners- (€37m), the Mainly Tillage farms (€13m), Dairy & Other system (€9m) and specialist Dairy farms (€5m). The reductions in FFI would be 10%, 6%, 4% and 1% respectively. Farming systems in the 10-30 ha farms would benefit with an FFI increase of between 4 and 8% but Hill farms would benefit by €54m, a 36% FFI boost. Losers would be farms of 50 to 100 ha, €50m equal to about 8% of FFI. There would be a transfer of €52m from Full-time farms to Part-time farms, equivalent to FFI losses of 4% and gains of 9% respectively. Most of the Full-time farms are in the Cattle Other system while the Part-time farms are mainly in Cattle Rearing. The regional impact would be a transfer of income from mainly inland counties to border and costal counties. The regional gains and losses vary within the range 3 and 10% of the regional FFI

Strategies for the end of suckler cow farmers' careers without known successor

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Over the last 25 years, Charolais suckler cow farmers have increased the size of their farms by 65% with a constant workforce. This increase in size leads to a high capitalization, and this total working capital can limit the entry into farming for a young applicant and therefore the farm transfer. In 2005, 65% of the professional farm managers over the age of 50 have no announced successor; the future of these holdings is at stake. This paper focuses on farmers who are closed to retirement age without known successor and address the issue of their attitude toward farm management and farm transfer. A survey of 20 farmers is conducted. The analysis of strategies highlights the role of the land tenure system that interacts with the main objective of the transferor: converting its asset into cash or transferring its farm as a whole. It results in two kinds of farm management: a progressive decrease of activity without investment and a continuous investment to maintain their farm competitive. But all these farmers are aware of the magnitude of the working capital and that the dismantling will often be the only solution offered failing to find a buy-out applicant. Applicants for the installation must have a high cash contribution. The dismantling of large farms can make easier the installation of a young farmer on a smaller farm, but the question of the transfer of single farm payments is raised.

Contribution to innovation processes: a review of livestock farming systems models

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The role of computer-based modelling has become widely recognised in many fields, notably to aid in designing and assessing innovative solutions. We suggest drawing up a state-of-the-art about modelling approaches to identify to what extent livestock farming system models contribute to helping design novel and innovative production systems. We decided to focus on the farm scale considering that this entity is strongly affected by tensions emanating from social, economic and environmental evolutions. Thus we compared models in terms of types of explorations and roles for innovation processes. We tried to analyse how the renewal of the system representation modes contributes to the conception and assessment of innovative solutions within systems. We concluded by placing an emphasis on some key issues for which our analysis revealed a lack of consideration, in order for models to be more relevant concerning their usefulness with regard to innovation processes. Our analysis framework showed that some efforts have to be concentrated on improving the characterisation of the whole-farm decisional process. Some new stakes have to be explored concerning the work organization dimension. Representation of temporal aspects has to be more precisely defined, especially by taking long term into account and the superposition of different time scales. User-centered methodologies like participatory research and co-learning with players may pave the way to such improvements.

Differences in diet selection and grazing behaviour between equines and cattle grazing on upland vegetation communities

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Diet selection and grazing behaviour of 5 mares and 5 cows managed on natural shrubland with an area of improved pasture were studied at the beginning (May) and end (October) of the grazing season. Diet composition was estimated using alkane markers and the grazing behaviour was determined by recording the grazing activity on each vegetation type (short and tall heathland, and improved pasture). Differences in diet selection were only observed in October as both species selected only herbaceous plants in May, when the sward height of the improved pasture was 7.1 cm. The lower availability in October (3.2 cm) resulted in a decline of the proportion of herbaceous plants (0.85 and 0.68 in cattle and equines, respectively) and an increase in gorse selection by equines (0.30) and heather by cattle (0.13). In general equines spent more time grazing than cows (648 vs. 530 min/day) but with the decrease of the improved pasture availability from May to October, cattle increased the time spent grazing (from 483 to 576 min/day) while a decrease was observed in equines (from 687 to 609 min/day). Although cattle and equines spent similar average proportions of the grazing time on the improved pasture (0.85 and 0.82), equines spent more proportional time grazing over short heathland (0.11 vs. 0.04) and cattle on tall heathland (0.12 vs. 0.07).

Structural characterization of the sheep-goat system of the northwest region of Dominican Republic

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Data from 94 farms was collected by the direct survey method: parametric and nonparametric analysis of 25 variables related with structural aspects of the production systems were carried out. The farm systems present stocking rate of 110 ha and 291 animals characterized by rustic infrastructures and inadequate facilities. 63% of the farms lack fences, 15% of them have feeding places and 7% have drinking-troughs in the corrals. The mating system is natural principally of constant form (what does it mean?), 98% of the farms do not keep any records and average age at first mating is 6.6 months. The feeding is based on constant grazing of natural pastures (94%), with suplementation on 37% of the farms, principally on the cattle, sheep and mixed. The cattle average stocking rate is 0,84 LU/ha, and the average sale age and weight are 7 months and 23 kg /animal, respectively. Healthy treatments are carried out in 94% of the farms with frequency of 5 months, though with little private technical assistance. It can be concluded that the farm systems of the region studied are managed under a traditional structure, characterized by deficient facilities and generally present high variability in managing practices and productivity.

Characterization of organic ovine farms in Andalusian Dehesa

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The aim of this study was the identification and classification of the extensive ovine systems in the semiarid Andalusian Dehesa, taking in count their physical, productive, economic characteristics and management. A sampling of 100 farms was made in Andalusian Dehesa. By means of factorial and cluster analysis, three subsystems were identified. The first, denominated traditional system, responds to low levels of productivity and average daily gain. This system designates 56% of the cattle grazing surface. The third subsystem is denominated technified grazing and shows greater levels of productivity and average daily gain; they use greater levels of feed and they dedicate 77% of the ovine surface to the pastures. These farms apply a maximum criterion of benefits in the decision making. The second subsystem, denominated of transition marks the evolution between the traditional system and the technified one.

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New type of brown dairy cattle in Kazakhstan

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The south and East of Kazakhstan is mountainous, ranging in altitude from 500 to 1000 metres. In this environment it was recommended to use the Alatau breed which was derived in the 1950s by crossing local Kazakh breeds with Brown Swiss of Russian origin. On average milk yields were in the range 2,500 – 3,000kg with a body weight of 450kg. The cattle were traditionally grazed on mountain pastures and milked by hand. However in view of the rapid growth of the population in the cities, the productivity of Alatau breed could not meet the demand for milk. In 1975 a new type of brown cattle was created to solve the problem using Brown Swiss of American origin. In 2004 this new type of brown dairy cattle was approved in Kazakhstan. There are now in excess of 750,000 head of these cattle of which 300,000 are breeding cows. In the improvement process, the conformation of the cattle was improved as well as the morphological and functional properties of the udder which has resulted in increased milking speed, milk production and body weight. In large farms the yield of milk exceeds 5000kg at a fat content of 3.8% and a mean body weight of 530kg. Now in the Republic of Kazakhstan work on creation of three more new types of large horned livestock is nearing completion, that is: red – pied, black - pied and red steppe breeds.

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Animal fiber production in Turkey and its contribution to the sustainable rural life-the case study: the economic and structural analyses of the plants producing haircloth tent and mohair products

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In this paper, at the preliminary stage, the economic importance of animal fiber production in Turkey will be analyzed. In the second stage, quality properties of animal fibers such as fineness, staple length, single fiber length, number of crimp will be indicated. In the third stage, usage fields of animal fibers and their cultural features will be introduced. Economic analyses will be drawn up by statistical outputs and by some research results. Researches carried out in this field in Turkey will be used for the quality properties of animal fibers. For revealing of their usage field and cultural features, photographs and product samples obtained especially thanks to the studies carried out in the regions will be used. In this paper, it will be given the economic and structural analyses of the plants producing haircloth tent and mohair products.

Effect of housing system and sex on growth, carcass characteristics and meat quality of fattening rabbits

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In this study were investigated the effects of housing system (cage vs pasture pen) and sex on performances, carcass yield and meat characteristics of 96 growing mixed sex hybrid rabbits (NZW×C). Animals were housed in 12 wired cages (4 rabbits/cage) and in one open-air pasture pen (20×9m; 48 rabbits) and fed ad libitum with a commercial diet. The diet intake and live weight were controlled from 59 to 87 d of age. The intake of pasture by rabbits in the pen treatment was not registered. At day 87, 24 rabbits were slaughtered, carcass characteristics were determined and cooking loss (CL), Warner-Bratzler Shear Force (WBSF) and pHu of M. biceps femoris were measured. Data was analysed using Anova. Caged rabbits showed higher ($P<0.05$) weight gain (45.9 vs.34.2 g/d), feed intake (163.4 vs. 110.2 g/d) and live weight (3027 vs. 2675 g). Pasture pen rabbits had higher ($P<0.05$) proportion of hind part (26.4 vs. 28.7%), similar dressing out percentage (about 60%), lower ($P<0.05$) dissectible fat percentage (1.35 vs. 4.19%) and meat/bone ratio of hind leg (4.2 vs 5.0). Pasture pen rabbits showed higher CL (3.66 vs. 2.95%) and WBSF (4.11 vs. 3.17 kg/cm^2), and similar pHu 24h. Sex had no effects on parameters measured. It was concluded that the open-air system had negative effects on growth, positive effects in carcass characteristics and improved meat quality.

Bovine colostrum: an efficient and cost-effective growth promoter in piglet weaning diet

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We showed previously that the incorporation of 2% of bovine colostrum whey (BCW) in piglet diet reduces the post-weaning (PW) growth check. Two experiments were conducted to reduce the costs of its use. The 1st experiment evaluated the effect of 3 doses of BCW (0 (Whey 0), 10 (Whey 1) and 20 (Whey 2) g.kg^{-1} of a commercial diet). Each treatment was distributed to 3 pens of 13 newly weaned pigs for 28 days. In the 2nd experiment 4 pens of 12 pigs received the "Whey 2" treatment for 10 days and then the "Whey 0". Four other pens received the "Whey 0" diet for 4 weeks. In both studies, the feed ingestion and the body weight were measured. In the 1st experiment, an increase of growth performance, feed intake and feed efficiency in "Whey 1" and "Whey 2" treatments were observed the first week PW compared to the "Whey 0" treatment. However, there were no differences between the two supplemented treatments. In the 2nd experiment, the piglets receiving the "Whey 2" showed an increase in growth and feed ingestion the second week PW. Our results show that BCW is an effective growth pormoter for piglets at weaning and that it is possible to reduce the costs of its use by limiting the incorporation and the duration of the treamtent.

Efficacy of essential oils on broiler growth performance in a semi-commercial scale facility

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The purpose of this study was to investigate the efficacy of essential oils (EOs) in wheat-based diets on growth performance in broilers. The main active substances in the EOs product were thymol and cinnamaldehyde. Starter, grower and finisher diets contained xylanase and phytase and were prepared for each of the two dietary treatments (control and control+EOs). The starter and grower diets also contained coccidiostats which were removed in the finisher phase. The two dietary treatments were given to five replicate pens (of 1000 birds each) from day old to 37 days. Over the whole study there was a significant increase in body weight gain (BWG) of 7% and feed intake of 5% with EOs versus a control diet. There was a significant increase in BWG of 5% with EOs versus a control diet between 0-31 days. When coccidiostats were removed from the diet (32-37 days) the increase ($P<0.05$) in BWG with EOs was even greater (11%). There was no treatment effect on FCR throughout the study. The improvement in BWG with EOs was largely attributed to increased feed intake which was probably due to the known effects of EOs on increasing the secretion of endogenous digestive enzymes and improvement of nutrient utilization and microbial balance in the gut. Litter quality was poor across both treatments possibly due to the inclusion of high level of 'viscous' cereals in diets and low inclusion of xylanase.

Importance of carbohydrate-binding modules (CBMs) to decrease the dosage level of recombinant celulases used to supplement a barley based diets for poultry

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The nutritive value of cereals rich in soluble Non-Starch Polysaccharides is improved by supplementation with microbial cellulases and hemicellulases, for simple-stomach animals. Cellulases display a modular architecture that comprises a catalytic module linked to one or more non-catalytic Carbohydrate-Binding Modules (CBM). A prolonged and intimate contact of the enzyme with the target substrate is mediate by CBM's allowing efficient hydrolysis of the target polysaccharides. CBM's are classified in 50 families and family 11 displays high affinity for barley b-glucans. We have investigated the effect of family11 CBM in the function of recombinant derivatives of cellulase CtLic26A-Cel5E of C. thermocellum used to supplement a barley-based diet for broiler at lower dosage rates. The birds fed on diets supplemented with low doses of the recombinant CtLic26A-Cel5E modular derivatives or the commercial mixture Rovabio™ExcelAP display improved performance than the birds fed on diets not supplemented with exogenous enzymes ($P<0.1$). At the enzyme dosage used in this study (10 U/kg of basal diet),the modular enzyme containing CBM may be more efficient in improving the nutritive value of the barley-based diet for broilers than CtLic26A-Cel5E.

Utilization of palm tree leaves in feeding growing rabbit

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This experiment was conducted to investigate effect of using palm tree leaves (PTL) as a replacer of 33.33, 66.66 or 100% of clover hay as a source of fiber in growing NZW rabbit's ration. A total number of 60 unsexed, weaned NZW rabbits of 5 weeks old were randomly divided into 4 similar groups. Four pelleted experimental diets were formulated to be approximately isocaloric, isonitrogenous and isofibrous. Insignificant ($P \geq 0.05$) differences were observed in feed consumption among the different groups through all the experimental periods. Replacing 33.33% of the clover hay by PTL increased ($P \leq 0.05$) the values of CP and CF digestibility compared to the other groups. Also using 100% PTL as a replacer to clover hay increased ($P \leq 0.05$) EE digestibility than the other groups. The group received 33.33% of clover hay as PTL showed higher TDN and DCP values than the other groups. Insignificant effects were observed in blood parameters. Using of PTL in growing rabbits diet increased significantly live body weight and daily weight gain through the whole experimental period. Feed conversion ratio was improved with feeding PTL in the rabbit diets compared to control diet..Also insignificant differences were observed in carcass traits. Using PTL as a replacer to clover hay decrease feed cost, improve economic efficiency and prformance index.

Artificially rearing of kids with dairy milk

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In Austria, goat milk production is an increasing branch. The main goal is to produce milk. Therefore the farmers are not interested in rearing the kids. To investigate the possibility of motherless rearing of kids with cow milk an experiment was carried out together with the LZF Raumberg-Gumpenstein and BIO Austria and a private farm. Four different methods was investigated: undiluted warm cow milk (WU), with 25% water diluted cow milk warm (WV), undiluted, cold cow milk acidified (KU) and with 25% water diluted cold cow milk acidified (KV). At the beginning of the experiment the kids were 3-7 days old and the final body weight was defined with 18kg. In Gumpenstein in every group was 16 kids, on the farm there where only 15 kids in two groups, KU and KV. In Gumpenstein the rearing time was 76 to 94 day, at the private farm 52 to 60 days. Average daily gains was 164 to 195 g in Gumpenstein and 295 g on the farm. The daily feed intake was 1.8 to 2.4 litre in Gumpenstein and 2.2 to 3.0 litre on the farm. The better values on the farm can be explained by feeding hay from the beginning. The feeding method has no significant effect on fattening and slaughter performance. The kids in the groups with diluted milk had a higher feed intake and therefore the milk conversion was the same in all groups. But it is not possible to produce pure milk fed kids, they need also hay. For practice we suggest the method with cold, acidified and undiluted milk, because it is less work and also no energy for warming up the milk is necessary.

Low doses of rumen-protected conjugated linoleic acid (CLA) on dairy cows in mid lactation: effects on milk yield and quality

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The effects of low doses (0, 40 and 80 g/d) of a lipid encapsulated mixture of conjugated linoleic acids (LE-CLA), containing 7,92 and 7,68 g/kg of C18:2 cis 9, trans 11 and trans 10, cis 12, respectively, on milk (MY) and fatty acid (FA) yields of cows in mid lactation were investigated. Cows were fed a corn silage based TMR. Twelve Holstein cows were divided in 3 groups balanced for MY (29.5±5.1 kg/d), fat yield (1.26±0.2 kg/d) and days in milk (132±35 d), and treated according to a 3 x 3 Latin square design with periods composed by 14 d of treatment and 7 d of suspension. Before the daily TMR distribution, the doses of LE-CLA, partially or totally replaced by an equivalent amount of hydrogenated soybean oil, were accurately mixed with about 500 g of TMR, placed on individual bowls, and distributed to the cows tied to manger. Milk was collected at the 13th day of each period. Treatment (7 to 14 d) did not significantly affected DM intake (20.5 kg/d on average) and MY (27.7 kg/d on average). Increasing doses of LE-CLA linearly reduced milk fat content (3.9 to 3.1%; P<0,01), short chain FA yields (C<16; 258 to 219 g/d; P<0,04) and medium chain FA yields (C=16:0 + 16:1; 334 to 257 g/d; P<0.01), but did not significantly reduced the yields of longer chain FA (C>16; 361 to 333 g/d; P=0.79). The transfer of the trans-10, cis-12 isomer to milk averaged 6%.

Effect of feeding whole wheat or whole oat grain on chewing activity in lamb

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The aim of the present experiment was to compare eating and ruminating activity in lamb fed either whole wheat (W) or whole oat grain (O) ad libitum. Nineteen Shropshire lamb were spitted up into two equal groups from weaning at 20 kg to slaughter at 45 kg and fed whole grains ad libitum plus 100 g protein concentrates per lamb twice daily. Jaw movements (JM) oscillations values were recorded at 30 Hz continuously during 96 hours two week before slaughter. Daily time spent eating and rumination, number of ruminating periods (RP) and ruminating cycles (RC) were identified from the JM pattern characteristics and from observation of the lamb. Data were statistically analysed by Proc Mixed in SAS 8.2. Daily time spent eating and ruminating, mean ruminating time per kg grain, daily number of JM during ruminating (JM_R) and number of JM_R per kg grain were affected by grain type (P<0.05). Feeding W caused an irregular JM_R pattern, whereas JM_R pattern appears to be normal in lamb feed O. Daily time spent ruminating, mean ruminating time per kg grain, number of RC per RP and number of JM_R per RC were highest in lamb feed O (P<0.05). In conclusion, the content of physical effective fibre in O appears to be sufficient to stimulate regular ruminating in lamb.

Selective fractionation procedures for improving alfalfa nutritive value

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Alfalfa's total usability value may be upgraded by selective fractionation of highly valuated componentsso that the maximum benefit may be gained from feed ingredients according to sustainable feed production principles. The mechanical fractionation of dehydrated alfalfa meal (contained 20.23% crude protein-CP and 22.46% crude fiber-CF) by centrifugal separator with different sieve openings were investigated. High yield (75.25 and 69.34%) and good quality (25.12 and 25.63% CP and less than 18% CF) was obtained with sieve openings Ø1.5 and Ø1.8 mm. Fractionation of alfalfa meal with sieve openings Ø0.6 mm rendered protein fraction containing 28.56% CP and 14.62% CF but the yield of this high protein fraction was low (36.45%). This fraction can be used at much higher level in the diets for pigs and poultry due to significantly improved feeding value. Fractionation of alfalfa juice by coagulation and production of alfalfa protein carotinoid concentrate (APCC) were also investigated. Out of 100 kg alfalfa dry matter, using investigated production procedure, it is possible to obtain 9.1 kg APCC dry matter containing 57.00% CP, 10.57% fat, 2.10% CF, 1052 mg/kg total xanthophylls and 547 mg/kg β-carotene. It was also found out that APCC can be the substitute for 3-5% fish meal or 2-10% soybean meal in feed for broilers and layers with the simultaneous substitution for natural or synthetic pigments.

Effects of PolinaceaTM extract in periparturient dairy cows

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Dairy cows often show immunesuppression and inflammatory conditions during the transition period. To reduce these challenges, 2 mg/kg/d of Polinacea^{TM} (POL), extract of Echinacea angustifolia with immunomodulatory and antinflammatory properties, were administered to 4 cows around calving. Four similar cows were used as control (CTR). Health status, feed intake, rectal temperature (RT), body condition score, milk yield and composition and a large metabolic-haematological profiles were frequently checked in the month before and after calving. POL reduced RT before calving ($P<0.05$ vs CTR) and increased milk yield and feed intake till day in milk (DIM) 7, but also increased body losses in the 1st month of lactation. At the blood level, POL showed more favourable energy indices (e.g. higher glucose and lower beta-hydroxy-butyrate; $P<0.05$), but also a marked rise of haptoglobin. Interestingly, the negative acute phase proteins (e.g. albumin, paraoxonase) were slightly better than CTR till 28 DIM, suggesting no adverse liver consequences of inflammation. After calving, neutrophils showed a noticeably drop and neutrophils/lymphocytes rate showed a more favourable ratio (<1) than CTR. These changes, together with a lower reduction of globulin around calving, suggest a better immune status in POL. Therefore, POL seems to exert some positive effects on periparturient dairy cows, but some contradictory aspects (e.g. marked lipomobilisation and marked raise of haptoglobin) require further investigation.

Nutritive evaluation of three acacia species

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Leaves of three species of Acacia (A. cyanophylla, A. dealbata, A. karroo) were sampled in two periods (May and November), for nutritive evaluation. After freeze drying, the samples were chemically analysed (organic and mineral composition) and in vitro evaluated in a Daisy® Rumen Fermentor for dry matter (DMD) and organic matter (OMD) digestibility and for mineral (Ca, P, K, Mg) disappearances. Data were analysed for the effect of species, period and their interactions and correlations between some chemical and in vitro parameters were made, using the GLM and CORR procedures of SAS. Crude protein content was influenced by the periods ($P<0.001$), with the highest concentrations in November (15.6 vs 18.0%DM in May and November, respectively). The levels of Ca, P, Na, K, phenolic and tannin compounds, varied among species ($P<0.001$) presenting A. Karroo the higher mineral concentration and A. dealbata the higher phenolic and tannin contents. Cell wall components varied with the species ($P<0.001$), but the sampling period only affected ADF and ADL composition. With exception for Mg, differences of in vitro parameters ($P<0.05$), were observed for the species, presenting A. dealbata the lowest percentages of DMD (52.3), OMD (50.2) and Ca (96.1) and K (96.6) disappearances. Negative correlations ($P<0.001$) were observed between DMD, OMD and K and cell wall components.

Nutritional assessment of distillers dried grains with solubles produced by Slovak distillery

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The rapid growth of the ethanol industry has made large quantities of distillers dried grain with solubles (DDGS) available for animal feeding. In Europe the assessment of the nutritive value of DDGS is still under way. It is very important to distinguish between feedstuffs in cattle feeding with DDGS and always to specify the grain species. The aim of this study was to determine chemical composition of DDGS from two grain species (wheat, corn), corn gluten feed, corn and wheat and their effect on rumen degradability and intestinal digestibility. Effective degradation and degradation parameters were determined by in sacco method on the three rumen fistulated cows with outflow rate of $0.06.h^{-1}$. Intestinal digestibility of by pass protein was determined by method mobile bags on three cows with duodenal T-cannula. Results were evaluated by statistical programme Statistics. The content of crude protein (CP) was 305.4 $g.kg^{-1}$ DM for corn DDGS and 341.4 $g.kg^{-1}$ DM for wheat DDGS. There was variability in fat, ash and total phosphorus between corn DDGS and wheat DDGS. The effective degradation (Edg) of CP was higher for wheat DDGS than for corn one ($P<0.05$). Corn gluten feed had higher Edg of CP (75.2%) than corn DDGS (40.6%). The energy content of wheat and corn DDGS was similar (7.3 $MJ.kg^{-1}$ DM and 7.6 $MJ.kg^{-1}$ DM, respectively). The intestinal digestibility was higher for corn DDGS (84%) than wheat DDGS (78%).

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Replacement of fish meal by soy protein concentrate may have economical and environmental benefits

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Fish meal is a common protein source used in feed for piglets, poultry and aquatic species. Increasing demand for fish meal and limited availability has led to a rapid increase in fish meal prices. Hence, alternative protein sources are needed as replacement of fish meal in animals´ diets. Amongst alternative protein sources, soy protein concentrate is a proven substitute for fish meal in piglet-, poultry- and aqua-feeds. The withdrawal of antibiotics impacted on the feed industry and animal production. New nutritional management strategies were devised by formulating diets reducing the growth of harmful intestinal micro-organisms. To inhibit the over-growth of pathogen bacteria, the amount of substrates available for the intestinal micro flora must be controlled. Soy protein concentrates exhibit higher crude protein and amino acids digestibility than fish meal in piglets, broilers and in fish. Consequently lower amounts of indigestible protein are available for bacterial metabolism and therefore the overall intestinal health of animals is improved. In aqua-feeds, replacing fish meal by soy protein concentrate may reduce nitrogen and phosphorus excretion yielding in less water pollution. Replacing fish meal by soy protein concentrate maintains the growth performance in piglets, broilers and aquatic species. In conclusion, replacement of fish meal by soy protein concentrate may have economical and environmental benefits.

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Effect of *Calcarea carbonica* like grown promotor on the Pekin duck electrocardiogram

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A study was conducted to investigate the effect of Calcarea carbonica on Pekin ducks heart. 309 animals were divided on two treatments: alcohol 87% like control and Calcarea carbonica 200c, both substances were obtained at commercial homeopathic laboratory. The treatments were administered on the drinking water, 0.2 mL per kilogram of living weigh, one time every week. Ten ducks, 5 weeks old, were selected with random design from each treatment. Standard limb lead electrocardiograms (ECG) were recorded in every duck. The ECG exhibited R, S and P waves. Significance was determined by the Student t test. The mean of the amplitudes of waves were for R: 0,025 and 0,043, for S: 0,043 and 0,032, for P: 0,004 and 0,006, respectively. R and P were significantly higher for Calcarea. There were no significant differences between treatments for S wave. It's concluded that Calcarea carbonica 200c affects the ventricular work.

Evaluation of the quality of the buffalo milk produced in south-western Romania

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Milk was regarded from the ancient times as a main food for the people due to the optimal proportion of nutrients. The buffalo milk contains 58% more calcium, 40% more protein and 43% less cholesterol than the cow milk. The paper makes and evaluation of the buffalo milk produced in south-western Romania, in the counties of Dolj (D) and Olt (O), by determining milk protein (by Kjeldahl), fat (extraction with organic solvents), lactose (iodometric method), fatty acids (gas chromatography) and vitamins (HPLC). The following average values were recorded: for protein (g/100ml), 4.866±0.826(D), and 5.075±1.003(O); for fat (g/100ml), 7.977±1.694(D), and 7.604±1.810(O); for lactose (g/100ml), 3.446±1.093, and 2.746±0.499 for saturated fatty acids (SFA), 63.405±1.368 g%g fat (D), and 69.193±0.874 g%g fat (O); for monounsaturated saturated fatty acids (MUFA), 30.920±1.274 g%g fat (D), and 38.795±0.432 g%g fat (O); for polyunsaturated saturated fatty acids (PUFA), 2.427±0.132 g%g fat (D), and 1.949±0.156 g%g fat (O). The paper also evaluates comparatively the data on milk vitamins (g%ml) the average values being 0.453±0.407 (D), and 1.016±0.646 (O).

Role of a carbohydrate binding module from *Clostridium thermocellum* CtLic26A in the function of a recombinant cellulase used to supplement a barley-based diet for broiler chicks

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Barley has been accepted as an alternative for poultry feed but its anti-nutritional properties preclude its extensive use for monogastrics. Supplementing poultry diets with exogenous cellulases and hemicellulases, which depolymerize non-starch polysaccharides, has proved to be beneficial to poultry performance. Cellulases and xylanases display a modular architecture where a catalytic module is linked to one or more non-catalytic Carbohydrate-binding modules (CBMs). Here, we investigate the importance of a family 11 CBM, displaying high affinities for barley beta-glucans, in the function of recombinant derivatives of cellulase CtLic26A-Cel5E from Clostridium thermocellum used to supplement a barley-based diet for broiler chicken. Data showed that birds fed on diets containing recombinant modular derivatives from CtLic26A-Cel5E, or the commercial mixture Rovabio^{TM}Excel AP, display improved performance when compared with birds fed on diets not supplemented with exogenous enzymes. There was, however, no significant difference between the recombinant enzymes containing or not the barley beta-glucan specific CBM. Data suggest that the enzyme dosage used (30 U/kg basal diet) was probably too high for the efficacy of CtCBM11 to be noticed.

Session 19 Theatre 1

EFSA scientific assessments on animal welfare and interaction with animal disease and food safety

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EFSA provides independent scientific advice regarding risks associated with food and feed, including animal health and animal welfare (AW). Food safety (FS) implications have been considered in most AW Scientific Opinions, illustrating the interactions between AW, animal disease (AD) and FS. Open air systems for poultry may improve welfare but may increase the exposure to contagious diseases such as Avian Influenza. In laying hens, contamination with Salmonella might be higher when eggs are produced in some non-cage systems. In farmed pigs, space availability and social interactions may influence the pathogen spread by oro-faecal or respiratory route. Floor types that cause abrasions to feet or snout are likely to facilitate the spread of vesicular diseases (i.e. FMD). In pigs kept outdoors, contact with the wild fauna mainly wild boars, is believed to be a source of CSF. On animal transport, mixing animals at staging points may also spread infectious diseases such as Brucellosis. EFSA is working on the identification of standardised welfare indicators, following an overall approach, focused not only on AW aspects, but also considering the possible incidence on AD and FS. These may allow the establishment of control and monitoring plans for disease and welfare at farm level, ensuring a safer farm to fork food chain

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Session 19 Theatre 2

Animal welfare science in society: a combination of Welfare Quality-like approaches and human values

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Originally, the animal welfare (AW) discussion was dominated by animal science definition & reasoning (see Brambell, Broom, Bracke, Blokhuis). 'The public', however, comprises substantially more issues under AW. In a collaboration between the authors and Dutch governmental policy, a deliberate distinction and combination between these perspectives (animal versus others, mainly human) was used to bring clarification. This was applied in two cases. 1) In governmental AW policy, a full distinction between animal notions and (other) human values was made. This lead to the choice to focus explicitly on discomfort / 'suffering', and have a separate discussion on the ethical acceptability of use of animals for certain purposes (circus, fur). 2) The societal unease on the occurrence of large scale (20000+) pig farms turned into a cluttered debate with mixed argumentations. The distinction between the strict animal component and other values (unnatural, no respect, etc.) resulted in some ease for several parties involved and a clear position choice by the government: reduced quality of life for the animals is not acceptible and accepting the unavoidable deviation from the public ideal. The two real life examples demonstrate that a reflexive approach to the AW debate (clarification & explicitation and widening up of the definition) is productive. Defining AW from a wider perspective than animal suffering rather aids than complicates societal discussion.

Effects of non starch polysaccharides (NSP) in worm-infected chicks

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Two experiments (I and II), arranged as 2x3 factorial designs with infection (not infected/infected with Heterakis gallinarum) and diet [Control (CON), I-NSP (+ insoluble NSP), S-NSP (+ soluble NSP)] as main factors were conducted. Diets were fed until an age of 12 (I) or 11 (II) weeks. In week 5 (I) or 3 (II) each feeding group was divided into an uninfected subgroup and a subgroup being infected per animal with 100 (I) or 200 (II) embryonated eggs of H. gallinarum. Infection parameters were determined after slaughter. One week after infection the infected groups decreased feed intake and body weight (BW) gain ($P<0.001$). S-NSP caused lower BW than CON ($P<0.01$). Feed conversion rate was not affected by infection ($P>0.05$) and highest with I-NSP ($P<0.001$). In (I), no significant differences were observed between infection parameters of the three feeding groups ($P>0.05$). In (II), the higher infection dose caused higher total worm burdens with I-NSP when compared with S-NSP ($P<0.01$). CON and I-NSP did not differ significantly ($P>0.05$). Number and length of female worms were reduced with S-NSP compared to CON and I-NSP ($P<0.05$). The results indicate that insoluble NSP favours infection of chicks with H. gallinarum. Soluble NSP may enhance host resistance. However, this was only realized with reduced body weight development rates.

Factors affecting days open of dairy cows with chronic endometritis

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The objective of this retrospective field study was to evaluate the effect of clinical signs of chronic endometritis (CE) on days open (DO) in dairy cattle. 266 cows from 7 herds diagnosed with CE from day 14 postpartum participated in this study. A Cox's proportional hazards regression for DO with stepwise backward elimination was employed. The parameters corpus luteum presence, smell of vaginal discharge and size of uterus at diagnosis, treatment and 100 days milk production (ML100) were dropped from the model, while the variables type of vaginal discharge (TVD), ovarian cysts (OC) and severe body condition score loss (DBCS) proved to be significant with hazard ratios of 1.46, 1.97 and 1.94, respectively. 2-way interactions were tested with the use of a mixed model and only TVD*DBCS was significant. Odds Ratios (OR) for OC and DBCS were testet. Only 6.1% of treated cows developed OC, compared to 18.7% not treated (OR: 3.5, 1.4-8.7). ML100 proved significant for OC with OR 4.1 (2-8.5). Size of uterus and ML100 were significant for DBCS with OR 2.4 (1.3-4.5) and 4 (2.1-7.6). The results suggest that the fertility of animals diagnosed with CE varies with different symptomatology, which could be used in the decision analysis for treatment. Management factors like a severe DBCS and the presence of OC prolonged the DO of cows with CE.

Session 19 Poster 5

Effects of grassland biodiversity and mixed grazing of cattle and sheep on behaviour and production traits

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Mixed grazing of cattle and sheep may have positive long term effects on the biodiversity of pastures, animal performance and economic output. The effects are maybe related to the biodiversity of pastures. Growth rates of livestock grazing on grassland with a high biodiversity seem to be higher when compared with animals grazing on grassland with low biodiversity. The aim of this study was to examine the effect of mixed grazing and grassland biodiversity on behaviour and production traits of sheep and cattle. Cattle (Simmentaler) and sheep (German Black Head Mutton, Leine sheep) grazed separately or mixed on pastures with high or low biodiversity (each group with 3000 kg LW/0.5 ha). Animals were weighed weekly and behaviour was observed for 8 days during the vegetation period. Sheep and cattle kept separately grazed significantly longer on pastures with low biodiversity compared to the animals on pastures with high biodiversity ($p<0.05$). However under the mixed grazing situation, cows grazed significantly longer on pastures with high biodiversity ($p<0.05$). No differences were found in sheep. Body weights and daily weight gains did not differ significantly between the systems ($p>0.05$).

Session 19 Poster 6

Housing of fattening rabbits: familiar and not familiar litters

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No scientific studies were carried out on the effects of rearing littermate rabbits compared to non littermates during the fattening period. Studying the housing of familiar does in pairs, was found that losses of animals due to aggression were reduced when familiar does were kept together in breeding units. We carried out a research in a commercial rabbit farm, in two equal trials, using 80 commercial hybrid pups. At 42 days of age, we grouped in cages littermate rabbits (LP, n=10) and non-littermates rabbits together (NP, n=10). The fattening period lasted up to the age of 79 days. Each cage was equipped with a feeder and a nipple drinker. All the rabbits were weighed individually at the age of 42, 61 and 79 days of age. We recorded the mortality rate and means and standard deviations of weight gain were calculated. The average weight of littermate rabbis was always higher than the weight of non littermate rabbits (final weight at first trial LP 2741+314 and NP 2727+210; at second trial LP 2490+215 and NP 2439+299). As far as the mortality rate is concerned, during the first trial two littermate rabbits and seven non littermate rabbits died, while, during the second trial, five littermate rabbits and three non littermate rabbits died. The degree of familiarity seems affect positively the growth level without increasing mortality rate.

Session 19 Poster 7

The effect of weaning age on performance and meat quality in broiler rabbits

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The objective of this study was to evaluate the effect of the weaning age on growth, feed consumption and slaughter parameters in broiler rabbits of genotype Hyplus®. Rabbits were weaned at 21, 27 and 34 days of age by the 10 ones and were placed in individual cages. Feed and water were available ad libitum. During the experiment rabbits received commercial pelleted type feed mixture (9,5 MJ ME; 14.75% of crude protein; 4.18% of fat; 15.9% of crude fibre). There was no significant effect of weaning age on growth, weight gain, feed consumption and feed conversion. Rabbits weaned at 21 days of age have higher weight gain and lower feed consumption. Slaughter parameters at the end of the experiment, at 77 days of age, were significantly influenced by the age of weaning. Dressing percentage was significantly higher in rabbits weaned at 27 days of age. Share of single parts from the carcass in rabbits weaned at 21 days of age were significantly higher. Significantly ($P \leq 0.01$) higher proportion of renal fat was in the group weaned at 21 days of age (2.99%) in comparison with rabbits weaned at 27 and 34 days of age (1.28 and 1.29%, respectively). The study was supported by Ministry of Education, Youth and Sports of the Czech Republic (Project No. MSM 6046070901).

Session 19 Poster 8

Chemical characteristics and oxidative stability of meat from local rabbit population reared under organic system

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The aim of this trial was to study the effect of two housing systems (Organic, Conventional) on meat quality of local rabbit population. 84 local rabbits were housed in open air in colony cages under organic system; 72 rabbits of the same population and 72 hybrids were housed in colony cages under conventional system. The animals were fed ad libitum an organic diet and alfalfa hay. We slaughtered 90 animals at the weight of 2400 g at different ages (local rabbits: 102 days; hybrids: 90 days). For each group, 6 samples of L. lumborum were analyzed for chemical composition, fatty acid profile and lipid oxidation. Data were analyzed by ANOVA. The housing system did not modify meat chemical composition even if local population, reared under organic or conventional system, showed a lower fat content and a higher protein content than commercial hybrids (2.3, 2.3 and 2.8; 21.8, 21.9 and 21.0, respectively). C14 and C18:1 percentages were significantly lower in meat of hybrids than in meat of local population reared with conventional and organic system (C14: 3.21 vs 3.73 and 3.48; C18:1: 0.95 vs 1.10 and 1.01; $P<0.05$). Nevertheless, the polyunsaturated: saturated and the unsaturation index (M+P)/S did not show any significant differences, altough hybrids showed higher values (0.58 and 1.31 respectively). No significant differences were revealed for TBARS value. In conclusion, meat chemical characteristics seem to be more influenced by genotype than by rearing system.

Level of maternal nutrition between day 30 and day 80 of pregnancy affects postnatal muscular development of lamb offspring on day 150

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The aim of this study was to investigate the effects of ovine maternal under- or overnutrition during mid-pregnancy on muscular growth and development in offspring. For that purpose, mature Karayaka ewes were allocated randomly to three groups and were fed as follows: daily requirement for maintenance (control group, C; n=9) or 0.5×maintenance (undernutrition, UN; n=15) or 1.75× maintenance (overnutrition, ON; n= 7). The diets were offered for 50 days between days 30 and 80 of pregnancy. Lambs born were subjected to a fattening period for 60 days following weaning at day 90 and slaughtered on day 150. Live weight at slaughter and carcass yield of lambs in UN group were lower than that of C and ON groups ($P<0.05$). Weights of semitendinosus (ST), semimembranosus and gastrocnemious muscles were lower in UN group ($P<0.05$). The amount of total DNA in ST (0,74±0,09 vs. 0,41±0,07 µg/mg) and longissimus dorsi (0,82±0,11 vs. 0,55±0,08 µg/mg) muscles was higher in ON group than in UN group ($P<0.05$). UN increased the percentage of type IIA muscle fibers stained by ATPase in ST muscle compared with ON ($P<0.05$). These results indicate that maternal nutrition of ewes during mid-pregnancy can affect the postnatal skeletal muscle growth and development of the offspring.

The effects of ethylenediaminetetraacetic acid and microbial phytase on the concentration of minerals in serum and parameters for mineralization of tibia in commercial laying hens

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This experiment was conducted to evaluate the combined effect of ethylenediaminetetraacetic acid (EDTA) and microbial phytase on the concentration of minerals in serum and parameters of mineralization of tibia in Hy-line commercial layers (W-36) at 53-64 weeks of age. In total, 192 laying hens were tested. The experimental design was a completely randomized design with 6 treatments in a 3×2 factorial arrangement with three levels (0, 0.1 and 0.2%) of EDTA and two levels (0.0 and 300 FTU/kg) of microbial phytase in low available phosphorus diets. There was 4 replicates and 8 hens in each replicate. The concentration of zinc, copper and manganese in serum and that of ash, calcium and phosphorus of tibia was evaluated. The results showed that adding EDTA to low available phosphorus diets significantly affected the concentration of serum zinc and tibia ash calcium ($p<0.05$). Interaction between EDTA and microbial phytase significantly affected the concentration of copper and manganese in serum and tibia ash percentage ($p<0.01$). Using 300 FTU/kg of microbial phytase in low available phosphorus diets increased tibia ash phosphorus percentage ($p<0.01$).

Responses of North American and New Zealand strains of Holstein Friesian to homeostatic challenges during early and mid lactation

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Glucose tolerance tests, epinephrine challenges and insulin challenges, were carried out on 10 North American (NA) and 10 New Zealand (NZ) Holstein Friesian cows, on consecutive days commencing at day 32 ± 0.5 (mean ± s.e.m) of lactation (T1) and again commencing at day 137 ± 2 of lactation (T2). The insulin and non-esterified fatty acid (NEFA) responses to glucose infusion did not differ between the strains. The NZ cows had a greater clearance rate (CR) of glucose (2.04 vs. 1.66% / min) and tended to have a shorter (34.4 vs. 41.1 min) glucose half-life (t½) at T2. The NA cows had a greater glucose response to epinephrine across T1 and T2. Plasma NEFA concentration declined to similar nadir concentrations for both strains at T1 in response to insulin, though from a higher basal concentration in NA cows, resulting in a greater (-2.29 vs. -1.38) NEFA area under the response curve (AUC) for NA compared with NZ cows. The results indicate that the NA cows have enhanced hepatic glycogenolysis but similar lipolytic responses to catabolic stimuli. Results also imply that higher basal circulating NEFA concentrations in the NA strain in early lactation are not due to diminished adipose tissue responsiveness to insulin. There were indications that glucose clearance rate is greater in NZ cows in mid-lactation, which may form the basis of increased body tissue accretion during mid- to late-lactation in this strain.

Effects of lycopene on sperm quality, reproductive system and oxidative stress of rats treated with aflatoxin B1

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The aim of this study was to investigate if lycopene could diminish the adverse effects of aflatoxin B_1 (AFB_1) on sperm characteristics, testicular system and oxidative stress in rats. A total of 28 adult male Wistar- Albino rats (8 weeks old) were assigned to four treatment groups; controls, lycopene treated rats (10 mg/kg BW, daily by gavage), AFB_1 trated rats (2.5 mg/kg BW, single dose ip.) and lycopene + AFB_1 treated rats. The experiment lasted 15 days. The sperm motility was significantly decreased while the rate of total abnormal sperms was significantly increased in rats treated with AFB_1 alone compared with the levels in controls ($P<0.001$). The levels of MDA (serum malondialdehyde) in the testicular tissue of rats treated with AFB_1 were significantly higher than the levels in controls ($P<0.001$). Similarly, the thickness of the germinitive cell layer at seminiferous tubule in rats treated with AFB_1 was significantly smaller than controls. Treatment with lycopene significantly increased sperm motility ($P<0.001$) and alleviated the many negative effects of AFB_1 on sperm characteristic and testicular damage in rats. In conclusion, lycopene given by gavage protected the rats from the toxicity of AFB_1.

Short-term changes in n-6 and n-3 fatty acid contents of the diet around mating may affect ovine ovarian activity

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The aim of this study was to determine if short-term changes in n-6 and n-3 fatty acid contents of the diet during pre-mating and post-mating in ewes would affect the ovarian activity. Following the first detected estrus, 64 ewes were allocated to either control (C) (n = 32) or n-6 (n = 32) treatment until next estrous. At the second estrus, the ewes were then allocated to either the C or n-3 allowance until day 15 post-mating. Hence, there were four nutritional treatments; C+C, n-6+C, n-6+n-3, and C+n-3. In C, the ewes were fed a basal ration at maintenance level. In treatment periods, protected n-6 or n-3 fatty acids were added to the basal diet. Ewes were slaughtered on day 16 after the second oestrus, and the numbers and weights of corpora lutea and follicles were recorded. The numbers of corpora lutea were higher in ewes fed the n-6+n-3 diet than the C+C and n-6+C diets ($P < 0.05$). The numbers of small follicles of ewes fed the n-6+n-3, C+n-3 and n-6+C diets were lower than those fed the C+C ($P < 0.05$) diet and the numbers of large follicles of ewes fed the C+n-3 and n-6+C diets were lower than those fed the C+C ($P < 0.05$) diet. It is concluded that short-term changes in n-6 and n-3 fatty acid contents of the diet around mating especially n-3 fatty acid supplementation during post-mating in ewes may have a beneficial effect on ovarian activity.

Pregnancy season affects organ development and fattening performance of ewe lambs

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Nutritional effects established during pregnancy are proposed to have permanent effects on the offsprings. The aim of the present study was to investigate whether different maternal pregnancy seasons, reflecting contrasting nutrient availability to the mother and fetus, affect organ development and fattening performance of ewe lambs. Female lambs of indigenous Karayaka ewes from different pregnancy periods (October to February; A; n=16 and June to October; S; n=15) were subjected to a standard fattening period from day 90 of age following weaning. All ewes were maintained on rangeland during pregnancy with no concentrate feed supplementation except during the last 2 months. Carcass characteristics and organ weights of lambs were determined following slaughter at day 150. Lambs in group A had higher daily live weight gain (205±7 vs. 172±10 g; $P<0.01$) and carcass yield (46.4±0,5 vs. 43.8±0,7%; $P<0.01$) than those in group S. They also had heavier lungs, spleen and gastrocnemious muscle ($P<0.05$), but lambs in group S had higher weights of internal fat, suprarenal fat, kidneys, liver and rumen ($P<0.05$). These results may indicate that maternal pregnancy season with contrasting nutrient availability affects organ development and fattening performance of ewe lambs.

Milk production of Jersey×Holstein and Brown Swiss×Holstein crossbreds compared with their Holstein contemporaries

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Jersey×Holstein crossbreds (JH) and Brown Swiss×Holstein crossbreds (BH) were compared with pure Holsteins (HF) for age at conception, 305-d and lactational milk, fat, and protein production, days in milk and persistency. Cows were kept on three farms (1, 2 and 3) in Hungary and finished lactation between January 2006 and December 2007. The distribution of cows were: 1: JH (n=11), HF (n=35); 2: JH (n=8), HF (n=64); 3: BH (n=37), HF (n=39). JH crossbreds on farm 1 (JH1) could be bred significantly earlier (3.3 months) than HF1. JH2 and BH3 crossbreds could be bred 1.1 and 0.5 months earlier than their contemporaries (HF2 and HF3), but those differences were not significant. Based on the 305-day lactation records, crossbreds produced the same amount of milk as Holsteins. The amount of milk fat, protein and total milk solids produced did not differ among the three genotypes. Only milk component differences were significant between Jersey crosses and Holsteins: 4.84 and 4.73% milk fat (JH1 and JH2) vs. 4.11 and 3.88% (HF1 and HF2). Milk protein% differed only in one case: 3.5% of JH2 vs. 3.21% of HF2. No differences found in days in milk, though JH1 had the shortest (295 d) and HF2 the longest lactation (333 d). BS3 were lactating longer (309 d) than HF3 (299 d). Persistency did not differ among the genotypes and varied between 76.7% (HF1) and 81.38% (HF3).

To compare whole lactation twice-a-day milking with part lactation once-a-day milking at different stages of lactation

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This study investigated the effect of whole lactation twice-a-day (TAD) milking or part lactation once-a-day (OAD) milking at different stages of lactation on milk production and reproductive performance. Spring-calving, pluriparous Holstein-Friesian cows (n=42) were assigned to treatments after calving (mean=2 March): whole lactation TAD milking; TAD milking until 21 June followed by OAD milking for the remainder of the season (TAD/OAD); OAD milking until 21 June followed by TAD milking for the remainder of the season (OAD/TAD). Groups TAD, TAD/OAD and OAD/TAD each received 625 kg concentrate and post-grazing sward height was managed at 6 cm. Milk yield and composition, cow live-weight, body condition score and reproductive performance were recorded. Data were analysed using PROC Mixed (SAS).Cumulative milk yield, yield of milk solids, fat, protein and lactose contents were not significantly different for the three treatments. Milk yields and yield of milk solids were 6132, 6021 and 5776 kg, and 474, 469 and 446 kg, while protein contents were 3.46, 3.47 and 3.52 g/100g, respectively. TAD/OAD cows had the lowest submission rate, longest calving to service interval and lowest overall pregnancy rate. Cow live-weight and body condition score of the OAD/TAD group (692 kg, 3.07) was greater than that of the TAD group (607 kg, 2.54).

Investigations on the conformation traits, herd life and milk yield in Holstein cows

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In this study, the relations between conformation traits, herd life and milk yield in Holstein cows were investigated. The material of this study was formed by 247 head Holstein cows in Polatli State Farm and 47 head Holstein cows in Ankara University Agricultural Faculty Research Application Farm. In this study, seventeen linear type traits on a scale of 1 to 9, and 4 general traits on a scale of 65 to 100 were scored on a total of 294 head Holstein cows. Stature was measured by a measuring cane. The relations between traits were investigated by Spearman's rho coefficient. The best regression equation estimating 305-day milk yield was determined by Stepwise Linear Regression Analysis.The mean values of 305 day milk yield in Ankara University Agricultural Faculty Research Application Farm and Polatli State Farm were ranged between 4862-6559 kg and 6908-7847 kg, respectively. The positive and significant correlations were found between conformation traits and 305-day milk yield. These correlations indicate that an increase in 305-day milk yield could be achieved through selection on any of the conformation traits. The mean Total score values of Holstein cows that were grown up in Ankara University Agricultural Faculty Research and Application Farm and Polatli State Farm were ranged between 76.1-76.7 and 77.2-78.0, respectively, and cows in both two enterprises were classified as medium class.

Chemical composition, fatty acid profile and sensory properties of cheese from organic and conventional milk

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The aim of this study was to determine the chemical composition and the fatty acid (FA) profile in bulk milk monthly collected in one organic (ORG) and two conventional (CON) dairies (small processing cheese plants) located in a mountain area (Veneto Region, NE Italy). Cheese samples from ORG and CON milk were collected after 3 months of maturing under conventional conditions, were analysed to determinate chemical composition, FA profile then were subjected to sensorial analysis. Milk and cheese chemical composition were analysed according to official methods, FA were analysed by gas chromatography and sensorial analysis was carried out according to ISO 13299:2003 regulation. Multivariate ANOVA was performed for all data. High positive correlation between FA in bulk milk and in cheese were observed, particularly for n3 FA (R^2=94%) and CLA content (R^2=89%). Saturated and unsaturated FA in cheese samples were respectively lower and higher ($P<0.05$) than in bulk milk. From a nutritional point of view, the FA profile was better in ORG bulk milk and cheese than in CON ones. Slight differences were observed between the two CON dairies. Sensory analysis show that saltiness ($P<0.01$), intensity of smell, aroma and hardness ($P<0.05$) in ORG cheese differed from those in CON. The multivariate data analysis allows to discriminate cheeses from different production systems under the same geographic conditions.

The effects of crude protein level in the concentrate supplement on the performance of growing Holstein*Friesian calves fed low quality oat hay

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The objective of the present work is to investigate the effects of crude protein level in the supplement on the performance of growing cattle. Twenty one Holstein*Friesian calves were used in a complete randomized design over a 217-days fattening period. Calves had an average body weight of 150 kg and were in average 6 months old at the start of the trial. All animals received the same oat hay basal diet. They were allocated, based on their body weight, to 3 homogenous groups of 7 animals. Each group was assigned randomly to one of the following crude protein levels in the supplement: 1) Low Protein (LP); 2) Medium Protein (MP); 3) High Protein (HP). Results showed that total dry matter intake did not differ (P> 0.05) between treatments. Animals fed the MP treatment had significantly higher (P<0.05) average daily gains (ADG) than those receiving LP and HP treatments (1277 Vs 1225 and 1229 g/d for treatments MP, LP and HP, respectively). Feed conversion ratio was significantly lower (P<0.05) for animals fed the MP diet (4.1, 4.6 and 4.4 kg DM/kg of live weight gain for the MP, HP and LP treatments, respectively). No significant treatment effect (P>0.05) was observed for the dressing percentage. Economical analysis showed that MP treatment gave the highest gross margin per head. It can be concluded that a medium crude protein supplement (18%) appears to be appropriate level for growing calves receiving a diet based on low quality oat hay.

Effect of two different grazing systems on the performance of beef cattle grazing on hilly rangeland conditions

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The aim of this study was to evaluate two different grazing systems for the performance of grazing beef cattle on hilly rangeland conditions in eastern part of Turkey with altitude of above 2000 m. For this purpose, an experiment was conducted to compare two grazing systems; one with set stocking (SG) and the other one with rotational grazing using electrical fencing system (RG) to determine the grazing performance of beef cattle. Two grassland areas were chosen next to each other and an area of 10 ha was fenced with wires for rotational grazing. Biomass available for grazing was also monitored. A total of 60 Simmental beef cattle were assigned to the experimental units equally. The experiment lasted for 90 days. The results showed that there were statistically significant differences (P <0.05) in daily liveweight gains (DLWGs) between SG and RG groups, 0.940 and 1.100 kg/day respectively. Mean biomass dry matter and sward height in SG and RG were not statistically significant (P >0.05) during the experimental period. Therefore, it was concluded that rotational grazing using electrical fencing system can substantially improve grazing performance of beef cattle in the highlands of the eastern part of Turkey.

Comparison of ultrasound carcass traits in young beef bulls of three breeds

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The authors evaluated ultrasound measurements of longissimus muscle area (LMA), backfat thickness, rump fat thickness (P8) of Limousin (n=11), Hungarian Simmental (n=9) and Charolais (n=16) young bulls participating in self-performance test (SPT). The main goal was to compare the ultrasound parameters of these beef cattle breeds. The relationship among ultrasound parameters and other traits were assessed. Animals were kept in small groups, feeding was based on fodder and concentrates. Ultrasound parameters were assessed with a Falco 100 real-time ultrasound scanner and 3,5 MHz linear array transducer (18 cm scanning width). Breed of animals had no significant influence on ribeye area neither at the beginning, nor at the end of the self-performance test. Hungarian Simmental bulls had the greatest backfat thickness and P8 ($P<0.05$) at both times. At the end of the SPT, Charolais bulls had the lowest fat thickness (3.28±0.63 mm backfat thickness, 3.91±0.91 mm P8). At this time there was no significant difference in live weight of the three breeds. Contrarily, in average daily weight gain Hungarian Simmental bulls had significantly higher performance (1733±170 g/day) during SPT ($P<0.05$). Correlations among live weight and ribeye area at both times were $r=0.850$, $r=0.669$ ($P<0.01$). High correlations were established between P8 and backfat thickness ($r=0.665$ and $r=0.775$) measured at the beginning (measurement I.) and at the end (measurement II.) of SPT ($P<0.01$).

Inventory of reproduction performances in cattle herds from the artificial insemination network

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A survey was carried out in 2005 in Region Wallonne (Belgium) on the artificial insemination network of AWE (Association Wallonne Elevage). The network is divided in 18 teams, where around 6000 farms were involved. Data were collected during one working day of one inseminator in each of the 18 teams. The cattle herds were characterized by the production (dairy or beef), their size and geographical areas. Statistical analyses on the age at first calving and the calving interval which characterize the fecundity of both heifers and cows, were carried out on the averages and on the repartition of the farms according to classes. The conception rate and the apparent fertility index were used to describe the fertility of the herd. The age at first calving classes and the calving interval classes significantly ($P<0.001$) varied according to the geographical areas and the type of production. The average apparent fertility index was significantly ($P=0.029$) lower in the dairy herds than in the beef herds (1.92 vs 2.2 inseminations). In the beef herds, the reproduction performances were improved when the size of the herd increased ($-0.324<r<-0.183$ according to the parameters). There were positive correlation coefficients between the age at first calving and the other reproduction parameters in both types of production.

Assessment of a model for prediction of BW of beef cattle to determine the most accurate prediction range

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In this study, data from Brown Swiss cattle grown under feedlot conditions were used to evaluate a regression model developed for prediction of BW to determine the best possible prediction range. Data included the weights of animals ranging from 150 to 600 kg and were divided into 8 different weight classes at 50 kg intervals. The model used for evaluation was developed previously and based on regression of some body measurements. The model generally overpredicted BW values in all weight ranges. Discrepancies were high and significant ($P < 0.05$) at low weight ranges. However, beginning from the range 350-399 kg discrepancies started to decrease as the weight range increased. The most accurate results were obtained from the range 500-600 kg. The results indicated that the model does not provide very close agreement with reality when BWs of cattle were lower than 350 kg while the accuracy of the model improves as the BW increases.

Meta-analysis of beef sensory quality

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This project gathered data of beef and muscle characteristics from two different databases, INRA and a previous European program. A web interface was developed to extract data and was analyzed using basic statistical tools (correlation, variance analysis, etc) with R software; data being centered when different databases were used. The usefulness of this tool is described by studying the relationship between intramuscular fat content (IMF) and flavour (F) assessed by sensory panels. For all animals (n=638), mean IMF value was 25 mg/g and coefficients of variation (CV) were 14% and 61% for F and IMF respectively. IMF and F were positively correlated ($r=0.25$, $P<0.05$). Similar results where obtained using 201 animals from different animal types (steers, heifers, young bulls) and 437 young bulls from 15 European breeds. Within the Charolais breed, IMF mean values ranged from 20 to 30 mg/g and the IMF-F correlation varied from 0.36 to 0.58 ($P<0.05$) using subsets of 21 to 97 animals (either different animal types or young bulls from different origins) where the CV was higher than 40% and 13% for IMF and F respectively. By contrast, using a more homogeneous animal population typified by lower CVs for IMF and F, e.g. subsets of young bulls, steers or heifers, the IMF-F correlation was not significant. In conclusion, the well known relationship between IMF and F is dependant on the variability of the studied population.

Communication and decision making under EU policies: case study of farmers with autochthon cattle breed Cika

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One of the local breeds in Slovenia is the "Cika" breed, located on 323 farms. Our study examines how Cika farmers think about their future, what kind of info they do receive for the management and strategy of their farms, and what info and knowledge they would like to receive. The results were compared with the outcomes of a similar questionnaire under dairy farmers (1114) and under farmers with suckler cows (121). The results show significant differences between these three groups of farmers: Cika farmers are more located on the hills and mountains, and they have a higher interest in EU information regarding environmental measures and rural development programmes, in organic farming and in diversification than dairy farmers. However, suckler cow farmers have the highest interest in beef characteristics and production. Cika farmers' interest for know-how is mainly focused on animal health/animal welfare, grassland management, breeding work and environment. Indeed, Cika farmers are environmentally friendly oriented, while dairy farmers are more business oriented. Level of support from various organisations also differs between the 3 farmers' groups studied.

The usage of embryotransfer for increasing of calves growth ability in Charolais herd

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This research is focused on progeny growth abilities of Canadian type Charolais bulls used in natural mating and/or in embryotransfer systems. The growth ability of 207 calves from 6 fathers was evaluated during a 5-year period. The positive effect of sex on the growth ability of calves was determined in bulls at birth (+1.59 kg, $P < 0.01$), at 120 days of age (+11.25 kg, $P < 0.01$) and at 210 days of age as well (+27.58 kg, $P < 0.001$). The parity of the mother significantly affected live weight at birth ($P < 0.05$), the growth ability of calves at 120 days of age ($P < 0.01$- 0.001), when differences ranged from 33 to 48 kg, and the live weight at 210 days of age ($P < 0.05$) with higher difference of 47.48 kg. The effect of the birth of twins significantly affected live weight at birth, at 120 days of age ($P < 0.001$) and at 210 days of age ($P < 0.05$). The growth ability of calves born from embryotransfer was by 40 kg higher at 210 days of age ($P < 0.05$). Higher live weight of calves from embryotransfer was detected at birth (+0.45 kg) and also at 120 days (+14.20 kg), but without statistical significance. Mothers born after embryotransfer increase the breeding value of the herd by production of their daughters for herd turnover and quality sons - bulls for artificial insemination.

Effects of different dietary protein content on "in vita" performances and carcass characteristics of Friesian bulls

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Effects of different dietary protein content (DPC) in beef cattle feeding could affect environmental concerns, therefore a restricted DPC may be the most practical and cost-effective method to reduce nitrogen output. The aim of present study was to evaluate the effect of two different DPC on "in vita" performances and carcass characteristics of 16 Friesian bulls. When bulls were 10 months old, they were divided in two groups and fed with two diets with 14% (A Group) and with 17% (B Group) of DPC maintaining the same energetic content. Live weights were recorded every 20 days in order to calculate ADG. Residual foods were collected every day to detect dry matter intake. A group ingested less dry matter than B group (9,8 kg/d for 224/d vs 10,9 kg/d for 211/d). Bulls were slaughtered at about 534 kg of body weight (BW). Carcass weights, carcass yields, and carcass measurements were evaluated. During the first part of study BW of B group was higher than BW of A group. DPC did not influence ADG and carcass measurements. Results indicate that different DPC doesn't influence "in vita" performances and carcass characteristics. Key Words: Dietary protein content, "in vita" performances, carcass characteristics.

Utilisation of contrasting diets in Blond d'Aquitaine young bull production

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The purpose of this study is to assess the effects of three finishing diets on digestive utilisation, rumen pH regulation, methane production, feed intake and growth performance of young Blond d'Aquitaine bulls. An experiment was carried out using 30 weaned calves. Twenty-four calves were allocated to three treatment diets: hay and concentrate, maize silage and concentrate or ground maize-grain and straw. Animals had ad libitum access to the diets. Six animals were used for diet digestibility measurements. Animals were slaughtered after an eight-month finishing period when a commercial carcass weight for Blond d'Aquitaine (>400 kg) was achieved. Statistical analysis utilised GLM and MIXED procedures (SAS). Rumen pH was lower when feeding the maize-grain diet. With the hay diet, methane production was 3-fold higher that that observed with maize-grain diet (35.3 m^3 vs 12.5 m^3). Digestive interactions were evident with the maize-grain diet. Voluntary feed intake increased during the finishing period but the extent of the increase depended on the dietary treatment. The average daily weight gain (ADG) increased with the energy concentration of the diet (1.49 to 1.86 kg/d). Feed efficiency in terms of the Net Energy (UFV) was similar between diets (200 g of ADG/UFV). Young Blond d'Aquitaine bulls had a good utilisation of the high concentrate diets as evident from the high daily gain and feed efficiency.

Serum IGF-I, leptin and growth in early and traditionally weaned beef calves

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Fifteen spring-born calves were early (EW, at 90d) or traditional weaned (TW, at 180d). During indoors lactation period (0-90d), EW calves received concentrates. TW calves grazed with their dams in high mountain pastures (90 to 180d). After weaning, calves were fed concentrates ad libitum. Calves were weighed and bled at 45, 90, 180, 210, 240, 270, 300, 330 and 360 d to determine growth rates, concentrations of IGF-I and leptin. After slaughter (365d), intramuscular (IM) fat of L.D. was determined. EW and TW calves had different patternsof IGF-I and leptin concentrations and weight gain throughout the production cycle. In EW calves, IGF-I concentrations increased after weaning and peaked at 210d, whereas in TW calves they decreased from 90 to 180d, increased after weaning and plateaued at 240 d. Leptin concentrations remained steady until 90d in EW and TW calves, then in EW calves they increased, peaked at 240d and thereafter decreased, while in TW calves they barely changed. Serum IGF-I and leptin concentrations were correlated ($r = 0.42$, $P < 0.01$) in EW but not in TW calves. Moreover, serum IGF-I was correlated to weight ($r = 0.67$, $P < 0.001$) and ADG ($r = 0.59$, $P < 0.001$), whereas serum leptin was correlated to weight ($r = 0.52$, $P < 0.001$) and at slaughter to IM fat ($r = 0.72$, $P < 0.01$).

The effect of diet on mineral composition of longissimus of Hungarian Grey and Holstein young bulls

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In this experiment the effect of the extensive diet (grass/grass silage and concentrate linseed supplemented) versus intensive diet (maize silage and concentrate) on the mineral content of Hungarian Grey and Hungarian Holstein Friesian young bulls was analysed. In addition the relationships between fatty acid profile and mineral content of longissimus muscle were investigated. The mineral composition of longissimus muscle was mainly influenced by diet and there was a breed x diet interaction, whereas breed differences were detected for calcium (Ca) and sodium (Na). The phosphorus (P) and the iron (Fe) content in longissimus muscle of extensively fed animals were significantly higher, whereas Na and copper (Cu) content were lower. The beef of Hungarian Grey bulls contained less Ca and Na compared to Holstein counterparts. Among minerals the P and Fe content correlated negatively to intramuscular fat content. The closest correlations were determined between P and linolenic acid (C18:3n-3) as well as n-3 fatty acids ($r=0.81$). The lower n-6 and n-3 fatty acid ratio in extensive groups occured simultaneously with P, and with lower sodium proportion in longissimus muscle.

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Meat color and pH of Simmental steers and heifers slaughtered at different ages

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The aim of research was to assess meat color and pH of Simmental steers and heifers slaughtered at different ages. On slaughter line, data for 930 beef carcasses (528 heads calved in Croatia and 402 heads imported and fattened in Croatia) were collected. Color and pH were measured 24 h post mortem on musculus longissimus dorsi (MLD) cross section between 6th and 7th rib. Color readings were taken in the L*, a*, b* color space using Minolta Chroma Meter CR-410. At a same time, muscle pH was measured using an injectable electrode 56/57-SS of pH meter IQ 150. Beef carcasses were divided into three groups according to age. Average MLD values for first group (10-14 months) were: pH=5.61, L*=40.93, a*=24.41, b*=9.12, for second group (14-18 months) pH=5.61, L*=40.37, a*=23.70, b*=8.57 and third group (18-24 months) pH=5.62, L*=40.34, a*=23.95, b*=8.84. Significant difference ($P<0.05$) was found between the first and the other groups for pH value. Color parameters (L*, a*, b*) were different ($P<0.05$) between the first and the second groups. Steers had L*=39.34 and pH=5.64, significantly different ($P<0.0001$) from heifers (L*=41.75; pH=5.56), a* and b* also differed ($P<0.05$) between sex. Simmental steers and heifers calved in Croatia had higher L* values ($P<0.0001$) than imported Simmental animals. In conclusion, results showed significant influence of age and sex on beef meat color and pH.

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Low reproductive performances of dairy cows in Tunisia: major causing factors and economical impacts

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The objective of this work was to evaluate reproductive performances of dairy cows in Tunisia, to identify their major controlling factors and to estimate economical losses associated with reproductive deficiency. Calving and insemination dates were collected on individual Holstein cows over a 9-year period. Reproductive indices were calculated and their major affecting factors were identified. Economical losses associated with reproductive failures were also evaluated. Results showed poor reproductive indices over time. Average calving interval was 420 days. First service conception rate was 35% and the percent of repeat breeders was around 40%. Average service per conception is 2.8. Parity and calving and breeding seasons were associated with major reproductive indices. Moreover, the evaluation of fed diets revealed that cows in early lactation were often in negative energy balance. This was further supported by the low body condition scores (2.04) of cows and the high milk urea content (43 mg/dl) at this lactation stage. Economical losses associated with poor reproductive performances were in the range of 4 US dollars per cow for each additional day in the calving interval beyond 365 days. It can be concluded that reproductive inefficiency of Holstein cows explains, in part, the low profitability of dairy herds observed in the country over the last years .

Relative growth of ultrasound lumbar and tail-head subcutaneous fat depth of Barrosã autochthonous cattle breed

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Defining the pattern of growth of fat in ruminants particularly in extensive productions systems is important to understand the body composition changes throughout the year. However, little is known about Barrosã autochthonous cattle breed. The main objective of this study was to define relative growth pattern of lumbar and tail-head subcutaneous fat (SF) depth obtained by real time ultrasonography (RTU). One hundred and seventy Barrosã cows were used to study the relative growth of SF depth to live weight (LW) and body condition score (BCS). The LW (404±31 kg, range: 330 to 483 kg), BCS (3.9±0.45, range: 2.75 to 5.00) and ultrasound fat depth measurements were recorded. Animals were scanned with a RTU machine (Aloka SSD500V) using a 5 MHz probe. The hair was clipped, a gel was used and the probe was placed at measurements points. When a satisfactory image was obtained it was captured and digitised. The measurements made by image analysis (ImageJ 1.38X). The SF depth was measured over the 4th lumbar vertebra (SF4) and over the tail-head (SFT). To establish the relative growth the Huxley allometric equation in its logarithmic form was used. The allometric coefficient (b) was obtained for SF4 ($b=2.1>1$ and $b=0.79=1$, $P<0.05$, relatively to LW and BCS) and for SFT ($b=2.6>1$ and $b=1.78>1$, $P<0.05$, relatively to LW and BCS). Results indicate that the SFT exhibit a late development and therefore was more sensitive to body fat changes.

Post-mortem activity of chosen aminopeptidases in bovine muscle

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The aim of this study was to estimate the influence of meat ripening on the aminopeptidases degradation rate in Longissimus dorsi muscle in beef bulls. The study was performed on 16 beef bulls. The animals were slaughtered after 24 hours of fasting at the aged of 15 months. Next the carcasses were chilled for 24 hours at the temperature of 4 °C. The estimation of slaughter value was conducted on the basis of dissection. In the lysosomal fraction basing on substrates from SIGMA-Aldrich Co., the activities of alanine aminopeptidase (AlaAP, E.C.3.4.11.2), leucine aminopeptidase (LeuAP, E.C.3.4.11.1) and arginyl aminopeptydase (ArgAP, EC.3.4.11.6) were estimated. The activity of AlaAP, LeuAP ArgAP, was determined spectrophotometrically as Fast Blue BB derivatives at 520 nm. All determinations were performed with Lambda Bio20 spectrophotometer. Significant difference in AlaAP, LeuAP and ArgAP activity over the experimental period was observed. The activity of studied aminopeptidases increased rapidly 24 h post mortem. Our results show that the AlaAP activity increased slowly 14 days post-mortem and activity of LAP decreased 7 days post-mortem and next increased 14 days post-mortem. An increase in activity was also observed for arginyl aminopeptidase enzyme. The activity of this enzyme was twice as high as the control at 24 h post-mortem and thrice at 7 day and 14 day during storage.

Phenotypical description of present Hungarian Grey cattle breed by Video Aided Measurement method

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In our study we have investigated different body measures in Hungarian Grey Cattle livestock with Video Aided Measurement (VAM) method. We have measured 1150 Hungarian Grey cows in the herds of Hortobágy, Tiszaigar, Bugacpusztaháza and Apaj. In the course of the data processing as a first step we have established the statistical parameters of the body measures of all the examined Hungarian Grey cows. Their means (sd) in cm were: height at withers 133,0 (5,7); height of back 131,5 (5,7); rump height 133,7 (6,1) trunk length 157,6 (9,7); chest depth 76,9 (4,3); body length 152,6 (10,6); width of chest 45,5 (4,3). These parameters give a phenotypical characterization of the most important part of the Hungarian Grey Cattle stock in terms of breeding. Examining the individual stocks separately, we have determined the statistical parameters of the body measures of the various livestock, and comparing this data, we have studied the parameters in details. Finally, we have studied the differences between the herds with one way analysis of variance (ANOVA) method. According to our results, there were statistically significant differences of the measurements in all cases. In the future, we recommend the examination of the possible differentiation of the herds on the basis of the body measures and dimensions. It would be also important to compare the present and the historical data of the body measures.

Animal feed and milk quality in conventional and organic farming systems

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The task of work was to compare obtained milk quality depending on fed out feed making technology. Grass feed in organic farms without applying mineral fertilizers (1st variant) contained higher total protein level by 0.3%, phosphorus by 0.15%, sugar by 1.0% and digestible protein by 1.6% per feed unit, but less dry mater by 1.0%, fiber by 4.0%, total fat by 0.4%, nitrogen free extracts by 5.0% and calcium by 0.1%, better calcium and phosphorus ratio – 1.86:1 in comparison with farms where mineral fertilizers were used in 90 kg ha^{-1} amount (2nd variant). In the grass of 1st variant farms was observed a tendency of higher amino acids – aspartic acid, serine, glytamic acid, proline, glycine, valine, metionine, isoleucine, hystidine and lysine levels but less cystine, thyrozine, phenilalanine and arginine levels in comparison with 2nd variant grass feed. Mentioned above differences of amino acids levels were not statistically credible ($p>0.05$). By feeding out to cows of 1st variant farms grass feed it was ascertained in milk higher fat by 0.47% and sugar by 0.33% but less protein level by 0.21% in comparison with 2nd variant farms milk. Because of 1st variant farms milk had higher essential amino acids level and contained significantlly less amount of cholesterol it can be considered as more healthy than milk obtained in 2nd variant farms.

Relation among carcass composition, EUROP grading and X-ray computer tomography (CT) data

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In this study EUROP grades and the tissue composition of dissected carcasses and that of the rib samples determined by CT analysis were compared in Hungarian Grey (HG) and Hungarian Holstein (H) bulls fed either on grass silage (E) based diets and maize silage (I). Higher final weights were recorded in I groups in comparison with in groups E ($P<0.001$). Carcass weight and fat in carcass were higher in groups I ($P<0.01$). Higher lean meat and higher fat in carcass were recorded in HG breed based on the dressing data between the groups with different feeding regimen. In lean meat content of carcasses more than 5% difference was found within muscularity class P. Among muscularity classes no significant differences were present. Significant differences were established in fat classes of HG animals, 17 were assigned into the 2nd class and 3 animals to 3rd class, opposite to H, saying that H is fatter. The lean and fat content of rib samples of the same slaughter cattle analysed by CT showed a close correlation ($r = 0.88$-0.93) with the actual lean meat and fat content of carcasses. As both the dissection and CT-data showed animals in the extensively fed groups deposited more lean meat and bone and less fat. As compared to EUROP grading system the CT-analysis is of higher predictive value in estimation of the actual carcass composition in cattle. The carcass value qualification for cattle can be achieved more objectively with the incorporation of CT data into the EUROP carcass grading system in the future.

The production and quality increase of the fodders on grassland and their transformation in animal products at cows and buffalo cows in the conditions of an ecological agriculture

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The effect of grassland fertilization on the performance of grazing dairy cows and buffalo cows was investigated in two experiment fields (Brasov and Sercaia). The grass swards received either mineral fertilization at a rate of 150 kg N, 80 kg P, 80 kg K ha^{-1} yr^{-1} or farmyard manure at a rate of 150 kg N, 75 kg P, 210 kg K ha^{-1} every second year. Two groups, each of five dairy cows (on average) and ten dairy buffalo cows, were grazed on the two types of fertilized swards in a rotational grazing system. Herbage dry matter yield was slightly lower in the organic compared with the mineral fertilizer treatment. Herbage quality, however, was higher in the organic compared with the mineral fertilizer treatment. Average daily cow milk yield was 18,5 and 17,2 kg cow^{-1} and the daily buffalo cow milk yield was 6,5 and 5,4 kg cow^{-1}, the fat content of the milk 4,1% and 3,9% at daily cow and 7,6% and 7,02% for organic and mineral system, respectively. Hence, organic manure is a promising, ecologically and economically option for grassland based on dairy farming in Romania.

Longissimus muscle area in Simmental and Holstein veal calves and their crossbreeds

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The objective of this study was to determine longissimus muscle area (LMA) of different genotypes veal calves. For this purpose, 80 calves reared under identical feeding and handling conditions on the same farm were used. Study included two final weight groups of calves (150-160 kg and 190-200 kg). Day before slaughter, LMA was measured using Aquila vet scanner (Pie Med.), placing meat probe between 12^{th} and 13^{th} rib on right side. From each animal, two ultrasound images were taken. Carcass LMA was traced on transparent foil 24 hours post mortem and measured later with planimeter Robotron (Reiss Precision). Simmental calves had ultrasound LMA 36.51 cm^2, Holstein 32.16 cm^2 and crossbreds 33.51 cm^2. Carcass LMA for Simmental calves was 40.32 cm^2, Holstein 35.06 cm^2 and crossbreeds 36.54 cm^2. For both measures Simmental calves significantly differ from Holstein ($P<0.001$) and crossbreeds ($P<0.05$). Calves of final weight 190-200 kg had 4.46 cm^2 larger ultrasound LMA and 5.09 cm^2 carcass LMA, then 150-160 kg group of calves ($P<0.0001$). Pearson correlation coefficient between ultrasound and carcass LMA for Simmental calves were 0.95, Holstein 0.92 and crossbreeds 0.88. Results of this study show significant influence of genotype on LMA and high correlations between ultrasound and planimeter measured LMA.

Heritability estimates for productive life in Lithuanian dairy cattle population

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The objective of the study was to collect data for the Lithuanian dairy cattle breeding information system. We used W. Weibull distribution function of 3 parameters (h:- scale parameter, which determines width of the distribution; b: shape parameter, which determines shape of the distribution; g: location parameter, determines distribution location in time axis). The following parameters for Weibull analysis were determined: h=46; b=1.5; g=-22. After evaluation of influence of genetic and non-genetic factors to length of productive life of dairy cows evaluation model was created: $Y_i = HYS_i+F_j+A_k+L_l+Y_m+Y1_n+Live_o+P_p+Hc_r+Hy_s+H_t+Hs_u+M_v+B_w+W_x+e_i$. Here: HYS_i – fixed Herd*Year*Season effect; F_j – fixed sire effect; A_k – fixed effect, age at first calving; L_l – fixed effect of lactation nr.; Y_m – cow‘s milk production random effect; $Y1_n$ – cow‘s fat and protein production random effect; $Live_o$ – fixed animal status effect (culled or alive); P_p – fixed last lactation phase effect; Hc_r – herd change fixed effect; Hy_s – herd‘s average milk production random effect; H_t – herd‘s average fat and protein production random effect; Hs_u – herd size fixed effect; M_v – fixed effect of dam‘s sire; B_w – fixed breed effect; W_x – Weibull transformation formula; e_i – residual variance. Length of productive live heritability in Black-White population was 0.12 and in Red and Red-White population - 0.10.

Characterization of feeding plans on extensive systems in Lusitano broodmares by body condition and metabolic indicators assessment

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The main objective of this study was to evaluate the adequacy of feeding practices in Lusitano broodmares under extensive traditional management conditions using body condition scoring and some metabolic blood indicators. Monthly, BCS was assessed and blood samples were collected in three groups of mares from different stud farms, from the 9th month of gestation to weaning. Samples of supplementary feeds were also collected for nutritional assessment. Plasma concentrations of nonesterified fatty acids (NEFA), glucose, urea and albumin were determined. Data were statistically analysed by ANOVA. Changes on NEFA, glucose, urea and albumin concentrations were observed on the three stud farms ($P<0.05$). Under nutritional states were not observed. High levels of protein were occasionally detected in diets. This study could contribute to identify some critical phases where the availability of feeds is not sufficient to cope with nutritional requirements, allowing for the introduction of strategic supplementations.

Plasma calcium, phosphorus and magnesium in Lusitano broodmares under extensive feeding systems

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Macro minerals such as calcium (Ca), phosphorus (P) and magnesium (Mg) are of major importance on equine nutrition. The main objective of this study was to describe Ca, P and Mg plasma concentrations in Lusitano broodmares under extensive feeding systems. Three groups of mares belonging to different stud farms were kept on pasture and were supplemented with compound feeds and grass hay or oat straw, according to pasture availability and farm practices. Supplementary feeds were sampled for mineral content analyses. Blood samples were monthly collected from the 9th month of gestation to weaning. Plasma concentrations of calcium (Ca), inorganic phosphorus (Pi) and magnesium (Mg) were determined. Data were statistically analysed by ANOVA. Changes on plasma concentrations of Ca, Pi and Mg were observed on the three stud farms ($P<0.05$). Values varied between 2.42±0.08 and 2.95±0.04 mmol/L, 0.77±0.08 and 1.54±0.22 mmol/L and 0.69±0.03 and 1.11±0.03 mmol/L for Ca, Pi and Mg, respectively. These results provide preliminary data in Lusitano broodmares and are within the range observed in other horse light breeds and feeding systems.

Non invasive equine bone assessment: relationship between quantitative ultrasonography and radiographic absorptiometry methods

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The aim of this study was to compare two non invasive equine bone assessment methods: (i) quantitative ultrasonography (QUS) and (ii) radiographic absorptiometry. A group of 12 healthy adult horses were used. Measurements of speed of sound (SOS) in axial transmission mode were performed with a multisite QUS device on the mid section of the left third metacarpal bone (dorsal and lateral aspects). Radiographs were also taken and an aluminium stepwedge penetrometer was used to standardize readings. Radiographic bone aluminium equivalence (RBAE) was determined in the scanned areas. A linear negative correlation between SOS and RBAE values was found, with a correlation coefficient of -0.84, for bone central area in both views (dorsal and lateral measurements) and -0.81 for bone anterior and lateral cortices (dorsal and lateral measurements), for 48 data points. When all bone data were analysed together, the negative linear relationship was maintained and the same linear equation fits the data from either bone regions (r=-0.80). QUS demonstrated to be a valuable method to assess bone quality, providing important and complementary information in horse's longitudinal studies.

Linseed oil or sunflower oil as essential fatty acids supplements in horse compound feedstuffs: first results on fatty acids content in plasma triglycerides

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In exercised horses, large amounts of cereals are usually offered in order to meet the energy requirements. Fat has been suggested as an alternate compound. Vegetable oils are sources of fatty acids of the n-3 and n-6 series. Adult horses trained four days a week were used. In the control group, the horses were offered a diet based on 50% grass hay and 50% compound feedstuff made of 47.5% whole spelt, 47.5% rolled barley, 3% molasses and 1% mineral mixture. Eight percents of barley was substituted by 8% of linseed oil (52.8% of C18:3n3) or sunflower oil (52.9% of C18:2n6). Individual fatty acids in the plasma triglycerides were assessed on blood samples obtained before feeding and 2 hours after the meal. The supplementation did not affect the content of C18:1n9/7 in the plasma triglycerides. Linseed oil increased the plasma content of C18:3n3 (6.03vs2.07mg/100ml, $P<0.001$) and of C18:2n6 (78.94vs57.88mg/100ml, $P<0.001$) as compared with the control diet. When sunflower oil was offered, the corresponding contents were 1.43 and 89.5mg/100ml, $P<0.10$ and 0.001). The arachidonic acid -C20:4n6- content was reduced ($P<0.001$) both with linseed oil (1.08mg/100ml) and with sunflower oil (0.93mg/100ml) as compared with 1.13 mg/100ml in the control group. It was concluded that the both linseed oil and sunflower oil improved the pattern of the essential fatty acids in the plasma

Effect of deliberate rider relaxation and tension on horse heart rate and behaviour

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Horses' fear reactions can entail a number of problems such accidents. Therefore, identifying factors influencing fear in horses may aid to reduce accidents and ultimately lead to improved welfare and health in both horses and riders. Previous research suggests that riders can transfer their nervousness to the horse. The aims of this study were to investigate 1) if riders' deliberate tensing influences horses in a way similar to nervousness and 2) if riders' relaxation results in the opposite, i.e. if it has a calming effect on horses. Fourteen horses were each ridden by two different riders in the experiment, and the horses' heart rate, ear position and head position were recorded. The experiment involved riding a course in walk that included control situations (C), as well as situations during which riders were asked to relax (R) and to tense their muscles as if they were nervous (T). Mixed model analysis revealed no differences ($p>0.1$) in heart rates between C, R, and T. However, horses carried their heads significantly ($p<0.01$) more often in a lowered position during R compared to C and T, and their ears pointed more often backward during T compared to R ($p<0.01$) and C ($p=0.1$). These findings indicate that, unlike with true nervousness, horses assimilate deliberate rider tensing and relaxation into their behaviour, but not heart rate. Potentially, this effect enables riders to calm down their horses.

An investigation about weaving stereotypy in show-jumping horses

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Weaving is the lateral swaying of the head and may include swaying of the rest of the body and picking up the front legs. A survey was carried on in North Italy to collect information about the incidence of the stereotypy in show-jumping horses performing agonistic activity. Owners filled a questionnaire with 24 questions. 1285 horses were considered. 45 resulted weavers (3.5%). No correlation was found with coat colour: the distribution of weavers' coat colours reflected the incidence of the coats in the Italian saddle horse population. No prevalence of a breed or of warm-blooded horses was found. Weaving was not observed before 4 years of age, probably because foals were kept free ranging until this age. In 25% of the horses weaving appeared in the period of breaking, between 4 and 5 years of age, in the rest around 7 and 9 years, during a long period of inactivity after an injury. The preferred place for weaving was in front of the box door. 35% of the horses swayed only the head, the others head and sometimes legs. 90% of the horses could see other horses. Exercise (84% were trained every day, some 2-3 times a day) and time spent outdoor didn't reduce the stereotypic behaviour. 71% of the weavers had wood shavings bedding. 75% of the owners didn't observe negative consequences on the horse health status. Most of them had the perception that the stereotypy was not contagious.

Feeding practices in standardbred horses in the north of Portugal

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In this study we intended to characterize and evaluate the feeding practices of standardbred racing horses in the District of Vila Real. A field survey involving 12 standardbred race horses was conducted to determine feeding practices, estimate crude protein (CP), digestible energy (DE), and dry matter (DM) consumption by these horses and to compare those intakes with recommendations of the National Research Council (NRC). Trainers were interviewed regarding: 1) the age and sex of the horses; 2) their feeding practices, and 3) training and racing schedule to determine type of work for all horses. Also biometric measures were taken for all animals in order to estimate body weight. The average estimated BW was of 550kg and the type of work was classified as moderate for the majority of animals. The mean total intake of feed for all horses on an "as fed" basis was 14.5 ± 2.8kg.The estimated mean DM intake for all horses was 13.2 ± 2.5 kg. The mean percentage of roughage in the ration for all stables was 46%. The mean daily CP and estimated DE intakes for all horses were 1476.6 ± 279.6 g and 31.7 ± 5.5 Mcal, respectively. These data indicated that estimated CP, DE, and DM consumption were only slightly above the recommendations.

Phenotypic occurence of allergic eczema in Old Kladruber horse

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The aim of this study was to follow the occurence of allergic eczema (AE) in Old Kladruber horse which seems to be a very serious health problem in last decade esp. in grey population. The overall occurrence of AE in grey variety reached 20 – 32% in recent years.The occurrence of AE was studied as a categorical trait and possible influences of line and family were verified. Lines under inspection showed significant influence with the following level of AE: Generale 57.78%, Generalissimus 21.43%, Sacramoso 27.27%, Rudolfo 7.69%, Favory 0%.The mean percentage of AE in families reached 23.62%. The influence of the family on AE have not been proved so far (family A 28.21%, family B 28.57%, family C 21.03%, family P 25%, family R 17.86%). Special attention was payed to offspring of the stallion Generale Proxima XVIII vhich is exhibiting AE every year.The offspring of this sire showed 81.58% AE . The probability of AE in offspring is 76.9% in case of one parent with clinical AE, in case of both parents with clinical AE the probability is 91.7%. The occurrence of AE in Kladruber greys is substantially higher than on Icelandic horses (8% - Grandinson et al. 2006). At present the high level of hygiene reached by frequent washing of the whole body of the horse proved to be the best practical routine to fight AE.

Diversity of pig farmers' logic in Corsica

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Pig farmers in Corsica show a specialisation including farm transformation into pork cuts and farm sales. They reflect however differently on their perspectives. Our objective is to represent the diversity of the rationalities of the Corsican pig farmers, for which we use the farming styles approach. Semi-structured interviews were held with 18 pig producers, who were selected for their location, expressivity and attitude toward an ongoing project for herd book administration and for Protected Designation of Origin (PDO)-label of pork products. The interviews were transcribed and analysed for its modalities. 312 modalities were codified and analysed in a principal component factor analysis (in SPSS). Next the interviewees were listed for their correlation with the first three components (explaining 26.0% of the variance). A hierarchical cluster analysis was performed on the lists, resulting in four clusters of interviewees. The logics of the clusters were identified by interpreting the modalities of the correlated elements of the components. The interpretation of the correlations revealed an eco-cultural regional style of farming, with a logic based on seasonal production and pork processing, with subtle, micro-regional distinctions. Within this style two dimensions explained the clustered diversity of the four logics: (i) the orientation on collective action (i.e. the attitude towards the PDO / herd book project), and (ii) the incorporation of technology in the farming system.

Assessment of floor design in finishing pig pens: integration of slat width, gap width and proportion of solid floor

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Floor design in pig housing systems affects the environment in the building as well as pig welfare. The optimal floor in a slurry based system minimises a) the contact between excrements and animal, b) the emitting surface, c) the risk of claw lesions and d) offers a comfortable lying area. These aims are addressed through factors such as slat width, gap width, total area and solid : slatted ratio. The aims are often conflicting, and the factors determining a good floor interact strongly. E.g. it can be argued that a pen which contains a solid part for resting, requires wider gaps in the dunging area to allow sufficient dung removal, compared to a fully slatted pen. However, most studies on floor design investigate single factor effects. A meta analyses is required, and a literature review was conducted to collect data on e.g. pen fouling, lameness and salmonella infections in relation to floor factors. Attempts to quantify the combined effects of factors through a modelling procedure was of limited success. However, the combination of different sets of experimental data into plotted graphs provided a better insight into the relative merits of flooring factors. The review suggests that integrated research on floor design in pig housing systems is needed. Furthermore, as experimental data collection is expensive, an international farm analysis system including a wide range of floor designs should be considered to improve our understanding of the ideal floor.

Captive bolt air jet stunning can improve welfare and meat quality of slaughter pigs

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Captive bolt stunning (CB) is not routinely used on slaughter pigs in large abattoirs because accurate shooting on high numbers of not sufficiently restrained animals is difficult causing concerns in regard to welfare and poor meat quality. When the small and deep lying brain in the pig's head is not effectively hit the animals may not loose consciousness or regain consciousness before sticking often followed by extensive convulsions of the animal's body influencing meat pH and jeopardising the setting of the correct bleeding cut and the animals may not de-bleed fast enough. Combining CB with an subsequent air pressure shot (jet) (CB+air; 40 pigs) through the shoot canal into the skull which destroys the brain even if the brain cavity is not perfectly hit by the bolt results in lower peak catecholamine levels and lower lactate ($p<0.006$) concentrations in the sticking blood, higher pH and Py values ($p<0.05$) in muscles, less clinical reflexes to painful stimuli (0 vs 9%), less movements (48 vs 100%) but higher audible heart activity (73% vs 63%) compared to conventional CB (70 pigs). The optimal position of the shoot canal in the skull is demonstrated. The new CB air jet method seems to reduce significantly the stress of the animals and increases meat quality.

Temperature, water intake and eating rank of sows for health- and fertility monitoring

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The aim of the present study was to investigate the body temperature, water intake and daily eating rank for gestating and lactating sows for health- and fertility monitoring. Data recording was performed on the research farm of the University of Kiel since April 2007. The body temperature was measured with injectable transponder of 68 sows (n=7162) controlled by rectal measurements (n=1546). A water flow meter was installed in farrowing pens and in the dry sow house to measure the individual daily water intake of 77 (n=5825) and 105 sows (n=3035), respectively. Daily feed was given by an electronic sow feeder, which recorded the sow number, beginning and ending of feed intake and amount of feed. From 77 gestating sows (n=5517) the rank was defined according to the order of visits at the feeding. On the day of birth rectal and transponder temperature increased to 39 °C and remained constant over the lactating period. Average water intake of the gestating (g) sows was 19 l/d (s_g=14.1 l/d). On the day of birth water intake declined, but up to day 14 of lactation (l) the water intake increased (μ_l=26.1 l/d s_l=14 l/d). Aggression was high when new sows were housed. Some days later the eating rank was already stable. There were 2% (n=108) eating rank alterations, which differed more than three standard deviations. In further analysis the relationships between temperature, water intake, eating rank and the health- and fertility disorders were evaluated.

Comparison of three economically optimised feeding patterns for growing pigs

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Three optimised feeding patterns were compared experimentally. Optimisation was performed with a bio-economic model aimed at maximizing returns to pig place. Animals were 60 crossbreds of Finnish Yorkshire and Landrace pigs. Pigs were grown from 25 kg to 110 or 120 kg live weight and weighed weekly. They were fed according to feeding norms, starting from 1.6 FU/d (1 FU = 9.3 MJ NE) at 25 kg weight to 3.3 FU/d at 120 kg. Lysine was assumed to be the limiting amino acid. Compared feeding patterns were A) three phase-feeding; B) feed composition adjusted weekly to fit pig requirements and C) similar to B, but lysine concentration was 10% lower. The studied traits were feed conversion rate, average daily gain, feed consumption, lysine and protein consumption, meat percentage, and feed price. Data were analysed using SAS MIXED procedure. Statistical models contained litter as a random effect and sex, end weight, feeding pattern and end weight*feeding pattern interaction as fixed effects and initial weight as a co-variable. End weight affected most traits significantly. Patterns B and C tended to grow pigs faster than A, and pattern C tended to decrease feed price and meat percentage (not significant). Feeding pattern affected significantly protein consumption. In economic calculations high slaughter weight and reduced protein content gave the highest return to pig place.

Effect of the genotype on qualitative traits in pigmeat

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The objective of this study was to determine the influence of the pig's genotype on meat quality traits. We used a total 60 finishing pigs of two common Czech 4-way crosses, both with a (maternal Czech Large White x Czech Landrace) dam and either a (Hampshire x Pietrain) or a (Duroc x Pietrain) sire. The right half-carcass was dissected into individual parts. Samples for chemical analysis were taken from the musculus longissimus lumborum et thoracis (MLLT). The representative ones were homogenized and analyzed for the content of water, total fat, crude protein (CP), ashes and selected amino acids (AA). Statistically significant differences between genotypes were found for muscle colour, water content, CP content, and AA proline content in the MLLT, and also for electrical conductivity (EC50) of the musculus semimembranosus; EC50 of the MLLT did not differ significantly.

Use of serial pig body weights for genetic improvement

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This study examined the utility of serial weights from FIRE stations for a longitudinal analysis of body gain. Data included 884,132 body weight records from 3,888 purebred Duroc pigs. Pigs entered the feeder station at age 77-149 d and left at age 95-184 d. A substantial number of records were abnormal. Data were cleaned using robust regression (M-estimation) with age as linear and quadratic covariables. After discarding the outliers, 607,597 records remained. Daily weight (170,443 records) was calculated as an average of cleaned body weight records for each animal in 1 day. Daily gain was calculated as the difference in body weight between consecutive days (152,636 records). Average daily gain was 0.85 kg (SD=1.16 kg). As a 2nd step, only animals with ≥ 50 records and an SE of the residual ≤ 2 kg were included (89,257 records). After removing records outside of 3 SD from the mean, the final data set included 69,068 records of daily gain from 1921 animals. Daily gain based on daily, weekly and monthly records were analyzed using repeatability models. Heritability estimates (h^2) were 0.02%, 3.3% and 13%, respectively. SE of h^2 based on daily records was larger than the estimate. After extensive editing, weight records from automatic feeding stations are useful for genetic analyses based on weekly or monthly but not daily.

No substantial GxE interactions for growth rate and backfat thickness in organic and conventional pig production

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The aim of this study was to investigate genotype by environment (GxE) interactions for growth rate until 100 kg and backfat thickness at 100 kg inorganic and conventional pig production environments. Breeding values were estimated for 29 Hampshire AI-boars, based on slaughter records, registered November 2003 to August 2005, from offspring raised in 6 certified organic herds (mean = 60 offspring/boar; mean = 8 litters/boar). The statistical model included the fixed effect of sex (2 classes), litter size 2 weeks post partum (3 classes; <10, 10-12, >12) and herd (6 classes) and herd-year-season and birth litter as random effects. Conventional breeding values were collected from the breeding organization Quality Genetics' breeding evaluation (December 2005). In the organic environment, h^2 was estimated to 0.30 and 0.37 for growth rate and backfat thickness respectively, and r_g was estimated to -0.11. Spearman rank correlation between organic and conventional breeding values were 0.48 (p=0.009) for growth rate and 0.42 (p=0.022) for backfat thickness. We conclude that for growth rate and backfat thickness there is no substantial re-ranking of boars between organic and conventional pig production environments in Sweden. Thus, with regard to these production traits there is no need for a special organic breeding program.

Genetic resistance to respiratory diseases in Danish pigs

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A previous study in Denmark indicated significant genetic effects for respiratory diseases in pigs. The objective of this study was to validate the results in an independent and enhanced data material and to identify genetic variation for resistance to commonly occurring lung diseases in crossbred growing pigs. A total of 9468 Duroc x (Landrace x Yorkshire) pigs in a commercial herd were assessed for incidence of four categories of respiratory diseases, measured as lesions at slaughter: i.e. catarrhal pneumonia, chronic pleuritis, pleuropneumonia and pericarditis. In total there were 169 Duroc sire groups where the number of crossbred offspring ranged from 4 to 259 with a standard deviation of 40.4. The prevalence of the disease in the offspring groups varied from 1% to 39% for catarrhal pneumonia and from 13% to 88% for chronic pleuritis. Identification of genetic variation for resistance to each disease trait was assessed by testing for significant sire effects in a binomial model using generalised linear mixed models. Genetic parameters for the different disease traits were analysed using a linear animal model. The results indicate existence of additive genetic variation to respiratory diseases. Heritabilities for the four analysed diseases were below 0.1 and genetic correlations to production traits suggest that selective breeding for resistance might be successful.

Optimizing breeding plans for market-oriented smallholder pig production in NW Vietnam

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A deterministic approach was used to evaluate the current breeding program implemented at smallholder farms with market-oriented pig production in NW Vietnam. Model calculations were based on information from the project's breeding plan and data from a survey conducted in 5 project villages. 120 smallholders with 169 sows were approached in individual interviews. Data on farmers' breeding management and trait preferences were analyzed with SAS 9.1. As a next step, a basic breeding plan reflecting actual breeding practices and an alternative breeding plan considering increased pig performances were developed and evaluated with the computer program ZPLAN to assess profitability and genetic merit. Results indicate that both improved local and exotic breeds should be incorporated in breeding programs. Breeding objective traits include daily gain and carcass quality, as well as reproductive traits. Continued success of breeding programs largely depends on the profitability. The current breeding program, however, is unprofitable and its long-term sustainability seems unlikely. Genetic gain is achieved in daily gain and carcass traits, while reproductive performances are reduced. Increased pig performances would have no significant effect on the profitability and genetic merit. Thus, further model calculations are necessary to find possibilities how to improve breeding for smallholder pig production in a profitable way.

Effect of muscle troponin T (TNNT3) gene polymorphism

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The aim of the study was to determine if the troponin T (TNNT3) gene polymorphism affects the slaughter traits of Polish Large White pigs, in particular carcass meat percentage. A total of 17 Polish Large White gilts, kept at slaughter pig testing stations were investigated. Feeding and management systems were consistent with current station methodology. The analysed slaughter traits were determined during half-carcass dissection. All the animals studied were free of the stress gene ($RYR1^T$). The TNNT3 gene polymorphism was determined using PCR-SSCP technique in 10% polyacrylamide gel. The two analysed fragments of the gene were exon 13– 14 and exon. 14 – 15. The study revealed the presence of 2 alleles (A, B) in exon 13 – 14. Frequency of the alleles was 91.2% (B allele) and 8.8% (A allele). In exon 14-15, there were 3 alleles with a frequency of 76.4% (C allele), 11.8% (D allele) and 11.8% (E allele). Statistical analysis showed that D and E alleles in exon 14-15 increased overall carcass meatiness by approx. 3% whereas A ellele in exon 13-14 reduced carcass meatiness by approx. 2.6%. A positive tendency for the above alleles was observed for loin eye area measured behind the last rib. These alleles increased this trait by approx. 2 cm^2. The differences were not significant. For other analysed slaughter traits related to muscling, no differences were found in these exons between animals of different genotypes.

Effect of the RYR1 genotype on fattening and slaughter traits and muscle fibre profile in pigs

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The aim of the study was to determine the effect of the RYR1 gene polymorphism on fattening and slaughter traits and muscle fibre profile of m. longissimus lumborum in fatteners. A total of 143 Polish Large White (PLW) and Polish Landrace (PL) gilts were analysed for the polymorphism of the RYR1 (ryanodine receptor) gene using PCR-RFLP technique. Two groups of animals were distinguished in each breed: NN homozygotes and Nn heterozygotes. Animals were fed, slaughtered and evaluated in accordance with testing station methodology. Myosin ATP-ase activity was used to determine three types of muscle fibres (I, IIA and IIB). The percentage and mean proportion of individual muscle fibres were studied. The results obtained showed that the RYR1 genotype had no significant effect on slaughter or fattening traits. As regards the parameters of m. longissimus lumborum microstructure, the RYR1 genotype had an effect on muscle fibre percentage in the PLW breed. Compared to heterozygous fatteners (Nn), homozygous animals (NN) were characterized by a significantly greater proportion of type IIB muscle fibres and a smaller proportion of the other fibre types (I, IIA). This effect was not found in the PL breed. In both breeds analysed, the RYR1 genotype had no significant effect on muscle fibre size. There was only a tendency towards an increased diameter of all muscle fibre types in the group of heterozygous animals (Nn).

Effect of breed and carcass weight on adipose tissue content in pig carcass belly

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Breed and carcass weight effects on carcass belly adipose tissues composition were compared in four breed or hybrid pigs. The experiment involved Large White (LW), Landrace (L), Large White sire line (LWs), Pietrain (PN) and Duroc (D) breeds in combination: 1. pure breed LW, 2. hybrid LWxL, 3. hybrid (LWs x PN)x(LW x L), 4. hybrid (D x PN)x(LW x L). Lipid content was measured in 162 pig belly parts of breed group carcass half with a large variation in carcass weight. The animals were slaughtered from 90 to 140 kg live weight and the left side was separated into primal cuts. Representative samples were taken from primal cuts of belly and total fat content was determined by petrol ether extraction. Hybrids (LWs x PN)x(LW x L) and (D x PN)x(LW x L) had lower fat tissue content (30.26% and 31.83%) ($P<0.01$) than LWxL (46.4%), whereas, LW hybrid had intermediate values (40.2%). It was registered that Peitrain is a typical breed with excellent meat efficiency with low fat. Relation between carcass body weight and fat content in belly was found. Increasing of carcass body weight by 1 kg was attached with increasing fat content in belly by 0.41%. Correlation between carcass body weight and fat content in belly was 0.51 ($P<0.0001$).

Dynamics of the leanness of different pig breeds in Lithuania

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With increasing demands for lean pork meat, selection of pigs in Lithuania is developed namely for this trend. The analysis of lean meat percentage of purebred Lithuanian White (LW), Large White (La. W), Yorkshire (Y), Landrace (L), Duroc (D) and Pietrain (P) pigs, grown in the breeding centres and evaluated by ultrasonic apparatus Piglog 105, was carried out on the basis of the data for the years 2000-2006 supplied by the State Pig Breeding Station. 26 953 pigs of mentioned breeds were used for that purpose. According to the investigation data, in 2006 at the breeding centres of the country the average lean meat percentage of LW pigs was 56.9%, that of Y 58.0%, La.W 58.5%, L 58.8%, P 59.4% and D 59.5%. If compared with the data for 2000, the leanness of LW pigs in 2006 has increased by 6.9% ($P<0.001$), that of La.W and L, respectively by 2.2 and 2.5% ($P<0.01$), D by 1.6% ($P<0.05$), Y by 0.2% and lean tissue deposition in P pigs decreased by 0.6%. Higher genetic trend of the leanness of LW pigs breed has been influenced by immigration of English La.W boars. by their leanness, Lithuanian Whites is becoming comparable to Yorkshires and Large Whites bred in the country. During analyzed period this indicator of Yorkshires and Pietrains was not statistically significant. However, muscularity of Pietrains pigs decreased. Consequently, of the all imported pig breeds Pietrains are most difficultly adapting in Lithuania.

Genetic trends of different MHS genotypes in Lower Saxony Pietrain boars

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Genetic comparisons of homozygous negative (NN) and heterozygous negative (Nn) Piétrain boars in relation to the six economically important traits daily gain, loin eye area, ham proportion, lean meat content, pH_1 loin and meat colour were made to describe effects on this traits in the case of eradicating the n-allele. Data of 11,422 female purebred and crossbred progenies tested in two test stations of Lower Saxony were analysed. For statistical analysis three animal groups were defined: purebreds in two-pig pens, crossbreds in two-pig pens, and crossbreds in groups with ten pigs. Variance components and breeding values were estimated simultaneously for all three animal groups with an animal model by REML. Adjacent mean breeding values were calculated with respect to year of birth, MHS genotype, and animal group. In daily gain and in the two traits of meat quality homozygous negative sires (NN) have a genetic superiority compared to the heterozygous negative sires (Nn). In contrast the gene carriers (Nn) have somewhat higher breeding values in the three carcass traits, but over the years the differences between the two genotypes decreased clearly. Assuming that this trend will be continued a complete eradication of the n-allele will be reasonable.

Studies of the pig carcass leanness with different devices

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In 2006-07, a study was carried out to determine by different methods the lean meat percentage of pig carcasses and calculate the regression equations for the pig carcass classification apparatus. 2800 pigs from 11 pig farms were slaughtered at the slaughter – house. Equal numbers of gilt and castrates (each group - 61 head) have been chosen for evaluation of 34.4% lean, 36.1% average fatness and 29.5% fat pig carcasses. 122 left carcass halves have been selected for the trial according to the following criteria: carcass weight, gender and backfat thickness (6 cm from the splitted mid-line between the 3rd and 4th last ribs) measured by FOM. Prior to dissection, the carcasses additionally were measured with the apparatus HGP7 and IM-03 that have the installed regression equations not adapted to the meat percentage assessment of the pig population in Lithuania. The average weight of pig carcasses (n=122) was 77.6 kg, carcass leanness by the dissection method was 57.6%. The study indicated that carcass measuring with the apparatus FOM, HGP7, IM-03 resulted in, respectively, 2.0, 2.4 and 1.4% lower predicted lean meat content in comparison with the dissection method. The dissection data was the basis for calculating regression equations of predicted lean meat content.

Effect of Pietrain as terminal sire on raw ham quality

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A study was conducted to evaluate the effect of crossbreeds with Pietrain as terminal sire on raw ham quality. For that purpose, two groups of 12 pigs were formed: crossbreeds from Pietrain sire on Landrace x Large White dams (PxLL) and crossbreeds from Pietrain x Hampshire sire on Landrace x Large White dams (PHxLL). All pigs were fed the same diets from weaning until slaughter. Fat thickness and muscle depth was measured using two point method. Colour (L*, a*, b*) was measured 24 h post mortem on M. biceps femoris, while pH-value was measured 24 h post mortem (pH24) on M. gracilis. Raw ham weight was measured after trimming for dry-cured ham production. All data were analyzed by the GLM procedure of SAS (SAS v9.1, SAS Inc., NC). Colour parameters (L*, a*, b*) and muscle depth were not significantly different between crossbreeds. PHxLL had higher hot carcass weight (132.20 kg, $p<0.001$), pH24 (5.81, $p<0.05$) and fat thickness (20.75 mm, $p<0.05$) than PxLL, but there was no significant difference in raw ham weight. In conclusion, different crossbreeds had effect on hot carcass weight, but no effect on raw ham weight and muscle depth, with slight effect on ham quality.

Management of reproduction and parturitions in sows

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The objective of this study was to evaluate the management of reproduction in sows in selected farm of commercial rearing of pigs. The reason of implementation of method of controlled parturitions was the reduction of stillborns piglets in litters. The hormonal preparations (Oestrophan inj. ad us. vet., Hypophysin ® LA inj. ad us. vet., Oxyto-kel 10 inj. ad us.vet.) were used. For assessment of sows´ reproduction results the total of 821 litters of 240 sows in period of 24 months was monitored. The first group - FG (without hormonal preparations – 12 months of observation – May 2004 to April 2005) contained results of 472 litters and second group – SG (with controlled parturitions – May 2005 to April 2006) contained results of 349 litters. Litter size - all of born piglets, live born piglets, inter parturition period, interval to first insemination, service period, were evaluated. There was find out relevant improvement in SG of sows in these characteristics: all of born piglets (+0.8504 pc), live born piglets in litter (+1.1457 pc), weaned piglets (+1.1457 pc) per sow; shortening of inter parturition period (-8.1272 days), interval to first insemination (-3.9270 days); servise period (-3.9607 days); number of stillborns was lowered to 3.9607% and mortality of piglets to 9.8794%. Number of parturitions per year (turnover) was up from 0.1258 to 2.4405 litters /sow/year.

Relationships between genotypes and carcass traits of pigs

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The study evaluated the carcass composition and relationships between carcass traits of three pig genotypes [White Meaty – WMx(Hampshire x Pietrain – PN), n = 78; WMxLandrace, n = 66; WMx(Yorkshire x PN), n = 55]. The average carcass weights (CW) of slaughtered pigs were 89.0, 86.17 and 85.73 kg. Day after slaughter, dissections of half sides to twelve carcass parts were done. Average backfat thickness (BF), weight of shoulder (WSH), of loin (WLOI), of ham (WHAM), of belly (WBEL), of tenderloin (WTEND), of lean meat (WLM and of prime meaty cuts (WPMC) were determined. The portion of shoulder (PSH), of loin (PLOI), of ham (PHAM), of tenderloin (PTEND), lean meat content (LMC) were calculated. Pigs of WMx(HAxPN) had significantly higher BF (28.82 mm) than other two genotypes (25.54 and 26.78 mm). They had also significantly highest WSH, WLOI, WHAM and PSH, PLOI and PHAM (13.49 vs. 12.91 and 13.10%, 16.63 vs. 15.86 and 15.77%, 24.84 vs. 24.59 and 24.08%). All carcass parts correlated with BF positively (from 0.17* to 0.44***) besides WTEND (-0.24***). Similarly, correlations between carcass parts and WLM (resp. WPMC) were positive and highly significant (0.26*** to 0.88***). WLOI and WBEL correlated with LMC negatively (-0.35*** and -0.37***) whereas other carcass parts positively but in various intensity (from 0.01 for WSH to 0.22** for WTEND). The results suggest different carcass composition of pig bodies belonging to various genotypes.

Merino singleton wethers produce more wool and are more responsive to insulin and adrenalin than twin wethers but do not differ in response to adrenocorticotropin hormone

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This study was conducted to determine whether there were differences in metabolic responses to homeostatic signals in sheep born as singles or twins. Ninety-two (56 singles and 36 twins) merino wethers (42.1±4.8kg; 20.5 months) were injected with 2 μg/kg adrenocorticotropin hormone (ACTH) i.m. and blood samples collected immediately before 45 min after the injection of ACTH to determine plasma cortisol. Twelve wethers (6 twins and 6 singles) were brought indoors and responses to adrenalin (0.1 and 1.6μg/kg), insulin (0.125U/kg) and glucose (0.3g/kg) measured. Singles were heavier ($P<0.001$) than twins at the first (30.7 v. 25.0 kg) and second (43.5 v. 40.2 kg) shearing. Similarly, singles produced more greasy wool ($P<0.001$) than twins at the first (3.60 v. 2.85 kg) and second (4.76 v. 4.35 kg) shearing. Reductions in non-esterified fatty acids (NEFA) in response to insulin and glucose were greater ($P<0.05$) in singles than in twins. Also, the rebound in NEFA after insulin injection was greater ($P<0.05$) in singles. The NEFA responses to adrenalin tended ($P<0.10$) to be greater in singles. There were no differences ($P>0.20$) in cortisol response to ACTH. Differences between twins and singles in wool growth and productivity may be related to metabolic responses to homeostatic signals.

Lactational and reproductive effects of melatonin in lactating dairy ewes mated in spring

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Dairy ewes of 2 breeds (Manchega, n = 57; Lacaune, n = 53) were used to evaluate the effects of using implants of 18 mg melatonin (MEL) for improving fertility during lactation in spring. Ewes were switched from a seasonal lambing (December) to an out-of-season lambing system (October). Lambs were weaned (5 wk) in January and ewes machine milked thereafter (wk 5 to 30 of lactation). At spring (April 21) lactating ewes were assigned to groups according to breed to which experimental treatments were applied: Control (untreated; n = 55) and MEL (s.c. implanted 42 d before mating; n = 55). Rams of each breed were also treated with 3 implants of MEL 60 d before mating and joined with ewes for 90 d (June 2 to August 31). Ewes were dried off during July. Milk recording and sampling were done weekly and fortnightly, respectively. Results showed no effects ($P > 0.05$) of MEL on milk yield and milk fat and protein contents in both breeds. Both MEL and control ewes showed good ability for out-of-season breeding during milking, and lambing was concentrated in 21 and 25 d, respectively. On average, fertility (89 vs. 100%; $P < 0.05$) and prolificacy (1.84 vs 1.92; $P = 0.12$) increased as a result of the MEL treatment. Lamb birth weight (3.72 kg BW) and mortality rate (4.2%) did not vary. In conclusion, use of melatonin in dairy ewes was effective to improve reproductive performance in out-of-season conditions, without effects on milk yield and milk composition.

Relationship between milk fatty acid composition and milk fat yield in Sarda dairy sheep

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Aim of the paper was to evaluate how difference in yielding ability for milk fat affect milk FA composition in a group of Sarda dairy ewes fed the same diet. Individual milk samples were collected weekly from 48 ewes during eight weeks of experimental period. Ewes were at the second month of lactation and they were fed the same diet (based on grass hay and concentrate). Daily milk yield was recorded weekly. Milk samples were analysed for protein and fat content, and for FA composition. The animals were grouped according to the amount of daily milk fat yield: A) 38-57 g/d, B) 58-63 g/d, C) 64-73 g/d, D) 75-110 g/d. Milk from group D showed a higher content of FA from C4 to C10 and a lower content of monounsaturated FA (MUFA) and conjugated linoleic acids (CLA) than Group A (+13%, -6%, and -18%, for C4 to C10, MUFA and CLA, respectively), while Group B and C showed intermediate values. These results could be related to differences in the activity of mammary lipogenic enzymes and stearoyl-CoA desaturase enzyme (SCD). In our study 6 milk FA pair ratios representing a proxy for SCD activity were evaluated. Group A showed higher values of FA ratios than Group D (+ 20% as average of all FA pairs). In conclusion, increasing ability of daily milk fat yield is associated with lower milk content of MUFA and CLA. Strategy aimed to improve milk FA composition should keep into consideration individual ability for milk fat yield.

Adipose cellularity but not lamb growth is affected by Vitamin A supplementation during early post-natal development

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Growth parameters, carcass and Longisimus dorsi area and lipid content, size and number of adipocytes in three adipose depots (omental, perirenal and subcutaneous) were studied. Twenty-four male Rasa Aragonesa lambs were assigned to two groups: Control, receiving only the vitamin A of the feeds and Vitamin A, receiving a supplement of 500,000 IU/animal twice a week. The effect of the Vitamin A was studied at two moments of the lamb development: 58 ± 0.7 and 101 ± 6.5 days of age. Results at the two experimental periods showed that there were no significant differences between both groups (Control and Vitamin A) on growth, carcass and Longissimus dorsi area and lipid content but it was observed that the lambs supplemented with vitamin A had a bigger number of adipocytes in the perirenal depot ($P < 0.05$) and smaller adipocytes in the omental and perirenal depots ($P = 0.06$) when the animals had 100 days of age, suggesting that hyperplasia and hypertrophy processes were affected on the different adipose depots depending on their degree of maturity.

Effects on survival at birth in meat sheep breeds

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Lamb survival is the crucial factor influencing sheep productivity. The purpose of this study was to analyze the influence of sex, litter size, parity and lambing difficulty on survival at birth (SB) in Danish Texel, Shropshire, Oxford Down and Suffolk. Data used in the analyzes were collected from 1992 to 2006 by the Danish Agricultural Advisory Service. Survival at birth was recorded within 24 hours after birth. Analyzes of variance were carried out using SAS glimmix macro with logistic models. The total frequency of SB was 88.3%, 91.6%, 91.6% and 92.4% for Shropshire, Oxford Down, Suffolk and Texel, respectively. There was a curvilinear relationship between SB and birth weight. Female lambs had significantly higher incidence of SB ($p<0.05$) compare to male lambs in all studied breeds. Surprisingly, twin-born Texel lambs had significantly higher SB compare to singletons and triplets. The mean SB of triplets was significantly lower ($p<0.001$) than for twins in Texel and Suffolk. Survival at birth was significantly higher ($p<0.001$) in lambs born without difficulty in all analyzed breeds. Lambs from ewes in first parity had the lowest survival rate, especially when their birth weight was higher than average.

Effects of feeding system on the carcass and meat fat depots in Churra Tensina light lambs raised on Spanish dry mountain areas.

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Forty-eight single male of Churra Tensina light lambs were used to evaluate the effect of four feeding systems on carcass characteristics and fat depots. The treatments were: GR, lambs and ewes were continuously grazing and were unweaned; GR+S, as the previous one, but lambs had free access to concentrate; DRL-GRE, had free access to concentrate fed and ewes grazed during 8 h/day, thereafter remaining indoors with lambs; DRL, lambs and ewes were always kept in confinement with free access to concentrate. In DRL-GRE and DRL lambs were weaned at 45 days old. The lambs were slaughter when reached 22-24 kg. Abdominal fat weight (mesenteric and omental) was recorded and 24 h post-refrigeration cold carcass, renal and pelvic fats (previously removed) were weighted. Both intermuscular and subcutaneous fats were obtained through dissection. The intramuscular fat was determined by chemical analysis. GR lambs presented lower growth rates, age, carcass weight and dressing percentage than the rest of treatments. Feeding system affected all fat depots ($p<0.01$) except pelvic, renal and intramuscular fats ($p>0.05$). GR presented the lowest amount of total body fat, being the subcutaneous fat the most reduced fat depot. Carcasses from grazing systems are in accordance to the consumer demand.

Interrelationships among predictors of lamb carcasses composition

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The objective of this study was to identify a reduced set of variables from an original data set of 18 carcass measurements in order to avoid redundancy, collinearity problems, and to simplify the development of models to predict lambs carcass composition. One hundred and twenty-six lambs, 86 males and 40 females, of Churra Galega Bragançana Portuguese local breed were slaughtered, and carcasses were weighed (HCW) approximately 30 min after exsanguination. After cooling at 4ºC for 24 h a set of seventeen carcass measurements were recorded, and data interrelationships were analysed following the common factor analysis procedure. All variables were highly and positively correlated with HCW ($r > 0.46$), being especially high in the carcass dimensions measurements ($r > 0.75$). Subcutaneous fat thickness measurements were highly and positively correlated ($r > 0.58$) with breast bone tissues thickness measurements. Three common factors (factor I = carcass weight; factor II = subcutaneous fat thickness; factor III = breast bone tissues thickness) were retained, and accounted for 83.5% of the variation in the original variables. This study demonstrates that common factors analysis can be used to condense the information given by large sets of variables, allowing selecting a reduced number of variables, which contributes to reduce collinearity problems, and to simplify the development of models to predict lamb carcass composition.

Development of a rapid and simple approach for kid carcass evaluation by video image analysis

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The objective of this work is the development of a simple and cost-effective video image analysis (VIA) system to evaluate kid carcass in small slaughter units. To achieve this objective a trial was conducted with 42 kid carcasses (6.6±2.6 kg) and models to predict carcass composition from VIA were established. While the carcasses were hanging in the gambrel an image of the dorsal view of each carcass was obtained with a digital camera (Sony, DCR-TRV460). For imaging, carcasses were placed in front of a non-glare black surface and illuminated with standard lighting. The camera was placed perpendicular to the carcass long axis. A total of 44 geometric measurements (linear and area) were obtained after carcass image analysis with the ImageJ 1.39j software. The carcasses were entirely dissected into muscle, subcutaneous fat, intermuscular fat and bone. A stepwise regression analyses (SAS Cary, NC) was performed to predicted carcass composition from carcass weight (CW) and carcass measurements. For all carcass composition traits the best fit was obtained with CW and 3 or more carcass measurement (R^2 range 0.77 to 0.99, $P<0.01$). The results show that the approach reported in this study offers potential for predicting carcass kid composition using VIA. Further research is needed to improve this technique for establish kid value-based marketing programs.

Yellow grease as an alternative energy source for nursing Awassi ewes

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Thirty Awassi ewes (average BW = 52.0 ± 8.4 Kg; average age = 5 ± 2 yrs) nursing single lambs and their lambs were individually-housed to study the possibility of using yellow grease (restaurant fat) as an energy source by partially replacing barley. Ewes and their lambs were randomly assigned to one of three dietary treatments (10 ewes with their lambs per treatment): no added fat (Control), 3% added fat as yellow grease (YG), or as soybean oil (SO) by partially replacing barley in the control diet. All diets were formulated to be isonitrogenous, isocaloric, and to meet all nutrient requirements for nursing ewes. Body weight change for ewes was not affected ($P = 0.66$) by dietary treatments. Additionally, DMI (averaged 2.8 kg/d), milk yield (averaged 797 g/d), efficiency of milk production, milk composition, and milk composition yields were not affected ($P > 0.20$) by dietary treatments. For lambs, final BW (averaged 19.7 kg) and average daily gain (averaged 255 g/d) were not affected ($P = 0.97$) by dietary treatments. However, the cost of daily DMI and milk yield were least ($P < 0.01$) for YG and similar ($P > 0.50$) for the control and SO diets. Under conditions similar to our study, it is economically feasible to partially (10%) replace barley with restaurant fat without adversely affecting the performance of nursing ewes or their suckling lambs.

Intake of nutrients by Ile de France lambs fed with diets containing sugar cane forage variety or corn silage

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Voluntary intake of dry matter (DM), organic matter (OM), mineral matter (MM), crude protein (CP), ether extract (EE), neutral detergent fiber (NDF), acid detergent fiber (ADF), total carbohydrates (TCHO) and non-structural carbohydrates (NSC) were evaluated on 32 Ile de France male lambs, non castrated, distributed among the treatments: 60% of corn silage:40% of concentrate (60%CS:40%C); 60% of sugar cane forage variety:40% of concentrate (60%SC:40%C); 40% of corn silage:60% of concentrate (40%CS:60%C) and 40% of sugar cane forage variety:60% of concentrate (40%SC:60%C). The roughage:concentrate ratio did not affect (p>0,05) the intakes of DM, OM, MM, CP and TCHO, with average of 1,042.6; 987.5; 55.1 and 753.3 g/day. There were greater EE (28.8 g/day) and NSC (551.7 g/day) intakes for lambs that received 40% of roughage in the diet. The animals fed with higher roughage:concentrate ratio showed higher NDF and ADF intakes (274.0 and 132.9 g/day. The lambs fed with corn silage showed higher consumption of all the nutrients, except NSC (517.8 g/animal/day). The sugar cane independently of roughage: concentrate ratio results in lower consumption of nutrients when compared to corn silage.

Performance of Ile de France lambs fed with diets containing sugar cane forage variety or corn silage

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Dry matter intake (DMI), daily weight gain (DWG), feed conversion (FC) and feedlot period (day) of 32 Ile de France non castrated male lambs were evaluated. The lambs were distributed among the treatments: 60% of corn silage:40% of concentrate (60%CS:40%C); 60% of sugar cane forage variety:40% of concentrate (60%SC:40%C); 40% of corn silage:60% of concentrate (40%CS:60%C) and 40% of sugar cane forage variety:60% of concentrate (40%SC:60%C). The animals remained confined until reach 32 kg of corporal weight, when they were slaughtered. The lambs fed with diets containing the higher roughage:concentrate ratio required the longer period to reach the adequate slaughtering weight, which demanded yet a superior time of confinement (77 days). The animals fed with lower roughage:concentrate ratio and corn silage showed higher DMI, 867.1 and 862.2g/animal/day and DWG, 314.3 and 294.6g/animal/day. Lambs fed with corn silage or sugar cane independently of roughage:concentrate ratio showed the same feed conversion (2.9).

Animal performance and fatty acid composition of lambs fed with different vegetable oils

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Twenty seven lambs were used to investigate the effects of the inclusion of 4% hydrogenated palm oil (HPO) or sunflower oil (SFO) in the concentrate on feed intake, animal performance and fatty acid composition. Animals (16.2±0.27 kg initial weight) were fed concentrate (Control, HPO or SFO) and barley straw ad libitum and slaughtered at 25 kg. Vegetable oils did not affect ($P>0.05$) feed intake and animal performance. SFO caused an increase ($P<0.001$) in trans-C18:1 and tended to increase ($P<0.10$) total CLA in subcutaneous fat. Atherogenicity index was lower ($P<0.05$) in subcutaneous fat and tended to be lower ($P<0.10$) in intramuscular fat of lambs receiving SFO. Therefore, SFO improves fatty acid composition of fattening lambs without affecting animal performance.

Effect of abandoning mineral fertilization of pastures on health-promoting value of lamb meat

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The objective of this study was to evaluate the effect of abandoning mineral fertilization of mountain pastures on health-promoting value of lamb meat. Meat (musculus longissimus dorsi) from a total of 20 Polish Mountain lambs was investigated. Two groups of single-born lambs with mothers were grazed using the rotational system on two separate pastures: E – ecological and unfertilized, and N – intensively fertilized (170 kg N/ha). Stocking rate was 8 lambs on unfertilized pasture and 12 lambs on intensively fertilized pasture. Experimental slaughter was carried out and the nutritionally most important fatty acid fractions were analysed. The results were analysed using analysis of variance. The n-6 to n-3 unsaturated fatty acid ratio in the meat of both experimental groups, despite significant differences, assumed favourable values: 1.47 in group E and 2.13 in group N. The proportion of PUFA in the meat of E ram lambs (27.81 g/100 g of all fatty acids determined) was 21% higher compared to that found in group N ($P\leq0.05$). A similarly favourable tendency was found for CLA concentration in rams E (1.88 g/100 g of all fatty acids determined), which was 46% higher compared to that in group N ($P\leq0.05$).

Conjugated linoleic acids effects on preadipocyte sheep differentiation

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Conjugated linoleic acids (CLA's) have been extensively studied regarded their potential to alter lipid metabolism. Trans10, cis12 isomer has been shown to alter body composition by reducing body fat mass and to inhibit 3T3-L1 cells differentiation. We analysed the effect of isomers trans10, cis12 and cis9, trans11 on the differentiation of sheep preadipocytes in vitro. Lamb preadipocytes from the stromovascular fraction of subcutaneous and omental tissues were isolated and cultured. Differentiation inducers (1.6 mg/ml insulin, 2nM tri-iodothyronine, 10 nM dexamethasone, 10 mM rosiglitazone) and one of the two isomers (50 mM) or a mixture of the two (25 mM each) were added. Differentiation was assessed with Red O oil staining and the number of differentiated cells was analysed by flow cytometry. Results were analyzed by Anova. There were not differences between omental and subcutaneous adipocytes, similarly to results found when cells were challenged with oleic acid but opposite to results found with other differentiation inducers. This corroborates the hypothesis that omental cells lose their "resistance" to differentiation when cultured under certain stimuli. Addition of CLA's did not change the number of differentiated cells although there was a tendency for a higher number of differentiated cells, irrespective of the isomer. This differs from results with cell lines but is in accordance with some results in pig primary preadipocytes and suggests species and/or experimental model specific responses.

Effects of feeding system on the subjective and instrumental measures of subcutaneous fat colour in Churra Tensina light lambs raised on Spanish dry mountain areas

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Forty-eight single male lambs of Churra Tensina breed were used to evaluate the effect of four feeding system on subcutaneous fat colour, both instrumental (SFCi) and subjective (SFCs). The treatments were: GR, lambs and ewes continuously grazing and the offspring were unweaned; GR+S, as the previous one, but with concentrate for lambs; DRL-GRE, lambs with concentrate and ewes grazing 8 h/day, then remaining indoors with lambs; DRL, lambs and ewes kept in confinement and fed with concentrate. In DRL-GRE and DRL, lambs were weaned at 45 days old. They were slaughtered at 22-24 kg LW and 24h post-mortem SFCi (CIEL*a*b* space) and SFCs (Colomer Rocher et al., 1988) were measured. Feeding system had effect on the SFCi measure. Grazing lambs (GR and GR+S) presented higher b* and C* values than indoor lambs (DRL-DRE and DRL) ($p<0.05$). No differences were found on L*, a* or H*. SFCs was not affected by treatment ($p>0.05$), although all carcasses from indoor lambs were classified as white whereas 83% and 46% carcasses from GR+S and GR, respectively, were white classified. The slight instrumental and subjective differences observed on subcutaneous fat colour were not a commercial constraint, being furthermore a suitable tracer the products coming from grazing systems.

Relationship between *Longissimus thoracis et lumborum* muscle chemical fat and intramuscular adipocytes diameter obtained by computer image analysis

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The loin intramuscular fat, or marbling, has been associated with meat characteristics that are in accordance with consumer preferences and some reports highlighted the relation between their structure and meat quality. Our objective was to establish a relationship between Longissimus thoracis et lumborum muscle (LM) chemical fat and the intramuscular adipocytes diameter (AD). Samples of intramuscular adipose tissue were obtained from the LM between the 1st and the 2nd lumbar vertebrae of 34 sheep carcasses (19.3±3.3 kg). Intramuscular adipose tissues were fixed for 24 h in Bouin fluid, dehydrated and embedded in paraffin. Then, the samples were sectioned (5 µm thick), stained with hematoxylin and eosin and observed at 20X magnification in a microscope equipped with a camera (Nikon FXA). The digital images were analysed with the ImageJ1.38X software converted into an 8-bit binary format and a threshold function was used and the intramuscular AD was measured. The LM intramuscular fat was determined by chemical analysis (Soxhlet method) using a LM joint from 13th thoracic to 4th lumbar vertebrae. The results showed positive correlation between intramuscular AD and the weight of LM intramuscular fat ($r=0.795$, $P<0.001$). From the current data set it can be concluded that carcasses with larger marbling flecks may contain larger adipocytes.

The Booroola (FecB) gene in Czech Merinolandschaf population

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Totally 2110 Merinolandschaf ewes were included into performance recording scheme in the Czech Republic in the year 2007. Average litter size of recorded ewes was 1.53 lamb/lambing. Nevertheless, there are ewes with much higher prolificacy (even 10 lambs in 2 lambings). The blood samples of the animals with outstanding breeding values for prolificacy were collected and the polymorphism in the BMP1B gene were investigated using PCR-RFLP method. Totally 14 heterozygous carriers of the FecB gene were found until now. Mean for litter size of female FecB carriers is 2.3 lamb/lambing. Average breeding value of the FecB carriers for litter size is +0.34 lamb/lambing, what is +4. s.d. above the population mean. The FecB gene detected in the Merinolandschaf population originated probably from two Booroola rams imported to Czechoslavakia from New Zealand in the middle of the 1980s. The semen of these rams was used for insemination of Merino ewes in several flocks. During the last decade of 20-th century, the Merino population in the Czech Republic was over-cossed by imported Merinolandschaf rams.

The effect of artificial rearing on lamb growth and ewe milk production of Chios sheep

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Multiparous Chios ewes were randomly allocated on either a natural suckling (NS) regime (109 ewes) or were separated from their lambs at birth (124 ewes); separated lambs were artificially reared (AR) on milk replacer. Lambs were weaned at 35±3 days of age. After weaning, 30 male lambs from NS and 45 lambs from AR, were fattened for 63 days. Milk yield of ewes was recorded at 20 days after lambing and at monthly intervals thereafter. Birth weight of lambs was similar in both rearing methods. NS lambs grew faster before weaning (318 g/day) than AR lambs (275 g/day) and were heavier at weaning (15.6 VS 13.9 kg). After weaning, males from both groups had similar growth rate (NS: 313 and AR: 303 g/day), reaching the same final weight of 34.5 kg at 98 days. Non-suckling ewes produced more milk ($P \leq 0.05$) than NS ewes (291 kg in 220 days VS 229 kg in 189 days, respectively). Regarding milk fat and protein content (%), no differences were observed between suckling and non-suckling ewes (fat: 5.94 and 5.86, protein: 5.42 and 5.46, respectively). In addition, ewes on NS produced 19.3 kg of surplus milk before weaning. Results indicate that artificially reared and suckling lambs reached the same weight at 14 weeks of age despite the lower weaning weight of the former group, while ewes on the zero suckling regime produced more commercial milk over the whole lactation than NS ewes. In dual purpose breeds as the Chios, artificial rearing of lambs may increase farmers' income.

Effect of weaning lambs in two stages or by abrupt separation on their behaviour and growth rate

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Compared to the natural weaning process, artificial weaning is an abrupt break of the mother-child-bond, which causes stress and can have negative effects on the health of animals. In calves weaning stress could be minimized by using a two-step weaning method. The aim of the present study was to examine the behaviour and growth rates in lambs weaned by two different methods. The study was performed using 158 ewes and their lambs of two different breeds, namely the Merinoland sheep (ML) and the Rhoenschaf (RH). Lambs were either weaned with 8 or 16 wk of age. The weaning methods were the traditional weaning and a two-step method (lambs were prevented from suckling for 1 wk before separation from the ewe). Daily observations of 3 h (scan sampling) were carried out for 8 d (4 d before and 4 d after weaning). Additionally an agitation score, bleating frequencies and daily weight gains were recorded. No significant differences were found for daily weight gain between the different weaning methods ($p>0.05$). Lambs with a weaning age of 8 wk had higher daily weight gains until week 12 and 16, compared to lambs with a weaning age of 16 wk. Traditionally weaned lambs were significantly more agitated and bleated more ($p<0.001$) compared to lambs weaned by the two-step method. It can be concluded that the two-step weaning procedure causes less agitation and bleating without affecting the growth rates of lambs.

Winter shearing in the Latxa dairy sheep: effect on dry matter intake during lactation, milk yield, milk quality and body condition

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Winter shearing is becoming a common practice among Basque farmers. To assess its impact upon lactation, two similar experiments were carried out during consecutive milking campaigns (2004 and 2005): 56 pregnant ewes in 2004, and 64 in 2005, were blocked in 2 groups on the basis of body weight (BW) and genetic value for milk yield. Half of them were shorn 5 weeks before lambing. During lactation, ewes were milked twice a day, feeding consisting of: i) 800 g/day commercial supplement provided during milking; ii) 820 g/day luzerne hay; and iii) Grass silage offered ad libitum. Milk yield, food offer and refusals were recorded daily during the trial. Ewes were weighed at the beginning and at the end of each trial. Data were analysed using the GLM procedure of SAS. In both trials supplement dry matter intake (DMI) was unchanged but silage DMI was higher ($P<0.05$) in shorn ewes. As for body reserves evolution, in 2004 non significant differences were found in BW change or body condition score (BCS) change. Nevertheless, in 2005 shorn ewes decreased BW ($P<0.09$) and BCS ($P<0.05$) whereas in control group an increase in BW and BCS was observed. As for milk yield, milk fat and protein percentages, non significant differences were found between treatments in 2004 or 2005. In conclusion, late-pregnancy winter shearing increased intake but did not improve milking performance of Latxa dairy ewes.

Lipidic fraction of ewe's milk: trend of milk fat globules morphometry and fatty acids profile during lactation

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The trial was carried out on individual milk from 20 pluriparous Massese ewes, homogeneous for lambing dates and parity, reared in the same herd and kept indoors after weaning of lambs. Every 15 days, from 40 to 100 days post-partum, milk production, morphometric characteristics of milk fat globules and fatty acid profile was evaluated. The milk fat globules was divided according to their size into 10 classes of 1 mm class widths, from <1mm to >9 mm. Subsequently the ten classes were grouped into three size categories of fat globules: small (<2 mm), medium (from 2 to 5 mm) and large (>5mm). Milk production was highest at 55 days post partum and subsequently decreased, similar trend was found also for the average diameter of milk fat globules and for the percentage of medium and large globules. According to previous studies, the number of globules/ml and the average diameter of globules showed inverse trend (Martini et al., 2008). The acidic composition of milk changed significantly during lactation: saturated fatty acids as C14:0, C16:0; C21:0 and C22:0 increased and C8:0, C10:0 and C18:0 decreased; the monounsaturated fatty acid C16:1 increased; between polyunsaturated fatty acids C18:2 and C22:6 decreased and C20:4 and C20:5 increased. In conclusion, our results would seem to indicate that, during lactation, the average size of milk fat globules decrease and milk quality gets worse from a nutritional point of view.

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Evaluation of production systems in Hungarian goat sector

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Bigger part of the members in the Hungarian goat industry is still unknown, so to establish the exact size of the sector creates some difficulties. Estimated actual number of does is 50 000, kept on some 7,000 farms. The goat population consists of sparse and relatively small herds. The average herd size is about 20 does and their offspring, varying in size between a few and 500 head. Along with the three native breeds, some exotic breeds are also bred. Dominant part of the goat farms run under extensive production system, and only a few ones belong to intensive one. The number of semi-intensive farms is increasing, however, not more than a couple of hundreds of farms could be included to this group. The farms with really industrial production system could rarely found. Based on these most of the does are kidding from January to July and only a couple of farms are producing milk over the winter period. Free mating system is used on the bigger part of the farms, however the planned mating is utilised on the 40% of the farms. The best marketing period for selling kids is around Easter, but too many kids are born late. Kids are weaned and sold in 7-8 weeks of age with 8-16kg of body weight. The extensive bringing-up method causes quality problems in selling kids for foreign market. These are the main reasons selling only the 10% of the kids for abroad.

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Distribution of external characteristics of Hungarian milking goat breeds

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There are three variants of the local goats, which have heterogeneous external characteristics and production. The colour suits of examined population are basic requirements of created breed, so-called Hungarian Milking White (HMW), Hungarian Milking Brown (HMB), and Hungarian Milking Multicolour (HMM). The breeding plan defines the production and external traits as well like colour (from white to black), striate (on head and legs, or on shoulder), hair length, horn, ears length, tinklers, beard and udder. Lack of horn, beard, tinklers, or hair length are not elemental aspects in formation of breeds, but important markers. At present, 15 000 female goats are registered as HMW, HMB, HMM or crossed of these variants. The udder characters were measured by 4 aspects, like udder type, relative udder size and teat size (small, medium, big or extra big) and udder shape (regular, irregular, genetically abnormal). About half of this population has normal horn (44.48%), whenever 39.34% are hornless. 9.77% percentage of them have short ears. The 68.15% of the population have short (less than 50mm), and 18.76% of them have semi-long hair (50-100 mm). The udder is among varieties; the most typical udder is medium type, medium size and medium teat size with irregular shape (23.48%). The ratio of regular shape udder is 17.54%, when the extra big relative udder size is only 1.06%.

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Production traits of imported Saanen, Alpine and Boer goats in Hungary

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The purebred imported goat breeding was restarted in mid 1990's. Saanen goats firstly arrived to Hungary with an importation of 80 does (and 3 bucks) from the Netherlands in 1994. This importation was followed by others in 1998-, and 2000. The first Alpine goat importation happened in 1998 (25 does arrived from Germany), and some hundred doses of sperms were imported from France. The Boer goat's breeding also started in 1998 with imported embryos. Nowadays, about 100 Boer goats are in the country. There were some purebred 1000 Saanen and 500 Alpine does bred in the country in 2006. The authors compared the lactation, reproduction, and weight gain data of imported goats with the breed standard of original places. The level of production traits of imported goats was well behind (20-35%) the data of original countries . Differences in lactation yields reached 200 litres during the first lactation after importation, and became significantly smaller only in the third lactation. Saanen goats were the most productive compared to the other breeds. The pooled together data in milk production of Saanen and Alpine goats in Hungary was lower (approximately 160-200 litres) than French, Dutch and German production standards in 2004. The Boer goat production traits were almost on same level (prolificacy and daily weight gain) than in other countries.

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The milk production traits of Balkan goat breed estimated by using a mixed linear model

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The influence of fixed effects of flock, lactation, genetic group (subpopulation) on the milk yield and lactation duration of 529 animals of Balkan goats (the most numerous goat breed in Montenegro) in the four different flocks were analyzed using mixed linear model. In analyzing of daily milk yield, the effect of test day and random effect of head (flock, lactation, genetic group) were included in linear model too. All considered factors in the models (except genetic groups) have significantly affected the milk traits ($P<0.05$). The average values for studied traits were: 204 days (lactation duration), 140,5 kg (milk yield), and 0,683 kg (daily milk yield). The estimated coefficient of determination (R^2) of considered traits were: 0.568, 0.5596 and 0.831, respectively. Results of the study showed significant differences between different flocks and lactations, as well as wide variability into observed groups as a consequence of different management of flock and unappropriate selection applied in the flocks. Key words: goats, milk trait, mixed linear model

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Weather effects on milk production traits in Camosciata goats: preliminary study

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Heat stress is a limiting factor in dairy production in hot climates impairing growth, milk production and reproduction. The effect of the Temperature-Humidity index (THI) on Camosciata goat milk production has been investigated. For this preliminary study only one Camosciata goat flock has been used. Two subsequent lactations (2005-2006 and 2006-2007) with in total 711 test-days belonging to 90 goats have been used. Production data consisted of daily milk including fat and protein contents. A multiple regression model has been applied, the model included as fixed effects the litter size, days in milk * lactation interaction and the THI. Weather information from the same day as the test-day was used. Based on these preliminary results, no effects of the THI on production traits have been found. All models used were significant. Goats of this farm, even though they are reared in a hot environment, do not seem to be affected. However further analysis are needed to confirm these results.

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The advent of breeding hairsheep

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Sheep in Hungary (1.106 million ewes) produce unprofitable wool, are docked, horned and seasonal breeders. Shearing is a duty, since the wool can reach 10% of the body weight, hinders the thermoregulation and serves as a hotbed for parasites. About 92% of the dry matter content of the wool is protein, which could be also utilized in the meat or milk. Shearing means stress, causes cutting injuries frequently infected, reducing milk and meat production, and the dipping is toxic for humans, sheep and the environment. Improvement of meat and milk production is expected by omitting the wool. Our objective is the reduction of the wool quantity, its becoming shedding, later disappearing, aseasonality, tail shortening and increasing the frequency of polledness. We have growing Somali, Barbados Blackbelly and Dorper flocks and some Mouflon hybrids. Crossing experiments with Argali are planned. Dewooling - tail shortening - dehorning - aseasonalizing programmes started by crossing Hungarian Merino, British Milksheep, Lacaune and Tsigai sheep with hairsheep rams. This work is supported by the Hungarian NKFP_07_A3 programme and by the Hungarian – Chinese bilateral cooperation.

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Reproductive, meat and milk performance traits of Charolaise sheep raised in the region of Warmia and Mazury

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The study was conducted on a breeding flock of Charolaise sheep, in the region of Warmia and Mazury. The analysis included: reproductive traits over the years 2002-2006: fertility, fecundity, lamb survival rate and reproductive performance; meat performance traits: body weight, daily gains, live (USG) measurements of musculus longissimus cross-section and fat thickness over the loin eye; milk performance traits: daily milk yield, milk production over a 70-day lactation period, proximate composition of milk: the concentrations of fat, protein, lactose and dry matter, and somatic cell count (SCC) in milk. It was found that Charolaise sheep are characterized by very good meat production traits, reflected in a fast growth rate and muscle development of ewes and rams both before and after weaning. Good production results were greatly dependent on high milk performance levels. Mean daily milk yield was 2431,43ml and 1185,71ml at 28 and 70 days of lactation, respectively, while total milk production over a 70-day lactation period was 128,92 kg. The sheep showed also high fecundity-170,08%, compared to a mean of 153,38% over a five-year period.However, significant lamb losses, both perinatal and post-natal, considerably decreased the overall reproductive performance of the herd, which was at an average level of 107,65%. Charolaise sheep are generally sensitive and require greater care, particularly in the perinatal period.

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Defence mechanisms of the offspring of ewes fed a diet supplemented with yeast (*Saccharomyces cerevisiae*) during pregnancy and laction

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The aim of the study was to determine the stimulating effect of a natural immunostimulator-dried brewer's yeast (Saccharomyces cerevisiae) – on non-specific humoral and cellular immunity of the offspring of ewes fed a diet supplemented with Saccharomyces cerevisiae yeast during pregnancy or lactation. The study involved 66 lambs divided into 3 groups: I-control group fed a diet not supplemented with yeast, II–experimental group fed a diet containing dried brewer's yeast (Saccharomyces cerevisiae) since the 4^{th} month of pregnancy, and III–experimental group fed a diet with the addition of yeast since lambing. The indicators of non-specific humoral immunity (lysozyme activity, ceruloplasmin activity, total protein content, gamma globulin content) and non-specific cellular immunity (respiratory burst activity of phagocytes – RBA, potential killing activity of phagocytes–PKA, MMT assay of lymphocyte proliferation) were determined in blood. The obtained results are indicative of the significant effect of dried brewer's yeast on all of the evaluated parameters of non-specific humoral, except tatal protein content, and cellular immunity in lambs. It may be concluded that yeast can have a practical immunopreventive effect on those animals, especially in periods marked by increased susceptibility to bacterial and viral infections.

Effects of feeding sesame hulls on growth performance, nutrient digestibility, and carcass characteristics of Black goat kids

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Twenty-one Black goat kids were used to evaluate the effect of replacing barely and soybean meal with sesame hulls (SH) on performance, digestibility, and carcass characteristics. Kids were fed finishing diets and assigned randomly to one of three dietary groups. Group one served as a control and received no SH (Cont; n=7), group two (SH100; n=7) and three (SH200; n=7) received 100 g/kg and 200 g/kg of SH, respectively. Kids fed SH100 registered higher ($P<0.05$) intakes of DM, OM, and CP compared to control fed kids and tended to be greater ($P<0.1$) than in SH200 diet. Intake of NDF and ADF was the highest ($P<0.05$) for kids fed the SH100 diet when compared to control fed kids and SH200 group. Intake of EE was greater ($P<0.05$) in the SH100 and the SH200 diets when compared to control. Digestibility of DM, OM, CP, NDF, and ADF were similar among all treatment diets. However, sesame hulls inclusion showed greater ($P<0.05$) EE digestibility. Final body weight, ADG, and FCR were comparable among all dietary groups. Cost of gain was lower ($P<0.05$) in kids fed the SH200 than in kids fed the SH0 diet while the SH100 group was intermediate. Dressing percentage, hot and cold carcass weights were not influenced by SH. Results of this study demonstrated the possibility of including sesame hulls in finishing diets by Black goat kids.

Challenges of including welfare and environmental concerns in the breeding goal

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The increasing concern about animal welfare and environmental services related to animal production calls for a proper accounting for these values in the definition of animal breeding goals. The aim of this paper is to review current status in existing methodology and to discuss challenges associated with considering welfare and environmental concerns in the breeding goal. Challenges include; 1) the value of improved animal welfare may not be reflected by prices and costs in the market economy, 2) the views of many different stake holders (farmers, consumers, citizens, and governmental authorities) need to be considered, 3) traits related to environmental goods and animal welfare are often negatively correlated with production traits, which means that a) increased emphasis on these traits will reduce response in production traits, and b) traits related to animal welfare and environment may deteriorate even when they are included in the breeding goal. Animal welfare and environmental issues can be considered by adding so-called non-market values representing the value of improved environment and animal welfare to the economic values in the breeding goal. Breeding goals addressing animal welfare and environmental issues should be defined by deriving economic values (market economic values and non-market values) using methods based on studying consumer and citizen preferences and desired gains in addition to traditionally applied profit equations.

Defining weights in a dairy cattle breeding goal

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Dairy cattle breeding goals have become more complex over time. It is therefore a complicated task to find the best relative weights for all traits to get the best Total Merit Index (TMI).In Norway we have used a TMI for selection in Norwegian Red for 40 years. In the 70's health and fertility traits were included making it a very complex breeding goal. Economical analyses were the base for the relative weights on traits, but it has gradually become a mix of economy and desired gains. There are several methods when using economical approaches. In the early years it was done by looking at the value of changing one trait one unit when everything else was constant. This principle is also used in the profit functions. Desired gains is a good method for including input from the users; the dairy farmers and/or the consumers, but that also mainly reflects the experiences. Predicting future situations will always be a question about guessing as presice as possible. In Norway research has been done where data about the real income and cost on the dairy farms were connected with informations about breeding values of the sires of the cows in the herds. The results demonstrate that selection is really creating value for the farmers, and they were also used to estimate relative weights of the traits in TMI. The conclusion is that the relative weights in a breeding goal must be based on the effects on genetic changes. Both economical methods and input based on desired gains are needed to come up with a solution which is likely to be the best.

Genetic relations between the group effect for average daily gain, and post-mixing aggression and skin lesions in Swedish pigs

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The possible consequences for aggressive behaviour and skin lesions from selecting pigs with a beneficial effect on the average daily gain (ADG) of penmates were assessed. Parameters for direct and group effects for ADG estimated previously on Dutch pigs were used to obtain estimated breeding values (EBV) for ADG in the study population (96 groups of 15 pigs). Aggressive behaviour recorded continuously for 24h post-mixing and skin lesion counts 24h and 3 wks post-mixing were available. The statistical model included the fixed effects of sex, line, litter size, mixing weight and the random effects of litter at birth, mixing group and pig for all traits, plus a group effect for the trait ADG. Genetic analyses were run with ASReml. Correlations between EBVs showed that pigs with a beneficial group effect for ADG initiated fewer ($r=-0.23$, $p<0.001$) and won fewer ($r=-0.08$, $p<0.01$) of the fights they took part in. They spent less time involved in injurious fights ($r=-0.05$, $p=0.053$) but more time in non-injurious fights ($r=0.16$, $p<0.001$). Moreover, they had fewer lesions 3 wks post-mixing ($r=-0.23$, $p<0.001$). Selecting on group effects for ADG ought to reduce aggressiveness but may have other subtle effects on social behaviour such as fighting ability.

Feasibility and implications of selecting against pig aggressiveness

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Post-mixing aggressiveness in pigs is common but phenotypic variability exists. Using 1660 pigs, this study estimated the heritability (h^2) of aggressiveness and, using genetic correlations (r_g), validated skin lesion counts (LC) 24h post-mixing as a rapid predictor of involvement in aggressive behaviour that could be used in selection. It also examined the implications of reduced aggression for behavioural responses to a handling stressor (weighing) and activity levels 3 wks post-mixing. Duration involved in post-mixing aggressive behaviours showed a moderate to high h^2 (0.31-0.43). Lesions to the front of the body were associated with reciprocal fighting (r_g=0.67±0.04) and receipt of bullying (r_g=0.70±0.11) whilst those to the centre and rear were associated with receipt of bullying (r_g=0.80±0.05, 0.79±0.05). Aggressive pigs were slightly more active (r_g=0.28±0.17) and less behaviourally reactive during weighing (r_g=0.08-0.25) but the h^2 of these traits was low. A genetic merit index using lesions to the anterior, central and rear regions as separate traits should allow selection against animals involved in post-mixing fighting and the delivery of bullying. However, less aggressive pigs may be slightly less active in general but more reactive to handling.

Application of social effects in a pig breeding program

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Growth rate (GR) and feed intake (FI) are two traits affected by social interactions in pigs. 14.087 animals, with known pedigree, were used to estimate the total heritable variance including social genetic effects. The heritable variation approximately tripled compared to classical analyses considering only direct effects (25% vs. 71% for GR and 18% vs. 70% for FI). This result indicates that two-third of the heritable variation originates from social interactions and is ignored in the classical analysis. Rates of genetic improvement in pig breeding programs can be substantially increased by including social effects. Four selection strategies to calculate selection response including social effects were used. (1) Group selection, (2) selection based on relatives, (3) selection index and (4) selection on BLUP-EBV implemented using simulation were compared. Results indicate that a maximum increase of almost three times can be achieved for GR and FI by including social effects compared to the response to classical methodology ( ). Response to selection depends on the relatedness among group members and also on the selection procedure (individual selection or group selection). BLUP methodology with full sib groups yielded the highest selection response because of the highest accuracy for both GR and FI in pigs. Inclusion of social effects is therefore promising and can be applied directly.

Survival of the currently fittest: genetics of rainbow trout survival across time and space

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Increasing survival of fish via selective breeding is a promising method to reduce nutrient effluent and increase animal welfare. However, as a fitness trait, survival is assumed to exhibit low heritability due to selection and spatio-temporal variation in mortality agents not sharing the same genetic background. The inconsistent genetic determination in particular may contribute to low heritability in multigeneration data, even if certain cohorts exhibit high genetic variation. Analysis of survival from 10 year-classes of 121 905 rainbow trout reared at 3 test stations showed that treating survival as a single trait across all generations resulted in low heritability (h^2 = 0.08-0.17). However, when heritabilities were estimated from homogeneous generation and test station specific cohorts, a wide range of heritability values was revealed (0.07-0.70). Out of 64 genetic correlations between different cohorts, 20 were positive, but 16 were significantly negative, confirming that genetic architecture of survival is not stable across generations and environments. These results demonstrate that treating survival as one trait over several generations may not reveal its true genetic architecture and indicate that overall survival has limited potential to predict general resistance, and care should be taken when using it as a selection criterion.

Genetic analysis of temperament data of Goettingen minipigs

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For Goettingen minipigs as laboratory animals a calm temperament is very important. Therefore an inclusion of this trait in the breeding goal is planned. A data set with 10,033 animals for which at least one of nine different temperament traits was recorded was used. The temperament was scored with a range of 1 (aggressive) to 5 (very tame) while the pigs were on the scale (S, with an age of 2 mo), held on the arm (A, 2 and 4 mo), caught in the pen (C, 4 and 6 mo), standing on a table (T, 4 and 6 mo) and walking on the ground (G, 4 and 6 mo). The genetic parameters were estimated with bivariate models. Additionally, a factor analysis was applied to examine if the 9 traits can be combined to factors to facilitate further calculations. The heritabilities were in a range between 0.09 (C6) and 0.22 (T4). Genetic correlations were high to moderate (e.g. 0.44 between traits A4 and C6) between the traits whereas the phenotypic correlations were much lower. Due to these results two different factor analyses were carried out. The first factor analysis was calculated on the basis of the phenotypic data and resulted in two factors. Factor 1 described the traits recorded at 2 mo and factor 2 described the traits recorded at 4 and 6 mo. A second factor analysis was conducted based on genetic correlations. Due to the high genetic correlations between the traits no factors could be extracted from this data set. Considering these diverging results the best selection strategy was developed.

Breeding for resistance to footrot in UK sheep

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The use of breeding strategies to address footrot in sheep is a sustainable method to improve animal welfare, reduce chemoprophylaxis and sustain the viability of sheep farming. Research was initiated to i) evaluate a 5-point foot scoring method to differentiate the severity of foot lesions, ii) obtain genetic and phenotypic information of foot lesions from key UK sheep breeds, and iii) estimate genetic relationships among foot lesion scores and 12 other ewe and lamb traits. Observations of hoof lesions were collected from 13,867 animals with pedigree information in 2005-2007 from sheep reared on commercial and experimental farms that were linked genetically via Sire Reference rams. Results showed footrot lesions could be differentiated reliably and repeatably and the agreement of trained foot score assessors was high (r=0.87). Heritability estimates for ewes ranged from 0.05 to 0.36 and varied according to the trait analysed, method of analysis (observed or underlying 'threshold' scale), breed and prevalence of foot lesions. Phenotypic correlations with other traits were all less than 0.06. Genetic correlations ranged from -0.57 (s.e.0.31) with number of lambs reared, to 0.32 (s.e.0.15) with fleece weight. There are clear opportunities to reduce footrot prevalence through selection as part of a multi-trait index.

Robustness: breeding for optimum traits

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According to Dutch farmers a robust cow is a cow that produces milk without problems (udder health, fertililty and claw health), stays long in the herd and scores above average for body condition score (BCS), body depth (BOD), chest width (CHW) and rump width (RUW). Phenotypically, BCS, BOD, CHW and RUW have an optimum in relation with culling. Cows with more or less BCS, BOD, CHW and RUW than average are culled faster. Since May 2007 classifiers score robustness during the classifiaction of cows for conformation on a scale from 71 to 89 points. The aims of this study were (1) to estimate the heritability of the robustness score given by the classifier, (2) the correlation between robustness and BCS, BOD, CHW and RUW, and (3) examine what the effect is of breeding for robustness. Data was available from 92,113 scored cows. An animal model was fitted that took into account the fixed effects of herd visit, age at classification and lactation stage and a random additive genetic effect. The heritability of robustness was 0.11 and the genetic correlations with BCS, BOD, CHW and RUW were 0.70, 0.41, 0.72 and 0.16, respectively. Using bulls with a high breeding value for robustness results in cows with more body condition, more body depth, more chest width and wider rumps. Phenotypically the relation between robustness and BCS, BOD, CHW and RUW is non-linear, but genetically the relation is linear.

Effect of rearing system on rabbit behaviour

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To investigate the effect of two housing systems on the behaviour of a slow growing local rabbit population, "Grigia Rustica", 48 rabbits were divided into two groups: Indoor housed in colony cages (cm 65x40x32h, 4 animals/cage) and Outdoor in wire net floor colony cages (cm 100x150x76h, 8 animals/cage). One day before slaughter, rabbits underwent tonic immobility and open field tests. Tonic immobility was induced by placing the rabbit upside down in a V-shaped wooden cradle, with its head hanging over the edge and restrained for 50s with one hand placed on the sternum and the other hand covering the head; the test was repeated three times for a maximum time of 5 min to evaluate the response to external stimuli induced by a brief period of physical restraint. The open field apparatus consisted of a square enclosure (100x100 cm) with a concrete floor divided into nine squares by perpendicular lines. Latency time, digging, biting, standing, exploration, hitting, sitting were recorded as frequencies and analyzed by Wilcoxon test. The two housing systems did not show any statistical differences for tonic immobility ($P \leq 0.23$); nevertheless, a tendentially lower immobility induction was noted for Outdoor rabbits. In the open field test, the Outdoor rabbits showed higher frequencies of digging and lower thump ($P \leq 0.05$) in a closed corner; Outdoor rabbits also showed lower biting ($P \leq 0.01$) and sitting ($P \leq 0.05$) in the open field apparatus. In conclusion, the Outdoor rabbits showed less fear then Indoor rabbits.

A multidisciplinary research program for sustainable breeding goals and selection criteria

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To contribute to R&D for selection for societally important traits, the French Program « Agriculture et Développement Durable » and the National Agency for Research funded a 3-year project "COSADD" managed by geneticists and sociologists from INRA and Technical Institutes. To assess the diversity of stakes, four species, cattle, fish, pig and poultry, are studied as representatives of contrasting meat production systems and breeding schemes. The idea is to provide information for a potential reorientation of breeding goals accounting for social demand. Breeding goals had always been constructed by breeding organizations and geneticists to satisfy breeders' demand. A new consensus broadened to opinions of members of society must be built when defining sustainable breeding goals. A multidisciplinarity research is necessary to provide methodology and information to developp such a consensus that would legitimate at the society level the use of animal genetic resources. A first work package aims at a better understanding of the social building of breeding goals. A second work package should explicit and rank breeding goals across stakeholders and society. A third work package aims at the definition of new selection criteria in terms of animal welfare or environment. Research is undergoing and findings will be presented in 2009.

Maternal protective behaviour of German Angus and Simmental beef cattle after parturition and its relation to production traits

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A total of 390 German Angus (Aberdeen Angus x German dual-purpose breeds) and Simmental cows were repeatedly tested for maternal protective behaviour within 24h pp. The behavioural response of the dams was observed during routine handling procedures of weighing and ear marking of the calves. Scores from 1 (docile) to 5 (aggressive) were assigned by one person. Analysis of variance of maternal protective behaviour scores was performed using a model including breed, lactation-number and calving month as fixed effects as well as the interaction breed x lactation-number. Cows were included as random effects. Breed, lactation-number and the interaction breed x lactation-number highly affected scores. German Angus (2.78 ± 0.05) was scored higher than Simmental (2.29 ± 0.05). Furthermore cows with higher lactation-numbers were scored higher when compared with younger cows. Heritability was estimated with an animal model under consideration of the whole relationship matrix. Estimates differed between German Angus (0.14 ± 0.08) and Simmental (0.42 ± 0.05). Repeatabilities for scores were 0.24 (0.04) for German Angus and 0.42 (0.05) for Simmental, respectively. Weaning weights and average daily weight gains of the calves were not correlated with maternal protective behaviour scores.

Development of a breeding objective for Estonian Holstein cattle

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Economic weights of milk carrier (water with lactose), fat and protein yield, calving interval, age at first service, interval between the first and last service of heifers and length of productive life of Estonian Holstein (EHF) cows were estimated under assumed quota for milk production and non-quota conditions. Bio-economic model of a closed herd which included the whole integrated production system of the Estonian Holstein breed was used. Milk quota influenced the economic value of milk carrier yield and length of productive life. There were only minor differences in the economic values of functional traits. The standardised economic value of the most important traits represented 18 to 81% of the economic value for milk yield. Discounting had a relevant impact on the economic value of length of productive life. When defining the breeding objective, milk, fat and protein production, the interval between the first and last successful breeding of heifers, and length of productive life should be included in the breeding goal along with the traits with the highest economic value. Relative weights for the two groups of traits in the breeding objective, i.e. production and functional traits, were 79 and 21%, respectively.

Roughages to organic growing/finishing pigs: influence on activity behaviour and social interactions

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The effect of roughages on organic growing/finishing pigs' activity behaviour and social interactions was investigated. In experiment 1, 377 pigs were allocated evenly to a control treatment (C) or three treatments with access to additional roughages; hay (H), grass silage (GS) and whole crop barley silage (BS). In experiment 2, 138 pigs were allocated evenly to the C or the GS group. Pigs were housed indoors with straw in the lying area and with access to a concrete outdoor run, where H, GS and BS pigs were given roughages ad libitum. At four occasions, direct observations of the pigs' behaviour and continuous sampling of the pigs' social interactions were made. Statistical analyses were performed with the SAS programme. In both experiments, pigs given roughages were significantly more often outdoors than C pigs (p=0.030 and 0.003, respectively). Inactivity (lying or sitting) indoors occurred frequently in all treatments. In experiment 1, GS pigs tended to be more inactive than H and BS pigs (p=0.086), whereas no treatment effect was found in experiment 2 (p=0.613). Aggressive behaviour indoors occurred less in H, GS and BS compared with C in experiment 1 (p=0.056) and tended to be lower in GS than in C in experiment 2 (p=0.104). Our results confirmed that access to additional roughages significantly influenced the activity pattern and social interactions of the pigs.

Decreased phosphorus excretion with poultry manure by feeding extruded rapeseed

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The concentration of phosphorus in poultry manure are potential environmental pollutant. To decrease phosphorus excretion with manure, digestibility and utilization of diets feedstuffs phosphorus amount in the gut of poultry must be increased. It is recommended using of extruded feedstuffs in poultry diets. Comparative efficiency evaluation of broilers of cross Ross 308 and laying hens of cross Lohman Brown fed with extruded and cold pressed rapeseed oilcakes on total phosphorus excretion amount in manure was carried out. The concentration of available phosphorus in poultry diets - corresponding to commercial recommendations. Feeding of extruded rapeseed oilcake increased digestibility and utilization coefficients of diets phosphorus amount on average by 4.69% for broilers in age 42 day and by 3.52% for laying hens in age 36 weeks in comparison with feeding cold pressed rapeseed oilcake. Excretion phosphorus with manure decreased by 110 g per 1000 broilers per day by feeding out to broilers extruded rapeseed oilcake. By feeding out the feed containing extruded rapeseed oilcake phosphorus amount in hens manure decreased by 190 g per 1000 hens daily in comparison with feeding cold pressed rapeseed oilcake. By feeding out of extruded rapeseed oilcake it is possible to decrease environmental pollution with phosphorus compounds.

Deer meat and cattle crosses beef biochemical evaluation

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Deer farming is quite new animal husbandry branch developed in Latvia from the year 1994. There are about 6000 deer located in 50 farms. Demand for high quality deer meat is increasing rapidly during the last years. Deer farming has tendency to be orientated on meat production, selection, commercial hunting organization. The aim and tasks of the investigation were to clear up deer (cervus elaphus) meat biochemical indices, to evaluate diet value by investigations of amino acids content and to compare it with beef of cross LBxHE (Latvian brown and Hereford). The investigation was carried out in the year 2007. The biochemical analyses of deer and beef cattle (m. psoas minor) samples were carried out. Amino acids content was detected by HPLC, total protein by Kjeltex, intramuscular fat by Soxlet methods. Obtained results indicated that deer meat contained higher level of essential amino acids lysine by 6.3%, threonine by 11.0%, valine by 14.1%, methionine by 2.5%, isoleucine by 9.7%, leucine by 13.1%, phenylalanine by 10.7% than beef of LBxHE cross. Most of non essential amino acids of deer meat had increased contents in comparison with beef. Total protein content in deer meat was by 1.2% higher in average than in beef of LBxHE. Mentioned above difference of protein was not statistically credible ($p>0.5$). Intramuscular fat content in deer meat was by 0.4% less than in beef. It can be concluded from obtained results that deer meat is dietetic than beef.

Genetic analysis of piglet growth and its correlation to further reproductive performance in Landrace sows

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Our aim was to investigate the associations between piglet growth and return to oestrus and litter size in the following parity. Data on 10 603 Norwegian Landrace sows and their piglets, from 2000 to 2007, were used. The traits analyzed were litter weight at 3 weeks (LW3), weaning-to-service interval (WTS) and number total born in next parity (NBTnext) from first to second parity. Genetic parameters were estimated with a multivariate animal model. Heritability estimates for LW3 (n=10 603), WTS (n=8 379) and NBTnext (n=7 588) were 0.07, 0.04 and 0.12 respectively. Correlations between the traits were negative; LW3 and WTS (r_g= -0.17), LW3 and NBTnext (r_g=-0.08) and WTS and NBTnext (r_g=-0.05). Increased litter weight seems to have a favourable effect on oestrus after weaning but an unfavourable effect on number born in next litter. As a following step, direct and maternal effects on piglet's weight and correlations between the maternal effect and WTS and NBTnext will be estimated.

Stated preferences of llama keeping functions in Bolivia

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Llamas fulfil various functions in the socio-economic life of Andean smallholders. The objective of this study was to rank the functions of llama keeping. Ranking frequencies of stated preferences for 10 functions were calculated. LS-means were analysed by rank-based t-test for paired data. Multiple pair-wise comparisons between functions within ranking groups were displayed. Between-group comparison was performed by the Wilcoxon rank-sum test. The capital function was most important, followed by the transport function to cultivated areas. All pairwise comparisons indicated a significant difference for the two highest ranked functions. Functions from 3rd to 9th position showed poor separation due to high variance. Bottom ranked function for all ranking groups is the integration of animals in cultural events. Wilcoxon test revealed a higher appreciation of women for the dung ($p=0.0376$). Men put higher value on the sale of live animals (in case of emergency, $p=0.0006$; for free disposal, $p=0.0371$). It was concluded that traditionally important functions in terms of wealth and the integration of the animals in mixed farming systems prevail. Breeding policies will be more effective when taking into account farmers preferences and gender-specific perceptions.

Genetic and environmental effects on fitness traits in dairy cattle

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Selection decisions and management practices in the dairy industry have largely focused on increasing production. This has lead to the concern that modern dairy cows are less able to "cope" than in the past, leading to increased financial and environmental costs associated with reduced health and lifespan. The dairy industry today has a wider range of farming systems than in the past (e.g., organic systems versus intensively housed systems) and these too will test the "coping" strategies of the dairy cow. Firstly we will describe the impact of husbandry, management and systems on fitness traits in dairy cows. We will then focus on the genetic aspects of fitness traits in dairy cattle and suggest how selection may be used to improve these traits. Combining genetic and management improvements will help the dairy cow to be better adapted to modern dairy farming conditions and better suited to the range of farm types that may exist in the future. However, caution is required because improved husbandry techniques may actually contribute to a worsening of health due to animals that would previously have been culled now being able to contribute replacements. On the other hand, automated monitoring of health traits will enable earlier recognition of painful disease and thus improve welfare. Ensuring genotypes are fit for environments and vice versa will be a requisite for future farming systems.

Breeding for improved disease resistance in ruminants

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Breeding for enhanced resistance to infectious disease is an effective means of improving the health and fitness of ruminant livestock. The most amenable endemic diseases to genetic selection are likely to be mastitis, bovine leukaemia, gastrointestinal (GI) parasitism, tuberculosis (TB) and paraTB in cattle; and mastitis, GI parasitism and footrot in sheep. This presentation will concentrate on recent progress in parasite resistance and footrot in sheep, and present perspectives for mastitis and TB in dairy cattle. For nematode resistance and footrot in sheep, readily measured indicators of relative resistance are available, and modelling calculations suggest that observed genetic gains may be larger than predicted by genetic theory, due to decreased contamination from selection animals. In both cases genetic markers are sought, but the complexity of the host-parasite interactions may mean that individual markers are of insufficient value. For mastitis, selection on clinical signs or somatic cell count (SCC) is well established; however the longterm wisdom of decreasing SCC is often questioned. A solution to this problem may be to decompose SCC into baseline and response variables, along with a liability to become infected, and select for reduced liability. Bovine TB is an emerging zoonotic threat, and studies are currently underway to assess options for breeding cattle for increased resistance. For many diseases, resistance will be due to functional traits as well as immune response variables.

How do nematode-resistant sheep reduce faecal worm egg count?

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We hypothesised that nematode-resistant sheep will reduce worm fitness by controlling worm longevity and fecundity. Resistant (n=19) and control (n=10) Rylington Merinos, selected for low faecal worm egg count (WEC) over 15yrs in Western Australia, were penned and dosed thrice weekly with 3,000 Trichostrongylus colubriformis (Tr) and 3,000 Teladorsagia circumcincta (Te) for 18-weeks. WEC was measured weekly. Adult worm count, worm length and eggs/worm were determined post-mortem. For Te only; immature, early and delayed L_4 stages were counted. WEC $[\log_{10}(x)+10]$ analysis used a mixed model with 1st order interactions between genotype, linear and quadratic week terms and a random animal effect. Worm length was analysed with a mixed model and egg-carrying females by logistic regression. Bootstrapping was used when statistical assumptions were violated. Resistant animals reduced mean WEC by 81%, with different response patterns between genotypes. Resistant sheep had 90% fewer adult Tr worms. As a proportion of total Te burden, resistant animals had 11% fewer adults and 10% more delayed L_4. Resistant animals had reduced Te worm length (-0.7mm) and egg-carrying females (-13%). The data suggest resistant sheep reduced Tr fitness by inhibiting worm establishment and Te fitness by egg suppression and inhibiting development.

Recording of functional traits in contract herds for progeny testing of bulls in dairy cattle breeding programs

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Contract herds have a long tradition as a means for progeny testing in dairy cattle breeding programs. Using contract herds, a sufficient size of contemporary groups and progeny testing according to a pre-planned design can be ensured. Recently, the focus within contract herd testing has been on the recording of functional traits. The main trait groups to be considered are fertility, feet and legs, and udder health. Within these trait groups, a number of specific traits have been recorded in territory covering field schemes, e.g. milk recording schemes. However, some of these traits are only weak indicators while others lack precision in the recording process. For an efficient use of contract herds, new traits have to be developed which fulfil the requirement of being more closely related to the physiology of the cow. With respect to diseases, sub-clinical cases in addition to clinical cases should be considered. Ideally, new traits should reflect a predisposition of animal of being susceptible to a disease or not before the animal is diseased. A further, very important, requirement is the recording of cows in contract herds according to specific time periods which enable the proper definition of contemporary groups instead of recording individual cases of diseases at the time they occur. Contract herd recording schemes require elaborated links between sources of data and adequate data handling.

North American perspective on developments in performance testing of dairy cattle and applications in breeding programs

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Historically, programs for genetic improvement of dairy cattle have been completely dependent on national milk recording systems for data collection. Due to increases in average herd size, a large percentage of records now come from on-farm herd management software programs. These allow timely measurement of fertility and calving traits, as events are recorded when they occur, rather than at monthly intervals. More importantly, they provide data for traits that are ignored in national milk recording systems, such as flow rate, milking duration, and the incidence of mastitis, ketosis, lameness, metritis, or displaced abomasums. In the future, radio-frequency identification systems may allow routine measurement of activity, body temperature, and other interesting variables. Therefore, performance testing may become concentrated in large herds with on-farm software and electronic data capture systems. One breeding company has implemented intensive data recording in 175 large commercial herds, as compared with 1600 to 3800 progeny test herds for its competitors. Consolidation may also occur in sire acquisitions, with breeding companies relying on a few large, extensively phenotyped supplier herds. In the era of whole-genome selection, phenotypes for novel traits from selected herds can be combined with dense single nucleotide polymorphism genotypes to develop genomic predictions that can be used in the population at large.

Inferring relationships between health and fertility in Norwegian Red cows using recursive models

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Health and fertility are complex traits, and the phenotype for one trait may affect the phenotype of another trait(s). Disease in early lactation may affect both the cow's ability to show heat and to conceive after insemination. The objectives were to infer relationships between health and fertility using a model with recursive effects, which allows disentangling causal effects between phenotypes from the genetic correlation between traits. Records on clinical mastitis (CM), number of services to conception (STC), and interval from calving to first insemination (CFI) in first-lactation for 75,281 Norwegian Red cows, daughters of 428 sires, were analyzed. Recursive effects from CM to fertility were close to zero Genetic correlations between CM and fertility were low to moderate and favorable. Selection against CM is expected to improve fertility as a correlated response (shorter CFI and fewer STC). Simultaneous and recursive effect models may be useful to attain a better understanding of complex relationships between traits.

Claw trimming records and locomotion can improve selection for feet and legs

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Since lameness is an increasing problem in modern dairying, efforts have been made to improve the trait genetically. In the Nordic countries, first indices included feet and leg traits from the linear assessment scheme. Recently, other traits requiring more logistic recording challenges, have been collected, like veterinary treatments for claw disorders, locomotion (Loc) in Denmark, and disorders treated by claw trimmers in Sweden. This study presents genetic parameters and different index scenarios for these traits estimated on first lactation Danish Holstein cows. Estimated heritabilities were 0.01 for all subcategories of Claw- and Leg Disorders, 0.09 for Loc, between 0.13 and 0.27 for linear feet and leg traits, and about 0.06 for claw trimming data (Swedish estimate). The genetic correlation for Claw Disorders and Loc was 0.46, while those between Leg Disorders and Hock Quality or Bone Structure were 0.42 and 0.26, respectively. Different selection indices including disorders, claw trimming, Loc and Rear Leg Rear View (RLRV), were developed. The index including Claw Trimming and Loc showed the highest accuracy, especially for small daughter groups. Generally, Claw Trimming data achieved a higher accuracy than Claw Disorder data, and Loc is more advantageous than RLRV. The collection of Claw Trimming data and Loc and their inclusion in a Feet & Leg index are recommended.

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Effect of the age of Pomeranian lambs on meat quality

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The aim of the study was to evaluate selected quality indicators of meat from 50- and 100-day-old single ram lambs of the Pomeranian breed. Samples of m. quadriceps femoris were taken to determine proximate chemical composition, physicochemical properties, energy value as well as the concentrations of cholesterol, amino acids in protein and fatty acids in intramuscular fat. The sensory quality of meat was also estimated. It was found that meat quality was significantly affected by the age of lambs at slaughter. Meat from older lambs (aged 100 days) was characterized by a higher content of dry matter, fat, ash and cholesterol, a higher calorific value, a darker color, a higher water-holding capacity, a larger diameter of muscle fibers, less desirable ratios between ESAAs and NEAAs PUFAs and SFAs, DFAs and OFAs, as well as lower scores for tenderness and juiciness. Meat from younger lambs (aged 50 days) was marked by a lower content of intramuscular fat and cholesterol, a lower energy value and more desirable ratios between amino acids in protein and fatty acids in intramuscular fat, which makes it a valuable component of a low-calorie and low-fat diet.

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The influence of milk replacement on morphofunctional state of calves' digestive system

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To investigate the influence of milk replacement of the calf's stomach morphofunctional state, two groups of calves in age between 5-14 weeks was establish. Calves were fed with two kinds of milk replacement (respectively PA1 and PA2) and control group (five calves) were fed with whole milk (PP). Calves in all groups received an equal amount of hay and fodder. It was ascertain that pH in saliva was not significant in calves who were fed with PA1, PA2 and PP. Saliva reaction in place of parotid and mandibular salivary glands excretory duct opening were alkaline (pH 8.7 ± 0.28). Intraruminal pH in 5-14 week old calves rumen apart from food were between 6.4- 7.4. Differences in intraabomasal pH dynamics were establish in animals fed with PA1, PA2 and control group. After whole milk intraabomasal pH decreased during first hour till the level of 3.7 – 3.8 and in the further two hours stabilized till 3.1 – 3.2. After PA1 or PA2 intraabomasal pH in the time period of 2-2.5 hours reached pH 3.7 – 3.8, while in further three hours the level of pH decreased till 2.7-3.8. Endoscopical and gastrohromoscopical view of abomasums mucous membrane gives evidence about differentiation level of fundal glands in different age of animals.

Changes of goats' milk quality parameters after dehelmentisation of animals

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The purpose of the study was to investigate the goats milk quality parameters in the relationship with invasion of strongilates in digestive tract. The amount of strongilates was determined in one gram of feces using method of MacMaster. Milk goats were dividend in three groups: 1.Animals without invasion of digestive strongilates. 2.Animals with invasion of digestive strongilates in a level of 317 eggs in one gram of feces (15 animals). 3.Animals with invasion of digestive strongilates in a level of 936 eggs in one gram of feces (15 animals); and animals of this group after dehelmenthisation. The amount of urea, cholesterol and amino acids and their correlation were investigated in milk. We observed that invasion of digestive strongilats in goats do influence some of milk parameters. In animals without invasion the average amount of urea in milk was 4.0 mmol/l, in group two – 5.5 mmol/l, buti n animals in group three – 3.4 mmol/l. The average amount of cholesterol in goats milk was 13.89 mmol/l in group one, 12.89 mmol/l, in group two and 14.9 mmol/l in group three. The specific tendency was obtained in amount of amino acid in one gram of milk dry matter. With an increasing of level of invasion, amount of amino acids increased.

The determination of growth function in young hair goat

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In this study, it was aimed that the estimating of growth curves for live weight from birth to twelfth month age in young Hair goats. For drawing growth curves, Gompertz, Logistic, Brody, Negative Exponential and Bertalanffy growth models were used. Straightness degrees of these models for growth estimate are R^2=0.977, R^2=0.964, R^2=0.989, R^2=0.974 and R^2=0.982, respectively. It was leant on this finding reached a decision that Brody and Bertalanffy growth models are suitable for identification of variations in live weight of young Hair goats.

Relevance of purebred information for predicting genetic merit of survival at farrowing of crossbred piglets

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The objective was to infer (co) variance components for survival at farrowing in purebred (P) and crossbred (C) pigs. Data were from 13,643 (1,213 litters) C and 30,919 (3,162 litters) P pigs, produced by mating the same 168 P boars to 319 Large White-derived crossbred females and 1,413 P sows, respectively. The outcome variable was pig survival at birth, coded as a binary trait. A Bayesian bivariate threshold model was implemented via Gibbs sampling. Effects of sex, parity of the dam, litter size and year-month of birth were assigned flat priors; those of litters, dams and sires were given Gaussian prior distributions. Marginal posterior means (SD) of the sire and dam variances in P were 0.018 (0.008), 0.077 (0.020), respectively in the liability scale. For C, corresponding estimates were 0.030 (0.018) and 0.120 (0.034) respectively. The posterior means (SD) of heritability of survival in P and C, and of the genetic correlation between these traits were 0.049 (0.023), 0.091 (0.054) and 0.248 (0.336), respectively. The genetic correlation was also low, and a 95% Bayesian confidence region (-0.406, 0.821) included zero. Even tough uncertainty of estimates is large, results suggest that genetic progress for survival at birth expected in C when selection is based on P may be nil.

Updating genetic parameters for piglet survival

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Phenotypic and genetic trends for litter size are clearly positive in most of the world, similar trends for number weaned are lower. As a consequence phenotypic trends in stillborn and pre-weaning mortality are positive. This is partly the result of reduced input of labor, and partly because of negative correlated genetic trends of litter size. To optimize selection for current markets, we re-addressed the two traditional survival traits: farrowing survival (FS: complement of stillborn) and pre-weaning survival (PWS). FS was modeled by both additive-genetic and maternal-genetic effects; PWS was modeled including an extra genetic effect for foster-dam. The models log-likelihoods justified inclusion of the direct additive genetic effect. Sufficient cross-fostering of piglets in the data is required to be able to estimate genetic effects of foster dam. The dataset consisted of 75,765 records of individually recorded piglets with known cross-fostering status on a closed TOPIGS multiplication farm with a pedigree of 78,572 animals. Variance estimates for FS: error 623.5, additive genetic 3.79, and maternal genetic 15.50; for PWS: error 819.8, additive genetic 7.29, maternal genetic 7.87 and foster dam genetic 30.09. Absolute genetic correlations were lower than 0.1 within traits and lower than 0.4 among traits. Heritabilities were low, but the sum of the genetic variance components of 19.3 for FS and 45.3 for PWS are very promising for selection.

Causes of death of piglets in three types of farrowing pens

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Perinatal piglet mortality leads to an enormous economical loss in pig production. On the other hand there is increasing public concern about the restrictive nature of crates which were developed to improve space utilisation and to minimize piglet mortality. The aim of this study was to analyse the reasons of death of piglets in crated and free farrowing systems. Data were collected in a commercial farm (n = 600 sows) with three different types of farrowing pens: pens with a crate (CR), fully slatted free farrowing pens (FS) and free farrowing pens with a separate lying and dunging area (FC). A total of 408 litters with 4991 piglets born were observed from birth to weaning at three weeks of age. Each piglet dying during parturition or suckling period (n=1082; 21.7%) was dissected and classified in different causes of death: stillbirth (18.5%), crushing (38.0%), low viability (11.7%) weakness or illness (17.2%) and other reasons (14.6%). Binary logistical regression analysis was used to identify significant effects on different causes of death. Whereas the type of farrowing system had no impact on stillbirth ($p<0.05$), the probability for crushing was highest in FS ($OR_{FS-FC}=1.62$; $OR_{FS-CR}=2.84$; $OR_{FC-CR}=1.77$). Further factors like body condition score and stomach content of the piglet, parity of the sow and ambient temperature were found significant in the final crushing-model. It is supposed that the crated system was favoured by the farm-specific production conditions.

Impact of gut microbiota on development of the immune system in the pig gut

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The gut microbiota plays an important role in immune development and homeostasis in the intestine. Reduced exposure to environmental microbes affects the composition of the microbiota and can have compounding effects on the successful development of immuno-competent, pathogen-free animals. This concept is embraced by the "Hygiene Hypothesis", which postulates that increased incidences of immune-mediated diseases are the consequence of reduced infection and microbial colonization during early childhood. In relation to animal production, the immune system might be negatively affected by the high hygiene status adopted in many intensive rearing systems. Some of the production advantages of extensive rearing systems could relate to improved microbiological and immunological status of outdoor-reared animals. This talk will present results from the GUTWEAN project (part of the "Sustainable Systems for Weaner Management" program). GUTWEAN has investigated interactions between neonatal biology, rearing environment and post-weaning nutrition with emphasis on how commensal bacteria influence the function of the innate and adaptive immune system in healthy and diseased pigs.

Effect of fermented liquid feed on the performance of weaned piglets

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The use of fermented liquid feed (FLF) could be an alternative for growth-promoting antibiotics, which are banned now as feed additives for pigs in the EU. In this study, the effect of FLF vs. the same dry feed (complete commercial starter diet), fed ad libitum, on weight gain and feed/gain ratio was investigated in two groups of 15 weaned piglets each (barrows; initial weight 7.9 kg; 5 piglets per pen and 3 pens per treatment). The FLF was inoculated with Bactocell® (Lallemand, France) and prepared at 30 °C in a 1:2.5 ratio of feed to water. Daily, half of the volume was withdrawn and replenished. After inoculation the FLF reached a steady state after 2 days, showing the characteristics of good FLF (pH < 4.4; lactic acid > 130 mmol/L). The FLF remained stable during the 4-week trial. Piglets' weight and feed intake were recorded weekly. Average daily feed intake (dry matter, DM) and daily weight gain amounted to 374 g vs. 325 g and 245 g vs. 176 g for the control and FLF respectively. The average feed (DM)/gain ratio was higher on FLF compared to dry feed (1.85 vs. 1.57). Finally, 3 piglets per pen were sacrificed to investigate the counts of E. coli in the gastro-intestinal tract. Only in the stomach there was a significantly lower count of E. coli for the control group compared to the FLF group (3.5 vs. 4 Log10 CFU/g). Hence, it is concluded that FLF was not successful in this study.

Effect of electro-activated water on litter size of sows and development of piglets during weaning period.

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A good quality of water is very important for the health of animals. We tested the effect of the Anolyte fraction of electro activated water produced with a reactor out of brine. Anolyte is an elctrochemical activated neutral and hyperchloric acid with a pH of around 8 and a redox potential of 780 - 900 mV. It has a disinfectant effect inside the water pipes, as water with an redox potential > 500mV damages the cell wall of the bacteria. Four trials were conducted using sows from 2 farms that got either untreated water or water with 3% Anolyte. Additionally they got 7 days around birth 2x2 liter pure anolyte/day. In all the trials there were differences in litter size, partly the control group, partly the test group was higher. In 3 of the 4 trials the number of dead born per litter was 0.5 lower in the test group than in the control. In the 4th trial in the test group 2 sows had 5 or 6 dead born piglets that caused no difference between both groups. As we observed, that in the first trials sows on Anolyte produced more mucose, birthlength was measured. It was observed that birthlength was 5 h for the control and 3.5 h for the Anolyte group. On farm A the weight of the 28 days old piglets was 10.55 kg in the test group vs. 10.19 in the control. On farm B the weights, at 26 days of age, were 8.33 kg in the test and 8.20 kg in the control group. It can be concluded that Anolyte has a positive effect on the birth and the piglet´s growth.

The effect of the growth environment of suckling piglets on their further growth intensity
V. Juskiene and R. Juska,

In 2006-2007, a study was carried out with two-month old crossbreed piglets on the pig farm in Skėmiai to determine the effect of the growth environment of sucking piglets on their further weight gains. After weaning at 2 months of age, indoor born and outdoor born and raised pigs were raised indoors till the end of the finishing period. From 2 to 4 months of age the pigs were raised in littered pens with 1.16 m^2 area per pig. From 4 month of age, the pigs were raised in unlittered pens with 1,34 m^2 area per pig. The study indicated that weight gains of both groups of pigs from 2 to 4 months of age were similar. However, in the finishing period from 4 months of age, pigs born and weaned outdoors gained daily on the average 0.09 kg (P=0.018) more than the pigs born and weaned indoors. In the period from weaning till slaughtering, the average weight gain of the pigs born and weaned outdoors was 0.05 kg (0.038) higher than that of the pigs born and weaned indoors. The relationship between the piglet weight at weaning and further pig growth indicated that from 2 to 4 months, the weaning weight of piglets born and weaned indoors had no influence on their further weight gains, while the weaning weight of the piglets born and weaned outdoors had affected further growth of the pigs from 2 to 4 months of age (r=0.055, P=0.024) and during the whole experimental period (r=0.47, P=0.056).

Effect of supplementing sows diets with vitamin E on performance and on immune response of suckling piglets
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The effects of supplementing gestation and lactation diets of sows with vitamin E on the immune function and performance of their piglets were studied. Twenty four sows were assigned in two experimental groups. One group received the control diet and the other group was supplemented with 500 mg/kg of a-tocopherol acetate during the last week of gestation and during lactation. Increasing sows' dietary vitamin E concentration resulted in higher liveweight gain of piglets until day 21 ($P<0.05$). The concentrations of a-tocopherol in blood plasma and different tissues (liver and lung) of 4 day old piglets significantly increased with increasing level of dietary vitamin E in sows' diet. The overall improvement on piglet performance and vitamin status was due to higher level of a-tocopherol content in colostrum and milk in treated sows compared with the controls ($P<0.05$). The immune status of the piglets was measured as lymphocyte proliferation response to concanavalin A (Con A) and the IgG concentration in blood plasma and sows colostrum. Both immune parameters and colostral IgG were not significantly affected by treatment ($P>0.05$). In summary, the data presented in this study indicate that supplementation of the sow diet with vitamin E has beneficial effects on performance of the suckling piglets

Relationship between sows' behaviour and crushing piglets

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The aim of this study was to analyse the relationship between behaviour traits of sows and their association with piglet crushing. The behaviour of 386 German Landrace sows were videotaped continuously starting 12 hours ante partum until 48 hours post partum in a nucleus herd. Forty sows were randomly sampled in a block data design considering different matching criteria (number of piglets born alive, parities and farrowing date). Two blocks of sows were compared: twenty sows that crushed more than one piglet (C) and 20 sows that crushed none (NC). Traits like lying–down behaviour, posture changes and maternal responsiveness were analysed (n = 75.000). Ante partum C sows were less active than NC sows in performing movements. The extent of nest building behaviour before farrowing was decreased in primiparous C sows regarding duration ($P<0.01$) as well as frequency ($P<0.01$). Post partum rolling movements were shown more often ($P<0.01$) in primiparous C sows. Seasonal influences tended to result in more rolling behaviour. Primiparous C sows showed less attentiveness towards their piglets by taking fewer nose-to-nose contacts ($P<0.01$) and looking less frequently to the piglet nest. In conclusion, especially primiparous C sows were more likely to show carelessness and to perform rather risky body movements (e.g. rolling) than NC sows.

Possible voluntary dry matter intakes by grazing ponies

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Most equine diets are based on forage. Although it is relatively easy to determine voluntary intakes of forage by housed horses, intakes by grazing horses are more difficult to determine. Methods used to determine voluntary dry matter intake (VDMI) by grazing equines include marker studies (e.g. using n-alkanes), measurements of faecal outputs and known forage dry matter digestibilities, changes in body weight after accounting for excretory and insensible losses, determination of bite size, number and feeding duration, or subtraction of harvested residual herbage from calculated herbage allowance. Reported estimates of daily VDMI by pastured equids usually range from 1.5-3.0% of BW, but higher VDMI of ca. 5% of BW have been reported but have been regarded as outliers. Nevertheless, horses and ponies grazing good quality pasture can increase their body condition score rapidly, suggesting that such animals have ingested more forage than previously supposed or that the forage DE is greater than expected, or a combination of both. To investigate this, the range of VDMI of previously housed ponies grazing mid – late summer temperate pasture over a six week period was estimated. This was calculated by use of values quoted in the literature for the DE value of poor and high quality pastures, the reported upper and lower values for DE required for maintenance (DE_m) and per kg of bodyweight gain (DE_{gain}) of mature equines and measured weight changes of the ponies over the six week grazing period. Calculated VDMI ranged from ca. 3->5% of BW/d.

High-quality pasture for horses

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The purpose of this study was to improve the management and utilization of pasture in horse farms. Six grasses and mixtures were grown: timothy, meadow fescue, tall fescue and mixture of timothy/meadow fescue, timothy/tall fescue and tall fescue/smooth meadow-grass. The area was divided in three equal paddocks which were grazed in two week intervals. Each paddock consisted of four replicates where treatments were in randomized order. This allowed 24 grazing options for horses. Due to some difficulties in the establishment, grazing was not started until the beginning of July. Yield before and after grazing and sward height were measured. In addition to conventional feed analysis, NDF, ADF, water-soluble carbohydrates (WSC) and organic matter pepsin-cellulase solubility were also determined. Fructans were analyzed from pure grasses. Botanical composition was determined. The palatability of grasses was evaluated on the basis of feeding behaviour. The crude protein content averaged from 111 to 195 g/kg DM. The WSC content ranged from 75 to 186 g/kg DM. Tall fescue, tall fescue/smooth meadow-grass and meadow fescue produced the highest yields. The palatability of timothy and tall fescue/smooth meadow-grass was superior compared to others. Experiment will continue in summer 2008.

Preference for artificial drinkers in British native ponies

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Native ponies normally roam freely in natural habitats, but may encounter transport and livestock markets with artificial water drinkers after the annual round-ups. The preference for 3 different artificial drinkers in unhandled Dartmoor ponies was assessed. (N=18, 10 females, 8 males, 5 months old). They were transported to the study building a week after the annual roundup and housed in (random) groups of 3 in test pens (5x4m). Each pen contained one automatic waterbowl, one bucket and one specially designed flowing water trough. Ponies were fed hay only. Latency to drink after 5 h transportation was measured, together with the time spent drinking and the amount of water consumed from each drinker. The latency to drink (all groups) was 80.5±32.94 min (mean±SEM). All drinker types were chosen equally for initial drinking. The ponies were then tested individually for 4 days, to assess individual drinker preferences. Based on drinking time and amount of water consumed over the test period (25.2±4.66, 11.5±4.26, 2.4±2.23 min and 25.0±4.06, 13.6±4.39, 0.3±0.08 l for bucket, trough and bowl respectively, mean±SEM), individual ponies chose mainly one type of drinker, this was either the bucket or the flowing water trough (NS, paired t-tests). They avoided the bowl (bowl vs. other drinkers, all tests $P<0.02$, paired t-tests). This has implications for the welfare of native ponies sold through livestock markets.

Wrapped forages for horses

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Wrapped forages (silage and haylage) have become more common in horse diets during recent years. However, silage and haylage is commonly produced in big bales which are not suitable for use in stables with few animals, as they often contain too much forage to be consumed before onset of aerobic deterioration. Smaller bales are therefore of interest, but knowledge of the chemical and microbial composition in such forage and changes in those variables during storage of small bales is limited. Also, knowledge about silage and haylage as a feed for horses is limited. A series of studies involving both production and use of forages for horses was therefore performed. Chemical (including content of α-tocopherol and β-carotene) and microbial composition in silage and haylage was investigated in relation to production techniques and after long-term storage of bales. In general, small bale silage contained less lactic acid and had higher pH and ethanol content than general levels in chopped silo silage. The influence of forage conservation methods on horse preference was also investigated. Hay, haylage and silage were produced from the same grass crop and the forages were offered simultaneously to horses, which preferred the silage. The influence of forage conservation methods on equine hindgut fermentation was studied using fistulated horses. Hay, haylage and silage were produced from the same grass crop and fed in a changeover study. All forage types influenced hindgut fermentation similarly.

Feeding the growing horses with hays or silages based diets

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From the studies carried out by HN and INRA since the eighties it arise that growing horses can be fed with silage diets (prewilted silages or haylage) as well as with dry forages to raise sport or leisure horses. Silages of Graminea or natural grassland can be fed to horses. The grasses should be ensiled at a minimum of 30% DM or should be wrapped at least at 50 – 55% DM whereas the whole plant of maize should be ensiled at minimum of 30 – 35% DM. But the silages should be very well preserved according to the standards determined by INRA. Dry matter intake of silages or hays based diet and related growth performance have been measured in growing horses of 1 – 2 and 3 years of age according to the production goals: sport or leisure during several subsequent experiments to state the guidelines for feeding such forages based diets. Silages can be fed either limited or ad libitum, depending either of the nutritive value and DM content, or/and of the age of horses and the goal of production: sports vs. leisure. Amount and composition of concentrates to be supplemented have been stated in these different situations. And the substitution rate forages /concentrates has been established for each type of forages fed to the different class of age of horses as well, to support accurate rationing according to the nutrients requirements stated by INRA

Effect of forages on glycaemic index/response in the horse

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The concept of glycaemic index (GI) was developed approximately 25 years ago as a means to classify carbohydrate-containing foods based on their blood glucose raising potential. Although the true benefits may still be controversial there have been numerous studies looking at the role of GI in the prevention and management of type 2 diabetes, cardiovascular disease, obesity etc. In the horse, work has suggested that marked changes in glucose concentrations may be linked with abnormalities in growth and an increased risk of developing insulin resistance (potentially linked with an increased risk of laminitis) and/or obesity. This has led to increased interest in diets for horses that do not result in marked post-feeding insulin and glucose responses but still enable them to grow, perform and live active healthy lives. Most of the work looking at the equine GI or glycaemic response to feeds has concentrated on starch-rich feeds rather than the role of forages. Recent work, however, has suggested that pastures with high levels of starch, sugar and/or fructans can result in marked fluctuations of blood glucose and insulin in a similar way to the feeding of large cereal based meals. A reduced glycaemic response, in the horse, however, may not always be desirable if it results from impaired small intestinal digestion and leads to inappropriate amounts of rapidly fermentable material reaching the hind-gut. This paper will discuss how different forage types and feeding practices involving forages may affect the glycaemic response in the horse

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Fatty acid composition of liquid and solid associated bacteria in the cecum and colon of horses

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Cecal and colonic contents from horses were used to characterize fatty acid (FA) profile of solid (SAB) and liquid (LAB) associated bacteria. Contents were collected from five adult horses immediately after slaughter. LAB were obtained by differential centrifugation. SAB were isolated from solid phase formerly suspended 24h with saline solution (0,85%) of carboxilmethilcellulase, at 8ºC. The suspensions were filtered and the resulting liquid was submitted to differential centrifugation as described for LAB. Bacterial pellets were freeze-dried, grinded and analysed for FA. Contrarily to what is reported for rumen bacteria, no differences between LAB and SAB were found for either total FA and FA profile. The mean FA concentration in bacteria was 167mg/gDM where 52% were C18 FA and 13.5% were odd and/or branched chain FA. FA profile of bacteria sampled in colon and in cecum presented some significant differences. The cecum bacteria presented higher ($P<0.05$) C18:2n-6, C18:3n-3, C18:1 trans isomers than colon bacteria. The odd and branched chain FA did not differ between all bacteria population indicating that it may not be suitable for discriminate between bacterial sub-populations but might be useful as a global microbial marker in equine ceco-colonic ecosystem.

Comparison of milk fatty acid composition between different production systems and seasons

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The aim of our study was to evaluate milk fatty acid composition and its variability in Slovenia. For this purpose 47 bulk milk samples in year 2005 were collected. Samples were divided among two seasons (summer and winter) and two production systems (organic and conventional). Summer milk samples contained significantly lower portion of SFA (64% vs. 70.3%) and significantly higher portion of MUFA (30.9% vs. 25,9%) and PUFA (5.1% vs. 3.9%) in comparison with winter milk samples. Milk from conventional production system contained statistically higher concentration of SFA (68.0% vs. 66,3%) and statistically lower concentration of MUFA (28.0% vs. 28,8%) and PUFA (4,1% vs. 5.0%) compared with organic production system, the differences being higher during summer season. The highest content of CLA (1.6%) was observed during summer season in organic production system and the lowest CLA content was determined in samples collected during winter season in conventional production system (0.55%). Similarly to CLA, season and production system affected the concentration of linolenic (C18:3 n-3) acid, while concentration of linoleic (C18:2 n-6) acid remained relatively constant. These results suggest that milk produced from organically reared dairy cows especially in summer season contained higher amounts of health promoting FA than milk form conventionally reared cows in both summer and winter season.

Effects of choline and rumen protected choline (Reashure®) on energy-related biochemical metabolites of lactating dairy cows

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Eight multiparous Holstein cows with an average milk production of 34.6 kg/d and body weight of 662.5 kg were used to evaluate the effect of choline chloride and rumen protected choline (Reashure®) on energy-related biochemical metabolites of lactating dairy cows in early lactation. The experimental design was a 4×4 Latin Square with 21 day periods. Experimental treatments were: 1) No choline (NC), 2) choline chloride (CC) fed at 50 g/d, 3) rumen protected choline (RPC 25) fed at 25 g/d and 4) rumen protected choline (RPC 50) fed at 50 g/d. Rumen protected choline was blended with 0.25 kg of ground corn and fed once per day as a top dress. Diets contained 17.4% crude protein, 21% ADF, 34% NDF and 41% NFC on DM. Blood samples from coccygeal vessels were collected on last day of each period and analyzed for glucose, triglyceride, cholesterol, BUN, VLDL, LDL and HDL. The results show that blood metabolites such as glucose, triglyceride, cholesterol, BUN, VLDL and LDL were not affected by treatments ($P>0.05$) and choline chloride (CC) decreased concentration of high density lipoproteins ($P<0.05$). Therefore, results of this investigation indicated that choline had no significant effects on biochemical metabolites of dairy cows in early lactation.

Effect of feeding different concentrate: corn silage ratios with or without protected methionine supplement on productive and reproductive performances of lactating cows

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Twenty Friesian lactating cows after a month from calving were divided into four groups to evaluate the effects of dietary factors. 1-(Concentrate: Corn silage) ratio (50:50) or (25:75)% of their TDN allowances according to (NRC 1989) 2-supplementation (corn silage with or without protected methionine (PMet) on milk production and composition, some blood parameters and reproductive performances. Data were statistically analyzed by SAS (1998) according to the two ways with interaction model. Milk production was improved by feeding 75% corn silage (CS) and by supplementing PMet. Average 4% FCM yield were 13.11 vs14.57 kg/day by 50% CS vs 75% CS ration and 13.16 vs14.52 by without vs with Pmet.ration. 75% CS ration increased milk fat content. Supplementing PMet increased milk fat and milk protein contents. Feeding 50% CS ration increased plasma total proteins while prolactin were decreased. Plasma total proteins, total lipids and prolactin were increased by adding PMet. Conception rate was higher and numbers of services/conception were lower with 75% CS ration and with PMet. Feeding 75% CS ration or adding PMet showed higher level of blood plasma progesterone. The results obtained suggest that the addition of PMet and an increased proportion of CS can improve lactating cows performances.

Prediction of indigestible neutral detergent fiber of grasses

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In this study, four grass species (*Dactylis glomerata* L., *Phleum pratense* L., *Lolium perenne* L., *Festuca arundinacea* L. and *Hybrid Felina* (*Lolium multiflorum* L. x *Festuca arundinacea* L.)), commonly used in roughages for ruminants, were harvested at different maturities of primary growth (n = 60), and evaluated for dry matter (DM), crude protein (CP), ash, crude fat, neutral detergent fibre (NDF), acid detergent fibre (ADF), acid detergent lignin (ADL) and indigestible neutral detergent fibre (INDF) contents. INDF content was determined by in sacco rumen degradation of grasses for 12 days in non-lactating cows. ADL content resulted a reliable ($R^2 = 0.78$; residual mean square error of 17.65 g/kg DM; $P < 0.001$) parameter to predict INDF contents. Over a six week period of maturity INDF content increased ($P < 0.001$) in all grasses. It was confirmed by this study that the INDF content of grasses, which markedly increased during maturity, could effectively be predicted from ADL content. This research was supported by the Ministry of Agriculture (grant MZE 0002701403) and the Ministry of Education of Czech Republic (grant MSM 6007665806).

Influence of a different balance of protein in the rumen on the utilization of the dietary nutrients by cows and rams

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The aim of our investigation was to estimate the influence of dietary protein level and balance of protein in the rumen (BPR) on the protein degradability and digestibility by cows and rams. We carried out two series of physiological and balance trials with fistulated cows and rams. As dietary components at the first series we used meadow hay, sunflower meal, barley and mineral-vitamins mixture. The experimented protein levels were: 8, 10, 12 and 14% (in DM). As dietary components at the second series we used: corn silage, alfalfa hay, straw and conventional compound feed. The experimented protein levels were: 8, 12 and 16% (in DM).Theoretical levels of BPR were between -54 and 0 (cows, I series), 10 and 30 (rams, I series), -190 and 130 (cows, II series), -19 and 13 (rams, II series). It was found an influence of the dietary factors on pH and ammonia N level in cows rumen content, blood urea N concentrations both the cows and rams and nitrogen balances of rams. In general we made conclusions on the meaning of the selected nutritional factors for the optimal utilization of dietary nutrients by ruminants.

Essential fatty acids content in beef meat as influenced by crushed, flaked or extruded linseeds.

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Meat is a source of protein. It also contains polyunsaturated fatty acids of the n-3 and n-6 series. Linseed is commonly used to increase the n-3 content in meat. Due to its small size, linseed must be processed before being offered to cattle. Thirty two culled cows and 20 young growing fattening bulls were fattened with a diet based on sugar beet pulps. The animals were divided in 4 groups. The first group was offered a control diet while a diet with crushed, flaked or extruded linseed was given to the others. Samples were obtained for chemical analysis from 17 muscles representing the meat pieces of the whole carcass. There were no effects of the diets on the chemical composition – dry matter, ash, protein and ether extract – of the meat. There were no effects either of the diet on the main fatty acids content in meat which were C18:0 at 115.45mg/100g, C18:1n9/7 at 246.9mg/100g and C18:2n6 at 95.8mg/100g. By contrast, the inclusion of linseed increased ($P<0.001$) the C18:3n3 content – average of 19.7 vs 13.8mg/100g in the 17 muscles - . There were no differences between the treatments of the linseed. The inclusion of linseed reduced the content of the n-6 fatty acids, the effect being significant for C18:3n6 ($P<0.01$), for C20:2n6 ($P<0.001$), for C20:3n6 ($P<0.001$) and for C20:4n6 ($P<0.01$) but still with no differences between linseed treatments. There was, as result, a reduction (3.19 vs 3.98, $P<0.001$) of the n-6/n-3 ratio.

The effect of olive tree leaves and grape marc inclusion in dairy sheep and goats diets on their CLA and VA milk fat content

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Olive tree leaves (OTL) and grape marc (GM) are by-products with high linolenic (LNA) and linoleic (LA) acid content, respectively, which can be used to increase the cis-9 trans-11 $C_{18:2,}$ conjugated linoleic acid (CLA) content of milk fat. An experiment was conducted with 16 Friesian ewes and 16 Alpine goats to study the effect of olive tree leaves and grape marc inclusion in sheep and goats diets on their milk FA profile, with emphasis on cis-9, trans-11 $C_{18:2,}$ CLA and VA milk fat content. The ewes and the goats, from parturition to the 90th day in milk (DIM) were fed the control (C) diets and then both groups were divided into two sub-groups (treatments). The control groups of both species continued to be fed the C diets, whereas the treated groups were gradually switched over a 2 week period (DIM= 91-105) from the C diets to that of treatment 1, which had air dried OTL. These OTL diets were fed ad libitum for one month (DIM =106-135). After that period, the same treated groups after two weeks of gradual adaptation (DIM =136-150) were switched to treatments 2, which had air dried GM. The GM diets were fed ad libitum for one month (151-180 DIM). The results showed that the OTL and GM diets increased the cis-9, trans-11 $C_{18:2}$ CLA and VA content in milk fat, versus the C diets, only in sheep milk fat. The different response of sheep and goats to OTL and GM diets needs further investigation.

Effects of dietary PUFA on the lipid composition and quality of Suffolk ram semen

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Previous studies have shown that manipulating the diet can modify semen PUFA in non-ruminants. Apparently, no similar work has been done in ruminants. This study evaluated the extent of incorporation of marine PUFA; C20:5n-3 (EPA) and C22:6n-3 (DHA) into semen and their impact on semen quality. Suffolk rams (24) were fed a 30:70 basal diet of concentrate + haylage, and allocated to four treatments; Megalac (M), Megalac + green lip mussel (MGLM), protected fish oil (FO), and FO + GLM (FOGLM). After 8 weeks, semen and blood samples were collected, fatty acids (FA) and semen quality were analysed. The diets had no effect on sperm numbers, motility, viability or morphology. FO significantly increased plasma EPA and DHA, but not C18:3 n-3. Plasma levels of EPA were 0.5, 1.2, 13.1 and 14.3 g/100g FA ($P<0.001$), whilst those of DHA were 0.7, 1.2, 5.5 and 4.6 g/100g FA ($P<0.001$) for M, MGLM, FO and FOGLM respectively. C18:3n-3 was not detectable in semen. FO diets increased EPA in semen, 0.1, 0.1, 0.3 and 0.3 g/100g FA ($P=0.012$) for M, MGLM, FO and FOGLM. DHA was high in semen and was not influenced by diet. DHA in semen was 12 times higher compared to plasma levels, 37.7 versus 3.0 g/100g FA. Our results confirm that DHA is the major n-3 PUFA of ram semen. Although FO increased EPA and DHA in plasma, this did not translate into their increased incorporation into semen lipids. We speculate that DHA of ram sperm originates largely via de novo synthesis in the testis from the precursor fatty acid C18:3n-3.

Protein synthesis in the liver is differently altered by the dietary supply of nitrogen/energy ratio in lambs

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The amino acid (AA) supply to the muscles and the production efficiency depends partially on the liver AA removal (major fates of AA in the liver are protein synthesis (PS) and ureagenesis). The liver is also at the crossroad of AA and energy metabolism, which also impacts on AA availability. The aim of this study is to challenge liver PS adaptability to a low energy (E-) or low nitrogen (N-) feed supply compared to a well balanced diet (C) using complementary approaches: in vivo (A) and ex vivo (B). (A): 6 multi-catheterised lambs were fed the 3 diets according to a Latin square design and infused ^{13}C Leucine to measure liver exported PS. (B) 18 lambs were fed one of the 3 diets, slaughtered and liver slices were incubated ex vivo with ^{14}C Valine to measure PS. A significant decreased (æ) net AA hepatic uptake in both E- (-18%) and N- diets (-38%) was observed. Is PS responsible for this æ hepatic removal? The answer is yes in the E- diet because in vivo PS æ (-12%). Since no stimulation of PS was shown ex vivo, external regulatory factors like insulin (arterial concentration: -25%) may regulate PS in vivo. N- diet had no effect on in vivo PS (P=0.84) but ex vivo PS ä (+47%) : the liver was more efficient to sustain PS with less AA available; the mechanisms involved are not linked to insulin and remain to be determined. In N-, other metabolic pathways are responsible for the æ net hepatic AA uptake.

Dry matter and NDF rumen degradability assessed by two *in vitro* techniques on seven feeds

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Dry matter (DMd) and NDF (NDFd) degradability of 0.5 g of corn meal, soybean meal, sugar beet pulp, dried corn silage, alfalfa hay, grass hay and wheat straw were assessed *in vitro* with Daisy^{II} (D) and with an automated gas production batch system (AGS). Incubations (48 h at 39 °C) were performed in same conditions: 3 rumen fluid donor cows, laboratory, staff and procedures. Two experiments, one for DMd and the other for NDFd, were performed. In each experiment, 3 trials x 7 feeds x 4 jars x 3 replications and 3 trials x 7 feeds x 3 replications were performed with D and AGS, respectively. For D and AGS the DMd mean values were 67 vs. 79% ($P<0.01$) while for NDFd were 58 vs. 71% ($P<0.01$), respectively. The DMd and NDFd mean values provided by both techniques for the 7 feeds were correlated: $DMd_D=1.17*DMd_{AGS}$ -25.8 ($SE_D=4.5\%$; $R^2=0.93$) and $NDFd_D= 1.26*NDFd_{AGS}$ -31.8 ($SE_D=10.6\%$; $R^2=0.83$). With D the standard deviation (SD) for DMd and NDFd of the feeds ranged from 2.3 to 8.8% and from 2.1 to 12.2%, respectively, while with AGS the SD values ranged from 0.4 to 2.9% and 1.0 to 4.3%. AGS provided more repeatable measures of DMd and NDFd than D and also provided repeatable kinetics of gas production.

Effect of feeding whole wheat or whole oat grain on particle size and whole grains in faeces from lamb

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The aim of the present experiment was to compare faeces characteristics in lamb fed either whole wheat (W) or whole oat grain (O) ad libitum. Nineteen Shropshire lamb were spitted up into 2 equal groups from weaning at 20 kg to slaughter at 45 kg. They were fed whole grains ad libitum plus 100 g protein concentrates per lamb twice daily. The average daily intake of W and O one week before slaughter was 1100 and 990 g, respectively. At that time faeces were collected twice daily during two days, washed in bags with a pore size of 10 µm, dried and sieved into five sieving fractions plus whole grains before canning. Particle length (PL) and width (PW) were measured by image analysis. Data were analysed by proc mixed in SAS 8.2. Proportion of particle dry matter (PM) in faeces dry matter, proportion of whole grains in PM and particles retained in the bottom bowl were affected by grain type ($P<0.05$). The arithmetic mean PW, the most frequent PW, the median PW and the 95% PW values in PM excl. whole grains were affected by grain type ($P<0.05$). O and W grains accounted in average for nine and sixteen percentage of faeces PM, respectively. In conclusion, the ability of the reticulo-rumen to retain whole grain appears to be related to the intake of physical effective fibre

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Effects of sodium bicarbonate supplementation on milk yield and milk fat ratio of dairy cows under high temperature conditions

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An experiment was conducted to investigate the effects of sodium bicarbonate supplementation on milk yield and milk fat ratio of dairy cows raised under high temperature conditions. 12 Holstein cows divided into 2 groups and fed with regular (control) and sodium bicarbonate supplemented (2%) diets during the 8-week experimental period. Feed consumption, regular and 4%-fat corrected milk yields, fat-free dry matter, pH, density of the milk were found to be 17.49±1.10 and 17.15±0.99 kg; 16.70±0.86 and 16.72±0.72 kg; 12.34±0.71 and 13.21±0.64 kg; 10.57±0.50 and 10.98±0.19%, 6.56±0.33 and 6.63±0.30; 1.018±0.001 and 1.017±0.001 g/ml for the control and bicarbonate groups, respectively; while, body temperatures were 39.25±0.65 and 39.04±0.45 ^{0}C; number of pulse 85.57±7.02 and 77.91±4.70 per m; respiration counts 82.41±8.83 and 80.83±4.06 per m. Thermal humidity index (THI) calculated for July and August were 79 and 78. There were no significant differences between the two groups in terms of the criteria evaluated above ($P>0.05$). Depending upon the data obtained from the experiment, it could be stated that sodium bicarbonate supplementation of the diets during hot and humid days of Summer in Antalya did not significantly affect they performance and milk composition criteria in Holstein cows.

Influence of exogenous enzymes from anaerobic source on growth performance, digestibility, ruminal fermentation and blood metabolites in lambs fed of orange pulp silage in total mixed ration

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Thirty Rahmani lambs (21.1±1.01 kg BW) were assigned equally to three experimental groups in a randomized complete block design. The experimental groups: control (CTL) 30% yellow corn (YC) and 0% orange pulp silage (OPS), T1 :23% YC and 15% OPS and T2 :23% YC and 15% OPS-ZADO) in TMR Anaerobic exogenous enzymes (ZADO®) was added at 0.5% in the total mixed ration (TMR). Growth performance (during 12 weeks), digestibility, ruminal fermentation activities and blood metabolites were observed. ADG of lambs was improved (P<0.05) by 58 and 95% in T1 and T2 groups, receptivity, versus CTL. Partially replacement of YC with OPS or OPS-ZADO improved the nutritive value and all nutrient digestibility of the TMR TDN was improved (P<0.05) by 7% in T2 than CTL. DCP was increased by 4% in T1 and T2 than CTL. Plasma globulin was increased (P<0.05) in T2 with a significant reduction of plasma cholesterol concentration than other groups. Total VFAs were higher (P<0.05) in T2 groups than others. A partially replacement of OPS-ZADO with YC in TMR improved the nutritive value, animal performance and immunity in sheep.

Effect of increasing of Canola meal in Midlactation Holsteins diet on milk yield, milk composition and some blood metabolites

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In this experiment, effect of Canola meal utilization on milk production performance and some blood metabolites of lactating Holstein cows were studied. Twelve lactating cows in third-parous with average weight of 585±55 kg, milk yield 36±6 kg and days in milk 109±22 were used. A latin square (cross over time) design was conducted in which 4 treatments were tested in 4 period of time and 3 squares. Each period included of 14 days adaptation and 10 days for blood and milk sampling. Milk fat, protein, lactose, total solids, solids non fat and urea and blood 3-Iodothyronine, thyroxin and albumin levels were determined. Results showed by increasing the level of Canola meal in the diets, milk composition such as fat, protein, lactose, total solids and solids non fat were significantly increased but no significantly variation was found for raw milk yield, 4% fat corrected milk and milk urea concentration. In addition, inclusion of Canola meal did not affected the blood 3-Iodothyronine, thyroxin and albumin.

Both high-starch and low-starch concentrates can develop the rumen function of unweaned dairy calves

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Eight Friesian calves were implanted with a ruminal cannula at 1-2 wk of age to study effects of type of concentrate on rumen development. From d 4 calves were fed 4.8 kg/d of skim milk-based milk-replacer (610 g powder/d) in two meals. Calves were individually housed in pens with no bedding and no access to hay. Four calves had free access to a traditional starch-based concentrate (T) and 4 calves to an alternative low-starch high-fibre concentrate (A). A contained 16.2% cereals, 30% grass pellets and 24% sugar beet pulp compared with 57, 2.5 and 3.4%, respectively, in T. A and T were similar in protein (19%), but varied in starch (106 vs. 320 g/kg DM), NDF (360 vs. 165 g/kg DM) and ME (13.0 vs. 14.2 MJ/kg DM). Rumen fluid was obtained in wk 2, 3, 4, and 5. In A compared with T calves, concentrate intake was 257 and 128 g/d (n.s.), average rumen pH 5.61 and 6.32 ($P<0.02$), and daily gain 438 and 380 g/d (n.s.). At d 40, rumen weight ($P<0.11$), papillae length ($P<0.06$) and shape ($P<0.07$) were improved in A- compared with T-calves. However, the treatment effects seen were mainly due to two T-calves hardly eating any concentrate (28 g/d) having high rumen pH and weak papillae development. When excluding these two calves, treatment differences disappeared. Thus, at the same level of concentrate intake, rumen development was not different between the two types of concentrates.

Prediction of rumen degradation of starch from maize grains by boiling with α-amylase solution

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The objective of this study was to predict rumen degradation of starch using an extraction procedure by boiling with a α-amylase solution for 30 minutes. Three fistulated ewes fed a diet based on maize silage (50%, DM basis) were used for the in sacco incubations. Fifteen samples of maize ground grains (4 mm) were incubated in the rumen for 3, 6, 9, 12, 18, 24, 36 and 48 h. After incubation, residues were ground (0.5 mm) and analysed for starch. The degradation constants were estimated from the equation p=a+b[1-exp(-ct)] and the effective degradability (ED) was calculated as: a+[(bc)/(c+k)] for passage rate (k) of 0.02/h (ED2) and 0.07/h (ED7). Correlations were established between in sacco degradation constants and ED and starch soluble in α-amylase solution. No significant ($P>0.05$) correlations were found between starch degradation constants determined in sacco (a, b and c) and starch soluble in α-amylase solution. However, starch soluble in α-amylase solution explained 85.6, 81.1 and 81.6% of the variation in predicting a+b, ED2 and ED7, respectively ($P<0.001$). We concluded that boiling with α-amylase solution has potential to accurately predict in sacco ED of starch from maize ground grains.

The Small Ruminant Nutrition System, a nutrition model to account for dietary supply and requirements of nutrients for sheep and goats

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The Small Ruminant Nutrition System (SRNS) is a mechanistic model to predict nutrient requirements and biological values of feeds for sheep and goats based on the Cornell Net Carbohydrate and Protein System framework. The evaluation of the SRNS for sheep using published papers indicated no mean bias (MB; 1.1 g/100 g) and low root mean square prediction error (RMSPE; 3.6 g/100g) when predicting dietary OM digestibility for diets not deficient for ruminal nitrogen. The SRNS accurately predicted gains and losses of shrunk body weight (SBW) of adult sheep (MB = 5.8 g/d and RMSPE = 30 g/d) when diets were not deficient for ruminal nitrogen. The SRNS for sheep had MB varying from -34 to 1 g/d and RSME varying from 37 to 56 g/d when predicting average daily gain (ADG) of growing lambs. In the SRNS for goats, energy requirements are predicted based on the equations developed for the SRNS for sheep, modified to account for specific requirements of goats. The evaluation of the SRNS for goats showed accurate predictions for ADG of kids (RMSEP = 32.5 g/d), daily ME intake (RMSEP = 0.24 Mcal/d g/d;), and energy balance (RMSEP = 0.20 Mcal/d g/d; r^2 = 0.87) of goats. The SRNS model is available at http://nutritionmodels.tamu.edu.

Effect of incubation medium nitrogen content on gas production and prediction of *in vivo* organic matter digestibility of grass silage

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The effect of incubation medium N content on in vitro gas production (IVGP) and prediction of in vivo organic matter digestibility (IVOMD) of grass silage was studied. 24 samples were incubated for 96 h in buffered rumen fluid with N added to the medium (N^+) or not (N^-). Fermentation kinetics otained using the N^+ or the N^- medium were described according to a generalized Michaelis-Menten model. Data were analysed using the GLM procedure of SAS. Stepwise multiple regression analysis was used to obtain prediction equations for IVOMD using IVGP parameters. Medium N content did not affect asymptotic gas production or the shape of the curve, but time to reach half of the asymptotic gas production (B) was shorter (16.7 vs 23.1 h; $P<0.05$) for samples incubated in the N^+ medium. Maximum IVGP rate was higher (0.0497 vs 0.0345; $P<0.001$) and it occurred sooner in time in N^+ incubated samples. Regardless of the N medium only the B parameter showed significant correlations with IVOMD, but they were higher for samples incubated in the N^+ medium (-0.77 vs -0.72). Correlations between maximum IVGP rate and IVOMD was higher with samples incubated in the medium N^+ (0.85 vs 0.75) and ocurred sooner in time (12 vs 15h). Improved IVOMD predictions (R^2) were achieved with the N^+ medium (0.76 vs 0.52). In conclusion, exogenous N should be added to the incubation medium of grass silage to allow an optimal microbial growth.

Carcasses of Belgian Blue double muscle culled cows or growing fattening bulls: essential fatty acids content in 17 meat pieces

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In human diets, meat is a large source of proteins, trace nutrients and minerals. There are also polyunsaturated fatty acids of the n-3 and n-6 series. In Western Europe, beef meat represents a rather large part of meat consumption. The carcasses are cut in pieces for specific use in meal preparation. As opposed to the usual practices in other breeds, the carcasses of the Belgian Blue double muscles animals are cut according to the muscles. A total of 52 carcasses -32 from culled cows and 20 from growing fattening bulls- were used. The carcasses were cut in a plant associated to the slaughterhouse. A total of 17 different muscles pieces were obtained and packed for sale. A sample was taken from each piece for fatty acids analyses. The total fatty acids content was on average 1038.0 mg/100g in the cows and on average 425.3 mg/100g in the bulls ($P<0.001$). The content of C18:1n9/7, C18:2n6, C18:3n3 varied to a large extent ($P<0.001$) between muscles. It was on average 246.9 mg/100g with extremes of 108.4 and 561.6 for C18:1n9/7. The corresponding values were 95.9, 72.3, 122.4 mg/100g for C18:2n6 and 18.3, 14.1, 23.4 mg/100g for C18:3n3. A close relationship ($R^2=0.98$) was calculated between the C18:1n9/7 and the total fatty acids content while there were no relationships between the C18:2n6 or the C18:3n3 and the total fatty acids contents ($R^2=0.01$ and 0.28 respectively).

Nutraceuticals in dairy cow nutrition: an overview

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Nutraceuticals are different products, which are produced or isolated from feeds, like fatty acids and selenium, that have physiological influences or provide protection against some chronic diseaes. Dietary fats have impacts on the lactating dairy cows, especially when their diets have a lack of energy and some fatty acids (e.g. linoleic acid, conjugated linoleic acid) can interact as substrates for specific enzymes. Feeding by-pass fat, which are rich in EPA and DHA can absorbed from the gastrointestinal tract and they effect not only the lactation level, but also the pregnancy. The fat supplementation containing conjugated linoleic acid can decrease milk fat content and enhances the energy balance especially in special environmental circumstances (e.g. in high temperature). Feeding fats containing high linoleic acid can decrease the interval to first ovulation, reflecting an improved health status and resulting an increased pregnancy rate.Feeding of organic selenium sources, like selenium yeast in the periparturient period can improve the immun responses and increse the second service pregnancy rate. The use of some antioxidants, like beta-carotene for an extended period postpartum can increase not only the pregnancy rate, but also milk yield. Therefore the supplementation of dairy cow diets with nutraceuticals not only can have positive influences on milk yield but also can reflect major advancements in housing, nutritional managemnt and health protection.

Effect of Yea-Sacc on the persistency of the milk production of high performing dairy cattle on a fiber feed

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A dairy trial was set up at agricultural highschool during 90 days . Two groups (control and a treatment group) were put on the same basal feed containing high levels of silage (corn, grass; triticale), soybean and rapeseed meal, beet pulp and a mineral/protein concentrate. The control (17 cows) versus treatment (16 cows) were constructed based on number of lactations (2.8 and 2.7resp.), days in milk (132 and 137 resp.), milk production, milk fat and protein and SSC. Cows were milked at most 3 times a day and treatment cows received at maximum twice a day 5 g Yea-Sacc (provided by 25 g of Yea-Sacc Powder) in the milk robot dosed on top of the. Stats on milk production, milk fat + protein, and on SCC were performed on a monthly basis using a Students T-test.. Results indicated that during the trial period a significant difference in milk production ($p< 0.05$) between control and Yea-Sacc of 1.5 kg/cow/day was measured during the trial period while somatic cell count stayed low. Milk fat and protein levels did not change. It can be concluded from this trial that even on a high quality feed, in which safe margins to reduce the risk of acidosis, Yea-Sacc gives and additional increase in milk production of 1.5 kg/cow/day due to improved rumen function.

Effects of by-products from biofuel production on feed intake and performance of growing fattening bulls

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The high global demand for energy leads to an increasing production of biofuel. During the production process starch and plant oils are used. The remaining protein rich by-products such as rapeseed meal (RSM) and distillers dried grains with solubles (DDGS) are available for animal nutrition, but the variety of production processes leads to a wide variation of feed quality. The aim of this study was to compare the use of RSM and DDGS with soybean meal (SBM) in diets for fattening bulls in order to evaluate effects on feed intake and performance parameters. 59 Holstein bulls (four groups) started the trial at an initial live weight of 246 kg. The bulls received 0.5 kg/d of a mineral premix and maize silage for ad libitum intake. In addition the animals were offered either SBM (1.1 kg/d), RSM (1.5 kg/d), DDGS (1.7 kg/d) or RSM+DDGS (0.8+0.8 kg/d). The experimental rations were formulated to be isonitrogenous and isoenergetic. Feed intake as well as daily liveweight gain was registered individually. The bulls were slaughtered at 558 kg live weight. Daily DM intake was 7.5, 7.6, 7.7 and 8.0 kg, and the crude protein content of the diets 14.2, 14.0, 14.4 and 14.3%, respectively. The daily weight gains were 1380, 1410, 1300 and 1450 g for SBM, RSM, DDGS and RSM+DDGS respectively, and were significant different only between DDGS and RSM+DDGS. It can be concluded that RSM and DDGS are suitable to replace SBM in diets for fattening bulls.

Effects of chitosan extracts on *in vitro* ruminal degradation and fermentation of rations differening in the forage to concentrate ratio

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The in vitro gas production technique was used to study effects of different chitosans differing in the deacetylation degree (75; 85 and 95%) on rumen microbial metabolism. 750 mg/L of culture fluid of three chitosans (CHI1, CHI2, CHI3) was incubated for 24h in diluted ruminal fluid with tree rations differing in their forage to concentrate ratio (80:20; 50:50; 20:80). Each treatment was tested in triplicate in two periods. Samples were collected for volatile fatty acid (VFA). Methane concentration was estimated stoichiometrically. In vitro true organic matter digestibility (IVOMD) was also calculated. All chitosans significantly decreased the rations' IVOMD but to a higher extent in the 80:20 ration (535.2; 515.5; 493.2 vs 677.8 g/kg). However, none of the chitosans significantly decreased total VFA concentration. CHI2 and CHI3 increased the molar proportion of propionate increasing c3:c2 ratio with all rations, but more extensively in the 20:80 ration (0.4; 0.5; 0.5 vs 0.3). All chitosans significantly decreased methane production in the 80:20 ration (0.8 vs 1 mmol/d), but only CHI2 and CHI3 significantly reduced it in the 20:80 ration and to a higher extent (0.7 vs 0.9 mmol/d). In conclusion chitosans may allow the manipulation of rumen microbial fermentation regardless of the feedstuff incubated, however more promising results could be achieved in diets rich in concentrate.

Dose-response effects of chitosan extracts on ruminal degradation and fermentation of a high concentrate ration

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The in vitro gas production technique was used to study the dose-response effects of chitosans on ruminal fermentation of a high concentrate ration. Three different chitosans (CHI1, CHI2, CHI3) at four different doses (0,325, 750,1500 mg/L culture fluid) were incubated for 24h in diluted ruminal fluid with a 20:80 forage to concentrate ration (NDF: 32.23%; CP:21.37%). Each treatment was tested in triplicate in two periods. Samples were collected for volatile fatty acid (VFA). Methane concentration was estimated stoichiometrically. In vitro true organic matter digestibility (IVOMD) and partitioning factor were calculated. All chitosans significantly decreaded the IVOMD (701.7; 687.4; 684.5 vs 857.1 g/kg), and this reduction was progressive as the dose increased from control to the highest dose. However, none of the chitosans significantly decreased total VFA concentration at any dose. The highest doses of chitosans significantly increased the VFA/OM truly degraded substrate ratio (8.9; 9.1; 8.4 vs 7.3 mmol/d). CHI2 and CHI3 significantly increased the molar proportion of propionate significantly increasing c3:c2 ratio as dose was increased (0.58-0.49-0.37;0.65-0.54-0.42 vs 0.3). CHI2 and CHI3 significantly reduced methane production in a greater extent with the highest doses (0.65;0.55 vs 0.9 mmol). In conclusion careful selection of chitosans and doses is necessary to achieve beneficial responses in rumen fermentation.

Effects of chitosan extracts at different doses on *in vitro* ruminal degradation and fermentation of a fat rich ration

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The *in vitro* gas production technique was used to study the dose-response effects of chitosans on ruminal fermentation of a fat rich ration (10% DM basis). Three different chitosans (CHI1, CHI2, CHI3) at three doses (0, 750,1500 mg/L of culture fluid) were incubated for 24h in diluted ruminal fluid. Each treatment was tested in triplicate in two periods. Samples were collected for volatile fatty acid (VFA). Gas production values were recorded. Methane concentration was estimated stoichiometrically. *In vitro* true organic matter digestibility (IVOMD) and fat content in the residue of incubation were calculated. Data were analysed using the PROC GLM procedure of SAS. Except for CHI3, all chitosans decreased the IVOMD in a dose dependent manner (500.6-568.1; 576.7-587.8 vs 684.7 g/kg) and increased the amount of fat in the residue with the highest dose (14; 14; 13 vs 8 mg). However, none of the chitosans at any dose decreased total VFA concentration. All chitosans increased the molar proportion of propionate increasing c3:c2 ratio (0.4 vs 0.3), and this increase was dose dependent. CHI2 and CHI3 significantly reduced methane production regardless of the dose (0.7; 0.8 vs 1 mmol/d). In conclusion chitosans may allow the manipulation of rumen microbial fermentation of a fat rich ration and a careful selection of chitosans and doses may allow achieving beneficial responses in rumen fermentation in fat rich rations.

Effect of concentrate quantity on milk parameters and grazing time in a rationed dairy sheep grazing system

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Dairy sheep production systems in the Basque Country are based on pasture utilisation by partial time grazing in spring. In this period forage resources are managed by shepherds matching herbage, forage and supplements with production requirements. The aim of this study was to evaluate the effect of concentrate quantity on dairy milk yield (DMY) and quality (% fat and crude protein), grazing behaviour and live weight (LW). The experiment was conducted over 4 weeks with Latxa dairy ewes. Sheep were blocked into homogeneous groups of 12, and each block was randomly assigned to 1 of 3 different concentrate quantities (CQ): 500, 750 and 1000g/d. Each ewe received 275g DM of lucerne hay and had access to pasture 4 h/d. Data were analysed considering as fixed effects concentrate quantity, week, their interaction and a covariate (initial values). As for grazing time, the lowest the CQ offered the longer the grazing time (56.3, 54.6, 35.9 min/h). However, CQ level did not significantly affect DMY (1.08, 1.12 and 1.07 l/d) or quality (fat: 6.33, 6.54, 6.14%; crude protein: 4.95, 5.05, 4.89%). Therefore, it seems that low-middle CQ ewes covered milk production needs by grazing and high CQ ewes used the exceeding energy to increase LW (61.4, 61.3 and 62.6 kg, $P<0.05$) instead of DMY. In conclusion in this production system no economical advantage is achieved when offering more than 500 g/d of concentrate.

Effect of a modified glucomannan fraction from yeast cell wall extract (Mycosorb®) on milk production of lactating Mediterranean Italian breed buffaloes

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The objective of this study was to evaluate the effect of a modified glucomannan fraction from yeast cell wall extract (Mycosorb®, Alltech Inc.) on milk quality (SCC, % fat & protein) and quantity. The study was conducted where visual observations indicated the presence of mycotoxin contaminated forage. The trial was done on a "before and after" basis with production figures being compared before and after the inclusion of Mycosorb Farm Pak. (including Mycosorb at 20% on a carrier). Mycosorb Farm Pak was distributed at 100 g/head/days for the first 10 days and 50 g/head/day after until the end of the trial. The study was conducted with 87 Lactating Buffaloes (Mediterranean Italian breed). The basal diet consisted of corn silage, Ryegrass hay, maize meal, feed concentrate (28% proteins). With inclusion of Mycosorb in the diet, the aflatoxin M1 level in the milk was decreased from 10 ng/Kg to 5 ng/Kg after 24 hours and remained at these levels for the remaining 15 days; milk protein improved); milk yield increased by 0.130 l/h/d.In conclusion, the inclusion of Mycosorb into the diet can be used to improve the productive performance, milk composition and reduce aflatoxin M1 level in the milk of lactating Mediterranean Italian breed buffaloes.

In sacco degradability of amino acids in rapeseed meal and extruded rapeseed meal

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In this study, nutritive value of rapeseed meal and extruded rapeseed meal were compared. The degradability experiments were performed using in sacco method in three dry cows (Black Pied) with a large ruminal cannula (120 mm internal diameter). The cows were fed twice a day (at 6 a.m. and 4 p.m.) and their daily feed rations consisted of alfalfa hay (4 kg), maize silage (10 kg) and barley meal (1 kg) with a vitamin and mineral supplement. The bags (nylon bags of pore size 42 mm - Uhelon 130 T, Silk & Progress Moravska Chrastova) containing feed samples were attached to a cylindrical carrier. They were incubated in the rumen for 2, 4, 8, 16, 24 and 48 hours. The effective degradability of amino acids (rumen outflow rate 6%.h^{-1}) was determined as follows (in %): Arg 82.5, 86.0; His 84.5; 91.3; Ileu 89.6, 86.5; Leu 90.6, 87.4; Lys 82.4, 87.8; Met 97.6, 91.5; Phe 93.9, 87.1; Tre 86.7, 85.5; Val 89.6, 86.6; Ala 93.3, 87.7; Cys 76.2, 90.1; Gly 89.1, 87.9; Pro 81.2, 87.2; Ser 87.2, 85.9; Tyr 87.2, 86.8 for rapeseed meal and extruded rapeseed meal, respectively. The statistical differences were determined for all amino acids ($P < 0.05$), except of Tre, Gly, Ser, and Tyr. This research was supported by the Ministry of Agriculture of the Czech Republic (NAZV, project No. 1B44037 and MZE 0002701403).

Effect of increasing of Canola meal in Midlactation Holsteins diet on apparent total tract digestibility of nutrients

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In this experiment, effect of Canola meal utilization on coefficients of digestibility and protein degradability in lactating Holstein cows were studied. Twelve third-parous lactating cows with average weight of 585±55 kg, milk yield 36±6 kg and days in milk 109±22 were used. This study was carried out on a Latin square (turn over in time) statistical design basis with 4 treatments: treatment 1, 2, 3 and 4, containing 0, 25, 50 and 75 percent of ration total protein meals respectively, as variable in 4 period of time in 3 squares. The experiment was divided to four 14-d adaptation period and 10 days as sampling period. Rations chemical composition and protein fractions were determined according to AOAC - Van Soest & CNCPS respectively. Also, In vivo digestibility of applied rations was assessed using acid insoluble ash as marker. Results indicated that increasing the Canola meal in diets caused significant increases in acid detergent fiber and neutral detergent fiber digestibility coefficients for ration 4 in comparison with rations 2 or 3. In the other hand, soluble protein concentration especially non protein nitrogen fraction of Canola meal was significantly higher than Soybean meal and Cotton seed meal. Also, neutral detergent insoluble nitrogen of Canola meal was significantly lower than Cotton seed meal which this could improve digestibility of ration.

Influence of grass composition on milk urea content with grazing dairy cows

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Nitrogen (N) excretion in cattle increases with dietary N level. The N content of grazed grass in intensive grassland production is often largely in excess as compared to the requirements in the dairy cows. It is difficult to estimate the N excretion by cattle in pastures. Indicators are therefore needed to evaluate risks of N losses with animals on grass. The first aim of this experiment was to study the effects of crude protein (CP) and soluble carbohydrates (SC) contents in grass on milk urea content. The second aim was a prediction of milk urea content from the chemical composition - fat and protein - of milk, which are parameters easily available in commercial farms. The present data were obtained from grazing trials carried out at the Experimental Research Station in Liège during 10 years with dairy cows in a rotational system. The cows grazed from May the 1st till mid October and received 1 kg of dried sugar beet pulp per day. CP and SC contents were determined in grass by NIR method. Urea, fat and protein contents were determined in milk tank samples every 2 or 3 days. The best regression for milk urea content (R^2=0.62) was obtained when calving date (P<0.06), milk fat (P<0.001), milk protein content, SC (P<0.02) and CP (P<0.05) in grass were included in the model. It could be speculated that the SC content in grass effect on milk components was an energy effect of the diet – grass – while surprisingly, the effect of CP content in grass was less strong.

Convergence of scientific disciplines: a necessity for system based research and development

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In 2000 Wageningen UR started the Interdisciplinary Research and Education Fund (INREF). INREF is development oriented and conducted by 'sandwich' PhD students working in the South. INREF aims to produce research that makes a difference to the end users, to trigger innovative, interdisciplinary and comparative research, development and education, to strengthen interdisciplinary education at Wageningen University, to expand international partnerships and to attract funding. The research should have a problem and social focus and aim at institutional capacity building. In the first and second phase two of 6 programs in Africa, SE Asia and Latin America included livestock and fish. INREF-POND focusing on integrated aquaculture-agriculture systems will be presented. Tilapia breeding in low input environments, pond nutrient management, the nutrient dynamics of low, medium and high input mixed farming systems and the socio-economic context were addressed. African,Vietnamese and Dutch students graduated with varying levels of interdisciplinarity. Partners are the World Fish Centre in Egypt, Can Tho University and the departments of Animal and Environmental Sciences of WU. The goals of Competing Claims on Natural Resources executed in Southern Africa will be presented in more detail. The program has developed a multiscale framework and the Describe, Explain, Explore and Design method to carry out research to enable poor communities.

How to educate animal production systems specialists?

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Animal Production Systems graduates explore sustainable development options for complex problems of animal production systems. They are taught in the discipline 'systems approach'. Graduates are characterised by being able to; 1) analyse and assess characteristics and functioning of diverse animal production systems in their ecological and societal context at regional, national and global level; 2) analyse and assess consequences of various animal production systems for the environment and society; 3) design more sustainable systems; 4) interpret the concept of sustainability. To reach these objectives students receive three courses. In the first course they acquire the language of discipline. Students learn, e.g., to define components of the system, relations between components within the system, boundaries, and possible inputs and outputs of the system. In the second course they learn to apply methods used to study sustainable development in animal production systems. They learn, e.g., how to collect and analyse data about societal and economic consequences of systems with animals. In the third course they learn to develop projects to study complex problems related to new systems within animal production. Students apply learned methodologies to emerging systems with animals in Europe or in developing countries. Finally, students apply the systems approach in their MSc thesis.

Session 30 Theatre 3

Application of social science methods in livestock farming system research

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Livestock farming systems (LFS) research focuses on integrated approaches to the livestock sector viewed as complex nested systems encapsulating social and biotechnical systems, in order to cope with challenges for sustainable development of livestock production. The fundamentals of this research area are developed from frameworks provided by general theories about complex adaptive systems, and by sustainability sciences. General methodology is built with scientists from a wide array of disciplines, from ecology to social sciences. Interdisciplinary approaches allow considering concomitantly behaviour of human actors, economical means, technology and biological processes involved and support the understanding of the dynamics and development topical issues of real-life livestock farming systems. We review in the paper the use of social sciences methods in LFS research to assess livestock-farm management strategies, the variety in farm dynamics and interrelationships between farmers and other actors within the rural areas and the food chain. Such approaches impulse a renewal in the relationships between scientists and the socio-economical actors of the livestock sector in order to enhance common capacity to meet the challenges for sustainable development. In the last part of the paper we discuss from the experience gained the conditions for an efficient use of methods originating in social and other sciences in animal production research projects which are sustainable-development oriented.

Session 30 Theatre 4

Product value chain analysis methods in the livestock sector

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The market oriented livestock sector is a complex process with horizontal and vertical interactions and scales.The focus on multiple objectives, participatory interaction, multi-disciplinarity, on food nutrition and health, on technology, sustainability and product safety resembles a paradigm shift in R&D and the respective education. The method toolbox includes rapid and in-depth approaches with participation or external actors. Partnership arrangements are required for the vertical and horizontal scale and stakeholder involvement and allow implementation of participatory action research (PAR) following a learning cycle. PAR methods avoid the traditional relation between subjects and objects and involve existing knowledge settings and norms. Analytical methods to be applied at a given chain level should address production efficiency and effectiveness. At the producer level, e.g. dairy production, could include the checklist for Quality Management (QM dairy), enterprise related cost-benefit calculations, parameter of herd dynamics and the relevant set of performance parameter. The Institutional Analysis for Development (IAD) methods focus on relations among stakeholders and organisations along the chain, the institutional change (policy, rules, regulations, legal setting), and factors driving change, information infrastructure and organisational effectiveness.

Session 30 Theatre 5

Approaches to environmental management and accounting in livestock farming systems
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Livestock systems are characterized by complex within farm interactions as well as a set of interactions with outside farm resources and impacts. In order to evaluate the effect of changed management in response to farmer's own priorities or external pressure, it's often not satisfactorily to just consider one part of the system. I.e comparing organic and conventional dairy systems, typically N utilization at the herd level is lower in organic systems compared to conventional systems, whereas when considered at the farm level, the N utilization is higher in the organic systems. In order to understand i.e nutrient dynamics it's relevant to consider each of the within farm compartments – herd-, manure storage-, and field pool, but at the same time to take into account their interactions, since each compartment cannot be managed separately in real life. Examples of such interaction are presented and a methodology for making such analysis is proposed. Similarly, while it's important to understand the on-farm dynamics, it's equally important to take into account use of off-farm resources in order to assess system functioning and efficiency and ultimately it's acceptability.

Session 31 Theatre 1

New tools in monitoring animal behavior and health for decision making
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The feasibility of including a body shape measure in methods for automatic monitoring of body reserves of cattle was evaluated. The hypothesis tested was that the body shape of a fatter cow probably is rounder than that of a thin cow and, therefore, may better fit a parabolic shape. An image-processing model was designed that calculates a parameter to assess body shape. The model was implemented and its outputs were validated against ultrasonic and thermal camera measurements of the thickness of fat and muscle layers, and manual body condition scoring (BCS) of 186 Holstein-Friesian cows. The thermal camera overcomes some of the drawbacks of a regular camera, and the correlation between its measurements and fat and muscle thickness was 0.48. The hooks and the tailhead nadirs of a thin cow diverged from the parabolic shape. Further research is needed in order to achieve fully automatic, accurate, body condition scoring and monitoring animal behavior and health.

Design of future dairy farming systems

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Future dairy farming systems should be designed to integrate grazing cows, animal and public welfare, environment, landscape and profitability. Innovations such as free-walk housing systems, mobile milking systems and the use of intelligent software can make different dairy farm systems more sustainable. A free-walk housing system has no cubicles. The extra space enables cattle to express their natural behaviour. The lying area can be made with anorganic bedding material like sand or plastic or with organic material such as compost or dried manure. In Minnesota (USA) much experience has been gained with compost dairy barns and in Israel with dried manure. Research is under way with free-walk housing systems using a variety of bedding materials. Cow comfort, emissions of ammonia and green house gasses will be measured as well as the economical consequences. Cows graze less in the Netherlands because farms are getting bigger and integration with an automatic milking system is becoming increasingly difficult. Therefore we are developing mobile milking systems to make grazing possible on larger farms and to follow dairy cattle in large nature areas. Recent developments in intelligent software have the potential to improve dairy management in all type of farming systems. For example introduction of Dynamic Linear Modeling (DLM) has provided a new self learning dynamic feeding system which enables economy of feed costs by indicating both efficient and less efficient cows.

Innovative Ideas of multifunctional land use in the global context

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Agriculture is the main reason of land use. The challenge is to develop sustainable land use systems in the context of superior importance and multi-functionality. Sustainable land use must integrate economics, ecology and social aspects and consider international commitments and globalisation. Natural and human resources define the land use patterns and potential. Innovative ideas are needed to create the land use of the future. GM-cropping is not the only new trend. In the last decades some ideas have influenced agriculture and land use as well: - Low input farming systems with added values, e.g., organic farming, PDO-production - Ethical farming, e.g., animal welfare on farms, historical/traditional farming - Non-food biomass production, e.g., energy and raw material goods - Agro-environmental schemes, e.g., maintenance of landscapes and biotopes - Educational and therapeutic agriculture, e.g., school farms, farming with handicaps These innovative ideas show that agricultural development with increasing food production through increasing input, intensification and specialisation is not the only route to go. Particularly in developed countries, these innovative land use pattern play an important role - last but not least for the image of farming. Many of these pattern have been developed by farmers and non-farmers in the western world. These innovations ask for adaptations to be economical applicable to other environments and societies.

Optimization of insemination decisions and value of pregnancy in dairy cattle

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Objective was to optimize insemination decisions for individual dairy cows and determine value of pregnancy. Currently, dairy farmers in the USA tend to not consider differences in individual animal performance when making decisions about the breeding period for nonpregnant cows. A more accurate computer program based on dynamic programming was developed. Innovative is that individual cow performance, such as future milk production, in the current lactation can be much more accurately taken into account than in the past. Consequently, the optimal decisions for some cows may be significantly different from those of earlier optimization programs and from current practice. Under typical assumptions for herds in the USA, optimal intervals to conception for average first and second parity cows were 133 and 112 days, respectively. Cows that produced 15% more milk had intervals of 169 and 140 days. Optimal average intervals to first insemination were 77 and 70 days for first and second parity cows but cows that produced 15% more milk had intervals of 99 and 77 days, respectively. Lower producing cows had shorter intervals. Costs per day earlier or later were negative before the optimum but increased to more than $4 later in lactation, depending on individual cow performance. Insemination values ranged from less than $0 to more than $200. New pregnancy values ranged from less than $0 to more than $800. The improvement in accuracy is an important step towards more realistic and practical computerized decision support on large dairy farms and will improve efficient and profitable dairy farming.

A cost effectiveness approach to identify cheap and accurate indicators to assess livestock impact on biodiversity

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During the last 20 years, numerous agro-environmental indicators have been developed and combined into models to assess the impact of livestock on biodiversity and to monitor agro-environmental policies. Surprisingly, most studies on indicators do not explicitly mention accuracy and cost as desirable properties. This paper reports the results of a study aimed at (i) measuring the accuracy and cost of a wide range of indicators combined into models for the assessment of livestock impact on biodiversity and (ii) discussing their usefulness on the basis their cost and accuracy. Nine model selection procedures (MS) and two cross validation techniques (CV) were used to combine two types of biodiversity indicators (stocking rate and sward characteristic) measured on 252 grazed plots during two years. Sensitivity, specificity, and probability of correctly ranking plots were estimated for each model. Results showed that MS and CV had low influence on accuracy. Accuracy and cost of models were mainly influenced by the type of indicators. Models based on stocking rate indicators only were less accurate (-8%) than those based on sward characteristics but they had the lowest cost (531 versus 2495 €) with a satisfactory discriminatory ability (c. 75%). This statistical method could support researchers, farm advisers, and decision makers in comparing various indicators.

Move the milking parlour to the cow

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The discussion about milking cows in the field is intensifying. About 85% of dairy farmers in The Netherlands keep the cows outside. Grazing is still cheaper. In a field study the family income of a small dairy farm (about 50 cows) varies from 21 K€ (housed inside) to 38 K€ (grazed outside). At a size of 110 dairy cows the family income varies from K€ 85 (housed inside) to 89 K€ (grazed outside). However, farmers get more problems with the management of a bigger herd in the field. Too, the extent of the herd does not comply with the scale of landscape. Consequently, with an increasing size of the herd a farmer tends to keep the cows permanently inside. To deal with these management problems farmers in the Netherlands developed a mobile voluntary milking system. This system can automatically milk the cows in the field, stand alone. We split the large dairy farm up in small efficient units of fixed groups of 60 cows, which can be milked and grazed at large distance from the farm. We started also to develop a cow management system based on GPS, which can influence the walking direction of the cows, and we will implement an automated strip grazing system. For the winter period we developed a new housing design: low cost and suitable to the landscape. This system is applicable in extensive farming regions and nature reservations.

Performance of using electronic identification for milk recording in dairy goats

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Murciano-Granadina goats (n = 24) were used to evaluate manual (M) vs. semi-automated (SA) system for milk recording. Milking was done once daily in a 2 × 12 platform (6 milking units by side). M used ear tags, on-paper data recording and manual uploading to a computer; and SA used electronic bolus, manual data recording on a reader and automatic data uploading to computer. Data were collected for groups of 12 goats for 15 test-days. No difference in recording time between M and SA was observed (1.33 ± 0.03 min/goat on average). Time for transferring recording data to computer was 4.81 ± 0.34 min and 1.09 ± 0.01 min for M and SA groups of 24 goats ($P < 0.001$), respectively, but only increased by 0.19 min in SA for each additional 24 goats. Overall milk recording time was greater in M than in SA (1.52 ± 0.04 vs.1.39 ± 0.04 min/goat; $P < 0.05$) . SA decreased with operator training. No difference in errors was detected between M and SA during recording (0.6%), but an additional 1.1% error was found in M at data uploading. Reduction in labour cost per milk recording ranged from 0.5 to 12.9 €, according to goats (24 to 480 goats), and accounted for 40% of the electronic identification costs. In conclusion, use of electronic identification proved to be an efficient system for milk recording. Expected benefit was greater with trained operators and larger goat herds.

Planning agents' work in cows artificial insemination services

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This study aimed at determining the optimal allocation of clients to agents and the optimal route for each agent. The agents provide artificial insemination services to dairy cow farms, which are provided in Israel by SION Ltd. The objective is to minimize total travel and work times of all agents, while balancing the average number of cow treatments (checking and insemination) and the average working hours per day among agents and serving all demanding cows within half day. Materials and methods: (1) a regression analysis was used to develop a model to predict the duration of cow treatments. The input for this analysis included the number of farms and the type, and the number of cows treated and preparation activities in each farm. (2) An optimization model was formulated for farm allocation and routes' design. (3) Heuristic schemes were developed to solve this model. Results: (1) 21% reduction of total traveling time. (2) 56% reduction in the standard deviation (SD) of daily work times. (3) 18% reduction in the SD of the number of worker's treatments. (4) Studying the impact of the geographic distribution of clients and agents locations on the solution, and (5) the trade-off between work balance and times.

Mastitis and lameness detection using different statistical methods

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The aim of the present study was to assess the potential of detecting dairy cow's diseases such as lameness or mastitis using serial information from milk yield, electrical conductivity of the milk, water and feed intake and activity. Data recording was performed on a dairy research farm. A dataset of about 13,500 observations from 138 Holstein cows was available over a time period of seven months. The reference data for incidence of mastitis were treatments and the weekly somatic cell count (SCC). Samples of SCC exceeding 400,000 and 100,000 cells/ml were used as two boundaries together with treatments to define cases of mastitis. Reference data for incidence of lameness were claw and limb treatments. Mastitis alerts were generated by a multivariate fuzzy logic model. If the sensitivity was set to be at least 80%, the specificities ranged between 75.8 – 93.9% and the error rate varied between 41.9 – 95.9% depending on mastitis definition. Lameness detection was performed with univariate control charts using the activity to find significant deviations as a sign for lameness. Depending on the design of the control charts sensitivity and specificity varied between 48 – 67% and 70 – 87%, resp., while the error rate was high with 88 – 98%. Multivariate analysis will follow in order to reduce the number of false positive alerts.

Determination of grazing pressure using RS Techniques and monitoring the change in grassland status by GIS

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This study was aimed to determine the grazing pressure using LANDSAT satellite images and to evaluate and compare the change in grasslands by years using GIS (Geographic Information Systems). For this purpose, maps showing currrent status of grasslands and those showing the distribution of grasslands 21 years ago were prepared for evaluation and comparison. The Lands at 5 TM satellite images taken in 2005 and the report on land use map in 1984 were used. To determine the current status of grasslands, red (0,45-0,52 µm), near infra-red (0,52-0,60 µm) and infra-red (0,63-0,69 µm) bands of images were used; unsupervised classification was applied and the distribution map of grasslands showing the present status was produced. To define the past status of grasslands the land use map was digitised according to the database revised in 1984. Then the two maps were overlapped in GIS and as a result, the change between years 1984 and 2005 was highlighted. This study showed that in 21 years of time, grasslands were decreased by 9.76%, while agricultural lands were increased by 8.65%. Furthermore, it was observed that the increase in agricultural land has created pressure on grasslands. Key words: Grasslands, Landsat, GIS, Land use

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Medium-term performance of electronic rumen boluses for the identification of different goat breeds in the U.S.

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Goats (n = 295) from 4 breeds were identified with 3 types of electronic bolus (32 mm HDX transponders) to assess the breed effect on bolus retention. Ruminal pH was used to evaluate feeding conditions. Bolus types were: B1 (75 g, 68 × 21 mm, n = 100), B2 (82 g, 69 × 21 mm, n = 100) and B3 (20 g, 56 × 11 mm, n = 95). Bolus distribution was (B1, B2, B3): Alpine (25, 24, 25), Boer-cross (26, 24, 23), Angora (25, 26, 24) and Spanish (25, 25, 23). Goats also wore a flag-button plastic ear tag (4.6 g, 51 × 41 mm). Bolus was read with a hand-held reader. Retention of boluses and ear tags (read/applied x 100) was monitored during 180 d. Ruminal pH was measured in samples of 5 goats at wk 1, 2, 3 and 4. Ruminal fluid was obtained at 2 h after feeding with an oro-ruminal probe. Ruminal pH differed according to breed and feeding conditions (lactating Alpine, 6.5; yearling Alpine, 6.7; Boer-cross, 6.6; Angora, 6.3; Spanish, 6.3; $P < 0.01$) but no effect was observed on bolus retention. Only 1 goat regurgitated a B3 bolus during a laparoscopy surgery. At 180 d, boluses and ear tags retention differed (99.6 vs. 97.2%; $P < 0.05$). In conclusion, breed and feeding conditions had no influence on bolus retention, which remained over the ICAR requirements (>98%). Long-term performance of the devices is under study.

Influence of a changed milk fat/ milk protein ratio by breeding measures on the greenhouse gas emissions in the milk production

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The reduction of greenhouse gases is an issue of worldwide importance. The further genetic increasing of the milk protein content at a simultaneous lowering of the milk fat content on basis of a high production level (e.g. 9000 kg of milk/cow/year) leads to a reduction of need of energy (for the milk fat production) and - at the same time - to a increasing of the food protein requirement for the milk protein production. This influences the excretions (e.g. N- excretion, CH4-emission) of the individual animal only a little (at constantly high production level). Related to the produced milk protein amount the excretion becomes, however, less and the positive effect on the environment is more signifcant. Under consideration of the calculated methane emission and N-excretion, the increase of the animal performance (under specific attention of an increased milk protein content) and a possible reduction of the number of ruminants should currently be the most effective measure for obtaining a decrease of methane emissions at short notice.

Maintenance of early pregnancy in ruminants

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Regression of corpus luteum (CL) is caused by a positive feedback loop between secretions of endometrial prostaglandin (PG) $F_{2\alpha}$ ($PGF_{2\alpha}$) and luteal oxytocin. Trophoblast cells of the conceptus secrete interferon-τ (IFN-τ) that inhibits $PGF_{2\alpha}$ secretion. Two IFN-τ regulatory mechanisms within the endometrium focused on expression of estrogen (ER) and oxytocin receptors (OTR), and control of the PG cascade. IFN-τ is associated with an inhibition in expression of ER to reduce OTR in the luminal epithelium of the endometrium. This is well established in sheep, as well as cattle, such that luteolytic pulses of $PGF_{2\alpha}$ are inhibited and lifespan of the CL is extended. IFN-τ also regulates PGH synthase-2 (PGHS-2), the rate limiting enzyme for PG production. In vitro studies with bovine endometrial cells demonstrated IFN-τ dose effects, negative to positive, on production of $PGF_{2\alpha}$. In vivo studies during early pregnancy documented an increase in endometrial PGHS-2 expression in cattle and sheep. However, endometrial PGHS-2 expression responses to intrauterine IFN-τ infusion among experiments were variable (i.e., +/-) in cattle and sheep. Strategies to attenuate PG secretion to increase pregnancy rates and embryonic survival have utilized fatty acids, bST and NSAIDs. IFN-τ regulates interferon responsive genes in the endometrium and in blood cells. Microarray technology has identified IFN-τ responsive transcriptomes that are up- and down-regulated in the endometrium.

Key steps from fertilisation to pregnancy in Holstein cattle

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This review will focus on key steps of the complex processes from fertilisation to pregnancy. Fertilisation, the activation of the embryonic genome, maternal recognition of pregnancy and embryonic loss are such key steps. Fertilisation rates can be high in heifers (≥90%) and are lower in cows. They are influenced by oocyte developmental competence, a criterion whose molecular basis is not well defined but obviously depends on gene expression. However, in this context glucose-6-phosphate dehydrogenase activity, activity of the kinases MAP and Akt, which are reflected by corresponding gene expression and mitochondrial activity, are useful markers to assess developmental competence of oocytes. The activation of the embryonic genome and the degradation of maternal transcripts and proteins occur simultaneously. Gene expression studies in the 8-cell compared to M II stage showed that there are approximately 300 genes up-regulated. Recognition of pregnancy involves molecularand cellular interactions among the conceptus, uterus and CL.In cattle, interferon-tau produced by the embryo acts in an antiluteolytic as well as in a luteotrophic manner. Data about embryonic losses show considerable variation among studies. They are mainly influenced by the observation period and the applied method. The greatest occurrence of mortality was observed until day 18. The increasing knowledge about the regulation of reproductive processes can lead to valuable tools for management of reproduction also of high yielding Holstein cows.

Factors affecting prenatal mortality in pigs

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During last decade improved selection on litter size has resulted in an ovulation rate of on average 25-30, with realised average litter sizes of approximately 13. Since fertilisation rate is usually rather high, prenatal losses are substantial and can have negative consequences for the surviving foetuses and thus newborn piglets. This review will focus on mechanisms of prenatal losses and management factors affecting prenatal survival and development. Major aspects are embryonic quality and the limited uterine capacity for the approximately 25 embryos. Early embryonic mortality (up to the implantation phase) is mainly due to developmental differences between embryos. After implantation losses occur mainly due to uterine crowding (too many embryos relative to uterine capacity). Uterine crowding leads to limited uterine space for the surviving foetuses, compromising further development. The quality of embryos can be affected in many ways. Even before ovulation the negative energy balance during lactation, but also nutritional factors during the follicular phase may affect oocyte quality and thus embryo quality. Also during pregnancy, nutritional factors may affect embryonic and foetal development and survival. Especially specific amino acids and vitamins can affect placental and foetal metabolism, partly compensating negative effects of restricted uterine space.

Comparison of sperm motility and progesterone level in relation to pregnancy rate of Ovsynch-treated Holstein cows

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The objective of study was to determine course of progesterone level (P4) in milk of Holstein Ov-synch treated cows between 10th day before and 35th day after evaluated AI and their pregnancy rate (PR) in relation to sperm motility in their cervical mucus during survival test (from 30 to 90 minutes). Milk samples were collected from 27 cows with reproduction problems from February to April 2006. Data set was analysed by general linear model with using of calving season, parity, level of milk production, number of evaluated AI and health status as a supplementary factors. Course of P4 in Ov-synch treated cows differed from supposed standard curve, we detected from 1.89 ng to 5.28 ng of P4 in day of evaluated AI. The highest PR and lower level of P4 from evaluated AI to 18th day after AI ($P<0.05$) were found in cows with best sperm motility in their cervical mucus after 30 and 90 minutes of survival test. Simultaneously, higher level of P4 from 6.58 ng to 7.58 ng ($P<0.05$) was detected in 25th day after evaluated AI in group of these cows. These results can indicate higher significancy of sperm survival in cervical mucus in relation to P4 level in milk for earlier determination of cow´s biological ability to conceive.

Plasma Inhibin A determination at periovulatory period could be predictive for buffalo fertility

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To test whether InhibinA assays can be used to predict the fertility in buffalo cows, 15 buffaloes were assigned to 3 synchronization treatments: group A (n=5) treated with PRID for 10 days+1000 IU PMSG and PGF2α (0.15mg cloprostenol) on the 7^{th} day; group B (n=5) treated as group A but PMSG and PGF2α were administered on the 10^{th} day; group C (n=5) received GnRH (150μg gonadorelin) on day 0+PGF2α on the 7^{th} day+GnRH on the 9^{th} day. Buffaloes were artificially inseminated at 72 and 96h from PRID removal in group A and B and at 84h from PGF2α injection in group C. Since 2 days before the 1st insemination the number and size of all follicles>2mm were assessed for 4 days by ultrasound and plasma InhibinA levels were measured. The conception rates were 60%,40% and 20% in groups A, B and C, respectively. In all groups there was a positive correlation between number of follicles>6mm and InhibinA ($r=0.92, P<0.0001$)assayed two days before the 1st insemination; a positive correlation between the same parameters ($r=0.97, P<0.0003$) assayed the same day was found only in pregnant buffaloes. In the same day the InhibinA levels were 29.6, 9.9 and 6.5 pg/ml ($P<0.05$) in groups A, B and C, respectively and 21.5 and 9.9 pg/ml in pregnant and non pregnant buffaloes. These results suggest that follicles>6 mm are the main source of InhibinA and this latter could be useful to predict the outcome of artificial insemination.

Interrelationships between body condition score, leptin and luteinising hormone secretion in fat-tailed sheep

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Data accumulated in our laboratory over the last ten years have been utilised to find out relationships between body condition score, plasma leptin concentrations and LH secretion in indigenous fat-tailed Tuj sheep. Body condition score was measured in the scale of 5 (1-emaciated to 5-obese). Leptin concentrations were measured in blood plasma by radioimmunoassay. LH measurement were carried out at various physiologycal stages, e.i anoestrous season, oestrous season or prepubertal period. Blood sampling for LH was carried out to find out both tonic and surge modes of secretion. For the identification of number of pulses, tonic secretion of LH was evaluated by PC PULSAR program. Overall, our results showed that body condition score was a useful tool in predicting pulsatile LH secretion. Body condition score was positively correlated with plasma leptin concentrations and also with surge mode of LH secretion. Plasma leptin concentrations, in turn, were positively correlated with LH secretion. As a general conclusion, leptin appears to be one of the mediators between body fatness and reproduction in fat-tailed sheep

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Response of the reproductive activity to melatonin treatment in Sarda breed sheep with different BCS

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The aim of this research was to investigate how much BCS could influence reproductive response, using male effect, in Sarda ewes treated with melatonin implants. For the research 80 adult ewes of an average age of 3,2 ± 1,3 years and lambed in November, were used. The animals were subdivided into four groups (n = 20 per group) as follows: group A, animals with BCS < 2.5 which were treated on April 20th with a subcutaneous implant at the base of the left ear containing 18mg of the melatonin (Melovine®, Ceva Santé Animale, Agrate Brianza, MI); group B, animals with BCS <2.5 not treated; group C, animals with BCS >2.5 treated on April 20th with the same implant of the group A; group D, animals with BCS >2.5 not treated. On May 25th two males were introduced in each group. From May 25th to July 7th, every week blood samples were collected from each animal for progesterone dosage. Moreover lambing date were recorded. All the animals of the A group, the 55% of the B group, the 60% of the C group and the 35% of the D group were cyclic within the first 28 days from males introduction. At the end of the experiment all the animals of the A and C groups were cyclic, vs the 90% of the B group and the 75% of the D group. In conclusion, BCS influences considerably the reproductive response to male effect and melatonin treatment improves reproductive efficiency.

Identification with cDNA microarrays of discriminant genes and gene networks involved in pig ovarian follicular atresia

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Folliculogenesis corresponds to the development of follicles leading to either ovulation or degeneration, a process called atresia. Even if atresia involves an apoptosis process, this mechanism is not well understood. The objective of this project was to analyse gene expression in pig granulosa cells of ovarian follicles during atresia using transcriptome analysis with a 9 024 cDNAs microarrays. Gene expression was then quantified in several physiological states of pig ovarian follicles. Two cross-classified biological factors are considered: the stage of development of the follicular growth (small, medium and large follicles), and the follicular status (healthy vs early or advanced atresia, determined by counting the number of pycnotic cells). One hundred twenty six significantly regulated genes were demonstrated using a linear model (ANOVA, FDR <0.1). They were clustered into three groups according to the follicular status. They could be assembled into networks such as those involved in development, early or advanced atresia. In conclusion, we have identified in the present study some gene networks involved in follicular atresia which will lead to a better understanding of the molecular regulation of follicular development and atresia.

Maternal feed intake during the peri-conception period alters hormonal environment of the embryo

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In sheep, reduced maternal feed intake during the peri-conception period alters fetal myogenesis. Early hormonal mediators for such events, however, are not well documented. Aim of the current study was, therefore, to investigate whether maternal feed intake influences hormonal environment of the embryo. Indigenous Karayaka ewes with a synchronised oestrus were individually fed roughage and concentrate diet (11.3 MJ ME/kg dry matter) at either 1.4 x maintenance (H; high) or 0.5 x maintenance (L; low) from Day -6 until Day 7 (mating on Day 0). Plasma concentrations of insulin, IGF-I and cortisol were determined by enzymeimmunoassay in maternal blood samples on day 7 post mating and in fetal samples on day 90 of pregnancy. Maternal plasma concentrations (ng/ml) of cortisol (26,1±3,7 vs. 42,6±6,0) was higher but those of insulin (0,34±0,09 vs. 0,20±0,01) was lower in L ewes (P<0.05). The change on maternal plasma IGF-I concentrations during the feeding period was higher (P<0.05) in H group (46,1±11,6) than in L group (20,5±3,2). There were no significant differences between H and L groups in terms of fetal plasma concentrations of insulin, IGF-I or cortisol on day 90 of pregnancy. These results indicate that maternal feed intake during the peri-conception period in naturally mated ewes may alter hormonal environment of the embryo.

The seasonal changes in blood serum thyroid hormones and total testosterone hormone concentrations in white goats

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The aim of this study was to investigate seasonal changes in the blood serum triiyodothyronine (T3), thyroxine (T4) and testosterone concentrations in White goats. High environmental temperature had significantly negative effect on the serum concentrations of tyhroid hormones ($P<0.01$). There were no significant differences between males and females in terms of serum concentartions of thyroid hormones. There was a significant relationship between serum testosterone concentrations in males and season ($p<0.01$). While the highest serum testosterone concentration (10.84±1.59 ng/ml) was determined on October, the lowest serum testosterone concentration (2.10±0.41 ng/ml) was observed on April. In conclusion these results may show that metabolic and reproductive hormone concentrations change with the season in the White goats as expected.

Effect of synthetic GnRH analogues on ovarian follicular growth dynamic and oestrus

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The aim of the present study was to evaluate the stimulating effect of synthetic GnRH analogues without using prostaglandins on ovarian follicular growth dynamic and oestrus. The study was made on 30, 3 to 9 years old Lithuanian Black and White (LBW) and German Black and White (GBW) breed cows. The study was conducted in Lithuanian Veterinary Academy practical training and research farm. Oestrus in 23 cows was stimulated using synthetic GnRH analogues Dalmarelin (Lecirelin) (Fatro S. p. A., Italy) and in 14 cows with the use of Depherelin® (Gonavet® 50, Veyx - Pharma GmbH, Germany). Dalmarelin (Lecirelin) induced oestrus in 100% of stimulated cows, and Depherelin® (Gonavet® 50) induced oestrus in 92.9% of stimulated cows. Following injection of synthetic GnRH analogues, preparations Depherelin® and Dalmarelin, plasma progesterone concentration decreased, due to the ovulation of dominant follicle, or onset of new follicular wave. Cows stimulated with Dalmarelin had faster follicular growing rate and bigger size of follicles at ovulation compared to Depherelin® and control group cows ($p\leq0.05$). In the pregnancy trial, following 45 days after artificial insemination, the highest percentage (43.5%) of pregnant cows, was determined in the group of cows stimulated with Dalmarelin.

North European short-tailed breeds of sheep: a review

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The short-tailed sheep, native of an area stretching from Russia to Iceland, are generally considered a primitive type. These robust northern sheep seem to have been spread by Norse vikings to several countries in this area some 1000-1100 years ago. They have several common characteristics in addition to the fluke shaped and tapered short tail, such as a wide range of colour patterns, dual coated wool and the ability to thrive under harsh environmental conditions, often in isolated marginal areas. While some 30 short-tailed breeds are still found it is clear that their population sizes have declined in most cases and several of them are now rare and endangered. Although these breeds have mainly been confined to certain localites some of them have gained considerable distribution due to their genetic merits, such as prolificacy. Of these the Finnsheep and the Romanov are best know being exported to several countries in the world where their genetic material has been utilized through crossbreeding with local sheep. This has resulted in the production of some new synthetic breeds. Meat is now generally the main product of the North European short-tailed breeds and their crossbreds while wool, skins and milk are normally regarded as by-products, yet of considerable economic importance in some cases. Such breeds have clearly a role to play in sustainable grassland-based production systems in the future.

Performance and utilization of Northern European short-tailed breeds of sheep and their crosses in North America: a review

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The major Northern European short-tailed breeds in North America utilized in commercial lamb production are Finnsheep and Romanov. Finnsheep and Romanov were first imported into Canada in 1966 and 1981, respectively. Relative to several crosses of traditional breeds, Finnsheep or Romanov crossbreds have a younger age at puberty, an extended breeding season, and greater litter size. The Romanov appears to be superior to the Finnsheep for these reproductive traits. Finnsheep and Romanov crossbreds are inferior to many traditional crosses for growth rate, carcass merit, fleece weight and fleece quality. Fleeces of Romanov crossbreds are of especially poor quality due to a large content of hair fibers. Optimum use of these two breeds is as sires to produce F1 or quarter-blood ewes of either 50 or 25% Romanov or Finnsheep breeding and 50 or 75% of traditional maternal breeds (e.g. Dorset, Rambouillet). These crossbred ewes are then mated to a sire breed (e.g. Suffolk or Hampshire) to produce market lambs with desirable growth and carcass traits. The Finnsheep has been used in the development of three new maternal breeds in North America: Polypay (25% F), Outaouais (49% F) and Rideau (40% F). The Shetland and Icelandic are two additional Northern European short-tailed breeds that are increasing in popularity. They produce unique fleeces, white and in various colors, that are desired by hand-spinners and fiber artists.

Investigation of growth and carcass characteristics of pure and crossbred Awassi lambs

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The aim of this experiment was to study post-weaning growth performance of ram and ewe lambs, and carcass characteristics of ram lambs of five genotypes: Awassi (A), F_1 Charollais-Awassi (CA), F_1 Romanov-Awassi (RA), B_1 Awassi-(Charollais´Awassi) (ACA), B_1 Awassi-(Romanov´Awassi) (ARA). Ninety-six lambs (50 ram lambs; 46 ewe lambs) were separated into 10 groups according to their sex and genotype. At 9 months of age, 30 ram lambs (6 lambs/genotype) were randomly selected and slaughtered. Weaning weight differed ($P<0.001$) among the five genotypes being greater for F_1CA. Post-weaning live weights differed among genotypes ($P<0.001$) and according to lamb's sex ($P<0.01$). Genotype and lamb sex affected ($P<0.001$) average daily gain. The CA lambs outperformed other genotypes while ram lambs had better performance than ewe lambs. Final live weight was the highest ($P<0.01$) for CA genotype. Fast and carcass weights differed ($P<0.05$) among the five genotypes. Longissimus surface measurements differed ($P<0.05$) at B site and A/B (width:depth) ratio with Awassi genotype having the shallowest eye muscle. Right and left shoulder and rack percentages differed ($P<0.05$) among the genotypes. Results indicate that crossbreeding Awassi with exotic breeds improves growth rate and meat production.

Utilization of Finn Landrace and Romanov short-tail sheep to improve prolificacy of sub-tropical Egyptian sheep

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Subtropical Egyptian sheep are characterized by their ability to breed all the year around, good fertility but low prolificacy. In the 70's, Ministry of Agriculture started a program to improve productivity of the two main Egyptian breeds, Rahmani (R) and Ossimi (O) through crossing with the prolific Finn (F) and later in the 80's the brown R sheep with the Romanov (V). The program aimed to introduce 25% of prolific blood to the local breeds and to test the crossbreds under small holder conditions. F and V ewes continue to show their seasonality under the sub-tropical conditions, while the crossbreds were able to breed all the year round with some seasonality. Autumn mating performed significantly better, lambs weaned/ewe mated were 1.7 versus 1.29 and 1.22 from winter and summer mating, respectively. The ½ FR ewes had the highest number of lambs born (1.63) and number of lambs weaned (1.32)/ewe mated, while ¼ FR ewes had the highest in kg born/ewe mated (4.51 kg). Conception rate was high in ¼ F, while ½ FO had the highest number of lambs born and weaned (1.53 & 1.33), kg born and weaned (4.54 & 16.77)/ewe mated. For Romanov crossbred, ½VR had high fertility, number of lambs born (1.26), while ¼VR had higher kg weaned/ewe mated (13.76) but low in other traits. Under the breeders conditions ¼ F ewes lambed 1.65 lambs /ewe/year, weaning 20% more kg than the locals. On the other hand, the ¼ V ewes weaned 1.78 lamb/ewe/year, 28.6 kg/ewe/year, 15% more than the ¼ F.

The short-tailed Iceland breed of sheep

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The short-tailed Iceland sheep were imported by the Nordic settlers some 1100 years ago, mainly from Norway. The impact of sheep of other breeds, imported sporadically in small numbers from the middle of the 18th century to the middle of the 20th century, has been negligible. Iceland sheep show greater variation in colour and horn forms than any other European sheep breed. A unique breeding line, the Leadersheep strain, has evolved within the breed over centuries and recently two single genes enhancing prolificacy were discovered. In addition to the 455.000 winterfeed sheep kept in Iceland, overseas populations of the Iceland breed are mainly in Greenland, the U.S.A., Canada and the U.K. The estimated total breeding population of Icelandic sheep, 500.0000, appears to be more numerous than any other purebred population of North-European short-tailed sheep in the world. This hardy and versatile breed is well suited to utilize rangeland pastures, and has provided meat, wool, skins and milk through centuries in Iceland. In recent times, however, lamb for the domestic market and for exports is the main product. Organized breeding work and improved management have raised the level of productivity substantially in the 20th century. Thus the old Iceland sheep still plays an important role in modern Icelandic agriculture and fits well into global sustainability criteria in the foreseeable future.

Overview of the present Finnsheep population in Finland and recent studies

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The number of purebred Finnsheep (FS) is currently around 15000 ewes. The recording scheme consists of 6500 FS ewes of which the white is the most common one (about 5000). The rest is composed of black, brown and grey types. FS's wool is fine with a special shine, and some of it is used for handicrafts. The main product is meat. FS typically produce less meat than specialised meat breeds. Otherwise, FS is very prolific. Spring born ewe lambs are sexually mature in their first autumn. Average litter size is 1.8 in first lambing and 2.5 in older ewes. In order to improve meat production, slaughter lambs are often crossbreds with e.g. Texel. Because of the high economic importance of meat production, breeding work has focused on developing breeding value estimation for meat traits. Back muscle thickness is measured on about 1000 FS lambs every year. Genetic diversity and origin of FS have been examined by molecular genetic markers. These studies have indicated that FS display a high level of genetic diversity. In addition, pedigree analysis was conducted recently to estimate the population structure of FS. The average relationship coefficient was low, about 1.5%, and the effective population size was 119. In recent years, cryopreservation of sperm has been initiated to maintain the breed's genetic resources. The conservation programme of the Finnsheep population is enhanced by the subsidy for endangered breeds.

Old Norse sheep

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Old Norse Sheep Our marketing name is Norwegian Wildsheep. This is not because they are wild, nor feral, but they live a free life outdoors all year. This is the indigenous Norse short tailed sheep, which has changed little since Iron Age. Norse sheep are small and hardy and are extraordinary good mothers. The Norse sheep is moulting annually .The fleece may have all kinds of colours, it is a double fleece with long kemp and soft very fine underwool. The wool is not very long, rather short and dense and saturated with lanolin. Norwegian Villsau association is a nonprofit organisation, working for farmers by promoting "wildsheep" and safeguarding traditional farming methods. We have made a set of production standards, containing both breed descriptions and production methods. To be marketed as "wildsheep" the sheep must be kept outdoors freerange in the heathlands. NVL main option is to keep this sheep as original as possible, maintaining its distinctive features, as nature itself has perfectly suited it to live in heathlands.

Romanov sheep in the Czech Republic.

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Romanov sheep were first imported into the Czech Republic from Russia in the year 1954 in order to produce high quality raw material for fur industry. The repeated imports took place during the 1970's for hybridization purposes. In the year 2007 totally 1065 ewes in 95 flocks were controlled. Averages for lamb daily gains and litter size were 197g/day and 2.56 lambs/lambing in the year 2007. Breeding values are estimated by the BLUP Animal Model method for live-weight of lambs at the age of 100 days (both direct and maternal genetic effects) and for litter size. Rams are scored for body conformation too. Romanov sheep are well known for their hardiness, lamb vigor and lamb survival. One flock of Romanov sheep is milked in the Czech Republic. All Czech Romanov rams and ewes are polled. Relative frequency of the ARR allele of PrP gene in the population had risen from less than 5% in 2002 to 33%in females and 47% in males in 2006. Romanov sheep is often used in maternal position for crossing with meat breeds because the carcass quality of purebred lambs is rather low.

Physical features of Polish Heath Sheep in conservation breeding

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Zoometric measurements, as well as distribution of coat colours, were studied in 1981-85 in Polish Heath Sheep kept in Żelazna station. Seven of these measurements were repeated in 1996, and eventually in 2007. Additionally, extensive studies on colour distribution were carried out in order to assess breed exterior. Results enabled us to put forward some suggestions, concerning future breeding and preserving of the original type. 2007 results showed a significant decrease in oblique body length, together with a highly significant decrease of body length index, compared to those, obtained in 1981-85 and 1996. This indicates the desirable tendency to return to breed typical, almost square proportions. Additionally, we observed some increase in the length and width of head, what seems less desirable, and decrease in metacarpal circumference. As far as colour is concerned, there has been an increase in numbers of grey and light-grey sheep; both were described as typical and common colours in pre-war population.

The Polish Heath sheep: a breed that escaped extinction

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Polish Heath sheep, traditionally kept in North-Eastern Poland, used to have large population size, reaching 1.5 million head between the first and the second World Wars. By 1955, the population was reduced to 120,000 head only. In the next 20 years, the breed almost disappeared, and would have become extinct if supportive action had not been taken. The National Research Institute of Animal Production initiated a restoration programme, establishing in 1972-1973 a foundation flock in Czechnica, which comprised of 160 ewes and 27 rams. The main goal was to increase population size and ensure survival of the breed. A secondary objective was to restore the typical characteristics of the breed, that include: coat colour and structure, desirable proportion of medullated and down hair, high reproduction performance and aseasonality, good health and overall adaptation ability. The State support for the in-situ conservation effort resulted in progressive increase in the population size of the breed: from 500 in 1971, to over 2200 in 1991. The introduction of conservation measures for native breeds within agri-environmental programme in 2004, resulted in renewed interest in the Polish Heath sheep. In 2007, 2958 ewes were being kept in 63 flocks within the conservation programme. The primary current task is to find options to increase long-term profitability of utilization of the breed.

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Allele and genotype frequencies of PRNP gene in short-tailed polish heath sheep in the flock under programme of preservation of domestic animal resources

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The research was carried out at the Research Farm of Sheep and Goats of Prof. Adam Skoczylas in Zelazna in the flock of 166 ewes of short-tailed polish heath sheep and corresponding to them rams and lambs. The molecular SNP analysis for PRNP gene in rams born in 2007 and chosen for breeding purposes was conducted at the commercial KBioscience laboratory (UK). Further, the frequencies of alleles and genotypes were calculated. The results showed the occurrence of only three alleles of PRNP gene: ARR, ARQ and AHQ with frequencies of 30, 49 and 21%, respectively. By analogy, 6 genotypes of PRNP gene were observed with following frequencies: ARR/ARR (18%), ARR/ARQ (35%), ARR/AHQ (11%), ARQ/ARQ (25%), ARQ/AHQ (9%) and AHQ/AHQ (2%). Due to the obtained results, no presence of VRQ allel, which is responsible for the vulnerability for scrapie disease, as well as the low frequency of ARR allel, which gives the resistance against scrapie, were observed. The results indicate to operate a breeding programme to improve the ARR frequency in polish heath sheep via the usage of rams homo- or heterozygous for the ARR allele in mating programmes.

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Level of reproduction in short-tailed polish heath sheep at the example of the flock under the programme of preservation of genetic resources of domestic animals

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The history of polish heath sheep in Poland was strictly tied to the tendencies in sheep breeding after the World War II. Due to the trends, which emphasised the wool production, the population of this breed decreased. The last and partially crossed animals were bought at the end of 1970s and the restoration programme according to breed pattern described by M. Czaja in 1937 and compiled on the base of the flock in Swislocz (Belarus). During the process of the restoration of the breed the prolificacy appeared to be much lower than described and expected in the breed pattern (190-210%). The state of the high prolificacy at the aforementioned level was gained in the years 2001-2007 and ranged between 202-213%. This study will present basic values of reproduction traits as well as the factors influencing them in the flock of polish heath sheep in Żelazna Research Farm due to the breed pattern.

Possibilities of usage of polish heath sheep for production of slaughter lambs

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Ewes of Polish heath sheep were commercially crossed with Berrichon du Cher, what allowed to gain high-valuable carcasses of F1 crosses. Whereas, rams of Polish heath sheep were crossed with meat-wool breeds to obtain F1-ewes which indicated significant improvement in reproduction performance. Similar effects were obtained after mating of F1-crosses of Friesian and Polish heath sheep both in the reproduction traits and also the improvement of the value of carcasses in crosses. Ewes originating from crossing of meat-wool breeds with rams of Polish heath sheep and Friesian-heath sheep were mated in the next step with typical meat breeds (Suffolk, Ile de France and Berrichon du Cher) providing full-valuable carcasses for the meat market. Generally, the full usefulness of ewes and rams of polish heath sheep as well as Friesian-heath sheep crosses mating with meat-wool breeds and in final, commercial crossing with typical meat breed assure the production of high-valuable carcasses.

Possibilities of usage of Finn sheep for production of slaughter lambs

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Finn sheep were introduced in Poland with the aim of usage in production programmes. Finn rams as well as their crosses with east-friesian sheep are used in mating with Corriedale ewes in meat-wool type to obtain crosses presenting high level of reproduction traits. According to the crosses of Finn sheep this entertainment succeeded, however the quality of carcasses appeared to be less valuable in rams. In next step, the crossed ewes were mated with rams of one of the meat breeds (Suffolk, Ile de France) and the offspring presented high-classed carcasses. Comparison of usefulness of both meat breeds in this mating scheme showed better results in the meat performance of offspring in Ile de France than in Suffolk. Generally, the results indicate full usefulness of finn breed in mating aiming to improve the reproduction traits as well as the full usefulness of female offspring in slaughter lambs production coming from crossing with meat breed rams.

Biological and farming traits of Lithuanian native coarsewooled sheep

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In 1995, a flock of almost extinct local coarsewooled sheep was formed at the Institute of Animal Science of LVA. At present, the number of sheep amounts to 100, the total population being 1000. The flock is kept with the aim of conservation of the genofond of local sheep and studies of their biological and farming qualities. The studies carried out in 1997-2007 have indicated that local coarsewooled ewes can exhibit estrus at any time of the year and lamb even twice a year (average fertility 1.6-2.3 lambs). In a 20-day lactation period, ewes produced about 16-25 kg of milk containing 6-9.5% fat, 3-5.5% protein and 3.5-6% sugar. The average weight of newborn lambs was 1.8-4.2 kg, at 20 days 4.5-9.7 kg, at 2 months 11-16 kg, at 4 months (at weaning) 15-23 kg and at 12 months of age 32-44 kg. The weight of adult ewes was about 40-56 kg and that of breeding rams 46-67 kg. Each year, the average wool clip per sheep was 2-4 kg of semicoarse white, grey, brown or black wool 22-34 cm long. The body conformation data for yearling female and male lambs indicated that local sheep are rather high (58-71 cm), have wide (16-20 cm) and deep (25-30 cm) chest, long head (16-21 cm) and tail (22-34 cm), and horns of various length (3-65 cm). Control slaughter data indicated that the dressing percentage of fattening rams slaughtered at 6 to 7 months of age was 44%, and that of the rams that were not fattened and slaughtered at 10 to 11 and 16 to 23 months of age, respectively, 41 and 42.5%.

Quality of meat from Skuddy lambs

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The objective of the study was to evaluate selected quality indicators of meat from 100-day-old single ram lambs of the Skuddy breed, which is a vanishing, primitive sheep breed known since the Middle Ages in East Prussia and Baltic states. Samples of m. quadriceps femoris were taken to determine proximate chemical composition, physicochemical properties, energy value as well as the concentrations of cholesterol, amino acids in protein and fatty acids in intramuscular fat. It was found that meat from Skuddy lambs is characterized by a high content of protein (19.28%) and ash (1.22%), a low content of fat (1.56%) and cholesterol (17.47 mg/100g), a small diameter of muscle fibers (16.32µm), a relatively dark color, a high water-holding capacity, ESAA to NEAA ratio of 0.80, PUFA to SFA ratio of 0.15 and DFA (hypocholesterolemic) to OFA (hypercholesterolemic) ratio of 0.89. A high protein content, low concentrations of fat and cholesterol, a high share of essential amino acids in protein and a desirable fatty acid profile indicate that meat from Skuddy lambs has health-promoting properties.

Quality of meat from Pomeranian lambs, stored under modified atmosphere conditions

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The objective of the study was to compare selected quality indicators of meat from 100-day-old Pomeranian lambs, fresh and stored for 10, 20 and 30 days in a modified atmosphere – MA (80% N_2/20% CO_2). Samples of fresh meat and meat packaged in a MA were taken from m. quadriceps femoris to determine proximate chemical composition, physicochemical properties and energy value. It was found that the water-holding capacity of meat stored in a MA decreased as soon as after 10 days. The greatest changes took place in meat stored in a MA for 20 days. Compared to fresh meat, samples stored under modified atmosphere conditions were marked by a higher content of dry matter, protein and ash, which was most probably related to water loss (by 1.72 percentage units), a higher level of physiological maturity and an increase in acidity (i.e. a decrease in pH value from 5.62 in fresh meat to 5.49). Further changes, observed after 30 days of meat storage in a MA, included primarily a significant increase in color lightness and an insignificant increase in calorific value.

Short-tailed sheep in Poland: characteristics of genetic structure

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The aim of the prolificacy improvement programme carried out in Poland has been to rapidly improve the prolificacy of the national sheep population using improvement crossing with prolific breeds such as Romanov and Finn. The objective of the study was to characterize the genetic structure of prolific Romanov and Finn sheep and Polish Merino sheep (170 animals in total), based on the polymorphism of selected microsatellite DNA sequences recommended by ISAG for sheep parentage control. Allele frequency at the loci of seven markers was used to estimate genetic variation and genetic distance between the breeds. Observed (H_O) and expected heterozygosity (H_E) was 0.41 and 0.7 in the Polish Merino population and 0.39 and 0.63 in Finn sheep, respectively. The highest H value was found in Romanov sheep (H_O – 0.59, H_E – 0.73). The mean number of alleles observed at the loci was 6.4 in Finn sheep, 7.1 in Romanov sheep and 7.7 in Polish Merino sheep. The effective number of alleles per loci in Finn and Merino sheep (3.4 and 3.5, respectively) was lower than in Romanov sheep (3.9). The low effective number of alleles and heterozygosity, observed in the Finn sheep population, show a relatively low level of genetic variation in the analysed group. The greatest genetic similarity was found between Finn and Romanov breeds. The high values of genetic distance between Polish Merino and the other groups indicate that Polish Merino sheep are considerably distinct from prolific breeds.

Characteristics of Wrzosówka sheep in a flock belonging to the national research institute of animal production

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A study of Wrzosówka sheep, using the example of a flock belonging to the National Research Institute of Animal Production, covered the period 1991-2006. Fertility of ewes during the initial period of breeding (until 1997) was low (min. 78.9%) and increased to 94.1% in the years that followed. Prolificacy index in the first 5 years ranged from 136.1 to 151.7% but increased to 192.5% over the last 6 years. Over the 16-year period, rearing performance of lambs was satisfactory (92.1%-98% on average) only in 1993, 1998–2001 and 2006. Reproductive performance ranged from 92.8 to 164.4%. Body weights of the ram lambs and ewe lambs measured at 2, 28 and 56 days postpartum showed a downward tendency in successive years. Coat colour analysis performed in lambs at 2 days of age showed that selection of parents for coat colour was correct, resulting in a low percentage of lambs with untypically red or spotted colour. Analysis of ewe coat colour showed that the proportion of dark grey and grey ewes decreased successively from approx. 92% in 1991 to 60.9% in 2003. The proportion of light grey sheep increased 3-fold, from 5.1% to 15.2%. The most worrying tendency recorded in the flock was strong expansion of black and greying black colour.

Romanov sheep in the sheep prolificacy improvement programme in Poland

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The "Sheep prolificacy improvement programme in Poland" was carried out in Poland in the 1990s. The National Research Institute of Animal Production was one of the research institutes that conducted experiments as part of this programme. The aim of these experiments was to determine the effect of Romanov sheep as a prolific component of the Polish Merino prolificacy improvement programme on the experimental population of sheep. The experiments were carried out on a sheep farm belonging to the National Research Institute of Animal Production in Pawłowice in 1994–2001. The experiments covered Polish Merino ewes, Romanov ewes, F_1 crossbred ewes (Romanov x Polish Merino), and F_2 crossbred ewes (Polish Merino x F_1). In the experiment, sheep were mated within pure breeds and, after a population of appropriate size was obtained, they were mated to the sire component to finally obtain crossbred sheep with 25% Romanov inheritance. The results showed that prolificacy obtained in particular crossbred groups was higher compared to the prolificacy of Polish Merino ewes, reaching 169.8% in the target F_2 crossbreds. It was found that 25% Romanov proportion in the genotype had a positive effect on all reproductive indices of the crossbreds.

Romanov sheep in Poland

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In 1989, embryos of Romanov sheep were imported from Toulouse in France (INRA) to the Experimental Station of the National Research Institute of Animal Production in Pawłowice as part of cooperation. Polish Merino recipients (51 ewes) were transplanted with 67 embryos. A total of 21 recipients gave birth to 25 lambs, including 13 ram lambs, 10 ewe lambs and 2 stillborn lambs. The first mating was performed in 1990, when ewes were mated at 10-11 months of age to 4 ram lambs. A total of 10 ewes gave birth to 23 lambs, including 13 ram lambs, 8 ewe lambs and 2 stillborn lambs. The flock has been pure bred and regularly increased. By 1998–1999, the flock had approx. 100 ewes. At present, Romanov sheep are raised in 6 flocks and their population is approx. 300 ewes and 15 flock rams.

Effect of amount of starter diet fed on response of weaner pigs to dietary energy concentration

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Forty-eight pairs of pigs weaned at 27 days of age (BW 8.3 +/- 1.04 (S.D.) kg) were used in a 2x2 factorial design to evaluate the effect of post weaning diet amount on performance to D 42 post weaning. Stage 1 treatments were LOW (2kg commercial starter; 5kg commercial link/pig) or HIGH (5kg starter; 10kg link) allocations followed (Stage 2) by low density (LD) or high density (HD) weaner diet (LD - 13.0 MJ DE/kg, 17.5% CP; HD - 15.0 MJ DE/kg, 20.0% CP) to D 42 (c. 27kg). From D 0 to 14, there was little difference in average daily gain (ADG: LOW 259g/d, HIGH 255g/d, NS) or feed conversion ratio (FCR: LOW 1.09, HIGH 1.15, NS). From D 14 to 28, HIGH pigs grew faster (542g/d v 484g/d; $P<0.05$) and more efficiently (1.42 v 1.56; $P<0.01$) than LD. From D 28 to 42 there was no significant Stage 1 * stage 2 treatment interaction. HD pigs grew faster than LD (624 v 523g/d; $P<0.01$) with better FCR (1.63 v 2.01; $P<0.01$). For the full 42-day period, there was a significant Stage 1 x Stage 2 interaction for FCR ($P<0.05$) but not ADG. HIGH pigs grew faster than LOW (465 v 424g/d; $P<0.05$) while the difference in FCR was not significant. HD pigs grew faster than LD (461 v 428g/d; $P<0.05$) and more efficiently (1.45 v 1.65; $P<0.01$). In conclusion, amount of starter and link diet fed did not affect the response to energy density in the diet fed to 27kg.

The effect of dietary energy density in the grower stage on response to energy concentration in finisher pigs

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Thirty-six pairs of pigs (initial BW 38.9 +/- 2.85 (S.D.) kg) were used in a 2x2 factorial design to evaluate the effect of dietary energy concentration in the grower stage (35 days) on the response to energy concentration in the finisher stage D 35 to slaughter). Grower pigs were fed a low (LG: 13.0 MJ DE/kg, 17.5% CP) or high (HG: 15.0 MJ DE/kg, 20.0% CP) density diets to d 35 followed by a low (LF: 12.9 MJ DE/kg, 16.0% CP) and high (HF: 14.8 MJ DE/kg, 17.5% CP) density diets. LG pigs had a significantly lower daily gain ($P<0.05$) and poorer feed conversion efficiency (FCE, $P=0.01$) than pigs fed the HG diet (802g vs. 873g, 2.69 vs. 2.36, respectively). They also had a lower hot (76.1kg vs. 81.2kg) and cold (74.5kg vs. 79.6kg) carcass weight ($P=0.001$), a significant ($P<0.01$) lower average daily carcass gain (647g vs. 731g) and poorer FCE of the carcass (3.31 vs. 2.94) and a lower kill-out-percentage (75.5 vs. 77.0; $P<0.05$). Feeding the LF diet resulted in a significant ($P=0.05$) poorer FCE (2.64 vs. 2.41), carcass FCE (3.27 vs. 2.98) and back fat depth (10.2 vs. 11.5) of the carcass compared to pigs fed the high energy density diet (HF). There was no Diet1 x Diet2 interaction for any trait.

Valine requirement in post-weaned piglets

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The continuing reduction in the crude protein (CP) content of diets leads to a greater need to know the requirements of individual amino acids. Valine (Val) is among the amino acids which are thought to be potentially limiting performance in piglets, even though little is known about its requirement. Three experiments were performed to determine the Val requirement in post-weaned piglets (12-25 kg). Two preliminary experiments were carried out to identify a diet in which Val was first-limiting and lysine (Lys) second-limiting for performance. This was necessary in order to express the Val requirement relative to Lys on a standardized ileal digestible (SID) basis. In the third experiment, 75 piglets were offered one of five diets differing in Val supply (ranging from 60 to 80% SID Val:Lys), while providing 1.0% SID Lys. The estimated Val requirement was 73, 68 and 68% SID Val:Lys using a linear-plateau model and 80, 75 and 71% SID Val:Lys using a curvilinear-plateau model for feed intake, daily gain and gain-to-feed ratio, respectively. Plasma Val (and alpha-ketoisovaleric acid), isoleucine and leucine concentrations after an overnight fast increased with increasing Val supply. Results of this study indicate that the SID Val:Lys requirement is approximately 72%, which is higher than the current NRC recommendation.

A tryptophan-enriched diet improves feed intake and growth performance of susceptible weanling pigs upon oral *E. coli* K88 challenge

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We tested the effect of the addition of 1 g L-tryptophan/kg of tryptophan to a standard weaning diet and of oral challenge with E. coli K88 (ETEC), on growth and health of piglets susceptible or not to the intestinal adhesion of ETEC. Were used 64 pigs weaned at 21d of age: a control group (8 pigs) fed a basal diet (B) and two challenged groups each of 28 pigs: one group fed B diet (group BE) and the other fed a diet with tryptophan (group TE). On d5 pigs were orally challenged with 10^{10} CFU E. coli K88 and sacrificed on d9 or 23. By in vitro test, the subjects of BE and TE groups were classified as susceptible (s^+) or non-susceptible (s^-) to the intestinal ETEC adhesion. In the first four days post-challenge, the challenge reduced ADG ($P<0.05$), and this reduction was greater in susceptible pigs ($P<0.05$). Tryptophan increased ADG and feed intake in susceptible pigs ($P<0.05$) from challenge to d4, but not later. The K88-specific IgA activity in blood serum was higher in challenged pigs ($P=0.102$) and was not affected by the diet. Moreover, as compared to standard diets, the supplementation with tryptophan, allows susceptible pigs to partially compensate for the effects of challenge. This is of practical relevance for improved genotypes due to the association of positive subjects with lean growth.

Conjugated linoleic acid and tryptophan supplementation improves immune response of weaned piglets

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Conjugated linoleic acid (CLA) enhances immune function while decreasing the negative effects of inflammatory responses. Aminoacidic profile of the immune system proteins is different than of muscle proteins, as higher Trp: Lys ratio. The aim of this study was to assess the effect of CLA in combination with two different Trp:Lys ratios in piglets in a low-health status nursery unit. There were 4 treatments arranged factorially with 2 CLA contents (0 vs 1%) and 2 Trp:Lys dietary ratios (0.15 vs 0.22). For the experiment, 336 piglets were used (7.6±1.78 kg BW) and allotted in 48 pens. Productive performance was especially poor because of a severe outbreak of diarrhea. Under these circumstances, CLA supplementation improved average daily gain (ADG) in 80% ($P=0.0001$) and FGR in 44% ($P<0.001$). Higher dietary Trp: Lys ratio allowed expressing CLA improvements in performance (P interaction <0.10 in ADG). Trp also improved ADG (170 vs 155 g/d; $P=0.02$). Mortality rate was not significantly affected, but in the total nursery period the highest risky group (0% CLA & low Trp content) showed the highest % of mortality (10.7%; $P=0.02$). We conclude that CLA supplementation improves ADG and controls clinical symptoms in the nursery period during an acute diarrhoea outbreak. Furthermore, higher dietary Trp content facilitates the expression of the CLA effect, demonstrating a synergetic effect between both of them.

Influence of dietary linseed on fatty acid composition of pig muscle and adipose tissue

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The aim of this work was to investigate the influence of dietary linseed on fatty acid composition of pig muscle and adipose tissue with special emphasize on the nutritionally important ratio of polyunsaturated n-6 and n-3 fatty acids. Corn based mixtures enriched with 3% of linseed and 97.5 mg of α-tocopherol per kg were used. In total, 36 crossbred pigs were fed ad libitum from 24.6±2.6 up 104.5±8.1 kg of live weight, slaughtered and sampled for meat (m.longissimus dorsi) and adipose tissue (back fat). Fatty acid composition in samples were determined by GLC and compared (Student t-test) to composition of fats of pigs from commercial production at same farm. In linseed fed pigs the content of n-3 fatty acids in muscle was increased nearly threefold in relation to pigs from commercial production (5.42 vs. 1.83%; P≤0.001), with lower n-6/n-3 ratio in meat (3.00 vs. 10.04; P≤0.001). In back fat the content of n-3 fatty acids was increased around 5.5 times (7.84 vs. 1.41%; P≤0.001), with lower n-6/n-3 ratio (1.94 vs. 10.33; P≤0.001). The back fat oxidative stability decreased with an increase in n-3 share. It is concluded that feeding linseed effectively lowered n-6/n-3 ratio in muscle and fat at nutritionally recommended values (<4) and considerably improved nutritional quality of pork fats.

Phytase supplementation to sorghum-soybean meal-based diets for growing pigs

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Two experiments were conducted to assess the efficacy of supplementing a phytase to sorghum-based diets on the apparent ileal digestibility (AID) of amino acids (AA) and performance of growing pigs. In Expt. 1, Ten pigs (av. BW 40.6 kg) fitted with a simple T-cannula at the distal ileum, were fed five diets in a repeated 5x5 Latin square design. Diet 1 was the negative control (NC), sorghum-soybean meal diet, with no supplemental inorganic P. Diet 2 was the positive control (PC), sorghum-soybean meal diet, with supplemental inorganic P. Diet 3, 4, and 5 were the PC diets supplemented with the enzyme at 250, 500, and 1000 units of phytase activity (FTU/kg diet), respectively. There was no effect of phytase supplementation on the AID of DM, crude protein, and AA (P>0.10). In Expt.2, 30 pigs (av. BW 22.9kg) were allotted to five diets. Diets were the same as those in Expt. 1. Daily gain (ADG) and feed intake (FI) were higher, and feed conversion (FC) was better in pigs fed the PC diet, as compared with the NC diet. Pigs fed the NC diet supplemented with the phytase had higher ADG, FI, and better FC than pigs fed the NC diet. There was no difference between pigs fed the PC or the phytase supplemented diets. These data indicate that phytase supplementation to sorghum-based diets had no effect on the digestibility of protein and amino acids, but improves the performance of growing pigs with no dietary supplemental inorganic phosphorus.

Performance of weanling piglets offered low, medium or high lactose diets supplemented with a seaweed extract from *Laminaria* spp.

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A 3 x 4 factorial experiment was conducted to investigate the interaction between different levels of lactose (L) (60 (low) vs. 150 (medium) vs. 250 (high) g/kg) and seaweed extract (SE) (0 vs. 1 vs. 2 vs. 4 g/kg) on growth performance and nutrient digestibility of weanling pigs. 384 piglets (24 doa, 5 kgs lwt) were blocked on the basis of lwt and assigned to one of 12 dietary treatments (n=8) for 21 d post weaning. There was a L x SE interaction ($P<0.05$) in average daily gain (ADG) and food conversion ratio (FCR) from day 0 to 21. At the low and medium level of L there was an increase in ADG as the level of SE increased to 2 g/kg ($P<0.05$). However, at the high level of L there was no further response in ADG as the level of SE increased above 1 g/kg ($P<0.05$). At the low level of L there was an improvement in FCR as the levels of SE increased to 4 g/kg ($P<0.01$). At the medium level of L there was an improvement in FCR as SE increased to 2 g/kg. However, there was no effect of SE on FCR at the high levels of lactose. There was a linear increase in average daily feed intake from d 0-21 ($P<0.05$) as levels of SE increased. In conclusion, pigs responded differently to the inclusion levels of SE at each level of L supplementation. The inclusion of a SE in piglet diets may reduce the need for high L diets and alleviate some of the common problems that occur post weaning.

Influence of use of by-products from bio-fuel production in feeds for growing-finishing pigs

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With an increasing production of bio-fuel (biodiesel and bio-ethanol) there is an increasing output of the by-products rapeseed-meal (RSM), distillers dried grain solubles (DDGS) and rapeseed-cake (RSC) in case of direct use of rapeseed oil in engines. The feed quality of rapeseed-meal is mostly equal and well documented in feed tables whereas rapeseed-cake differs in the content of ether extract and the feed value of DDGS is depending on the grain used and a lot of technical processes. In a trial with 100 growing-finishing pigs (50 females and 50 castrated males) from 35 kg live weight (LW) up to slaughtering (115 kg LW) the by-products RSM, DDGS, RSC as well as a combination of RSM plus DDGS have been tested in comparison to soybean-meal (SBM). A commercial hybrid (BHZP) was used. Feed was offered in mash form ad libitum as well as drinking water. The mean daily weight gain was 973 g/day and do not differ significantly ($p > 0.05$) between groups from 940 g/day up to 1010 g/day from the start up to the end of the trial. The mean feed intake was 2.69 kg/day up to 2.83 kg/day ($p > 0.05$). Also the slaughtering parameters showed no significant ($p > 0.05$) differences between the groups. Mean lean meat percentage was between 54.4% and 55.7% and the mean backfat thickness between 25.1 cm and 29.0 cm. From these data it can be concluded that the tested by-products may be included into diets for growing-finishing pigs, also at high production standard.

Effect of hydrolyzed fish protein on piglet growth performance after weaning

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In order to assess the use of hydrolized fish protein (HFP) on piglet growth performance after weaning two experiments were carried out during 2007: 192 weaned piglets (24 d of age; 4.6 kg BW) in trial 1, and 144 (23 d; 4.6 kg BW) in trial 2, were blocked in 4 replicates per treatment on the basis of weight and sex. Two dietary treatments were fed ad libitum from d 0 to d 15 after weaning (phase 1): i) a pre-starter including a 2% HFP as an alternative protein source or ii) a control treatment (CTR) fed with an standard pre-starter. During phase 2 (from day 16 to 41), every lot was fed with an standard starter on an ad libitum basis. Piglets were weighed in both phases to determine weight gain (WG). Dietary consumption (DC) was measured. Data were analysed using the PROC ANOVA procedure of SAS. In trial 1 DC was higher in piglets receiving HFP in phase 1 and 2; HFP diet did not significantly affect BW or WG at the end of phase 1 or 2. Feed conversion index (FCI) was unchanged in phase 1, but a higher FCI was found for HFP in phase 2. As for trial 2, DC was lower with HFP in phase 1 but higher in phase 2. Piglets fed HFP in phase 1 showed a tendency for a higher BW, but WG was unchanged. Unsignificant differences were found for BW or WG in phase 2. Thus, HFP showed a FCI significantly lower in phase 1 but higher in phase 2. In conclusion, low-level addition of HFP in pre-starter feeding did not seem to affect negatively piglet growth performance after weaning.

A survey of cull sow bone integrity in Ireland

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The third metacarpal is frequently used in experiments as an indicator of bone integrity in the pig. The objective of this study was to compile a reference database of the physical and mechanical properties of cull sow metacarpals. Experimental Methods Metacarpals (n=152) from eight randomly selected farms were collected at slaughter and stored at -20 °C until required. Bones were CT scanned for cross sectional area and Moment of Inertia measurements. Cylindrical sections from the diaphysis were used for mechanical testing and calculating bone strength indices, Young's modulus, maximum stress and maximum load. Statistical analysis Statistical analysis was carried out using GLM MANOVA from SPSS 12.0. Pearson correlations and regression co-efficient were calculated following normality checks using Kolmogorov-Smirnov test, Q-Q and box plots. Box's test was used to test equal covariance matrices. Results & Conclusions. The average of Young's Modulus was found to be 19.38 GPa (7.58 – 35.45) for sows ranging from 1st to 9th parity. Pearson correlations between parity and maximum load, bone mineral density and Young's modulus were r = 0.203, r = -0.056 and r = 0.164 respectively. Farm of origin did have a significant effect ($p < 0.05$) on bone parameters. The results suggest there is little change in bone mineral status throughout the parities examined.

Efficiency of higher contents of multienzyme composition in the diets for pigs

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At the LVA Institute of Animal Science fattening pigs were used in a trial to determine the effects of higher contents of multienzyme composition (α-amylase-100 U/g, β-glucanase–1100 U/g, cellulase–11 U/g, xylanase–1800 U/g, protease–1.2 U/g) on weight gains, feed intake, carcass and meat quality of pigs fed diets containing triticale. The results from the trial indicated that supplementation of 60-70% triticale containing diets with 0.1%, 0.125% of multienzyme composition resulted in higher weight gains only in the second fattening stage (over 50 kg weight) when the pigs gained daily 5-8.3% (P>0.1-0.4) more and consumed 3.1-5.1% less feeds per 1 kg gain than the control pigs. There was no significant influence on the growth and feed intake determined with 0.075% multienzyme composition supplementation of the diets. The carcass quality of the pigs fed triticale based diets enriched with multienzyme composition did not differ significantly from that of the control pigs. There were no significant differences for the physicochemical indicators of meat when the pigs were fed diets supplemented with 0.075%, 0.1% and 0.125% multienzyme composition, except that water holding capacity was, respectively, 3.82% (P>0.2), 4.92% (P<0.001) and 4.95% (P<0.001) lower and there was a tendency for lower colour intensity, respectively, by 23.8% (P>0.1), 15.7% (P>0.2) and 25.3% (P<0.025).

Influence of different diets on in vitam and post mortem performances of "Nero Siciliano" fattening pigs

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Two different diets in fattening period, Acorn (A) vs Barley (B), in vitam and post mortem performances of 24 "Nero Siciliano" pigs was studied. The animals were divided into two homogeneous groups of 12 called (A) and (B). The individual weight was recorded and the ADG calculated every month. After slaughtering, the thickness of the back-fat was measured and the yield was calculated. From loin a sample cut was isolated and dissected into the major tissues. Moreover, from the left half-carcass of each animal, on Longissimus lumborum (LL) muscle, were determined: pH1 (45') and pHu (24h), colour (CIEL*a*b* system; Spectral Scanner DV s.r.l.), cooking loss, Warner-Bratzler shear force (INSTRON 5542) and chemical composition. Data were analyzed with the GLM procedure of SAS®. Results obtained showed that only few parameters, between the two group, were statistically different: final live weight (A 109.93 kg vs B 120.45 kg; P=0.004), ADG (A 346 g/d vs B 465.5 g/d; P=0.004), the back-fat at the last thoracic vertebra (A 2.8 cm vs B 3.7 cm; P=0.023), in the sample cut, the bone (A 18.58% vs B 21.12% ; P=0.013), pH1 (A 6.28 vs B 6.12; P=0.005), pHu (A 5.77 vs B 5.63; P=0.003), L* (A 46.17vs B 48.90; P=0.010) and cooking loss (A 24.60% vs B 20.68%; P=0.008). The research was supported by Miur, PRIN – 2005 (Prof. Alessandro Zumbo).

The animal protein-replace on economy production in pigs

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Analysis of replacement impact of meat-bone meal for vegetable protein (soybean) on production potential was the major objective of this work. For this purpose 72 hybrid pigs [(LW_s x PN)x(LW_d x L)] at the age of 68 days from birth of an average total live weight 24.15 kg were fattened. The testing fattening period took 91 days. The half of pigs (group I) were fed with a CFM where the animal protein was replaced by vegetable one (soybean), the others (group II) by using the meat-bone meal. As regards the achieved live weight, feed conversion ratio and average daily gain in the end of the test it was assessed, that identical values were achieved in both groups (106.0kg resp. 106.2kg; 2.6kg resp. 2.66kg; 921g resp. 917g). Despite of practically identical weight achieved in regular intervals during the tests in both evaluated groups, a higher meat-formation in pigs was found out in comparison group II, while the difference between both of the groups is equal to approximately 1.5% of lean meat share during the fattening. Since no difference between the monitored groups was found out in profitability (34.03% resp. 34.04%) it can be stated, that meat-bone meal replacement by soyabean has no impact on the pig production potential as well as on economy.

International genetic evaluations of fertility traits considering more than one trait per country

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In order to include more than one trait per country in international genetic evaluations, data from September 2007 Interbull test run for female fertility traits in Holstein were used. The data included different fertility traits from Belgium (pregnancy rate), Canada (calving to first service, first service to conception), Germany-Austria (calving to first service, first to last service), Nordic (Denmark-Finland-Sweden) countries (calving to first service, first to last service), Spain (days open), Switzerland (calving to first service) and USA (daughter pregnancy rate). Eight single-trait MACE (ST-MACE) analyses, differentiated by various combinations of traits from two-trait countries and including only one trait per country were done. The variability of genetic correlations, breeding values and reliabilities among analyses were studied. In minor cases, replacing a trait from two-trait countries made significant differences in the genetic correlations among countries. However, those differences were numerically negligible. Whereas replacing a trait from Canada had only a significant effect on the Swiss scale international breeding values ($P<0.05$), the effect of replacing a trait from Nordic countries or Germany-Austria was significant on the international breeding values for the other countries ($P<0.001$). These influences were more considerable for reliabilities as all of them were significantly affected ($P<0.001$).

Use of sexed semen in commercial herds has minor effect on genetic trend, but reduces genetic lag in dairy cattle breeding schemes

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The aim of the project was to test whether use of sexed semen in commercial herds, with or without performing of MOET on bull dams (BD), increases the annual genetic gain for dairy cattle at population level. This was tested by stochastic simulation with three levels of sexed semen: no sexed semen, sexed semen to the best cows in each herd, sexed semen to all heifers and two levels of MOET: no MOET and MOET on all BD. The simulated population consisted of 450 herds with 100 cows per herd. Each year 50 young bulls, 10 active sires and 215 BD were selected by truncation across the population based on BLUP breeding values. The simulations were carried out for 30 years and each scenario was replicated 50 times. Use of sexed semen alone gave a positive increase in the annual genetic gain of 2.9 percent for sexed semen to the best cows (P=0.0657) and 1.0 percent for sexed semen to all heifers (P=0.3045). Use of sexed semen together with MOET on BD changed the annual genetic gain between -0.8 and 1.4 percent. Use of sexed semen decreased the genetic lag between the sires and the cows by 12 to 14 percent when sexed semen was used to the best cows (P<0.0001) and by 7 to 9 percent when sexed semen was used to all heifers (P≤0.0002).

Genetic correlations between production, type and functional traits in three French dairy cattle breeds

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Selection of dairy cattle in France is based on a total merit index computed from bull and cow EBVs on production, type and functional traits. These EBVs are derived using an approximate multitrait BLUP animal model which combines direct information on functional traits with information coming from early predictors, e.g., type traits. The MT-BLUP animal model is applied to individual average records corrected for all non genetic effects and computed at the end of each elementary genetic evaluation. Genetic parameters were estimated for the Normande, Montbéliarde and Holstein breeds from these pre-corrected records using a sire model. An AI-REML approach was adapted to obtain genetic correlations while considering the genetic and residual variances used in the elementary genetic evaluations as constants. Results confirm the strong genetic correlations between functional longevity, female fertility, somatic cell count and udder depth (range : 0.35 – 0.55), with a moderate opposition with production. In the long list of type traits routinely scored, some udder traits are relatively good predictors of functional longevity and somatic cell count. Fertility exhibits a slightly favourable correlation with rump angle and a unfavourable correlation with body depth and dairy form. Accounting for selection on correlated traits is important to obtain unbiased genetic trends for functional traits.

Evaluation for functional length of productive life in Slovak Pinzgau population

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Proportional hazard model was used to analyze the impact of relative milk production, parity and stage of lactation, age at first calving and herd size change on the length of productive life of 44796 Slovak Pinzgau cows. The calculations were carried out with Survival Kit 3.12. The most important factor was the milk production level within herd. The relation between the milk production level and the culling risk was strongly non-linear. Cows with extremely low milk production (less than 1.5 standard deviations below average) had a 4.8 times higher culling risk than average cows. The culling risk for highest yielding cows was about one half of the risk of average cows. In the first lactation the culling risk was highest at the beginning and decreased in the course of the lactation whereas in the subsequent lactations the culling risk was highest at the end of the lactation. The risk decreased with parity. The effect of age at first calving did not have a large influence on the length of productive life, although a linear increase of culling risk was observed as age at first calving increased. Cows from expanding herds were at lower risk to be culled compared to cows in herds of stable and decreasing size.

The use of multiple ordered categorical threshold model for the estimation of genetic parameters for the liability to mastitis in dairy cattle

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This study presents the analysis of mastitis data using different models for the estimation of genetic parameters (heritabilities, repeatabilities, breeding values). We used a test day thresholdmodel (TDTM), a multiple ordered categorical lactation thresholdmodel (MOCLTM), and a lactation thresholdmodel (LTM). In the TDTM 50 DIM were analysed, whereas in the MOCLTM and the LTM 50 DIM and 300 DIM were analysed. In the LTM and the MOCLTM the information was summarised into one observation per cow and lactation. In LTM this observation took values 0 or 1. In MOCLTM it took values 0 to 4, depending on the number of mastitis cases. Data were collected from 1998 to 2005 and 63,540 mastitis treatments were recorded. Information from more than 13,000 cows was available. The highest heritability ($h^2 = 0.15$) was estimated with the TDTM, but it was computation intensive. Genetic parameters estimated with the MOCLTM ($h^2 = 0.11$) was higher, compared to the LTM ($h^2 = 0.09$), where data recording took place during 300 DIM. Both models estimated a heritability of 0.08 when data recording was restricted to 50 DIM. The results of this study showed that the use of an MOCLTM reduces the information loss compared to an LTM.

Genetic parameters for pathogen-specific mastitis in Danish Holstein cattle

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The objective of this study was to estimate genetic parameters for pathogen-specific mastitis traits. The traits were unspecific mastitis and mastitis caused by S. dysgalactiae, E. coli, coagulase-negative staphylococci, S. aureus and S. uberis. Data from 168,158 cows calving first time from 1998 to 2006 were used in the analyses. (Co)variances were estimated using uni- and bivariate threshold models via Gibbs sampling. Posterior means of heritabilities (h^2) of pathogen-specific mastitis were lower than h^2 of unspecific mastitis, ranging from 0.035 to 0.076 for S. aureus and S. uberis, respectively. Genetic correlations (r_a) between the pathogen-specific mastitis traits ranged from 0.452 to 0.768, lowest for more distantly related pathogens like E. coli and S. aureus and highest for closely related pathogens like S. dysgalactiae and S. uberis. The results showed that the genetic base for defense towards mastitis is pathogen-dependent. Genetic evaluation for pathogen-specific mastitis traits may be useful, despite lower h^2 than unspecific mastitis, because the economic values for contagious pathogens is 78% higher compared to environmental pathogens and because r_a between contagious and environmental pathogens were significantly different from unity. However, improved recording of pathogens is critical for a successful genetic evaluation.

Random regression models for udder health traits in dairy cattle

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Linear multiple-trait random regression sire models were applied to longitudinal binary clinical mastitis and test-day somatic cell count data. The aim was to improve the current genetic evaluation for mastitis resistance by utilizing more of the available information and combining the two udder health traits into one model which could be easily applied in practice. Data from the Swedish milk-recording scheme on first-parity Swedish Holstein cows calving between 1998 and 2000 with information on veterinary treatments of clinical mastitis and test-day SCC up to 400 d after calving were used. For each cow, binary clinical mastitis observations were created by dividing their lactation into monthly intervals with a score of one if the cow had at least one treatment within that interval and otherwise zero. The heritability for SCC over time varied between 6 and 10%. The heritability for clinical mastitis over time was very low, especially at certain time points, probably due to the low overall mastitis frequency (12%). Single-trait analyses for the separate intervals gave a very similar description of the heritability for clinical mastitis as the random regression model. The correlation between predicted breeding values for clinical mastitis from the random regression model and a similar linear sire model during the first 50 d of lactation was nevertheless high (0.96).

The quest for genetically improved udder health: fine mapping a QTL for somatic cell score in the German Holstein

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Genetic selection for udder health in Germany is based on the indicator trait somatic cell score, which is highly correlated with clinical mastitis but has a low heritability. Finding quantitative trait loci (QTL) which underlie the genetic variance of udder health traits is imperative to successfully improving udder health and achieving higher mastitis resistance without the use of antibiotics or vaccines. Combined linkage and linkage disequilibrium analysis was used to fine map a QTL affecting somatic cell score on BTA27. A granddaughter design of 6 grandsire families with 492 progeny tested sons from the German Holstein population was used in this study. Nineteen microsatellite markers with an average marker spacing of 2.12 cM were genotyped along a chromosome segment of 38 cM. The QTL position could be narrowed to an interval of 1.79 cM. The ratio of QTL to polygenic variance was estimated at 0.155 for somatic cell score, with a restricted likelihood ratio test statistic of 10.61. These results indicate that the highly significant QTL in the chromosomal area studied is responsible for about 15.5% of the genetic variation in somatic cell score in the German Holstein population.

Genetic variation in the threshold of sensitivity to heat stress on milk production in cattle

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Past studies in genetics of heat tolerance assumed a fixed threshold in sensitivity to heat stress. The objective of this study was to assess the genetic component on individual variation for that threshold. Data included 379,833 first-parity test day records on 40,986 Holsteins. Inferences were obtained by a Bayesian non-linear hierarchical animal model. Effects in the model included DIM x milking frequency, Age, HYS of the milking day, and two animal effects: the intercept (I_i) and the regression (S_i) on the temperature-humidity index (THI) above an animal specific threshold (Ti). In the second hierarchical stage the means and the genetic and environmental (co)variances were estimated using a linear mixed model. The estimated heritabilities (posterior standard deviations) of I, S and T were 0.22(0.02), 0.26(0.05), 0.24(0.05), respectively, and the genetic correlations were $r_{g,I\text{-}S}$=-0.53(0.05), $r_{g,I\text{-}T}$=-0.42(0.1) and $r_{g,S\text{-}T}$=0.97(0.08). The estimated average of the threshold across all animals was 22.7(0.16) THI C^{o}. The marginal posterior mean for the heritability on the observed scale in the absence of heat stress (14 THI Cº) was 0.11(0.012), decreased to 0.10(0.014) at 30 THI Cº, and increased to 0.13(0.02) at 40 THI Cº. The DIC indicated a superiority of this model compared to a model with a fixed threshold.

Genetic parameters for milk, fat and protein in Holsteins using a multiple-parity test day model that accounts for heat stress

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Data included 585,119 test-days (TD) in first to third parity for milk (M), fat (F) and protein (P) from 38,608 Holsteins in Georgia. Daily temperature humidity indices (THI) were available from public weather stations. Models included a repeatability test-day model (MREP) with a random regression on heat stress index (HSI), and a test-day random regression model (MRRM) using linear splines with 4 knots and HSI, which was defined as THI over 22C from the 3rd day before the TD. Knots were placed at 5, 50, 200, and 305 days-in-milk (DIM). For both models the regular genetic variance increased by 30-40% from 1st to 2nd parity but slightly declined in 3rd parity for M and P. The heat stress variance doubled from 1st to 2nd parity and additionally increased by 20-100% in 3rd parity. The genetic correlations between heat -stress effects in different parities were ≥0.56-0.79 while the genetic correlations between regular and heat stress effects across parities and traits were between -0.30 and -0.47. With MRRM, the variance of the heat stress effect was about half of that with MREP. Genetic variance of heat stress strongly increases with parity. It is inflated with MREP due to timing of lactations to avoid the peak production during the times of heat stress.

Genetic correlations between measures of milk coagulation properties and their predictions by mid-infrared spectrometry

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Assessment of individual milk coagulation properties (MCP) is difficult to be carried out routinely on a large scale. Predictions of MCP by mid-infrared spectroscopy (MIR) might be an alternative to direct measures of MCP. MIR prediction of MCP is not very accurate but it can be used at the population level in milk recording schemes. From a genetic point of view, the relevance of MIR predictions (pMCP) and spectra loadings (SL) as indicators traits of MCP relies on the genetic correlations between MIR traits and measured MCP (mMCP). This study aimed to predict MCP of individual milk samples using MIR and to estimate genetic parameters for mMCP, pMCP and SL. Individual milk samples were collected from 1,064 Brown Swiss cows (progeny of 46 sires) reared in 38 herds. Rennet coagulation time (RCT, min) and curd firmness ($a_{30,}$ mm) were measured using a computerized renneting meter and MIR data were recorded over the spectral range of 4,000 to 900 cm^{-1}. Prediction models were developed for RCT (pRCT) and a_{30} (pa_{30}) by partial least squares regression. The root mean square error of cross-validation was 2.4 min for RCT (mean ± range: 14.9 ± 24.9 min) and 6.9 mm for a_{30} (mean ± range: 41.7 ± 58 mm). Genetic parameters for mMCP, pMCP and SL were estimated in bivariate Bayesian analyses using Gibbs sampling. Results on prediction models, genetic parameters, and ranking of sires are discussed.

Chromosomal regions underlying non-coagulation of milk in Finnish Ayrshire cows

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About 10% of Finnish Ayrshire cows produce non-coagulating (NC) milk, i.e., milk that does not form a curd in a standard 30 min testing time, and is thus a poor raw material to cheese dairies. A genome-wide scan under selective DNA pooling method was carried out to locate genomic regions associated with the NC-milk. Based on the hypothesis of the same historical mutation, two pools were made using 17 sire families. The number of daughters per sire averaged 1.9 in the pool of NC-milk and 2.9 in the pool of excellently coagulating milk. Before testing pools for homogeneity, allele intensities were corrected for PCR artifacts, i.e., shadow bands and differential amplification. Results indicating association were verified using daughter design and selective genotyping. The individually genotyped data consisted of 18 sire families with a total of 477 genotyped daughters, which amounts to about 12% of both tails of the milk coagulation ability. The data were analyzed using interval mapping under Maximum Likelihood and nonparametric methods. BMS1126 in chromosome 2 and BMS1355 in chromosome 18 were associated with NC-milk across families on an experiment-wise 0.1% significance level. By scanning gene databases we found two potential candidate genes: a non-specific serine/threonine kinase in chromosome 2, and in chromosome 18, sialyltransferase, which catalyzes the last step of glycosylation of kappa-casein.

Genetic parameters for major milk fatty acids and milk production traits of Dutch Holstein-Friesians

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We estimated genetic parameters for major milk fatty acids and milk production traits. One morning milk sample was collected on 1,918 Holstein-Friesian heifers from 398 commercial Dutch herds. Each sample was analyzed for percentage of fat and for fatty acid composition (wt/wt %). Heritabilities were high for C4:0 (0.42), C6:0-C12:0 (0.67), C14:0 (0.59), and C16:0 (0.43). Saturated and unsaturated C18 had heritabilities around 0.25, except for C18:2cis-9,trans-11 (CLA), which was 0.42. Genetic correlations were positive among C4:0 to C14:0, as well as among unsaturated C18, but correlations of C4:0 to C14:0 with unsaturated C18 were negative. The genetic correlation of C14:0 with C16:0 was strongly negative. The genetic correlation of C16:0 with fat percentage was positive (0.65), implying that selection for fat percentage should result in a correlated increase of medium chain fatty acids, while unsaturated C18 decreased with increasing fat percentage (-0.74). This study shows that milk fat composition can be changed by means of selective breeding, which offers opportunities to meet industry and consumers in providing milk with better health or technological aspects.

Genetic parameters for dairy cattle claw health traits recorded by claw trimmers

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Occurrence of dermatitis (DD), heel horn erosion (HH), sole haemorrhage (SH), and sole ulcer (SU) recorded routinely by claw trimmers were analyzed. Data consisted of Swedish Holsteins (SH) and Swedish Red (SR) dairy cows with claw trimmings between July 2003 and June 2007. Health traits were scored as absent (0), slight (1) or severe (2). Many cows were trimmed twice within alactation but only the first trimming was used for the analysis. The edited data sets consisted of 65 816 records from first and 24 121 records from second lactation of SH, and of 58 457 records from first and 22 282 records from second lactation of SR. Frequency of occurrence were highest for SH (25-27%) followed by HH (15-18%), DD (7%) and lowest for SU (3-5%). A linear animal model was used to obtain genetic parameters. Heritabilities across breeds were in the range 0.034 to 0.069 for first lactation and 0.032 to 0.085 for second lactation. Genetic correlations between the same traits in first and second lactation were close to unity. Genetic correlations between DD and HH and between SH and SU were moderate to high (0.30-0.90), whereas all other correlations were low (-0.02-0.30). The study shows that claw health traits recorded by claw trimmers are heritable and that claw health measured in first and second lactation is the same trait.

Effect of the DGAT1 gene polymorphism on milk production traits in Hungarian Simental cows

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DGAT1 encodes diacylglycerol O-acyltransferase, a microsomal enzyme that catalyzes the final step of triglyceride synthesis.The effect of the lysine/alanine (K232A) polymorphism of DGAT1 on dairy traits was confirmed by numerous authors and statistically significant differences were identified for milk fat, milk protein and milk yield in different breeds. The objective of this study was to determine the distribution of the genotypes and allele frequencies in the Hungarian Simental population and to investigate the effect of the DGAT1 locus on the milk production traits. 180 blood samples have been collected from different Hungarian Simental herds, and DGAT1 genotypes were determined by Polymerase Chain Reaction- Restriction Fragment Length Polymorphism (PCR-RFLP) assay. Milk production data have been registered throughout three consecutive lactations and statistical analyses have been carried out to find association between the individual genotypes and milk production traits. This project was supported by the Hungarian Scientific Research Fund (Project T048947) and National Research and Development Programme (4/025/2005).

Genetic correlations between combined claw health traits measured at claw trimmings of Swedish Holsteins and Swedish Red dairy cows

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Earlier studies have shown a high genetic correlation between dermatitis (DD) and heel horn erosion (HH), and between sole haemorrhage (SH) and sole ulcer (SU) measured at claw trimmings of Swedish Dairy Cows. Therefore, it was suggested to treat DD and HH as one trait (DDHH) and SH and SU as another (SHSU). Diseases were scored as absent (0), slight (1) or severe (2). When combining the diseases the one with the highest score was kept resulting in a combined disease frequency slightly higher than the two diseases separately, but lower than the sum of the two diseases. A linear animal model was used to obtain genetic parameters for DDHH and SHSU in first and second lactation. Heritabilities of DDHH were 0.065 (0.063) and 0.059 (0.068) for Swedish Holsteins (SH) and Swedish Red (SR) in first (and second) lactation, while heritabilities of SHSU were 0.047 (0.074) and 0.075 (0.055) for SH and SR in first (and second) lactation. Genetic correlations were 0.88 and higher between the same trait in first and second lactation, while correlations between DDHH and SHSU were in the range 0.23 to 0.47. The study showed slightly higher heritabilities for DDHH and SHSU compared to the mean of the heritabilities for DD and HH, and for SH and SU.

Genetic parameters and breeding values on weaning results of Charolais calves

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Weaning weight, preweaning daily gain and 205-day weight of 13087 Charolais calves (5277 male and 7810 female) born from 146 sires between 1990-2005 were examined. Variance, covariance components and heritabitity values and correlation coefficients were estimated. The effect of the maternal permanent environment on genetic parameters and breeding values were examined. Two animal models were used for breeding value estimation. The direct heritability (h_2^d) of weaning weight, preweaning daily gain and 205-day weight was between 0.54 and 0.59. The maternal heritability (h^2_m) of these traits was 0.32 and 0.38. The direct-maternal correlations (r_{dm}) were strong and negative (-0.84). Contribution of the maternal heritability and maternal permanent environment to phenotype is smaller than that of direct heritabilities ($h^2_m + c^2 < h^2_d$). The proportion of the variance of maternal permanent environment in the phenotypic variance (c^2) changed from 0.02 to 0.03. The rank of animals based on the breeding value for weaning traits has not changed when maternal permanent environmental effect was considered or without consideration in the modells used for evaluation. The genetic value for weaning results of Charolais population has increased since 1993.

Relation of own growth of sires of bulls to sons in progeny test stations

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Live weights and daily gains of 8,243 performance tested young sires of Czech Fleckvieh (dual purpose) till the age 400 days were analysed using Random Regression (RR) and Single Trait Animal Models. Evaluations were for entire period and for daily gains in various consecutive monthly intervals. Systematic environmental effects explained a higher proportion of variability in the RR for gains in short consecutive intervals (GSCI) than for other definitions of growth. The expected average reliability of estimated Breeding Values (BV) of young animals was similar for all methods from 0.42 to 0.46, but the rankings of animals differed. Determination (r^2) of BV between methods ranged from 0.64 to 0.94. Within-method correlations of BV of parents with progeny according the data from performance-test stations were highest for the GSCI. Correlations of BV of sires for own growth at performance-test stations with the BV of net gain of groups of progeny at progeny-test stations with the final live weight around 600 kg and age 500 days were according the method of sires evaluation from 0.26 to 0.38. Preferred method was according GSCI. This method allows include more data in the evaluations, and separate the growth curve into genetic and non-genetic parts.

Joint effects of CSN3 and LGB genes on coagulation properties in Czech Fleckvieh

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The objective of this study was to determine the joint effects of CSN3 and LGB genotypes on parameters of quality and coagulation of milk in Czech Fleckvieh cows. Three hundred and twenty-eight Czech Fleckvieh cows were determined for CSN3 (kappa-casein) and LGB (beta-lactoglobulin) genotypes using the PCR-RFLP method, milk quality parameters and coagulation properties. Fifteen genotype combinations were detected, with ABAB (21.0%) and AAAB (18.3%) as the most frequent. The observed genes significantly affected the contents of milk protein (crude protein, true protein, casein, and whey protein), as well as solid non-fat in milk, casein number and curd quality. BBAA was found to be the genotype with the highest positive impact on most of the milk characteristics evaluated. Whereas ABBB, BBBB, BBAB and ABAB had a positive influence on milk quality and milk coagulation properties, genotypes containing CSN3 allele E had a negative effect. This study was supported by project NAZV 1G46086.

Genetic parameters for linear type traits in Czech Holstein cattle

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Description and genetic evaluation of linearly described type traits of cows belonging to population of Holstein cattle in the Czech Republic has been developed and improved in several last years according to international standards in this area. For this reason and as well as for continual changes in population there was need of new estimation of genetic parameters both for newly incorporated and currently established traits. The data was extracted from database of conformation evaluation. The animal model used for analysis included effect of herd-date-classifier, classifier and season of calving as fixed effects, quadratic regressions on age at calving and stage of lactation at evaluation and random regression and random effect of animal. The parameters were estimated in single-trait models using REML.Estimated genetic parameters were in line with previous estimates for Czech population as well as with published results. The highest heritabilities were found for Stature (0.45), Rump Width (0.40) and Body Condition Score (0.36), whereas very low values (from 0.05 to 0.10) of heritability were found for some of feet and legs traits (Locomotion, Rear Legs Rear View, Foot Angle, Rear Leg Set). The financial support from the project NAZV 1B44035 is acknowledged

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Estimation of additive, maternal and non-additive genetic effects of growth traits in a multibreed goat project

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Data from purebred and crossbred kids, consisting of Angora (A), Baladi (B), Anglo-Nubain (AN), Damascus (D) and Zaraibi (Z) were analyzed to estimate breed additive and breed maternal effects and average individual (AI) and average maternal (AM) heterosis of birth (BW), weaning (WW), 6 month (6W) and yearling (YW) weights. Data were adjusted for the significant environmental factors. A multiple regression analysis was then conducted to estimate the genetic effects and to predict breed crosses. The additive effects of BW, WW, 6W and YW were not significant and positive, except those of 6W. Regression coefficients of the additive effects of BW, WW and 6W of D kids were the highest (2.15, 32.99 and -53.42, respectively). The highest regression coefficient of YW was for AN kids (111.05). Regression coefficients of maternal effects were negative and insignificant, except those of YW. The highest regression coefficients of BW and WW were for AN kids (-5.86 and -51.77, respectively), reflecting the superior mothering ability of the breed. The highest values of 6W and YW were for D kids (0.17 and -235.15, respectively). Regression coefficients of the AI heterosis of BW, WW, 6W and YW were positive (0.03, 0.45, 1.61 and 0.59, respectively), and the values of WW and 6W were significant. The corresponding values of the AM heterosis were significant, except YW (-0.09, -0.41, -0.64 and -0.45, respectively).

Relationships of body measurement parameters from cow pictures to milk yield and disease

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We estimated correlations of body measurement parameters extracted from cow pictures using computer image analysis to 305-day milk yield and medical treatments of mastitis and hoof disease. Data was 2,238 pictures taken from 1 month before calving to 5 months after calving. It consisted of 198 parity of 120 cows in 2000-2007. Two digital cameras were set at the left side and the rear of cow each, kept fixed distance. 18 parameters from udder and 5 parameters from leg and hoof were extracted using computer image analysis software Sigma Scan Pro 5. Udder length, udder depth and udder area had medium phenotypic correlations to 305-day milk yield, even before first calving. Fore udder attachment became weak just after calving and recovered gradually in next 5 months. Cows which had weak fore udder attachment on the average tended to catch mastitis. Cows which had good recovery of fore udder attachment were hard to catch mastitis in next lactation. Cows which had deeper heel had less medical treatments of hoof disease. Body measurement from cow pictures can be used to score linear type traits.

Genotype x environment interaction on weaning performance of Charolais calves

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The interaction of sire and herd in the Charolais breed of cattle was examined on data from the Hungarian Charolais Breeders Association. Data of 546 progeny (264 male and 282 female), born between 1990-2001, of seven sires from two herds were evaluated. Preweaning daily gain (PDG) and 205-day weight(205dW) were analysed. Herd, age of cows, year of birth, season of birth and sex of calves were treated as fixed, while sire and sire x herd were treated as random effects. Genetic (rg) and rank (rrank) correlations were calculated for sires represented in the two herds (A,B). Data were analysed according to Harvey (1990) Least Square Maximum Likelihood Computer Program and SPSS 9.0 for Windows. Results were as follows: rg= PDGA–PDGB: 0,43 ($P<0,01$); 205dWA–205dWB: 0,52 ($P<0,01$); and rrank= PDG: 0,179 ($P>0,05$); 205dW: 0,179 ($P>0,05$). According to the result of examination important and significant ($P<0,05$) sire x herd interaction were found in case of the two traits in Charolais breed.

Genomic markers for left-sided displaced abomasum in German Holstein dairy cows

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Displacement of the abomasum (LDA) is a common disease in Holstein dairy cattle and of considerable economic importance for dairy industry. Affected cows need veterinary treatment. Milk performance and productive life are significantly reduced. We identified four genome-wide significant quantitative trait loci (QTL) for left-sided displaced abomasum in German Holstein cows. The whole genome scan using 297 polymorphic microsatellites included a total of 336 animals from 14 paternal half-sib families. The four genome-wide significant QTL were located on bovine chromosomes (BTA) 1, 3, 21, and 23. These QTL were confirmed by further microsatellites and screened for single nucleotide polymorphisms (SNPs). We were able to develop population-wide associated SNPs for left-sided displaced abomasum in German Holsteins. Furthermore, we used our data to test for QTL of milk-performance traits, SCS and length of productive life (LPL) and overlapping QTL regions with LDA-QTL. On BTA1, 21 and 23, there were also overlapping QTL for LPL, on BTA1 for milk fat, and on BTA23 for milk protein and SCS. Milk yield QTL did not interfere with LDA-QTL in our data analysis. This study is an important step towards development of a genomic selection program balancing health traits, milk performance and LPL in Holstein dairy cows.

Genetic parameters of various manifestations of osteochondrosis in Dutch Warmblood horses (KWPN)

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Osteochondrosis (OC) is an important disorder in horses. Estimated heritabilities vary widely, due to different definitions used, and sometimes the use of small or preselected data sets. We estimated heritabilities of flattened bone contours and fragments, and genetic correlations between these, both between and within joints. Stifle, hock and fetlock joints of 811 randomly selected yearlings, descending from 32 representative stallions, were scored at 28 sites. At each site, OC was scored in 5 categories, distinguishing flattened bone contours from fragments. At animal level, estimated heritability was 0.23 for total OC. Heritabilities of fragments were higher than for flattened bone contours. Heritabilities were highest in the hock joints, intermediate in the fetlock joints, and lowest in the stifle joints. The genetic correlation at animal level, between flattened bone contours and fragments was high. The genetic correlation between hock and stifle joint was high, whereas correlations between the fetlock and other joints were moderate. We conclude that OC should be recorded in multiple joints, including both flattened bone contours and fragments. Results are important for unravelling the genetic background of OC, and enable estimation of breeding values to select sires.

Genetic correlations of radiographic health of the limbs with rideability and character in the Warmblood riding horse

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Multivariate genetic analyses were performed using results of standardized radiological examinations of 7,950 Hanoverian Warmblood horses and evaluations of rideability and character from mare performance tests at station of 2,952 Hanoverian Warmblood mares. Radiographic examinations were performed between 1991 and 2004 at on average 4.0 years of age. Performance tests were held between 1987 and 2004 at on average 3.3 years of age. Birth years of the horses ranged between 1981 and 2002. Genetic parameters were estimated with REML and relative breeding values (RBV) were predicted with BLUP in linear animal models for four radiographic health traits, rideability and character. Moderate heritabilities in the range of $h^2 = 0.1$ to 0.3 were estimated for osseous fragments in fetlock joints (OFF), osseous fragments in hock joints (OFH), deforming arthropathy in hock joints (DAH) and distinct radiographic findings in the navicular bones (DNB) as well as for rideability evaluated by judges or a test rider and character. There were indications of negative additive genetic correlations between radiographic health traits and performance traits, facilitating concurrent selection for these traits. Selection for radiographic health of the limbs is expected to support breeding progress in traits referring to basic qualities of a riding horse.

Heritability and repeatability of insect bite hypersensitivity in Dutch Shetland mares

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Insect bite hypersensitivity (IBH) is an allergic reaction of horses to bites of certain Culicoides species. Although its etiology is poorly understood, genetic factors are expected to be involved. Few studies estimated a heritability, but investigated data were small and mostly preselected. No estimates of repeatability are given in literature. Currently, no reliable and inexpensive tests are available to routinely check IBH in large numbers of horses. To study whether selection against IBH on clinical signs in Dutch Shetland mares is possible, heritability and repeatability were estimated. Mares (n = 6,073) were scored by 16 inspectors in 58 of 90 regions in The Netherlands during foal inspections in 2003, 2004, and 2006. Of all mares observed, 74.4% had one observation, 20.7% had two observations, and 4.9% had three observations, resulting in 7,924 observations. Mares descended from 984 sires and 4,455 dams. IBH was analyzed as a binary trait with a repeatability animal model. Prevalence was 8.8%, with a repeatability of 0.31±0.02. Heritability was 0.08±0.02 on the observed scale, and 0.26±0.06 on the underlying scale. It can be concluded that IBH, based on clinical signs, is a heritable trait in Dutch Shetland breeding mares. Therefore, IBH prevalence can be reduced by selection. Repeatability showed that including repeated measurements on clinical signs of IBH will improve the accuracy of breeding values for IBH.

How the study of the number of starts and of the starting status can inform about the selection bias when using earnings for breeding evaluations in race horses

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In France, horses earning some money represent 30% of the horses born for Trotters, 41% of the Thoroughbred horses in flat races and only 23% in jumping races. The question of a selection bias, when using earnings for breeding value estimation is therefore raised. To analyse this matter we looked at the number of starts of 2-5 year-old Trotters and Thoroughbreds born between 1996 and 2000 (58 841 and 19 957 resp.). Two variables were studied:-1 a none or all variable (starter/non starter) -2 number of starts excluding zero in trotting, flat and jumping races. The first variable reflects the phenomenon being prepared to participate in races. It appears "highly heritable" according to very high sire components (14%, 14%, 21% resp.) and also very high dam components (11%, 13%, 13% resp.). The second variable seems however, mainly environmentally or trainer dependent. Sire component is very low in trotting and jumping races (1%, 4% resp.) and average (10%) in flat races. A noticeable dam effect is observed in all three cases as shown by the greater dam component (3%, 11%, 14% resp.).The distribution of the number of starts for horses earning money compared to those not earning anything allows with some hypotheses to estimate the number of horses prepared to race but that never started. It leads to correcting the apparent selection rate from 30% to 86% in trotting, from 23% to 61% in jumping races and from 41% to 61% in flat races.

Breeding value estimation by repeatability and random regression models in Hungarian Sport Horses

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The aims of the study were to analyze the breeding value estimation alternatives for the Hungarian Sport Horses. The analyses were based on the Hungarian Sport Horse Studbook, results of mare own performance tests and show-jumping competition results. Breeding value based on own performance test results were estimated with an animal model. Breeding value estimations of sport results were based on repeatability animal model and random regression models. Different measurements of competition performance (square root of ranks, cubic root of ranks, quad root of ranks, Blom-normalized ranks, ranks transformed with cotangent function and difference between height of the obstacle and the fault points) were compared using a repeatability model with the same fixed effects. For random regression evaluation of show-jumping results the first order Legendre polynomial was sufficient. Heritability continuously increased and variance proportion of permanent environment effect continuously decreased with the increase of age. Breeding values can be estimated at different ages and from these values a composite breeding value index can be computed.

Marker based estimation of effective population size for the Swiss Franches Montagnes horse breed

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The concept of effective population size (N_e) contains relevant information for conservation activities. Beside pedigree based methods for the estimation of N_e, marker based methods, elaborating the information from linkage disequilibrium (LD), are described in literature. The goal of this study was the application of the marker based estimation of N_e for real data. Therefore a sample of 94 Franches Montagnes horses was genotyped for 22 microsatellites of the equine chromosome 3. The average spacing between markers was 2.1 Mb. For 68 marker pairs significant LD was found. Decreasing r^2-values were found for increasing distance, however with several outliers. These affected the estimation of N_e, such that over the last 70 generation no clear trend can be recognized. In the breed history of Franches Montagnes at least three epochs of introgression are documented, which might explain the irregularities in LD and N_e, respectively.

The genotype for coat colour genes as a criterion in the design of semen banks in the Jaca Navarra breed

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Main objective of a semen bank, is the maintenance of genetic diversity. Thus, minimum coancestry criterion is commonly implemented to decide the number of doses to obtain from each potential donor. However, if selection in favour/against particular alleles in a known locus exists for the 'living' population, genotypes of donors for that locus can be included into the criterion. Jaca Navarra is a Spanish pony from the Cantabrian-Pyrenean group. Only bay animals are included in the studbook, so animals with recessive alleles in MC1R and ASIP coat colour genes are removed from the population. The present study explores the consequences, for the global genetic diversity kept and the frequencies of coat colour alleles, of favouring/penalising the collection of those alleles, accounting for any restriction on the global coancestry (diversity) using optimisation via simulated annealing. Results suggest that, due to the lower frequency of recessive alleles in the population, trying to keep high frequencies of them leads to very high levels of coancestry in the bank, although balanced solutions may be found. Probably, the advisable solution would be to keep frequencies at the same level than in the living population and, thus, assuring the maintenance of the maximum genetic diversity.

Prevention of related mating in the Slovenian Lipizzan population

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The official number of Lipizzan horses in Slovenia in the year 2007 was 1030. Because of the small population, the main problem in breeding is prevention of related mating. Pedigree information is not sufficiently taken into account when planning mating, thus prevention of related mating is ineffective. 263 mares, born between 1997 and 2004, were used as potential breeding mares. Relationship coefficients, between five breeding stallions that will be used in the mating season 2008 and potential breeding mares, were calculated and analysed. 69 mares are not related to any of them. The other 194 mares are related with all 5 stallions, because all of these stallions are also related to each other. Relationship coefficients between stallions varied from 0.03 to 0.16. With the purpose of reducing related matings, a web application such as Decision Support System was made. With this program it is possible to examine relationship coefficients of all mares with all stallions and compute the inbreeding coefficients of the potential offspring. We estimate that using this kind of web application, as a tool of planning mating, would on average decrease the inbreeding coefficient of the offspring of 194 mares for a value of 0.03 to 0.06.

Genetic parameters for linear type and gaits traits in the Belgian Warmblood horse

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Linear scoring is one possibility to assess the conformation and gaits of the horse. In 2003, a linear scoring system was introduced for the Belgian Warmblood Horse (BWP). Since then, 987 mares aged of 3 or 4 years have been scored on a scale between -20 and 20. The aim of this study was to estimate genetic parameters for the height at withers and linear traits (17 type, 10 limbs and 6 gait traits). A multi-trait animal model including fixed effects for jury, age and location (date x place of appraisal) has been implemented. Genetic parameters for the 34 traits were computed applying a canonical transformation and an EM-REML algorithm with an additional deceleration step (MTC program). Heritabilities of the 33 linear traits were in the range of 0.16 and 0.55 and heritability of the height at withers was 0.37. Genetic correlations ranged from -0.60 to 0.98 with 75 correlations higher than |0.5|. The highest positive correlations were within traits of walk and traits of trot. The volume and the substance of legs were the most negatively correlated. The results show that the linear scoring system can capture genetic variation and could be used for breeding value estimation.

Design of a linear type trait system for morphological evaluation of Spanish sport horse breed: preliminary results

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The Spanish Sport Horse is selected for 3 disciplines: show jumping, eventing and dressage. Body measures have been analysed to define the morphological models presented in the population and to define a linear type trait system. Data consisted on 39 body measures (13 lengths, 11 angles, 5 heights, 5 widths and 5 perimeters) taken from 126 Spanish Sport Horses (65 males and 61 mares), ranging from 3 to 8 years old. There are 94 show jumpers, 23 eventing horses and 9 dressage horses. Body indexes were also calculated. Neck and croup angles have obtained the highest coefficient of variation (25.12% and 24.52%, respectively) for the 3 disciplines; whereas heights and body indexes obtained the lowest ones (2.02% and 1.17%, respectively). It could be due to the morphological differences between disciplines, mainly presented in functionality traits (angles). Discriminant analysis also showed morphology differences according to the discipline. In a principal components analysis the first factor (which showed more differences between disciplines) was refereed to "balance traits", and the second one to "proportional traits".

Heritability estimates for biometric measures of the Spanish Purebred horse

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Traits based on conformation scores, performance tests and competition results are the main selection criteria in almost all breeding schemes of horses. So, knowledge of genetic parameters is essential for the evaluation of breeding programs, estimation of breeding values (EBV) and predictions of response to selection. Morphofunctional traits are basic for the breeding scheme of the Spanish Purebred horse and accuracy of the EBV's are of major importance for breeders. A total of 16,472 horses (40.3% stallions and 59.7% mares) belonging to 537 studs were gathered between 2004-2005. Animals were 3.94±0.01 years old. They were measured for withers height, height at chest, leg length, body length, width of chest, heart girth circumference, knee perimeter and cannon bone circumference. Although the sample used was independent and more than twice in size than that previously used by Molina et al. (1999), the estimates of genetic parameters are consistent with those reported by these authors regardless the model fitted for the estimation. Because of the higher sampling size, the current estimates have lower standard errors. The estimates of heritability for most traits were lower than those reported by Molina et al. (1999), confirming the possible overestimation suggested.

Relation of limb conformation to sports career in dutch warmblood horses

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Distal limb injuries are the main reason for early retirement and lower performance in equine sports. Predisposition to limb injuries might be related to limb conformation. The relation of limb conformation to success in and length of sports career has therefore been studied. Genetic correlations were estimated between limb conformation, scored at studbook entry (n=44840) and sports performance of horses themselves or relatives (n=33459 in dressage and n=30474 horses in jumping). Effect of limb conformation on length of sports career has been studied using survival analysis to base and elite level of both dressage and jumping. Heritability estimates of limb conformation traits ranged from 0.16 to 0.27. Genetic correlations with sports were low to moderately positive, except for uneven feet being weakly negative correlated. Survival analysis showed that pastern angle was a risk factor in length of sports career at elite level of dressage and jumping. Limb quality was a risk factor in both levels of jumping. Uneven feet was a risk factor in elite jumping, which almost doubled the risk of being culled. It can be concluded that limb conformation is related to performance in sports and some conformation traits have a significant effect on length of sports career.

Selection in the genetic ressource: variation of linear assesment type traits in Old Kladruber horse

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The structure of the breed in 2006 was: 39 sires and 350 dams. The breed was closed against gene immigration in 1992. The effect of black and grey variety and the stud on conformation was studied on 494 horses of the Old Kladrub breed using the linear assesment of 32 conformation traits.The data were used for the estimation of population parameters and heritability coefficients. The specific properties and variation of the Old Kladrub horse in its current state were characterized by the overall mean, standard deviation, coefficient of variation and heritabilites. The highest coefficient of variation was found for the forelimbs-side view (40.14%), chest girth (36.25%) and height at withers (30.97%). Out of 32 traits, 28 were described preferable using the trait level 7 to 9. Of all traits 8 showed heritabilities within the interval of 0.200- 0.675. These traits are also candidates for selection criteria.The rest of the traits showed low heritabilites (below 0.200). Significant differences between both color varieties were found in 13 from 32 conformation traits. Significant differences between the nucleus Kladruby stud and the other private studs were found in 12 out of 32 traits. Significant interaction variety x stud was recorded for 7 conformation traits only.

Accounting for the breed effect in the estimation of genetic parameters of horse eventing competition traits

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In last decades the number of participants in young horse eventing competitions is increasing. These competitions usually involve a large number of horse breeds. Joint genetic evaluations must account for the effect of the breed of the individual to avoid bias. The goal of this study was to explore models to evaluate the breed effect in the genetic parameters estimation for 4 eventing competition traits: conformation, dressage, jumping and cross. Data included 1,811 records from 327 individuals belonging to the following breeds: Anglo-Arab, Spanish Sport horse, Arab, Spanish Purebred, Thoroughbred, Hispano-Arab, Spanish Trotter and others. Multivariate animal models were fitted to estimate variance components under REML, and to ascertain the influence of the breed on heritability. Across traits, estimates of heritability ranged from 0.07 to 0.29 for models including the breed as a random effect, and from 0.07 to 0.33 those fitted without this effect. Model fitted including genetic groups for the analysed breeds gave heritabilities from 0.05 to 0.33. The inclusion of the breed random effect reduced the estimates of heritability from 0.2% to 12.2% whilst the inclusion of the genetic groups reduced the estimates of heritability from 0.1% to 35.3%.

Application of a random regression model for the estimation of variance components for race performance in young Trotter horses in Spain: preliminary analysis

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A total of 36212 racing performance data recorded between 1990-2006 from 4960 Trotter horses in Spain were studied by Random Regression Model (RRM) to estimate variance components for race performance. The pedigree of each horse was extended until the 4th generation, with a total of 9201 animals. The dependent variable was racing time (time per kilometre) over the whole distances (1600-2750m) for young horses (2-4 years). Hippodrome-date (405) and sex (3) were included as fixed effects. Animals (9201), jockey (1009) and permanent environmental effects due to repetitions of records from an animal were random. The additive variance components and heritability (h^2) decreased as race distance increase (h^2=0.27 at 1600 m and h^2=0.13 at 2750 m). Genetic correlations were higher than 0.90 for adjacent distances. A high variability was shown in the breeding values for all animals and all distances in the data set. Differences were detected in the form of responses of horses along the trajectory of distances. The use of RRM is recommended in breeding programs of trotter horses in Spain, however it is necessary to analyze the relationship between performance at others ages.

Subdivision of Spanish horse populations assessed by comparing effective sizes computed from individual increases in both inbreeding and coancestry

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The aim of this work was to show the usefulness of comparing the effective population sizes (N_e) computed on individual increase in inbreeding (ΔF_i) and in coancestry (Δf_i) to asses the degree of population subdivision. This approach has been tested on several horse populations with different breeding policies: the Spanish Purebred (SPB, Andalusian) horse, its Carthusian strain, the Spanish Arab (A), Spanish Anglo-Arab (AA) and the Spanish Sport Horse (SSH). Reference subpopulations were defined to approach the last generation. Both ΔF_i and Δf_i were computed from inbreeding and coancestry coefficients accounting for pedigree depth using parameter t (equivalent to discrete generations). After averaging ΔF_i and Δf_i in each reference subpopulation, the effective size values obtained should be comparable in the case of random mating. N_e values were 55.2±0.56 and 80.2±0.01 for SPB, 22.2±0.18 and 26.9±0.00 for Carthusians, 39.1±0.33 and 57.8±0.00 for A, 219.8±13.68 and 341.6±0.49 for AA and 302.0±2.85 and 1175.4±2.85 for SSH, for N_e values computed from ΔF and Δf, respectively. The rate $\Delta F/\Delta f$ can provide a measure of the degree of population subdivision which resulted in about 2 and 4 for AA and SSH populations. Computations were done using the program ENDOG v4.5.

Demographic characterization and genetic variability of the Oriental Pure Horse, reared in Sicily, by genealogical data analysis

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The Italian stud book and the "Istituto di Incremento Ippico di Catania"provided the data. The complete data-set consisted of 406 individuals, including founders of the 1800's. The pedigree is therefore distributed through 13 generations. All demographic parameters were estimated using the Minbreed v1.0 software. The average inbreeding coefficient was equal to 0,8%. While the inbreeding coefficient for male and female separately was equal to 0,9% and 1%, respectively. Seventy-two percent of the male and 84,3% of the female populations were not related. The average relationship of all possible matings was equal to 3,9%. The maximum value of addititive relationship was equal to 75%. The N_e equals to 404,33. Annual inbreeding, considering random mating, was equal to 0.12%. All together these results are important to set up a selection scheme, so to valorize all the functional traits of this breed. The research was supported by PRA 2004 (Prof. Alessandro Zumbo).

The effect of age on results of 60-days performance tests of young mares in Poland

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The 60-days performance test for mares is intended for three years old mares, however older mares are allowed too. The results of older mares are calculated with 5% of penalty. The aim of the study was to verify if the penalty is supported by results achieved by mares in the test and what is the difference between groups of age. The material consists of 160 mares' results that attended the tests in the year 2007. Analysis of variance was used to evaluate the effects of test and age of horses (year of birth) on the different traits. The effect of test was statistically significant for most of the traits. The effect of age group was statistically significant for the traits: walk under rider ($p \leq 0,05$), trot under rider (($p \leq 0,05$), gallop under rider ($p \leq 0,005$). Other traits as well as the total performance result were not influenced by the group of age. Statistically significant differences were found mostly between 7 years old mares and youngest. The highest differences between the LSM for groups of horses in different ages were above 5%. Results may be affected by the genetic value of the horse, which could not be taken into account in the study (limited number of data). Results indicate that the penalty (if any) should be put on the single traits affected by the age group and not on the total result of the performance test. The highest scores for all traits were obtained by 5 years old mares.

The effect of age on results of 100-days performance tests of young stallions in Poland

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According to the current PHBA regulations horses over 36 months may attend the performance test for young stallions. The effect of the age of horses on their performance results was investigated on the performance test data from the year 2004-2007. Average age of horses was 1324 days (SD 153). The youngest horses were observed in year 2004, the highest SD was observed in 2007. The performance data of 329 stallions tested in two training centres was used for calculations. Analysis of variance was used to investigate the age effect. The effect of the age was analysed first as a linear regression (age in days), then as a fixed effect using year of birth. The statistical model also included the fixed effects of year, training centre, breed, group of show, rider. The coefficient of determination was in the range of 0,24-0,40 in the first analysis and 0,24 to 0,41 in the second one. The age effect analysed as a regression was statistically significant for jumping under rider in the trainer's evaluation ($p \leq 0,05$) and trot under the rider in the judges' evaluation ($p \leq 0,05$). The effect of the age treated as a fixed effect of the year of birth was not significant. Assuming that the effect of the age of horses is not due to genetic differences the phenotypic indexes used in horse breeding should be corrected for the age on the basis of the regression coefficient rather than by the class effect used nowadays.

Lithuanian horse breeding in 19th-20th centuries

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Until the middle of 19th century mostly small horses of the Žemaitukai breed were raised. The characteristics of the breed concentrated over thousands of years and these have influenced horse breeding not only in Lithuania but in other countries as well. The second half of 19th century witnessed intensification of agricultural production and large type of horses started to replace the dominating Žemaitukai. The enlargement was promoted by the demand for heavy draft horses and high export price. High prices for cavalry replacement horses before World War I have also harmed the Žemaitukai horses and increased the number of light type horses. According to the data of 1930, the horse population in Lithuania consisted of 36.3% indigenous crossbred horses, 49% heavy-type, 12.9% light type and 1.8% Žemaitukai horses. Occupation of Lithuania in 1940 and World War II violated the horse sector. In 1947, horse passportizationstarted and pedigree horses were entered into state and regional stud books. At that time the Žemaitukai were already a rarity, however, the number of high quality indigenous light and especially heavy-type crossbred horses was rather high. The local Žemaitukai horses became the foundation for the large type Žemaitukai and Lithuanian heavy draft horse breed. In the last decade of 20th century, horse breeding experienced depression due to political and agricultural reforms. Currently, Žemaitukai, large–type Žemaitukai and Lithuanian heavy draft horses are recognized as breeds under preservation.

Horse breeding in Lithuania

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In 1990, the changes in the economic situation had a negative influence on horse breeding. Registration of horses for breeding purposes was not broken off. The number of sport horses in Lithuania is increasing. According to the data of the Department of Statistics, there were 60900 horses in Lithuania. Most of them are not used for breeding purposes. In 2007, there were only 4.3%registered breeding horses in the Animal Recording database, 5000 horses exported for meat and 100 for sport or breeding. Currently there are 66 horse breeding farms and three National studs with the function of stallion depot in Lithuania. The management of breeding activities belongs to the recognized breeding institutions. There are 9 horse breeding associations: Zemaitukai Horse Breeders' Association - Zemaitukai stud book; Lithuanian Draught Horse Breeders' Association - Large-type Zemaitukai, Lithuanian Heavy Draught stud book; Lithuanian Horse Breeders' Association – Lithuanian Sport horse stud book; Lithuanian Trakehner Association – Trakehner stud book; Baltic Hanoverian Horse Breeders' Association – Baltic Hanovers stud book; National Racing Horse League – Trotter stud book; National Trotters sport Association – Orlov and French trotters stud book; National Racing horse club – Thoroughbred stud book; National Arab Horse Breeders' Association - Arabian stud book. The main sport organisation is the Lithuanian Sport Horse League.

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