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Is a world without meat realistic?

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Engineering of Gallinacean oviduct cells using electroporation and lipofection*M. Debowska, M. Bednarczyk and K. Stadnicka**UTP University of Science and Technology, Animal Biochemistry and Biotechnology, 28 Mazowiecka Street, 85-804, Poland; katarzyna.stadnicka@utp.edu.pl*

Highly secretive avian oviduct cells carry a promise to be efficient bioreactors of therapeutic proteins upon delivery of human exogenes into the engineered germ cells and expressing them under the promoters of egg white proteins. Apart from the chicken oviduct cells, the cells derived from a quail are considered a feasible tool to prove concepts for engineering techniques. In favour of a quail are its effortless handling, stable genetics and easy cultivation of primary oviduct cells. Here we tested different non viral methods to deliver plasmid pL-OG-OVAIFNEn-Egfp (Institute of Biotechnology and Antibiotics, Warsaw) containing human *ILFN2a* and a reporter *GFP*, into the cultivated quail oviduct epithelial cells (QOEC). The cells were derived from oviducts of laying quails (n=12, 7-10 wks) and cultivated in DMEM/F-12 with addition of epithelia promoting factors and depletion of serum 3 d post seeding. The exogene was delivered to the freshly isolated QOEC or to the QOEC at 70-80% of confluence, using: (1) lipofection (Lipofectamine 2000); (2) electroporation (Multiporator); (3) nucleofection (Lonza); (4) combination of both methods at $1.0-3.0 \times 10^5$ cells and 1 or 2 μg of pL-OG-OVAIFNEn-Egfp plasmid. The lipofection was tested at 0.5-5 μl ratios of Lipofectamine®. The electroporation was set at 140 V and 1 or 2 pulses lasting for 75 μs . The average efficiency of lipofection of freshly isolated QOEC measured by means of GFP expression pointed for 3.1%, electroporation for 4.25% and the combination of both methods for 2.07%. Nucleofection resulted in efficiency <1% with lost adherence ability. Electroporation shows to be the promising method for further optimization, but combining both lipofection and electroporation is worth developing in terms of similar efficiency and cell survival rate. One must take into account that various gene constructs may operate differently under diverse conditions of delivery. Research was funded by National Science Centre (2011/03/N/NZ9/03814) and The National Centre for Research and Development (PBS 3/A8/30/2015).

Session 50**Theatre 1****Is a world without meat realistic?***J.F. Hocquette¹, P. Mollier² and J.L. Peyraud³**¹Inra, UMR Herbivores, 63122 Theix, France, ²Inra, Communication, 75000 Paris, France, ³Inra, UMR Pegase, 35590 Saint-Gilles, France; jean-francois.hocquette@inra.fr*

Citizens have growing concerns about livestock and meat consumption. Answers cannot be simplistic solutions such as no meat, to avoid killing animals, improve human health and reduce harmful emission to the environment. First, farm animals are today well adapted to living with humans, and cannot simply return to the wild world without suffering. Second, the relationship between food and health has to be considered for the overall eating pattern, not for one part of the diet. Eating some products in excess as meat will cause health disorders. Nutritional recommendations will be met by consuming in a reasonable amount a variety of foods including lean meats because they provide high-quality proteins, micronutrients (iron, vitamins, etc). Eating meat from herbivores is also an efficient way to indirectly make the most of plants and grass. This is of particular importance in marginal areas, where climate and soil do not allow crop production. Therefore, conversion of plant proteins to animal proteins should be calculated for non-edible proteins (and not for total proteins), since 80% of food consumed by livestock is not consumable by humans. By this way, cattle will appear much more efficient in converting natural resources into edible products. Other claims should be carefully weighted: livestock do occupy 70-75% of agricultural land, but mostly non-arable lands; to produce 1 kg of meat, it is claimed that 15,000 liters are required, but only the blue water (river, ground water) is in competition with human needs, therefore 1 kg of beef requires less than 700 liters of blue water. In addition, carbon storage by grasslands corresponds to 30-80% of methane emissions by ruminants. Livestock manure in Europe represents an important supply of nitrogen and phosphorus to the soils. They are also a source of organic matter essential for soil fertility. Finally, livestock and meat consumption are closely associated with our cultural heritage (food gastronomy). Rearing livestock also offers jobs in rural areas and poor countries. In conclusion, livestock and meat production are faced with a range of sustainability challenges, including changing consumer perceptions and improving rearing practices, but no more meat is not realistic.