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Puberty attainment is affected by growth performance before 4 mo of age in dairy heifers

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► To cite this version:

Vanessa Lollivier, Frederic Dessauge, Marion Boutinaud, Yannick Le Cozler. Puberty attainment is affected by growth performance before 4 mo of age in dairy heifers. ADSA-ASAS Joint Annual Meeting, Jul 2013, Indianapolis, United States. ASAS - American Society of Animal Science, Journal of Animal Science, 91 E-Suppl.2, 2013, Journal of Animal Science. hal-01210480

HAL Id: hal-01210480

<https://hal.science/hal-01210480v1>

Submitted on 3 Jun 2020

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T275 Whole oats effects on digestive system development in neonatal dairy calves. F. X. Suarez-Mena^{*1}, A. J. Heinrichs¹, T. M. Hill², and C. M. Jones¹, ¹The Pennsylvania State University, University Park, ²Nurture Research Center, Provim North America, Lewisburg, OH.

The objective of this experiment was to study effects of whole oats in starter grain on digestive system development of pre-weaned calves. Male Holstein calves (n = 8, 42.5 ± 2.0 kg BW at birth) were fitted with a rumen cannula in wk 2 of life. Calves were housed in individual pens in a heated facility; bedding was covered with landscape fabric to avoid any consumption of bedding. Water was offered free choice, and milk replacer was fed to 12% of birth BW. A fixed amount of starter (containing 25% oats either ground and in the pellet or whole) was offered daily based on average intakes of calves on similar milk replacer diets; orts were fed through the cannula. Calves were randomly assigned to all pelleted starter (P, n = 4) or pellets plus whole oats (O, n = 4). Rumen contents were sampled at -8, -4, 0, 2, 4, 8, and 12 h after grain feeding for pH determination at wk 3, 4, and 5 of age. At 35 ± 1 d of age calves were euthanized, and organs were harvested, emptied, rinsed, and weighed to gauge digestive organ development. Total starter intake (3 wk; 4,596 P vs. 4,449 O ± 111 g) was not different (*P* > 0.05). Digestive organ mass was analyzed as a percentage of BW at harvest. Reticulorumen (0.81 P vs. 0.81 O ± 0.05%) and liver (2.21 P vs. 2.25 O ± 0.08%) were not different (*P* > 0.05). Omasum (0.16 P vs. 0.19 O ± 0.01%) was greater (*P* < 0.05), and abomasum (0.40 P vs. 0.46 ± 0.02%) had a tendency to be greater (*P* < 0.10) for O. Rumen papillae length (0.67 P vs. 0.59 ± 0.05 mm), width (0.48 P, 0.45 O ± 0.02 mm), and rumen wall thickness (0.96 O vs. 0.90 O ± 0.09 mm) were not different (*P* > 0.05). Average rumen digesta pH at 3 wk of age (6.32 P vs. 6.22 O ± 0.16) was higher (*P* < 0.01) than at 4 (5.93 P vs. 5.85 O ± 0.16) and 5 (5.86 P vs. 5.74 O ± 0.16) wk; pH was not different (*P* > 0.05) between treatments. Whole oats had no effect on reticulorumen weight or rumen papillae size but increased omasum and abomasum weight. Lack of treatment effect on papillae may be related to calves eating grain for only 3 wk. Rumen digesta pH decreased with age likely as a consequence of greater intake of starch and digestible nutrients.

Key Words: calf, rumen development, oats

T276 Puberty attainment is affected by growth performance before 4 mo of age in dairy heifers. V. Lollivier^{1,2}, F. Dessauge¹, M. Boutinaud^{*1}, and Y. Le Cozler^{1,2}, ¹INRA UMR1348PEGASE, Saint Gilles, France, ²Agrocampus Ouest, UMR1348 Pegase, Rennes, France.

In seasonal calving systems where heifers first calved at a young age, age at 1st insemination may be delayed for those born at the end of the calving period. A possible alternative is to increase growth intensity during the 1st year of rearing, and then, to reduce age at 1st calving (21 mo of age or less). Puberty should then occur at an early age for optimal fertility. A long-term experiment aiming at studying the effect of controlled growth intensity throughout feeding procedure is being conducted since 2009 including 60 to 70 Holstein heifers / year. In 2012, the effect of rearing intensity on puberty attainment was closely studied on 65 heifers born between August 26 and December 27, 2011. Animals born before December 1 were either fed a standard (SD) or an intensive (ID) diet from 0 to 6 mo of age, to reach 190 to 200 kg or 220 to 230 kg at 6 mo of age, respectively. Animals born after received ID until artificial insemination (AI). From 5.5 mo of age, blood samples were obtained from jugular vein every 10 d to determine plasma progesterone concentration. The plasma progesterone analyses were performed with AIA 360 robot. The intra- and inter-assay variabilities were 12.3 and 7.5%, respectively. Blood samples were collected until synchronization or AI. Single Anova analyses were performed through R Software. Puberty was detected on 56 animals, at an

average age of 10.2 (±2.0) mo and 296 (±37) kg body weight (BW). Age varied between 6.2 and 14.4 mo, whereas BW was comprised between 224 and 369 kg. Because of huge ADG variations within feeding regimen and limited number of observations, no effect of SD or ID was noted on puberty onset. Puberty occurred earlier when average daily gain (ADG) before weaning (77 to 80 d of age on average) increased (9.7 vs. 10.8 mo when ADG varied from less than 700 g/d to 700 g/d or more respectively; *P* < 0.05). To a lesser extent, ADG from weaning to 4 mo of age also affected puberty onset. In agreement with previous published studies, this study indicates that enhanced growth program during lactating phase and/or early stages of rearing may affect puberty attainment.

Key Words: heifer, puberty, onset

T277 The effect of various dilutions, milk replacer dry matter, and volume amounts on calf growth and performance. T. J. Earleywine, B. L. Miller, W. S. Bowen Yoho^{*}, and T. E. Johnson, Land O' Lakes, Inc., Webster City, IA.

Feeding an established volume of milk replacer (MR) solution without regard for dry matter (DM) by lowering the percentage solids is being done by producers. The objective of this study was to examine the effects of delivering a more dilute solution at the same volume on calf growth and performance. One hundred thirty-three (133) 3–10 d old Holstein calves with an average initial BW of 47.6 kg (SD = 2.21 kg) were shipped from Wisconsin to the Land O' Lakes Research Facility. Calves were randomly assigned according to BW and blood gamma globulin to one of 4 27% all milk protein/10% fat MR diets varying in dilution, MR DM, and volume amount. Days 8–49, treatments were as follows: High Solids, High DM, Low volume (HS/HDM/LV; 17.6% solids, 1.13 kg DM, 6.62 L solution/d); Medium Solids, High DM, Medium volume (MS/HDM/MV; 15% solids, 1.13 kg DM, 7.8 L solution/d); Medium Solids, Low DM, Low volume (MS/LDM/LV; 15% solids, 0.97 kg DM, 6.62 L solution/d); Low Solids, High DM, High volume (LS/HDM/HV; 12.6% solids, 1.13 kg DM, 9.2 L solution/d). Days 1–7, calves were offered the same % solids and 72% of MR DM stated above, with volume amounts adjusted accordingly. Calves were fed MR twice per day. Offering of MR was reduced by half, and calves fed once per d, during the last wk. Calf starter (22% crude protein, as fed basis) was fed ad libitum throughout this 49 d trial. Data were analyzed by Mixed Procedures of SAS. While there were no statistical differences (*P* > 0.05) in total BW gain, starter feed intake, or feed:gain, calves fed the MS/LDM/LV diet were numerically lower in total BW gain and numerically higher in starter feed intake when compared with calves on all other treatments. When considering offering a more dilute MR solution, it is important to deliver the same amount of MR DM to calves by offering more MR solution to support adequate growth of calves.

Table 1.

Item ¹	MR Diet				SE
	HS/HDM/ LV	MS/HDM/ MV	MS/LDM/ LV	LS/HDM/ HV	
BW gain, kg	33.1	34.0	31.0	33.4	1.09
MR intake (DM), kg	46.3 ^a	47.9 ^b	40.8 ^c	47.2 ^{ab}	0.380
Starter intake (DM), kg	19.8	19.4	21.1	18.8	1.29
Feed:Gain	2.05	2.00	2.01	2.01	0.040

^{a-c}Means in the same row not followed by a common letter differ (*P* < 0.05).

Key Words: calf, milk replacer, dilution