9. Empty body composition of female calves and heifers [German Holstein Breed] as a function of feeding intensity and live weight (Leerkörperzusammensetzung von weiblichen Kälbern und Jungrindern [Deutsche Holstein] in Abhängigkeit von Fütterungsintensität und Lebendmasse). H. Janssen*, U. Meyer, M. Spolders, G. Flachowsky and Hj. Abel – Braunschweig/Göttingen

To reduce age at first insemination high feeding intensities (FI) in heifer rearing are recommended. With a lack of new data for the empty body composition (EBC) and the quantity of protein and fat deposition in female calves and heifers positive as well as negative effects are discussed. The aim of this experiment was to assess the effect of different FI on growth, EBC and deposition of protein, fat and energy of female calves and heifers.

Methods: The study comprised a total of 36 female rearing calves and was divided into three periods (Period 1: week 1-14; 2: week 15-24; 3: week 25 until 460 kg live weight (LW)). After colostrum feeding, the animals where divided into two groups differing in drinking intensity in period 1 (Group L: 24.9 kg milk replacer (MR) over 43 days; Group H: 84.5 kg MR over 92 days). In period 2, the animals in both groups were fed on the same level, whereas at the beginning of period 3, each group was divided once again into two subgroups (Group L: low concentrate level; Group H: high concentrate level). Feed intake and LW development were registered individually during the whole course of the experiment. To determine the body composition 4 animals were slaughtered at the start of the experiment for whole carcass analysis and additionally 4 animals per group after each period. For more details see (1).

Results: Table 1 shows the EBC of female calves and heifers at each point of slaughtering as a function of FI and LW. Higher MR intake in period 1 (Group H) caused a significant higher daily live weight gain (LWG) as well as a significant higher fat and energy content per kg empty body (EB) at the end of period 1, whereas the protein content per kg EB was not different.

Table 1: Empty body composition of female calves and heifers according to different feeding intensities and live weight (n = 4 animals per group)

Period	Group	LW (kg)	LWG (g/d)	EB in % of LW	Empty body composition (per kg)			
					DM (g)	Protein (g)	Fat (g)	Energy (MJ)
	Start	47.3	-	90.6	284	190	47	6.1
1	L	115.1	737^{a}	76.4^{a}	292^{a}	184	63^{a}	6.6^{a}
	H	120.7	863^{b}	79.9^{b}	307^{b}	183	82^{b}	7.3^{b}
2	L	182.9^{a}	849^{a}	78.8	320	180	93	7.7
	H	198.6^{b}	937^{b}	79.1	318	179	92	7.6
3	LL	463.5	926	81.9	438^{ab}	164	228^{ab}	12.6^{ab}
	LH	463.0	948	84.0	462^{b}	157	261^{b}	13.7^{b}
	HL	464.8	826	80.6	424^{a}	166	210^{a}	11.9^{a}
	HH	464.9	925	83.5	461^{b}	157	257^{b}	13.6^{b}

LW=live weight; LWG=live weight gain from start to slaughter; EB=empty body; DM=dry matter; a<b, P<0,05 per period and column

However, there were no differences in the EBC between animals of group L and H at the end of period 2. Higher concentrate intake in period 3 (LH and HH) caused a significant higher fat and energy content per kg EB at the end of period 3, independent of previous liquid feeding intensity.

Conclusions: The results demonstrate alterations in EBC in female calves and heifers due to feeding strategies. This might cause consequences on the deduction of recommendations for the energy and nutrient supply. Therefore, further investigations should be conducted to study influences on body composition of growing female calves and heifers.

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Gefördert durch die H. Wilhelm Schaumann-Stiftung.

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10. Parameters measured in blood to evaluate metabolic stress: a comparison between the time courses in dairy heifers and cows during the transition period (Blutparameter zur Beurteilung von metabolischem Stress und Tiergesundheit: Vergleich der Verläufe bei Milchkühen und Färsen während des Übergangs von der Trächtigkeit zur Laktation). Helga Sauerwein*, Stephanie Hiss, Claudia Weinkauf and Sabrina Hachenberg – Bonn

Blood tests from individual animals are routinely used to diagnose disease problems in dairy cattle. In addition, blood metabolite tests may provide information about nutritional status in apparently healthy animals when combined with ration evaluations. Disturbances in the metabolic and regulatory adaptation to the needs of early lactation may not reach clinical relevance; nevertheless, being aware of such adaptive limitation is important for taking metaphylactic measures in time. We aimed to complement common testing parameters by analyses of oxidative stress as well as of two metabolically relevant hormones, i.e. insulin-like growth factor-1 (IGF-1) and leptin. In addition, we recorded the concentrations of haptoglobin (Hp), white blood cell counts and liver enzyme activity (glutamate dehydrogenase; GLDH) to test whether blood testing will yield divergent values between heifers and cows and would thus need separate interpretation.

Methods: Ten heifers and 7 Holstein Frisian cows (2^{nd} lactation) were studied 4 wk ante partum (a.p.) until 12 wk post partum (p.p.). They were housed in free stall barns (Riswick, Kleve, Germany; organic farming unit). All animals were fed a total mixed ration (TMR) based on grass and corn silage. Blood samples were collected weekly from 4 wk a.p. to 12 wk p.p., approximately 4 h after the morning feeding. Blood cell counts, ß-OH-butyrate (BHB) and GLDH were measured by VLK laboratory, Cologne. Hp, leptin and IGF-1 were measured with enzyme or radioimmuno assay (1-3); non-esterified fatty acids (NEFA) were analyzed using the Roche testing kit and oxidative stress was measured by a modified protocol of the ROMs test (reactive oxygen metabolites). Data were analyzed using the mixed linear approach (GLM) of SPSS using a hierarchical model in which the effect of calving was integrated.

Results: In general, the peripartal changes reported for the different parameters in the literature were confirmed in our study. When comparing the timely patterns of the different parameters between heifers and cows, differences ($p < 0.05$) were observed for oxidative stress, NEFA, GLDH and Hp as well as for leukocyte numbers. Oxidative stress was less in heifers throughout the time interval recorded. For NEFA, divergent timely patterns were observed: heifers showed an earlier prepartal increase than cows. Differences in GLDH activity were apparent only in p.p. values being higher in heifers than in cows. For Hp, the observation of relatively higher concentrations in heifers was limited to the last wk before and the first wk after calving. In heifers, the number of leukocytes was higher than in cows during the entire experimental period. In contrast to cows, a distinct decrease from week -1 to wk 2 relative to calving was visible. The blood profiles of leptin, IGF-1 and BHB and of neutrophils were not different between cows and heifers.

Conclusions: In general, the metabolic hormones considered herein seem to be less affected by the number of lactations than NEFA and GLDH. NEFA concentrations are increasingly recommended for evaluating herd health. When aiming to use blood test to monitor for metabolic stress, the differences observed between heifers and cows both in time and extent need to be considered for establishing reference values.

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