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Adult stem cells in adipose tissue and skeletal muscle of pigs differing in body composition

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Session 02

Poster 8

mRNA abundance of the lactate receptor HCA1 in two different adipose tissue depots of dairy cows

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The G-protein coupled receptor HCA1 mediates antilipolytic effects via binding lactate, an intermediate of energy metabolism. HCA1 is mainly located on adipocytes and enables them to respond to metabolic changes through fine-tuning of lipolysis. Thus we hypothesized that different amounts of concentrate in the diet, resulting in differences in the energy balance, will affect the HCA1 mRNA abundance in bovine adipose tissue (AT). Furthermore, we aimed to determine whether the mRNA abundance between subcutaneous (SC) and retroperitoneal (RP) AT differs among late pregnancy and lactation. Biopsy samples of SCAT and RPAT from 20 pluriparous Holstein Friesian cows were collected at day (d) -42, 1, 21 and 100 relative to parturition. Until d -42 all cows were fed the same silage-based diet. Between d -42 and d -1, 10 animals each were assigned to either a high-concentrate (HC, 60:40 concentrate:roughage) or a low concentrate group (LC, 30:70). From d 1 to 24 the concentrate proportion was increased from 30 to 50% for all cows. HCA1 mRNA abundance was not affected by treatment, but showed a time-dependent increase in SCAT from d -42 to d 100 ($P<0.05$). In RPAT, no time-dependent changes were observed. Comparing the fat depots, HCA1 mRNA abundance was higher in RPAT than in SCAT on days -42 and 21 ($P<0.001$). The presented results indicate that HCA1 mRNA is regulated independently of the feeding regimen. Differences between SCAT and RPAT suggest differences in the lipolytic regulation.

Session 02

Poster 9

Adult stem cells in adipose tissue and skeletal muscle of pigs differing in body composition

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The control of body composition is of the upmost importance for animal production. It is now recognized that adult stem cells are essential for tissue homeostasis. The current study was undertaken to determine whether changes in the relative proportion of muscle and adipose tissue mass in pigs are controlled by the plasticity of adult stem cells. Between 10 and 20 weeks of age, 24 Large White barrows from two lines divergently selected for residual feed intake (RFI), an indicator of feed efficiency, were fed *ad libitum* either a high-starch (LF) diet or a high-fat/high-fiber (HF) diet (n=6 per line and diet). At 20 weeks of age, stroma-vascular cells were isolated by collagenase treatment from subcutaneous adipose tissue and longissimus muscle. Cell immuno-phenotypes were then determined by flow cytometry using cell surface markers (CD34, CD56 and CD90). Irrespective of diet, low RFI pigs were leaner than high RFI pigs. In the two lines, pigs fed the HF diet exhibited a reduced body fatness compared with pigs fed the LF diet. Whatever the experimental group considered, adipose and muscle cells were predominantly positive for CD56 (muscle precursor marker) and CD90 (mesenchymal stem cell marker) markers. Cells expressing the CD34 hematopoietic stem cell marker were identified in muscle but not in adipose tissue. The proportion of CD90+ and CD56+ cells in adipose tissue did not differ between the experimental groups. In muscle, the proportion of CD34+ cells was higher ($P<0.005$), whereas that of CD90+ cells was lower ($P<0.005$) in the low than in the high RFI pigs, whatever the diet. The current study indicates that divergent selection for RFI in growing pigs had strongly affected the relative proportions of adult stem cell populations in skeletal muscle but not in adipose tissue. Altogether, there is no simple relationship between the proportion of adult stem cells and body adiposity.