Archives of Animal Breeding, Dummerstorf, 46 (2003) Special Issue, 178

BRENT SORENSEN[1,2], JOCHEN WEGNER[2], and RANDALL WESELAKE[1]

[1] University of Lethbridge, Department of Chemistry and Biochemistry, 4401 University Drive, Lethbridge, Alberta, Canada T1K 3M4
[2] Forschungsinstitut für die Biologie landwirtschaftlicher Nutztiere, Forschungsbereich Muskelbiologie und Wachstum,Wilhelm-Stahl-Allee 2, D-18196 Dummerstorf, Germany

Diacylglycerol Acyltransferase Activity in the Muscle Tissue of Two Metabolically Different Breeds of Cattle

The presence of intramuscular (i.m.) fat in beef results in marbling and, ultimately, enhanced meat quality. Diacylglycerol acyltransferase (DGAT) has been proposed as a candidate gene for i.m. fat deposition in cattle, as the enzyme product catalyses the final step of triacylglycerol (TAG), or fat, synthesis. Increased knowledge regarding the role of DGAT may allow for cattle to be selected for high marbling potential. The objective of this study was to elucidate the relationship between DGAT and other factors pertaining to i.m. fat deposition. Samples of *m. longissimus dorsi* from two metabolically different breeds; German Holstein (n=17) as a dairy type, and Charolais (n=16) as a beef type, were obtained at slaughter after 18 mo, and microsomal fractions were prepared via differential centrifugation. Microsomal DGAT activity was determined by measuring the incorporation of [1-^{14}C]oleoyl CoA into TAG. Six replicate values were obtained. The Bradford method was used to determine protein concentration and DGAT activity was either expressed as total activity (pmol TAG min^{-1} [g wet tissue weight]$^{-1}$) or as specific activity (pmol TAG min^{-1}[mg protein]$^{-1}$). Both specific and total DGAT activity were highly correlated ($r = 0.95$, $P<0.001$) and therefore only specific activity is reported. The SAS system was used to perform statistical analysis. The ANOVA model used took into consideration the influence of both breed and sire.
Charolais had a higher body mass (738 vs 665 kg, $P<0.001$) and greater area of *m. longissimus dorsi* (125.0 vs. 89.1 cm^2, $P<0.001$) than German Holstein. German Holstein had a greater percentage of fat in total body (24.4 vs 19.4, $P<0.001$) and intramuscularly in *m. longissimus dorsi* (4.1 vs. 2.7, $P=0.015$) as well as greater marbling score (2.8 vs. 2.1, $P=0.002$). German Holstein had higher specific DGAT activity than did Charolais (66.7 vs. 47.6 pmol TAG min^{-1} [mg protein]$^{-1}$), although this was not significant ($P=0.34$), likely due to high variation between animals. There was no influence of sire on DGAT activity. In German Holstein, there was significant negative correlation between specific DGAT activity and body mass ($r = -0.72$, $P=0.001$), and between DGAT activity and area of *m. longissimus dorsi* ($r = -0.53$, $P=0.03$) while no correlation was seen in Charolais. In German Holstein, there was also significant negative correlation between DGAT activity and the level of PPARγ, a transcription factor regulating fat specific genes, in subcutaneous fat ($r = -0.59$, $P=0.07$). A positive correlation, however is seen in Charolais ($r = 0.75$, $P=0.02$). The correlation should be confirmed using a larger number of animals. These results suggest that DGAT is involved in i.m. fat deposition, although further investigation must be performed using other muscles and fat depots.

Corresponding Author:
Jochen Wegner, Forschungsinstitut für die Biologie landwirtschaftlicher Nutztiere, Forschungsbereich Muskelbiologie und Wachstum, Wilhelm-Stahl-Allee 2, D-18196 Dummerstorf, Germany