Adipose tissue fatty acid composition from different body sites in reindeer calves during autumn and spring

Päivi Soppela and **Mauri Nieminen**
Finnish Game and Fisheries Research Institute, Reindeer Research, Rovaniemi, Finland

Seasonal variation in amount and metabolic activity of adipose tissue is prominent in reindeer, as in most arctic *Cervidae* species. Adipose tissue is the primary storage site for fatty acids, which serve as energy reserve, but the composition of which may also have function in thermoregulation and act as mechanichal support and protection for organs. Ruminant storage fat quality is less exposed to diet-induced changes than in monogastric animals (e.g. Christie 1981). As a response to varying functional demands, controlled seasonal and site-specific differences in fat composition would be expected.

Fatty acid composition of adipose tissue from different body sites of slaughtered reindeer calves was analysed in November (N = 10) and in April (N = 6) at the age of 6 and 12 months, respectively. Adipose tissue was sampled from three external (interscapular, peristernal and caudal) and three internal (pericardial, perirenal and intralumbar) anatomical locations. Total lipids were extracted with methanol-chloroform (1:1) and their fatty acid composition was analysed by gas-liquid chromatography.

Altogether 16 individual fatty acids from 14 to 20 carbon chain lengths were identified from the total lipids of adipose tissue in different body sites. The dominant fatty acid was oleic acid (18:1) followed by stearic acid (18:0) and palmitic acid (16:0) in each external site and in perirenal and intralumbar fats. Other fatty acids had smaller percentages (0–3 %). High degree of oleic acid (35–37 % in November and 40–47 % in April) agrees earlier studies (Garton & Duncan 1971). In perirenal fat higher proportions of 18:0 (34 %) were found compared to other sites (24–30 %). Pericardial fat differed remarkably from others having highest proportion of 16:0 (31 %) followed by 18:0 and 18:1 (both 29 %).

Adipose tissue was predominantly saturated in both seasons (range 48 to 66 %), but there was a trend towards unsaturation in each body site excluding pericardial fat during April. In agreement with earlier studies (Garton & Duncan 1971) we found that internal body fats from perirenal and pericardial deposits were more saturated than external fats. Polyunsaturated fatty acids had a smaller proportion during spring than during autumn in each body site. The highest proportion (3.2 %) of polyunsaturated fatty acids was measured in pericardial fat in November. Branched-chain fatty acids were highest (1.9 %) in pericardial fat in April.

Storage fats in reindeer during starvation are used sequently starting from subcutaneous deposits followed by visceral fats, and finally, bone marrow fat (see Nieminen & Laitinen 1986). Changes in fatty acid composition of external fats between autumn and spring may reflect desaturation or preferential order in uptake of fatty acids during winter. Higher proportion of oleic acid in external fats refers to more fluid properties compared to internal fats (18:1 acid melts at + 15°C, 16:0 and 18:0 at + 64 and + 69°C, respectively; Irving & Krog 1955).

References:

Christie, W. W. 1981 (ed.) 1981: *Lipid metabolism in ruminant animals.* – Pergamon Press, Oxford, England.

Garton, G. A. & Duncan, W. R. H. 1971: Fatty acid composition and intramolecular structure of triglycerides from adipose tissues of the red deer and reindeer. – *J. Sci. Fd Agric.* 22:29–33.

Irving, L. & Krog, J. 1955: Temperature of skin in the arctic as a regulator of heat. – *J. Appl. Physiol.* 7:355–364.

Nieminen, M. & Laitinen, M. 1986: Bone marrow and kidney fat as indicators of condition in reindeer. – *Rangifer, Special Issue No. 1:* 219–225.