Ann Zootech (1995) 44, Suppl, 295

Influence of fat supplementation in diets for bull-calves on growth rate and skeletal muscle metabolism

S Vovk [1], V Yanovych [2]

[1]Lviv State Agricultural Institute, Lviv-Dubliany 292040 ; [2]Institute of Physiology and Biochemistry of Animals, V Stus Street 38, Lviv 290034, Ukraine

Because of the high energetical value of fats and their regulatory influence on protein and lipid synthesis in skeletal muscles and other tissues of nonruminant animals, the investigation of productive and metabolic effect of dietary fats in ruminants has a great scientific and practical interest.

The purpose of our study was to investigate the influence of addition of tallow, sunflower oil or rapeseed oil to the diet of 30-180 day-old bull calves on growth, feed efficiency, total protein and lipid synthesis and oxidation of glucose, palmitate and leucine in skeletal muscles. Four groups of five bull calves of the black-piebald breed were used in the experiment. The calves of the first (control) group were offered a diet without fat supplementation. The animals of the second, third and fourth (experimental) groups were offered additionally 3 % of tallow, sunflower oil or rapeseed oil respectively, on the dry matter basis. Once a month as well as at the beginning and at the end of the experimental period, the live weights of calves were measured. On the 45, 90, 150 and 180 days of age, samples of quadriceps femoris (oxido-glycolytic muscle) were excised by biopsy from three animals per group. Muscle homogenates were incubated (i) with L-[U-^{14}C] amino acid mixture for an hour to measure the intensity of total protein synthesis, (ii) with L-[U-^{14}C] glucose to measure total lipid synthesis, (iii) with L-[U-^{14}C] glucose, L-[U-^{14}C] palmitate Na or L-[U-^{14}C] leucine - to measure the oxidation rates of these substrates (Vovk and Yanovych, 1990, Biokhimia, 55, 11, 2090-2094).

The average daily gains of calves of the 1st, 2nd, 3rd and 4th groups were 777 ± 29, 921 ± 44, 903 ± 31, 902 ± 19 respectively (means ± SD). However, the age of the animals did not influence daily gains considerably. The calves of the 2nd, 3rd and 4th groups consumed 8.7, 10.2 and 12.3 % less quantity of feed per kg of weight gain than the control calves. Incorporation of radiolabeled amino acid into total muscle proteins was 58.6, 24.4, 24.1 per cent higher in 2nd, 3rd and 4th experimental groups than in the control group. In contrast, the incorporation of radiolabeled glucose into the total lipids was 19.1, 12.0, 11.6 % lower in the 2nd, 3rd and 4th groups than in the control group. Radiolabeled CO_2 amounts formed during oxidation of glucose, palmitate and leucine were 19.4, 50.1, 18.6 % higher, 19.3, 20.3 and 20.4 % higher, and 42.0, 33.3, 30.4 % lower in muscle homogenates in the 2nd, 3rd, 4th groups respectively than in the control group.

Our results suggest that the stimulating influence of fat supplementation in diets of calves on growth may be explained not only by the energetical effect of fats, but probably also by their decreasing effect on the amino acid catabolism and their increasing effect on the protein synthesis in the skeletal muscles. The source of dietary fats and the age of calves did not affect the results apparently.