

Summary

The effect of selenitetriglycerides on the health status and expression of selected genes encoding enzymes involved in antioxidant processes in small ruminants.

Key words: selenitetriglycerides, lambs, kids, SOD, GPX, gene expression

Selenium deficiency remains a current issue in both sheep and goat farming. It contributes to the occurrence of immune system, reproductive system disorders, and diseases such as nutritional muscular dystrophy. This mainly affects young animals, aged 2-6 weeks old. The prevention of selenium deficiency is currently based on its supplementation with injectable or oral preparations, containing selenium in inorganic or organic form. Selenitetriglyceride are an organic form of selenium that can be administered to animals orally. They are characterized by low toxicity, high bioavailability, and absorption from the digestive tract.

The research was carried out on 12 lambs of the Kamieniecka sheep and 12 kids of the Alpine goat, aged 10 days. The animals were divided into 2 groups: control and experimental. For the first 7 days of the experiment, the experimental group was orally supplemented with a solution of selenitetriglycerides, at a dose of 0.5 mg selenitetriglycerides, per kg of body weight. Then, blood was collected from all animals on the 0th (before administration of the selenitetriglyceride solution for the experimental group), 1st, 7th, 14th, 21st and 30th day of the experiment. On the day 30. of the experiment, lambs and kids from both groups were euthanized, then the samples of the longissimus dorsi muscle, biceps femoris muscle, myocardium and liver was taken from them.

The following hematological parameters were determined in whole blood: hemoglobin level, hematocrit number, red and white blood cell counts, and red cell indices (MCV, MCH and MCHC). Glucose (GLUC), albumin (Alb), total protein (TP), , creatinine (Crea), urea (Urea), aspartate aminotransferase (AST), alkaline phosphatase (ALP), gamma-glutamyl transpeptidase (GGT) and lactate dehydrogenase (LDH) were also determined in the serum. Serum selenium (Se) concentrations were determined in all animals of the control and experimental groups. In addition, the activity of the glutathione peroxidase (GPX) and superoxide dismutase (SOD) in whole blood of all animals, were determined . Tissue samples of the longissimus dorsi muscle (*m.longissimus dorsi*), biceps femoris muscle (*m. biceps femoris*) and myocardium were stained with hematoxylin-eosin (HE) and with hematoxylin-

basic fuchsin picric acid (HBFP). In the tissue samples of biceps femoris muscle, myocardium and liver in kids and lambs, and longissimus dorsi muscle in lambs the analysis of mRNA expression of selected genes encoding enzymes involved in antioxidant processes, i.e. *GPXI*, *SODI*, was determined.

No significant differences were observed for most hematological parameters between control and experimental group of kids and lambs. Parameters that were significantly higher ($p < 0.05$) in the experimental group of lambs was MCHC on the day 21 and #LYMPH, MCV, MCH, HDW on the day 1 in kids. Biochemical parameters tested in the blood serum of the animals of the experimental and control groups showed significant differences ($p < 0.05$) in AST activity in lambs on the day 1 of the experiment, which was lower in the experimental group, and GGT in kids, which was significantly higher ($p < 0.05$) in the control group on the days 7, 21 and 30. The 30th day of the experiment also showed a significantly ($p < 0.05$) higher AST activity in the kids of the experimental group.

The results of serum selenium concentration in lambs and kids showed that supplementation with selenitetriglyceride causes a significant ($p < 0.05$) increase in selenium concentration on the 1st, 7th, 14th, 21st and 30th days of the experiment. The highest selenium concentration in the experimental group was recorded on day 7 of the experiment for both lambs and kids.

In addition, significantly higher ($p < 0.05$) GPX activity was observed in kids on the 1st, 7th, 14th, 21st and 30th days of the experiment. Similarly, SOD activity was significantly higher ($p < 0.05$) in selenitetriglyceride-supplemented kids. Moreover, GPX and SOD activities was significantly higher in group supplemented lambs. Serum selenium concentration in kids and lambs was significantly higher ($p < 0.05$) for both experimental groups after selenitetriglycerides supplementation.

Histopathological examinations of muscle samples stained in HE, in the case of 4 out of 6 kids and 4 out of 6 lambs of the control group, showed segmental sarcoplasmic dystrophy with striatal atrophy. No such changes were observed in the myocardium and in any of the samples taken from animals of the experimental groups. HBFP staining showed in the same 4 kids and 4 lambs belonging to the control group, lesions characterized by extensive necrosis of entire muscle fibers with disintegration of sarcoplasm and striatal atrophy, as well as the

presence of stimulated myogenic cells and phagocytic cells. No such changes were observed in the experimental groups or in the myocardium both groups.

In addition to the aforementioned changes, the following changes were observed in the tissue of longissimus dorsi muscle and biceps femoris muscle collected from 1 of the 6 studied lambs of the control group: muscle fibers necrosis with sarcoplasmic dystrophy and the infiltration of macrophages, lymphocytes, single eosinophils in single muscle fibers. Analysis of *GPXI* and *SOD1* gene expression showed no significant differences between the groups.

After supplementation with selenitetriglycerides, an increase in the expression of the *GPXI* gene in the biceps femoris muscle, liver in kids was observed. Moreover, an increase in the expression of the *SOD1* gene in the analyzed fragments of the liver in kids, as well as in the longissimus dorsi muscle (*m. longissimus dorsi*), liver and myocardium in lambs was noticed. In the case of the longissimus dorsi muscle, myocardium and liver in lambs, as well as the heart muscle in kids, a decrease in the expression of the *GPXI* gene was observed. Similarly, the *SOD1* gene expression was decreased in the biceps femoris muscle (*m. biceps femoris*) of lambs and the biceps femoris muscle and the heart in kids. In the case of the biceps femoris muscle in lambs, the expression level of *GPXI* remained at a level comparable to the control group.