

CORRELATIVE INTERDEPENDENCE BETWEEN BETA-HYDROXYBUTYRATE CONTENT IN BLOOD AND LIPID METABOLISM INDICES IN PLASMA OF HIGH-YIELDING COWS SUFFERING FROM KETOSIS

*M. Lychuk*¹, *L. Slivinska*¹, *M. Paska*²
lychukmg@gmail.com

¹Lviv National University of Veterinary Medicine and Biotechnologies
named after Stepan Gzhytsky, Lviv, Ukraine

²Lviv State University of Physical Culture, Lviv, Ukraine

One of the most widespread diseases of high-yield dairy cows is ketosis, which is most often recorded in the phase of intensive lactation, when cow's organism uses internal reserves, in particular lipids of the fat depot. However, the literature does not describe the direction of metabolic processes and the correlation between the level of ketone bodies and the lipid metabolism indices for the development of ketosis in cows. Therefore, the aim of the work was to establish correlation relations between the level of β -hydroxybutyric acid in the blood and lipid plasma spectrum of healthy high-yielding cows of Ukrainian black-and-white milk breed, suffering from subclinical and clinical forms of ketosis.

The research was conducted on three groups of cows: clinically healthy (n=10), suffering of subclinical (n=15) and clinically form of ketosis (n=8). The content of ketone bodies in the blood of cows was determined by using the system for monitoring glucose and ketone levels in the blood *FreeStyle Optimum* and test strips to determine the content of β -hydroxybutyric acid in the blood of *FreeStyle Optimum β -Ketone*. The total lipids content was determined in plasma by weight method after they were extracted with a chloroform-methanol mixture of 2:1 by the Folche method. Total lipids were divided into classes by one-dimensional thin layer chromatography on silicagel in hexane-diethyl ether-acetic acid system with respect to 70:30:1, followed by the determination of their amount by the bichromatic method.

While analyzing the content of β -hydroxybutyric acid in the blood, its true growth ($P_1 < 0.001$) in cows with subclinical and clinically expressed ketosis compared with healthy ones in 3.3 and 7.2 times, respectively, was established. In addition, the content of β -hydroxybutyric acid in clinically ill cows was in 2.2 times higher ($P_2 < 0.001$), compared with subclinical flow.

While analysing the lipid profile of cows blood at subclinical and clinical forms of ketosis compared with healthy ones, it was found increasing content of total lipids by 43.4 ($P < 0.001$) and 99.2 % ($P < 0.001$), as well as absolute content of lipids classes: triacylglyceroles — by 60.9 % ($P < 0.05$) and in 2.5 times ($P < 0.001$), mono- and diacylglycerols — by 88.0 % ($P < 0.01$) and in 3.4 times ($P < 0.001$), Non-Esterified-Fatty-Acids (NEFA) — by 58.1 % ($P < 0.001$) and in 2.4 times ($P < 0.001$), free cholesterol — by 73.3 % ($P < 0.01$) and in 3.5 times ($P < 0.001$), lesser extent — esterified cholesterol — by 32.9 ($P < 0.05$) and 39.8 % ($P < 0.05$), tendency to increase phospholipids — by 24.5 and 47.1 %. Clinically sick cows have shown a reduction in the proportion of esterified to total cholesterol by 21.2 % ($P < 0.001$) compared to healthy and by 15.8 % ($P < 0.01$) compared with subclinical course.

With the deepening of the pathology revealed: an increase in the correlation between the content of β -hydroxybutyric acid and the content of total lipids, triacylglycerols and NEFA; change in the direction of correlation from negative to positive between the content of β -hydroxybutyric acid and the content of mono- and diacylglycerols, free cholesterol; change in the direction of correlation from positive to negative between the content of β -hydroxybutyric acid and the content of esterified cholesterol and the proportion of esterified to total cholesterol.

In cows suffering from ketosis, lipolysis is exacerbated, as evidenced by an increase in the content of cholesterol and phospholipids. The change in the lipid plasma spectrum of cows, the strength and direction of the correlations between the content of β -hydroxybutyric acid in the blood and the absolute values of lipid metabolism, depending on the severity of the ketosis, was established.

Keywords: HIGH-YIELDING COWS, LIPID METABOLISM, CLASSES OF LIPIDS, β -HYDROXYBUTYRIC ACID, KETOSIS