The 1st Ukrainian-Polish Scientific Forum
AGRO BIO PERSPECTIVES
29–30 September 2021, Lviv, Ukraine

Institute of Animal Biology NAAS

THE CONTENT OF PHOSPHOLIPIDS AND THEIR FRACTIONAL COMPOSITION IN PLASMA OF HEALTHY AND KETOTIC COW

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Introduction

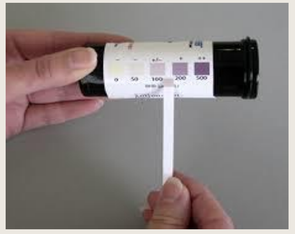
Ketosis of cows is one of metabolic disorders, causing significant decrease of milk productivity and pretermed sorting out of animals. Lipid metabolism plays a crucial role in the pathogenesis of ketosis, since under the deficit of metabolic energy gluconeogenesis is activated, which covers energy demand using internal reserves, in particular lipids. Majority of experimental papers are dedicated to investigation of the metabolism of neutral lipids. The main attention in our work is directed to examination of the content of phospholipids and their fractional composition in plasma of cows with ketosis, because in our opinion this may be important in exploration of the pathogenesis of the disease as well as in the analysis of the depth of pathological processes and intensity of disease development.

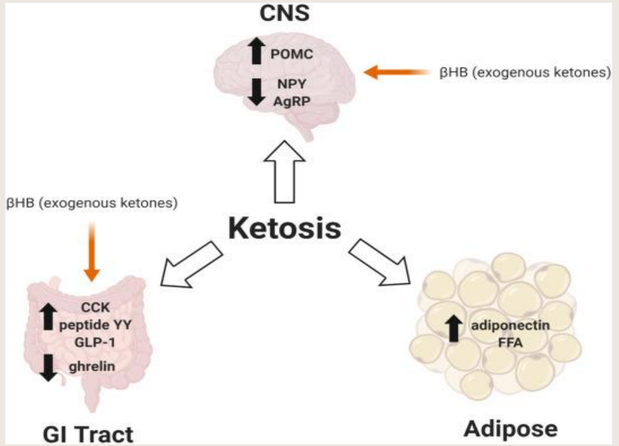
Material & Methods

Study was performed in March on ten cows of Holstein breed in their from second to fourth lactation with milk yield approximately 7.8 – 8.2 thousands of kg of milk per lactation. Clinical examination of cows was performed and the content of ketone bodies in urine was detected with diagnostic strips, which allowed to establish the diagnosis of ketosis. Laboratory examinations showed that the ketosis was accompanied by hepatodystrophy, secondary osteodystrophy and hypofunction of thyroid gland. The content of phospholipids and their fractional composition (lysolecithin, sphingomyelin, phosphatidylserine, phosphatidylcholine, phosphoinositol, phosphatidylethanolamine, cardiolipin, phosphatidic acid) was determined in plasma of cows using thin-layer chromatography technique. Obtained results were compared to such parameters in clinically healthy animals (n=10), which were kept on the same farm in analogous conditions.

Results

Conducted investigation of plasma content of phospholipids in ketotic cows revealed their significantly lower content ($p<0.05$) in comparison with clinically healthy animals (1.6±0.31 mmol/l vs 0.9±0.07 mmol/l). We suggest that fatty hepatodystrophy, which is concomitant with ketosis, may be the main reason for the change of phospholipid synthesis. Disorders of phospholipid synthesis in case of hepatocytes injury are explained not only by the deficit of lipotropic substances, but also by insufficient formation of ATP in liver cells, which serve as the source of energy for synthetic processes. Conducted laboratory analysis of the fractional composition of phospholipids in plasma of cows showed a range of differences. In particular, in plasma of affected with ketosis cows the levels of phosphatidylserine and phosphatidylcholine were significantly higher (2.8- and 3.2-fold respectively, $p<0.05 – 0.001$), and the level of phosphatidylethanolamine was lower (by 32%, $p<0.05$). The main reason for these changes is the activation of compensatory mechanisms, directed to reparation of hepatocytes, compensation of energy deficit and detoxication of organism. Moreover, the tendency to lowering of the level of sphingomyelin (by 14%) was revealed. The latter may be used as intermediator in cortisol synthesis, which in its turn is used for intensification of gluconeogenesis.





Conclusions

Changes in plasma phospholipid compositions was revealed in ketotic cows. In particular, relative level of phosphatidylethanolamine was lower, and levels of phosphatidylserine and phosphatidylcholine were higher on the background of decrease of the general content of plasma phospholipids in 1.8 times ($p<0.05$).