EVALUATION OF THE FUNCTIONAL STATE OF THE LIVER AND ENDOCRINE PANCREAS IN HEALTHY AND KETOTIC COWS DURING PROPIONATE LOADING TEST

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Introduction: Hypoglycaemia is the initial metabolic change underlying primary ketosis in early lactating dairy cows. It causes lipomobilization from body reserves and ketogenesis and lipogenesis in the liver. The propionate loading test in ruminants is used to estimate the intensity of gluconeogenesis in the liver, such as the insulin secretory capacity of the endocrine pancreas.

Objective: To evaluate the functional state of the liver and endocrine pancreas based on blood concentrations of glucose and insulin after propionate infusion.

Materials and methods: Puerperal healthy (n=10) and ketotic (n=10) Holstein cows were injected intravenously via the jugular vein with 1ml/kg body weight of a sodium propionate solution (1.84 mol·l−1). Blood samples were taken from the opposite jugular vein before and 8, 30, 60, 120, 240 and 480 minutes after injection. Blood glucose and serum insulin levels were determined by the photometric and RIA methods, respectively.

Results and discussion: The propionate administration in healthy cows led to a significant increase in glycaemia (P< 0.05) within 8, 30, 60, 120 minutes and insulinemia (P< 0.05) within 8, 120, 240 and 480 minutes of the experiment. In ketotic cows, glycaemia signicantly increased (P< 0.05) only within 8 minutes and insulinemia (P< 0.05) within 60 and 120 minutes. Blood glucose levels were significantly lower (P< 0.05) in ketotic cows than in healthy ones within 30, 60, 120 and 240 minutes as a result of the decreased gluconeogenetic ability of the liver in ketotic cows (fatty liver). Blood insulin levels were significantly lower (P< 0.05) in ketotic cows than in healthy ones within 240 and 480 minutes of the experiment. The obtained results showed the preserved function (relative insufficiency) of beta cells of the endocrine pancreas in ketotic cows.

Conclusion: Sodium propionate can be used as a therapeutic means in treating ketotic cows, as it indicates the synthesis of glucose and insulin necessary for preserving the health of dairy cows.

Keywords: Cows; ketosis; propionate; insulin; glucose