

CONCENTRATION OF GLUCOSE IN SERUM OF SIMMENTAL COWS FROM DIFFERENT GEOGRAPHIC AREAS

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Abstract

The aim of this paper is to examine the concentration of glucose in serum of Simmental cows from different geographic areas (lowland and mountain). The total number of tested animals was 42 healthy cows, by 21 at each farm, aged 3-5 years. The studies were conducted in two periods: autumn-winter (November-December), and repeated in spring (April-May) on the same cows. The concentration of glucose in the blood (serum) of tested animals does not exceed the physiological value.

Keywords: concentration, serum, geographic area, glucose.

Introduction

The concentration of glucose in the blood of ruminants is physiologically lower than other (monogastric) species and according to many researchers it ranges from 2.2 to 3.4 mmol/l (Stamatovic et al., 1989; Samanc and Damjanovic 1987; Radojicic Biljana et al., 2007). Of course, age groups, and even the time of calving, or whether the test animals are in puerperal or early lactation, physiologically vary, but not many and significant. After Lotthammer (1991), the concentration of glucose in healthy cows in advanced pregnancy do not exceeds the physiological value and reflects a balanced metabolism. During calving there was a sudden increase in blood glucose, which is considered to be a consequence of stress that occurs during childbirth-calving. After calving cows in puerperium or in early lactation phase, the concentration of glucose in the blood is significantly lower than before calving (Samanc et al., 1993). The needs for daily intake of glucose are higher than the body can provide in terms of high milk production, but it is an important factor in the formation of the most common metabolic disease known as acetoanaemia or ketosis.

Material and methods

The studies were conducted at two dairy farms of Simmental cows in the Republic of Srpska. Some authors (Lazic et al., 2015; Lazic et al., 2016) in their studies represent significance and representation of Simmental cattle, which shows great potential.

For testing were selected 21 cows by each farm, aged 3-5 years, divided into three groups: highly gravid or dried (7 cows), cows in the first days after calving (7 cows), lactating cows 2-3 months (7 cows). The studies were carried out in two periods, the fall-winter (November-December) and are repeated on the same animals in the spring (April-May). The analysis of serum was performed in accredited hematological-biochemical laboratory of the Institute "Hexalab" in Belgrade.

For statistical analysis we used a factorial analysis of variance and LSD test. Comparisons were performed by production status and locations. Statistical analysis of the results was done in the statistical package PrismaPad 4.00 and MS Excel.

Results and Discussion

The following tables show the data with the calculated mean values and factorial analysis of variance.

Statistically highly significant difference occurs in the concentration of glucose in the blood depending on the production status regardless of the location.

The largest needs for glucose are at the time of early lactation, or in conditions where the inflow of glycogen plastic matter is reduced, but also the increased use of the mammary gland in the synthesis of lactose. So some researchers have examined the level of glucose to the production of milk and have shown that there are no changes of level of glucose in production up to 15 liters of biosynthetic milk, but there are changes at quantities of 20 and 30 liters of milk, which is expected from high dairy races since the needs then are double higher than in those animals producing about 15 liters (Stamatovic et al., 1983). Jovanovic et al. (1987) found that glycemia prior to calving is 2.71 mmol/l on average, and within 10 days after calving is lower on average and amounts to 2.40 mmol/l. With values below 1.9 mmol/l occurs ketosis, although some cows have no ketosis even with the established 1.7 mmol/l, but only in circumstances when morphological and functional integrity of liver cells is preserved, and when conducted intensive gluconeogenesis, or when a low level of infiltration or degeneration of the cells of the liver by fat. Physiological value for glycemia in adult ruminants is from 2.2 to 3.3 mmol/l.

Table 1. First group of comparison

Location	Production status	\bar{X}	\bar{X} for locations regardless to status	\bar{X} for status regardless to location	
Lijevoče	Higly gravid	2.49	2.61	Higly gravid	Lactat. II/III
	Lactation II/III	2.74			
Nevesinje	Higly gravid	2.44	2.57	2.47	2.72
	Lactation II/III	2.70			

Statistics	Location	Production status	Interaction location. × production status
F _{exp}	0.11	4.14	0.00

Table 2. Second group of comparison

Location	Production status	\bar{X}	\bar{X} for locations regardless to status	\bar{X} for status regardless to location	
Lijevoče	Freshly calved	2.33	2.60	Freshly calved	Lactat. V
	Lactation V	2.87			
Nevesinje	Freshly calved	2.00	2.52	2.16	2.95
	Lactation V	3.04			

Statistics	Location	Production status	Interaction location. × production status
F _{exp}	0.29	29.62**	2.95

Statistically highly significant difference occurs in the concentration of glucose in the blood depending on the production status regardless of the location.

Table 3. Third group of comparison

Location	Production status	\bar{X}	\bar{X} for locations regardless to status	\bar{X} for status regardless to location	
Lijevoče	Lactation II	2.37	2.62	Lactat. II	Lactat. VI-VII
	Lactation VI-VII	2.87			
Nevesinje	Lactation II	2.36	2.55	2.37	2.80
	Lactation VI-VII	2.73			

Statistics	Location	Production status	Interaction location. × production status
F _{exp}	0.30	9.33**	0.20

Conclusions

The glucose concentration is an indicator of the metabolic balance or energy state, as well as the functional activity of hepatocytes. It is in ruminants physiological lower than for other types of animals, but ruminants also have a great potential of the synthesis process of gluconeogenesis, which is under the direct control of glucocorticosteroids. By multiple authors, the most distinguish is its upper physiological value immediately before calving, and its subsequent decline after calving, but not immediately after calving. And it refers mainly to cows with higher milking (Samanc et al., 2000; Jorritsma 2003; Radojicic et al., 2002). The needs for glucose by the mammary glands are the largest in the prior partus and soon after birth, because the synthesis of milk sugar lactose disaccharide needs two molecules of glucose (Bergman, 1973; Kaneko 1987). The glucose concentration in our tests was within the physiological values in all animals.

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