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The influence of synbiotic participation in feed ration for ewes on selected lamb blood parameters

Wpływ udziału synbiotyku w dawkach pokarmowych dla maciorek na wybrane wskaźniki krwi jagniąt

Summary. The aim of the study was to assess the influence of the MOS prebiotic and the Microbiosan probiotic use as supplements to feed rations for ewes on selected hematological and biochemical parameters of lamb blood.

The experiment was conducted on lambs from ewes receiving the MOS prebiotic and the Microbiosan probiotic experiment factor. During the time of rearing, selected hematological and biochemical parameters were marked in lamb blood. The prebiotic introduced in ewes' doses significantly affected ($P \leq 0.05$) the red blood cell number growth and the haematocrit value in lamb blood. A positive interaction of prebiotic and the probiotic was found concerning the number of white blood cells and the leukogram. In the examined lambs' plasma (group B and BM) a considerable decrease of cholesterol rate as well as an increase of HDL-cholesterol fraction were observed.

Key words: ewes, synbiotic, prebiotic, probiotic, blond parameters

INTRODUCTION

The main application area in Polish sheep-breeding, which has development perspectives, is sheep production [Roborzyński *et. al*., 2001]. Thus, breeders are more and more interested in all sorts of feed rations components that improve the health and condition of these animals great potential in prevention of the diarrhea syndrome of sheep and subsequent improvement in animal growth and feed conversion has been attributed to organic acids, probiotics or/and prebiotics. Fructooligosaccharides (FOS), galactooligosaccharides (GAL) and mannanoligosaccharides (MOS) have been the most widely

studied oligosaccharides as the alternatives to antimicrobials in sheep diets. The MOS supplement to animals' diet also leads to an increase of daily gain, better feed efficiency and a decrease of young animals' death rate. Previous studies appear to justify its use in foal, poultry, piglet, calf as well as rabbit, cat and dog feeding [Czech *et al*. 2005, Czech and Grela 2006, Klebaniuk *et al*. 2006].

The probiotics added in feed of animals brought a lot of advantages, too. In the ruminants they can stabilize the fermentation processes and rumen pH. A result of this is better health and elevated production of animals. There are not many reports on this synbiotic (prebiotic and probiotic) influence on lambs' wholesomeness.

The aim of the study was to assess the influence of the mannanoligosaccharide prebiotic and the Microbiosan probiotic use as supplements to feed rations for ewes on selected hematological and biochemical parameters of lambs' blood.

MATERIAL AND METHODS

A flock of 75 in-lamb ewes of the Polish Lowland Sheep, a strain of Uhrusk sheep, was divided into three experimental groups (C – control, B and BM – experimental groups). The primary feed ration during pregnancy and lactation was silage and meadow hay given at will, with intake control. Additionally, the ewes during lactation received middlings, according to their needs. The experimental factors were: the MOS prebiotic and the Microbiosan probiotic administered to sheep from B-group- prebiotic (10g daily each), BM-group- prebiotic (10g daily each) and probiotic (2g daily each).

After kiddings, the lambs stayed with mothers till they reached the weight of about 30 kg (about 2.5 months). Apart from mother's milk, all lambs received, from the third month of age, meadow hay and mash based on oats and middlings. During rearing, blood from lambs' jugular vein was taken under vet's control three times. The following indices were determined in full blood samples: RBC – red blood cells number, Hb – haemoglobin concentration, Ht – haematocrit, MCV – mean cell volume, the average volume of a red blood cell, MCH – mean cell haemoglobin, which is the average amount of haemoglobin in the average red cell, MCHC – mean cell haemoglobin concentration, which is the average concentration of haemoglobin in a given volume of blood and white blood cells number (WBC) – by means of chamber method as well as percentage of white cells (leucogram), using Abbacus junior measuring apparatus.

In blood plasma, the content of glucose, total protein, total cholesterol and HDL-cholesterol was determined using colorimetric technique (Cormey). Statistical analyses were used, according to ANOVA procedure.

RESULTS AND DISCUSSION

The lambs from the mothers fed MOS (group B) and MOS and Microbiosan (group BM) had a slightly lower weight at birth (by 0.98%) as compared to the lambs whose mothers were given the dietary units based on meadow hay (group C). The lambs from the experimental group were characterized by higher daily gains during the raising period.

Mean values of the examined haematologic and biochemical parameters remained within the reference range [Olfert *et al*. 1993, Winnicka 2004].

The prebiotic (MOS) addition to feed (B group) affected the growth of erythrocytes system parameters. It significantly increased the red blood cell number and the percentage of haematocrit in lamb blood. Other erythrocytes indices did not show any serious changes (Table 1). Analogous relationships in the values of erythrocytes indices were also observed in other studies conducted on sheep [Klebaniuk *et al*. 2006], mares [Czech and Grela 2006] and foals [Czech *et al*. 2005]. Erythrocytes indices MCV, MCH, MCHC, used mainly to determine the anaemia type, oscillate around lower reference range [Winnicka 2004].

Table 1. Lambs' erythrocytes system parameters
Tabela 1. Wskaźniki układu czerwonokrwinkowego jagniąt

Item Wyszczególnienie	Feeding groups Grupy żywieniowe			Mean Średnia	SEM
	C	B	BM		
RBC, 10^{12} l^{-1}	12.66[b]	13.60[a]	12.68[b]	12.94	1.15
HGB, g · l^{-1}	111.2	112.25	110.6	111.29	8.70
HCT, %	31.56[b]	34.18[a]	31.30[b]	32.21	2.32
MCV, fl	23.0	23.25	22.80	23.0	1.92
MCH, pg	9.10	8.73	9.08	8.99	1.03
MCHC, g · 1^{-1}	351.2	329.7	353.6	345.9	12.59

a, b – values in the same rows with different letters differ significantly at $p \leq 0.05$
a, b – różnice statystycznie istotne pomiędzy grupami przy $p \leq 0,05$
RBC – red blood cells – krwinki czerwone
HGB – hemoglobina
HCT – packed cell volume – hematokryt
MCV – mean corpuscular volume – objętość krwinki czerwonej
MCH – mean corpuscular hemoglobin – masa hemoglobiny w krwince czerwonej
MCHC – mean corpuscular hemoglobin concentration – stężenie hemoglobiny w krwince czerwonej

A considerably higher white blood cell level (WBC) in lambs from ewes receiving a supplement of MOS and a lower number of these cells in the blood of lambs from mothers receiving doses with the prebiotic and the probiotic are worth mentioning. Simultanously, in the case of lambs from both experimental groups (B and BM) there was a considerable increase of lymphocyte number (Table 2). This may be a positive effect of MOS which is to attract and bind pathogenic bacteria, like *E. coli* and *Salmonella*, thus eliminating any potential inflammatory foci in an animal organism [Czech and Grela 2006].

The concentration of biochemical parameters in plasma depends on the health condition and immunity as well as on the age and physiological period of animals [Baranowski and Klewiec 2000, Baranowski and Kmieć 1997]. The glucose and total protein level in the examined lambs' plasma differed slightly between groups (Table 3), and the values were close to those given in available literature [Winnicka 2004].

In the examined lambs' plasma a considerable decrease of total cholesterol in the group of lambs from ewes receiving doses with pre- and probiotic was noted. However, most important in lipid profile assessment is the lipoprotein fraction concentration of high density (HDL-chol), which should not be lower than 40% [Winnicka 2004]. The

lambs from this group (BM) were characterised by the highest level of this fraction, about 8% higher than in the case of the other lambs (Table 3). These results indicate positive effects of the used supplements. This fact is also attested by other studies [Czech *et al*. 2005], in which lambs receiving a supplement of MOS in their feed had about 16% total cholesterol less, which also correlated with a similar HDL-chol fraction increase.

Table 2. Number of white blood cell in blood plasma of lambs and leucogram
Tabela 2. Leukogram

Item Wyszczególnienie	Feeding groups Grupy żywieniowe			Mean Średnia	SEM
	C	B	BM		
WBC, 10^9 l^{-1}	12.68^{b}	13.45^{a}	11.32^{c}	12.48	1.03
LY, %	30.94^{c}	49.12^{a}	37.54^{b}	39.20	3.15
MI, %	0.82^{b}	2.98^{a}	0.82^{b}	1.54	0.03
GR, %	68.24^{a}	47.90^{b}	61.66^{a}	59.27	4.12

a, b – values in the same rows with different letters differ significantly at $p \leq 0.05$
a, b – różnice statystycznie istotne pomiędzy grupami przy $p \leq 0,05$
WBC – white blood cells – krwinki białe = leukocyty
LY – lymphocytes – limfocyty
MI – mids – midy
GR – granulocytes – granulocyty

Table 3. Chosen biochemical blood parameters of lambs
Tabela 3. Wybrane wskaźniki biochemiczne krwi jagniąt

Item Wyszczególnienie	Feeding groups Grupy żywieniowe			Mean Średnia	SEM
	C	B	BM		
Total protein, g · l^{-1} Białko całkowite	68.16	66.06	64.80	66.36	4.21
Glucose, mmol ·1^{-1} Glukoza	4.30	4.37	4.57	4.42	0.53
Total cholesterol, mmol ·1^{-1} Cholesterol całkowity	1.29^{ab}	1.43^{a}	1.08^{c}	1.25	0.03
HDL, %	56.02^{b}	56.76^{b}	63.99^{a}	59.08	3.77

a, b – values in the same rows with different letters differ significantly at $p \leq 0.05$
a, b – różnice statystycznie istotne pomiędzy grupami przy $p \leq 0,05$

CONCLUSIONS

1. The prebiotic introduced in ewes' doses influenced considerably ($P \leq 0.05$) the red blood cell and haematocrit increase in lamb blood.

2. The attested positive interaction between prebiotic and the probiotic concerning the leucocyte and leukogram number indicates a positive effect of experimental factors.

3. In the examined lambs' plasma (group B and BM) a significant decrease of the level of total cholesterol and a HDL- cholesterol fraction increase were observed.

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Streszczenie. Celem pracy była ocena wpływu stosowania prebiotyku (MOS) i probiotyku Microbiosan jako dodatków do dawek pokarmowych dla maciorek na wybrane wskaźniki hematologiczne i biochemiczne krwi jagniąt.

Doświadczenie przeprowadzono na jagniętach pochodzących od maciorek otrzymujących czynnik doświadczalny: prebiotyk (MOS) i probiotyk (Microbiosan). W czasie odchowu w krwi jagniąt oznaczono wybrane wskaźniki hematologiczne i biochemiczne. Prebiotyk wprowadzony do dawek maciorek wpłynął istotnie ($P \leq 0,05$) na wzrost liczby czerwonych krwinek oraz wartość hematokrytu w krwi jagniąt. Stwierdzono pozytywną interakcję prebityku i probiotyku odnośnie liczby leukocytów oray leukogramu. W osoczu krwi badanych jagniąt (grupa B i BM) obserwowano istotne obniżenie poziomu cholesterolu całkowitego oraz wzrost udziału frakcji HDL-cholesterol.

Słowa kluczowe: maciorki, synbiotyk, prebiotyk, probiotyk, wskaźniki krwi