COMPOSITION OF SOW´S MILK AND SELECTED METABOLIC INDICES AFTER ADMINISTRATION OF PROBIOTICS

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Abstract

There were 2 x 16 hybrid sows included into the trial. The trial lasted from 2 weeks before farrowing until weaning at 4 weeks after farrowing. Control group was fed with standard feed for lactating sows, experimental one was fed with control feed (same as that of the control group) with 400 g BioPlus 2B/t feed which equals $1.28x10^6$ CFU/g feed.
Milk-samples of all sows were collected on the 3rd and 14th day of lactation. Milk-samples were analyzed for cholesterol, total lipids, protein, lactose and total solids. Blood samples for determination of parameters of protein and lipid profile was taken on day 1 and 15 after parturition.The experimental group had higher content of lipids and cholesterol in milk compared with control group on day 3 and also on day 14 of lactation. No significant differences between groups were observed in total solids and lactose concentration in sow's milk. Level of cholesterol in blood of experimental group increased. As a result, significant higher cholesterol level was found in experimental group compared to control group on day 15 (P=0,038). Similar to cholesterol, total lipids in blood of experimental group was significantly higher in comparison to control group on day 15 (P=0.007). Results of our experiment indicate that the probiotics based on representatives of the genus *Bacillus* are able to affect the nutrient composition, e.g. total lipids and cholesterol, of sow´s milk and consequently improve performance and average daily gains of suckling piglets.

Introduction

Despite some advantages related to the use of antibiotics as stimulators of growth some adverse effects related to such practice have also been noted, particularly development of resistant bacterial strains and presence of antibiotic residua in the food chain of humans. The use of antibiotic growth stimulators had been banned in Sweden and Finland before admittance of these countries to EU and a little later Denmark also joined in this effort. The states mentioned initiated gradual elimination of antibiotic stimulators throughout EU.
In relation to this it is clear that we should concentrate on finding other means of prevention of the diarrhoeic syndrome of young of the farm animals and subsequent improvement in animal growth. Great potential in this direction has been associated with probiotics. Probiotics were characterised as microbial cellular preparations or components of microbial cells which are beneficial to the health and well-being of the host (Salminen *et al*., 1999).
Recently, in addition to conventional probiotics based on genera *Lactobacillus* and *Bifidobacterium,* preparations based on representatives of the genus *Bacillus* come into the foreground. At present, we recognise 77 species belonging to the genus *Bacillus*, of which the following are used most frequently: *coagulans, subtilis, clausii, cereus, toyoi* (Sanders *et al*., 2003). In the agricultural sector, *Bacillus licheniformis* has also been used to improve the health status of pigs and increase their weight gains. Germination of spores of *Bacillus cereus var. toyoi* in the intestinal samples from broiler chicks was confirmed. It seems that germination of spores in the digestive tract is a precondition of the potential probiotic effect resulting in improvement of health and increased weight gains in farm animals (Jadamus *et al*., 2001).

Material and methods

There were 2 x 16 hybrid sows - all with the same genetic background (Landrace, and cross-bred, Landrace x Slovak White) included into the trial. Control and BioPlus 2B groups was balanced according to the sows parity number. Both groups consisted of 8 uniparae and 8 multiparae.
From about 14 days before the anticipated farrowing date the sows were housed in conventional farrowing crates. The trial lasted from 2 weeks before farrowing until weaning at 4 weeks after farrowing. The weaning will take place from about 28 days.
Control group was fed with standard feed for lactating sows, experimental one was fed with the same type of feed with 400 g BioPlus 2B/t feed, which equals $1.28x10^6$ CFU/g feed.
In both groups the piglets received the same creep feed without additives until weaning.
Milk-samples of all sows were collected on the 3rd and 14th day of lactation from teats two to six between 9.00 and 11.00 hrs. Milk-samples were analyzed for cholesterol, total lipids, protein, lactose and total solids.
Blood samples for determination of selected parameters of protein and lipid profile was taken on day 1 and day 15 after parturition. The blood was sampled from the eye sinus.

Results

In spite of the fact that no significant differences were noticed in concentration of total lipids and cholesterol in milk, the experimental group had higher content of lipids and cholesterol compared with control group on day 3 and also on day 14 of lactation. The concentration of cholesterol and total proteins had slightly decreasing tendency in both groups, e.g. cholesterol decreased from 1.54%, 1.42% resp., to 1.2% or 0.91%. On the other hand, concentration of lactose increased on day 14 of lactation in both groups. No significant differences between group were observed in total solids and lactose concentration in sow´s milk (Table 1).Serum levels of total proteins were in physiological range and had increasing tendency in both groups. Though no significant differences were revealed between groups, the increase was higher in experimental group.

The albumin level was relatively uniform during the experiment and did not deflect from the reference range,group there was slight decrease of albumin in control group on day 15. Serum urea level increased in experimental and also in control group on day 15 in comparison with day 1. Level of urea in blood ranged from 3.66 to 4.64 mmol.l^{-1}. No significant differences were observed between groups in individual sampling.
Level of cholesterol in blood of experimental group increased. On the contrast, cholesterol level in control group was constant in both sampling. As a result, significant higher cholesterol level was found in experimental group compared to control group on day 15 (P=0.038).
Similar to cholesterol, total lipids in blood of experimental group was significantly higher in comparison to control group on day 15 (P=0.007). Total lipids in experimental group were steady in both samplings, but serum lipids in control group decreased in second sampling, that caused significant difference (Table 2).

Table 1 Level of nutrients in sow´s milk

	3rd day	14th day
TL - exp. group, g/100g	10.41±3.64	10.9±4.2
TL - control group, g/100g	9.14±3.80	9.31±2.31
TCh - exp. group, mmol.l^{-1}	1.54±1.48	1.2±0.6
TCh - control group, mmol.l^{-1}	1.42±0.85	0.91±0.35
TP - exp. group, g/100g	6.01±1.02	4.9±0.62
TP - control group, g/100g	6.16±1.55	4.69±0.49
TS - exp. group, g/100g	22.29±3.84	22.3±3.97
TS - control group, g/100g	21.26±4.32	20.54±2.09
Lactose - exp. group, g/100g	4.95±0.99	5.64±0.53
Lactose - control group, g/100g	5.06±0.99	5.77±0.35

TL – total lipids, TCh – total cholesterol, TP – total proteins, TS – total solids

Table 2 Level of total proteins, albumin, urea, total lipids and cholesterol in blood of swine

	0th day	15th day
TP – exp. group, g.l^{-1}	70.01±5.64	75.18±5.73
TP – contr. group, g.l^{-1}	70.88±4.26	72.93±8.21
Alb – exp. group, g.l^{-1}	37.69±4.38	36.34±2.93
Alb – contr.. group, g.l^{-1}	38.71±2.30	35.01±2.38
Urea – exp. group, mmol.l^{-1}	3.80±1.06	4.65±0.95
Urea – contr. group, mmol.l^{-1}	3.66±0.94	4.09±0.60
TL – exp. group, g.l^{-1}	2.03±0.50	2.01±0.60*
TL – control group, g.l^{-1}	2.30±0.50	1.47±0.43*
TCh – exp. group, mmol.l^{-1}	2.03±0.62	2.25±0.58*
TCh – contr. group, mmol.l^{-1}	1.84±0.36	1.83±0.47*

* P < 0.05, TP – total proteins, Alb – albumin, TL – total lipids, TCh – total cholesterol

Discussion

Ahrens *et al.* (1992) conducted an experiment on weanlings and observed that digestion of proteins in the small intestine of experimental pigs was significantly better (76%) in comparison with that in the control (68%). In another experiment Ahrens *et al.* (1992) recorded higher weight gains (by 13%) in the experimental group supplemented with BioPlus 2B in comparison with the control, however, the differences were insignificant.
Bacillus licheniformis and *Bacillus subtilis* produce proteases, amylase, and catalases, which may explain better weight gains in the experimental group. About half of all industrially produced proteases and amylases originate from bacteria of the genus *Bacillus*. These enzymes support digestion of feed which is particularly important for the young of farm animals.
Our results are similar to Alexopoulos *et al* (2004), who also revealed higher serum cholesterol concentration and serum lipids in experimental group. The increase in the values normally occurring between the first and the 15th day postpartum was more pronounced in the BioPlus 2B group, for both serum parameters examined.

Conclusion

Results of our experiment indicate that the probiotics based on representatives of the genus *Bacillus* are able to affect the nutrient composition of sow´s milk and increase some metabolic indices in blood.

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