Effectiveness of synbiotic preparations intended for turkeys and chickens breeding

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Abstract

Methods of breeding and feeding of consumption animals are crucial for the entire production chain, and as a result also for consumer health and the environment. Excessive use of antibiotic growth promoters (ASW) has led to the development of antibiotic resistance of bacteria, which was a threat to consumer health and had a negative impact on the environment.

On 1 January 2006 the use of ASW in feed for consumption animals was banned in the European Union (EU). As a result, alternative feed additives are sought to intensify production and increase food quality while taking into account animal welfare and respect for the natural environment. Many scientific reports indicate the beneficial effect of probiotic and prebiotic preparations on the health of poultry. The use of an appropriate combination of probiotic and prebiotic in preparations referred to as synbiotics may lead to a better health effect compared to the use of these ingredients separately.

The aim of the study was to determine the effectiveness of three synbiotic preparations in preventing bacterial diseases and poisoning caused by toxins, and improving the safety of feeding turkeys and chickens. The composition of the tested synbiotics comprised lactobacilli, *Saccharomyces cerevisiae* and inulin.

In the first stage, *in vitro* studies were carried out on the survivability of probiotics contained in three synbiotic preparations (A, B and C) in a model poultry digestive system. The high survivability of probiotic mixtures present in the composition of synbiotic preparations was demonstrated in an *in vitro* model of the poultry digestive system.

Then, the effect of the synbiotic preparations on the composition of the intestinal microbiota and its metabolism (profile of fatty acids and lactic acid and the activity of enzymes), as well as the genotoxicity of animal excreta was assessed. The researches were conducted *in vivo* on 868 chickens and 720 turkeys. The effectiveness of synbiotic preparations A, B and C in feeding chickens and turkeys was compared with probiotic preparations for poultry (BioPlus 2B® and Cylactin®).

It has been shown that feeding chickens and turkeys with feed supplemented with synbiotic preparations has a beneficial effect on the composition of the intestinal microbiota, causing an increase in the number of lactobacilli and *Bifidobacterium* spp., while reducing the number of potentially pathogenic bacteria, such as *Escherichia coli* and *Clostridium* spp. in the contents of the jejunum, the caecum and the excreta of animals.

Beneficial changes in the composition of the dominant intestinal microbiota caused by synbiotic supplementation were reflected in metabolic processes. An increase in the concentration of lactic acid and short-chain fatty acids (SCFA) and an increase in the activity of α-glycosidases was confirmed, with a simultaneous decrease in the concentration of branched fatty acids (BCFA) and the activity of β-glycosidases in the excreta of chickens and turkeys.

The research with chickens infected with *Salmonella* Typhimurium (ST) and chickens and turkeys fed with ochratoxin A (OTA) contaminated feed confirmed the protective effect of synbiotics in preventing bacterial diseases and mycotoxin-induced poisoning. It has been

shown that infection with ST and OTA present in the feed cause imbalance of the intestinal microbiota and its metabolism. The use of synbiotic preparations reduces this negative impact on animal health. The administration of feed with added Synbiotic C to chickens infected with ST results in a statistically significant reduction in the genotoxicity of the excreta. The addition of Synbiotic B or C to feed contaminated with OTA reduces the genotoxicity of chicken excreta, while in the case of turkeys no such effect was observed. It has been shown that synbiotic preparations are more effective in modulating the intestinal microbiota and its metabolism in chickens and turkeys than probiotic preparations BioPlus 2B® and Cylactin®.

Based on the conducted research, it was found that synbiotic preparations can be used prophylactically to modulate the balance of the intestinal microbiota and its metabolism in poultry. The most effective synbiotic preparation in the nutrition of both chickens and turkeys is Synbiotic C, which may be an alternative to ASW.