

Poultry (*Gallus gallus*) is the most studied animal species outside of mammals, and therefore is an invaluable model for studying basic immune mechanisms. The immune system of birds is an extremely complex, plastic and multifactorial entity whose functions are influenced by factors such as bird age, feed composition, feed and energy intake, the bird's genetic growth potential, environmental factors and stress. The digestive system is a very important organ system from the point of view of immunity. This is due to the fact that the main function of the intestines is to digest food and absorb nutrients from their lumen into the bloodstream, which means that the intestinal epithelium is in constant contact with large amounts and a wide range of antigens derived from exogenous sources such as food, resident microorganisms, commensal flora and potential pathogens. The microbiome of the poultry digestive tract is also important in maintaining an appropriate level of immunity. The gut represents an ever-evolving ecosystem where the largest lymphoid tissues in the organism, the neuroendocrine system and trillions of commensal bacteria permeate. Accumulating evidence suggests that the gut microflora plays a key role in the development and function of the host's immune system. The plasticity of the bird's immune system and its high sensitivity to external influences have led to many attempts to manipulate the immune functions, including vaccination, reduction or elimination of specific pathogens, the use of antibiotic growth promoters, and nutritional immunomodulation.

Literature data indicate that one of the substances that can exert an immunomodulatory effect and that can be used in nutritional immunomodulation in poultry is the biopolymer - levan. Due to the fact that this substance is produced, inter alia, in by probiotic bacteria used in animal nutrition (e.g. *Bacillus subtilis*), the influence of levan type biopolymers on the production parameters and health of various animal species, such as pigs, broilers, rats and fish, was investigated. It has been shown that it stimulated the immune response of carp family fishes, improved the fecal microbiota profile of growing pigs, increasing e.g. the level of bacteria of the genus *Lactobacillus* spp., improved nitrogen digestibility and digestibility of nutrients, improved the average daily weight gain of piglets during the first two weeks after weaning, prevented oxidative stress, decreased obesity rates and lowered the level of triglycerides and free fatty acids in rats fed a high-fat diet, improved the growth performance in the later stages of development of broiler chickens, and also reduced ammonia emissions. Therefore, levan has the potential to exert immunomodulatory effects in the gastrointestinal tract of poultry.

Therefore, the research objective of the project is to determine the potential immunomodulatory properties of levan used as a feed additive for laying hens and broiler chickens. Therefore, both laying hens and broiler chickens will be fed with feeds with different doses of levan. Its immunomodulatory properties will be determined by examining the morphological and biochemical indicators of blood, determining the composition of the microflora of the digestive system, determining the composition of intestinal mucin, conducting a series of histological and immunohistochemical studies on various sections of the intestine and lymphatic organs. The above project is innovative, and its effect will be to gain new knowledge in the development of the immune response of laying hens and broiler chickens under the influence of biopolymers that have not been used in poultry nutrition so far. The obtained results will be the basis for the development of feed additives with known immunomodulatory properties, which will be an alternative to the use of antibiotics in poultry production, which will have a significant impact on the development of animal science and fishery, especially in the context of public health protection.