

POPULAR SCIENTIFIC SUMMARY

The population of commercial **ducks** is becoming more popular, and in Poland, there is a noticeable increase in the number of birds kept in the direction of meat production. Outside of the production sector, attention should be paid to the use of ducks in scientific research. It is a niche genre that is a little-used experimental model. Ducks, which are waterfowl, whose digestive system differs from the commonly used bird model which are chickens. The differences between these species concern the structure of the goiter, namely in ducks there is pseudo goiter, which is a kind of extension of the esophagus, and in chickens, it is true goiter which is separated from esophagus. Another aspect that differ both species is the length of the digestive system in ratio to the body weight. The discussed birds from the *Anseriformes* family are characterized by a length of 10:1, while chickens, as representatives of burrowing poultry, are characterized by a ratio of 8:1. The third and very important difference between species is the development and size of the caecum. Ducks have a more developed caecum, which inter alia has a significant impact on the use of raw fibre from the feed, and also allows the use of forage in the feeding of waterfowl. An increased of intestinal bacteria population is also noticed in this part of the digestive system compared to other parts of digestive tract. The intensification of the production of broiler ducks is related to the fact that the nutrition is based on complete feed, in the form of crumbles or granules. They are characterized by a dry and rather loose consistency, which may have a potential impact on less development of the digestive system and limited stimulation of digestion physiology, including development and the activity of the gut microbiota. The poultry gut microbiome is a common research topic in many respects, and the scientific literature indicates that its quantity and activity are some of the most important factors contributing to the optimal health status of birds and their growth.

Support for the development of birds and the health status of their digestive system is commonly known by adding probiotic, prebiotic, and synbiotic substances, as well as eubiotics and phytobiotics to the feed. However, natural minerals, like aluminosilicates, are more and more often discussion in terms of the possibility of using them to improve the growth and functioning of birds. **Zeolite** and **halloysite** are compounds from the group of silicates with a characteristic spatial structure, containing admixtures of elements, including iron, magnesium, copper, sodium, and calcium. The available scientific literature indicates different results of research conducted in the field of the use of zeolite or halloysite added to the feed. Aluminosilicates have potential, as shown by the results of studies in the field of body weight gain and the tissue composition of carcasses, or morphological changes in the intestines, however, there are also scientific papers where no influence or negative effect on the growth of birds has been shown, depending on their level in the feed. Most of the research concerns the mentioned species - chickens. Moreover, many studies indicate the beneficial effect of reduction of toxic gases in the environment, including the ammonia' absorption, however, the mechanisms and possibilities of modulating the digestive system and phenotypic features of ducks have not been explained.

The aim of the project is to analyse phenotypic features and to assess the development and health status of the digestive system, taking into account changes in the quantity and activity of bacteria in the intestinal microbiome, protein profile in the intestinal mucosa and changes in gene expression responsible for immunostimulating mechanisms and influencing changes at the metabolic level of muscle tissue in two lines of ducks. **The obtained results will help to answer the questions** of the presented project, whether and how the aluminosilicates added to the feed affect the gut health status and phenotypic features, i.e. the growth, development, and characteristics of duck carcasses, meat and intestines. **The proposed research concept includes:** rearing ducks of the Pekin type (Cherry Valley and Orvia), analysis of the growth, the chemical composition of feed, and the level of apparent digestibility of selected nutrients after the use of 1% addition of zeolite or halloysite in the feed (task 1), tissue analysis of carcasses, physicochemical and histological features of muscles (task 2), biochemical profile of blood, histological evaluation of intestinal development, the content and activity of chemical compounds, including mucins, biogenic amines or ammonia (task 3), and multiomic analyses, including analysis of gene expression in the intestines and pectoral muscle, identification of intestinal mucosa proteins, profiling of indicator bacteria in the intestinal content and 16S rRNA sequencing (task 4). **The research hypothesis** assumes the effect of zeolite and halloysite at the level of 1% in the feed on the health status of the digestive system and phenotypic features of ducks of two lines. **The most important expected results** of research in this project is the broaden one's knowledge of the use of ducks, with particular emphasis on phenotypic features, mechanisms and changes in the digestive system, the quantity and activity of intestinal bacteria, chemical compounds, as well as gene expression and protein profile of the intestinal mucosa due to the use of zeolite and halloysite in feed.