In the last 30 years, the slaughter weight of broiler chickens has increased 2-fold with a shortening of the rearing period by almost half. Nowadays (in the 21st century), poultry meat production mainly uses highly selected hybrids of slaughter chickens, which are kept in an intensive production system (Michalczuk et al., 2013; Michalczuk et al., 2015). Unfortunately, such rapid genetic progress in the production of broiler chickens has contributed, among other things, to the weakening of the structures and functioning of the birds' digestive tract. One of the biggest problems is the thinning of the intestinal mucosa. Weakening of the intestinal mucosa has consequences in the form of diseases caused by disturbances in the composition of the intestinal commensal microbiota (e.g. salmonellosis and colibacteriosis). In intensive poultry production, intestinal diseases in birds are a major problem generating economic losses (Mateos et al., 2002; Jiménez-Moreno et al., 2009). One of the most common ways to combat the problem was to increase the use of antibiotic growth promoters (AGPs), which on the one hand stabilised the balance of the intestinal microbiota and on the other had a beneficial effect on production performance. As time passed, however, attention began to turn to the problem of the presence of antibiotic residues in meat and eggs and their harmful effects on human health, including allergenic and toxic effects. The problem of the use of antibiotics as AGP has been further compounded by the ever-increasing number of pathogens exhibiting antibiotic resistance, i.e., resistance to the bactericidal or bacteriostatic effects of antibiotics used in human and veterinary medicine. Consequently, as of 1 January 2006, a complete ban on the use of antibiotic growth promoters in animal production was introduced throughout the EU (Anadón, 2006; Michalczuk et al., 2024). Unfortunately, the action taken did not have the desired effect. Currently, 70% are used for treatment and as substances to stabilise the composition of the gastrointestinal microbiota of animals, and only 30% of global antibiotic production is used for human treatment. There are more than 700,000 deaths worldwide each year as a result of infections caused by pathogenic microorganisms characterised by antibiotic resistance (WHO, 2019; Michalczuk et al., 2024); in Europe, approximately 25 - 33,000 people die from this problem. The problem of antibiotic resistance in the EU also generates a huge economic loss of more than €1.5 billion per year related to covering additional healthcare and hospitalisation costs (Anderson et al., 2023; Michalczuk et al., 2024). The growing problem of antibiotic resistance and the total ban on the use of antibiotic growth promoters (AGP) in the feeding of slaughter animals presented nutritionists with the daunting challenge of finding alternative feed additives. On the one hand, they had to, among other things, protect the animal's digestive tract from colonisation by pathogenic bacteria and, on the other hand, be inert to the animal's body (Urban et al., 2023; Urban et al., 2024). Stabilising the gastrointestinal microbiota and improving the profitability of poultry production depends on a synergy between science and practice. Based on the results obtained from a number of experiments, a group of natural and effective substitutes for AGP has been created. Among the most commonly used natural replacements for antibiotic stimulants in the poultry industry are probiotics, prebiotics (including crude fibre) (Al-Khalaifa et al, 2019; Ricke, 2021; Urban et al, 2023; Urban et al, 2024) and synbiotics.

Crude fibre is the sum of fibrous substances (cellulose, lignin, and partly hemicelluloses) resistant to the digestive enzymes of the chickens' digestive tract. The occurrence of insoluble crude fibre fractions in the diet of broiler chickens affects intestinal morphological structure, gastrointestinal development, nutrient absorption, production performance, intestinal microbiota (Tejeda & Kim, 2021), and welfare indicators. The aim of this project is to evaluate the effect of the addition of a prebiotic (lignocellulosic crude fibre concentrate) used in the feeding of broiler chickens on the cecal microbiome, welfare, production performance, and meat quality. As part of the ongoing analyses, probiotic strains isolated from the caecal content will be given full genetic identification and used for further microbiological analyses (development of a concept for a new synbiotic line based on lignocellulosic crude fibre concentrate and strains residing in the caecal content). In this study, three research hypotheses are put forward regarding the beneficial effects of the addition of lignocellulosic crude fibre concentrate (used in feeding) on caecal microbiome composition, welfare, production performance, and meat quality of broiler chickens. The research plan of the study includes 4 milestones. The second milestone relates to the collection of caecal content and securing the genetic material obtained for further planned microbiological analyses. The realisation of the objectives planned for the third milestone relates to the analysis of production indices and the evaluation of physico-chemical quality parameters of the harvested meat. The final fourth milestone will be related to the transfer of the secured microorganisms isolated from the caecal contents for full genetic identification of strains, preparation of a report, scientific publications, and the development of a synbiotic concept.