Anisakiasis is one of the parasitic diseases of the digestive tract of animal origin (zoonosis). Over 20,000 cases of anisakiasis had been reported worldwide prior to 2010. Recent research has revealed that the total number of worldwide anisakidasis cases (almost all anisakiasis), caused by Anisakidae family, up to December 2017 was over 76,000. Human becomes an accidental host of *Ansakis simplex* L3 invasive larvae after eating infected fish, raw or undercooked. These parasites pose a very serious threat to the human health, because they can penetrate mucous membranes of the digestive tract and cause acute gastrointestinal problems, as well as severe allergic reactions.

One way to combat parasitic diseases is to use pharmaceuticals. There are three main groups of antiparasitic drugs: macrocyclic lactones, imidothiazoles, benzimidazoles. Each group has a different way of affecting the parasite. Despite this, the effectiveness of drugs is not always satisfactory, and the parasite's response to the pharmaceutical might differ from the known mechanisms of their action. An emerging problem is drug resistance, which is often associated with the way the drug molecule is metabolized. Many studies show the relationship between the expression of metabolic enzymes and drug activity and resistance. In order to understand how the pharmaceutical affects the parasite and to learn about the metabolism and effectiveness of the drug, 'omics' research is necessary. The combination of transcriptomic and metabolomic studies will allow the assessment of the effect of an external stressor (drug) on the gene expression profile as well as, caused by this stressor, biochemical changes. In addition, attention should be paid to the interaction of the parasite with the external environment. When using antiparasitic drugs, not only the target organism, i.e. the parasite, should be taken into account, but the interaction of the parasite with both the immune system and the intestinal microbiota of the host as well, as these are closely related parts forming a common ecosystem.

In our previous studies of the effects of drugs on *A. simplex* larvae, we noticed that the parasite's response differs from the mechanisms described in the literature. The results of our preliminary studies and literature data prompted us to formulate the **following research hypotheses**:

1) Differences in transcriptomic profiles (transcriptome) after the antiparasitic treatment and changes in biotransformation pathways (metabolome) between used antiparasitic drugs indicate the various effects of the individual drug on the *Anisakis simplex*;
2) Excretory/secretory metabolites of *Anisakis simplex* induce changes in transcriptomic profiles of human immune system cells and in transcriptomic profiles of bacteria species of the human gastrointestinal microbiota.

Thus, the current **study aimed to examine** excretory/secretory metabolites (ESMs) of *A. simplex*, resulting from biotransformation of antiparasitic drugs, and genes induced by those pharmaceuticals. The interactions of parasitic ESMs with human immune system cells and bacteria species of the human gastrointestinal microbiota will be also investigated by examination of their transcriptomic profiles. In the project will use three drugs from different groups: ivermectin, pyrantel and albendazole. The following **research objectives** have been formulated to verify the above hypotheses:

1) to identify metabolites of antiparasitic drugs (ivermectin, pyrantel, albendazole) present in larvae and in the culture medium after drug treatment of *A. simplex;*
2) to identify mRNAs present in *A. simplex* larvae cultured with and without antiparasitic drugs;
3) to identify mRNAs present in peripheral blood mononuclear cells (PBMC) cultured with and without concentrated metabolites of each of antiparasitic drug;
4) to identify mRNAs present in *Bifidobacterium animalis* cultured with and without concentrated metabolites of each of antiparasitic drug;
5) to compare the transcriptomes of a) *A. simplex* larvae, b) PBMC cells, c) *B. animalis* cultured with and without each of tested drugs or excretory/secretory metabolites/metabolomes (ESMs) to identify differentially expressed genes (DEGs);
6) to propose possible metabolic pathways of ivermectin, pyrantel and albendazole in *A. simplex*, together with genes taking part in their biotransformation.

Transcriptomic and metabolomic analysis of *A. simplex* larvae after *in vitro* culture in the presence of antiparasitic drugs (ivermectin, pyrantel, albendazole) will allow to detailed answers to very important questions e.g. "How do pharmaceuticals affect the parasite?" "How do larvae and exogenous metabolites affect the host organism (immune system, gut microbiota)?" This study will **allow to describe** complex biological system by looking at the **problem of anisakiasis holistically from the perspective of the effect of the drug on *A. simplex* larvae, as well as the effect of the drugs' metabolites excreted/secreted by the parasite, on the host.** The combination of transcriptomic and metabolomic studies is an innovative venture because the joint use of these methods in science is still rare. This approach will allow the analysis of metabolic pathway from the gene expression to the end products of metabolism.