Trichina (*Trichinella*) nematodes are dangerous parasites infecting numerous mammals including humans. Infection with the parasite occurs after eating raw or undercooked meat that contains invasive larvae and cause a disease called trichinosis (trichinellosis). Despite the strict veterinary inspections in animal farming and meat production, *Trichinella* is posing a threat to human health. European Centre for Disease Prevention and Control (ECDC) listed trichinellosis among eight zoonotic agents included in compulsory annual monitoring and mandatory reporting of foodborne outbreaks. The main *Trichinella* reservoir are carnivorous and omnivorous animals (e.g. pig, wild boar, fox, wolf, raccoon dog, bear), and the interpenetration of the sylvatic and domestic environment may contribute to the formation of new *Trichinella* outbreaks. Source of trichinellosis can be e.g. pork and game meat (mainly wild boars), but also horse meat, especially when eaten without prior specialist examination. Scientific data collected by parasitologists and presented during conferences and scientific meetings allow us to estimate that up to 20 million people may be infected with these parasites in China alone, and even more around the world. In the years 2012-2021 in the European Union, there were up to three hundred human cases per year, according to official reports. This number may be underestimated due to often non-specific symptoms of trichinellosis and the lack of experience in its diagnosis.

Despite a number of scientific research concerning parasitic worms, including *Trichinella*, no effective vaccines protecting against trichinellosis have been developed so far. Additionally, the exact functions of many key *Trichinella* proteins remain unclear. Many of these proteins are unique, that is, they have no sequence similarity to other known proteins. Therefore, they constitute interesting research target in the context of understanding their functions and revealing their vaccine potential. Developing a vaccine may be complicated, especially since parasitic nematodes have several developmental stages that differ from other pathogens in the immune response they induce. Furthermore, due to complex life cycles, stage-specific antigens, and host response evasion mechanisms, the potential of *Trichinella* to break vaccine-induced immunity is significant. Developing a vaccine is therefore a great challenge and the proper selection of protective antigens may be crucial.

Our preliminary studies involving immunoproteomic techniques and bioinformatics analysis allowed us to select a number of potentially immunoprotective *Trichinella* proteins. The selected proteins are immunogenic molecules, i.e. they induce the production of specific antibodies during infection. Additionally, they perform various functions related to basic cellular processes, manipulating host cell structure and function and alteration of host immune response. Our group distinguished two noteworthy groups among these proteins: multifunctional enzymes and effector proteins.

The main task will be to develop a multi-antigen vaccine formulation, i.e. consisting of a group of recombinant proteins, so that it is as effective as possible. Proteins, that have been selected by us, will be tested in various combinations, and then it will be verified which combination of proteins provides the greatest protection against infection in laboratory mice. Moreover, the immune response against the parasite after vaccination and after experimental infection will be studied and compared in detail, using methods such as flow cytometry, real-time RT-PCR and ELISA test. The future vaccine could be used for certain high-risk animal groups including pigs, hunting dogs, game and also, if necessary, humans. Additionally, this research will provide a much better understanding of the molecular basis of trichinellosis such as host-parasite interactions, immunomodulation and vaccine mode of action.