

## DESCRIPTION FOR THE GENERAL PUBLIC

*Toxoplasma gondii* invasion is one of the most common human parasitoses. The World Health Organization (WHO) estimates that one-third of the human population is infected with this parasite, and in some regions of the world the incidence of *T. gondii* invasion exceeds 60%. People most commonly become infected with a parasite *via* the oral route, through consumption of raw or undercooked meat containing tissue cysts, or vegetables and fruits contaminated with soil containing oocysts shed by cats. From the medical point of view, the reliable recognition of *T. gondii* invasion is very important for pregnant women, due to the significant risk of tachyzoite transmission *via* the placenta to the fetus, which can lead to miscarriages or cause neonatal malformations, neurological damage, and blindness in newborns. Detection of the parasite invasion is also significant for patients with immunodeficiency, for whom even the chronic phase of toxoplasmosis can be a serious threat. The most important, from the economical point of view, a result of the *T. gondii* infection in farm animals is abortion and stillbirth, which cause significant reproductive losses. The multiplicity of parasite transmission routes between different organisms suggests that the simplest way to prevent the further spread of *T. gondii* would be, as with other infectious diseases, to administer the vaccine. For many years, researchers have been conducted on obtaining a universal vaccine, which could be used primarily in farm animals. Developing an efficient vaccine will reduce the economic losses due to adverse effects of *T. gondii* invasion. A vaccine for veterinary purposes in addition to benefits for breeders will be important for public health, since it will minimize the risk of zoonotic parasite infection of humans eating raw or undercooked meat. Finally, a successful and thoroughly tested vaccine could be also considered for human vaccination to prevent infection, which apart from obvious social benefits would also have more dawn-to-earth economic advantages associated with financial outlays for medical care of pregnant women, or patients with immunodeficiency.

The aim of this project is the construction of *T. gondii* recombinant chimeric and fusion proteins in a mammalian expression system, and the assessment of their ability to react with specific anti-*T. gondii* IgG and IgM antibodies present in serum samples from experimentally infected mice and naturally infected humans. Proteins with the highest diagnostic potential will be used in further tests on detection of specific antibodies against *T. gondii* in sera from other hosts (e.g. cats, sheep, horses, swine). In the next stage of research on the animal experimental model, recombinant DNA plasmids encoding multiantigenic chimeric and fusion proteins will be tested for the induction of a strong cellular and humoral responses. At this point, selected parameters of humoral (such as the profile of specific serum antibodies) and cellular (such as cytokines which play a key role in the eradication of invading parasite) will be assessed. The final stage of the research proposed in the submitted project will be to determine the immunoprotective properties of the resulting DNA plasmids encoding multiantigenic chimeric and fusion proteins of *T. gondii*, defined by their ability to reduce the intensity of *T. gondii* invasion in the immunized mice.

Comprehensive research proposed in this project will answer the following questions: 1. Which recombinant proteins have higher antigenic properties based on their reactivity with specific antibodies against *T. gondii*? 2. How the type of experimental vaccine and route of administration affect the level of immunoprotection? 3. Which proteins have stronger immunogenic and immunoprotective properties? The results of this study will show which antigens important from the point of view of parasite's invasion to the host cell have strongest antigenic, immunogenic and immunoprotective properties. Thus, the obtained results may provide valuable information crucial for solving main problems related to the *T. gondii* infection: imperfection of used diagnostic methods and lack of effective immunoprophylactic measures.