## The role and importance of chemokines in parasitic invasions - a new way to develop an effective vaccine against helminths

Almost one-third of the world's human population is infected with parasites - worms (helminths), making them one of the most widespread infectious agents in the world. This problem also affects wild and farm animals, causing significant losses in the agricultural sector. One such parasite is the liver fluke (Fasciola hepatica), which occurs mainly in animals such as cattle and sheep and has zoonotic potential, i.e. it can also infect humans. It is present in over 70 countries and is considered a developing zoonotic disease by the World Health Organization (WHO).

Currently, infection control methods rely heavily on drugs; however, this approach is no longer satisfactory as drug resistance has emerged. Fighting helminth invasions remains a distant goal due to the lack of effective vaccines. Vaccines offer what drugs cannot accomplish - they protect against infection. However, despite extensive decades of research, no vaccine against helminths is available on the market, which indicates the difficulties involved in developing effective immunity against the parasite. This problem is because worms modulate the immune response of the host (infected person). They secrete molecules that can modify and trick the immune system. Dendritic cells and macrophages are the first cells to react to infection with pathogens (bacteria, viruses or parasites). They direct the immune system to respond and remember that it has been in contact with a particular pathogen.

The body needs to activate various cells to remove the parasite. For this purpose, cells secrete chemokines, substances that allow communication between different immune system cells. Worms to stop this communication process secrete unique molecules designed to modify the body's response so that it is beneficial to the parasite. Our preliminary research shows that these molecules can affect the chemokines secreted by macrophages and dendritic cells to orchestrate the immune response. It sends incorrect information, and the appropriate cells are not communicating effectively, which could help the parasite survive.

In our project, we would like to characterize the role of chemokines response during helminth invasion, find out which single molecules are responsible for inhibiting chemokine secretion and use these molecules as a potential vaccine in the form of DNA. Since this molecule can inhibit the secretion of chemokines, we will also deliver those chemokines at the vaccination site. In our opinion, this will allow you to trigger an appropriate immune reaction that will be effective in neutralizing the parasite, will be remembered by the body and prevent it from becoming infected with the parasite. This strategy is an innovative solution that has not been tested so far in developing antihelminthic vaccines.

Our research will provide knowledge that will help in the future to develop vaccines against other dangerous pathogens.