

Ticks are considered the most dangerous vectors of pathogens in the Northern Hemisphere for a reason. They carry many different species of bacteria, viruses and parasites (*Babesia*, *Theileria*) that are pathogenic to humans and animals. The health risks arise from the range of pathogens transmitted by a given tick species, as well as from tick densities in the environment and the rate of infection, which can vary widely for different pathogens and locations. Pathogens may be closely associated with a certain tick species, so the risk of infection will depend on the presence of this tick species and its infection. Ticks, similar to mammals including humans, are colonized by many microorganisms, which constitute tick microbiota. This microbiota may be necessary for the completion of tick life cycle, affecting for example tick feeding process. Some of microbiota components are key tick endosymbionts but may also interact with microorganisms pathogenic for mammals (tick-borne pathogens). We plan to look for such associations between non-pathogenic and pathogenic microorganisms occurring in different ticks from different regions of the world using modern molecular techniques (new generation sequencing, NGS).

In Europe, cases of the emergence of 'exotic' ticks are more and more often described, which along with the warming of the climate, find favourable conditions for survival. Such species include little known species of the genera *Hyalomma* and *Haemophysalis*. The presence of these ticks may pose a new threat to human and animal health, although exact data on their infection with pathogens is lacking. In a field study in 2019, we detected new locations of the *Haemaphysalis concinna* ticks in the Western Poland. Ticks were infected with a new, as yet undescribed *Babesia* species, resembling protozoa detected in humans suffering from babesiosis in China and Slovenia. We also detected *Borrelia afzelii* spirochetes in these ticks, the agents of Lyme disease. The results of these studies indicate the need for research on little known species of ticks.

In this eco-epidemiological project, we want to study a wide range of different species of ticks from around the world, with a focus on ticks of little-known genera such as *Haemaphysalis*, *Hyalomma*, *Amblyomma* and *Rhipicephalus*. In these tick species, we have a good chance of detecting (and describing) new species of pathogens from the genera *Babesia* and *Theileria*. NGS study should enable recognition of co-infection with different pathogens in ticks but also to find association between pathogenic and non-pathogenic microorganism presence in different ticks. Additionally, we want to check whether these tick species/genera can be involved in the transmission of *Borrelia burgdorferi* spirochetes.

Overall, our project will help to determine the vector role of little-known but expanding tick species and to determine not studied associations between tick microbiota and tick-borne pathogens in different regions of the world.