Resources intake for energy demanding physiological functions is accompanied by production of metabolic heat, which have to be dissipated to avoid detrimental overheating. In evolutionary biology exists the heat dissipation limitation (HDL) hypothesis which suggests, that energy turnover rate is constrained by the capacity to dissipate the body heat generated as a by-product of processing the energy that fuels physiological functions.

The aim of this project is a test of the HDL-related hypothesis that reproducing females faced with the heat dissipation constraint trade-off their parental investment with functioning of the immune system. During reproduction females' energy expenditures rate is at the highest level. Mounting of an immune response is also energy demanding function and an immune responsiveness-elicited fever appears as the effect of calorigenic heat production. Because these both functions increase energy turnover along with body heat production, they perfectly fit of the main HDL prediction. Moreover, if energy budgets of reproducing females constrain their ability to body heat dissipation, they will be forced to 'choose' a more important for that moment function and give its priority at the expense of second one. It is the reason why physiological trade-off between investment in reproduction or immunocompetence will appear.

The best animal model to test the limiting effect of heat dissipation are unique lines of laboratory mice divergently selected for a low or high basal metabolism rate. The females with a high metabolism (H-BMR line type) along with higher energy turnover rate, metabolic heat production and reproductive output have the same thermal conductance as their counterparts with a low metabolism (L-BMR line type). Experimental manipulation of the ability to heat dissipation in mice characterized by those divergences will help to find the relation between limits in heat loss and intensity of functions studied in this project. More specifically, I suppose that (1) the H-BMR mother mice will reduce their parental effort more than the L-BMRs, whereas there will be no between-line types difference in an immune response or (2) the H-BMR females will suppress an immune response more than the ones from the opposite line type, but parental effort will remain unaffected or (3) the H-BMR mother mice will reduce their parental investment as well as an immune response more than their the L-BMR counterparts.

Results of my project will contribute to better understanding of the basic physiological mechanisms governing the costs of reproduction and the effect of potentially constraining factors, such as heat dissipation. Also, my research gives opportunity for monitoring of an immune response in reproducing individuals, and ultimately will be important for human health and livestock productivity. Apart of the context of the HDL hypothesis itself, the findings of my project will be important within the broader immunological research community. They will shed new light on neglected to date issue of heat dissipation-related suppression of immune function under heat stress conditions.