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Seasonal changes in the immune defense in the ant Formica exsecta

Dimitri Stucki, Dalial Freitak, Nick Bos, Liselotte Sundström

Eusocial insects are favorable targets for parasites owing to high population density and high relatedness within colonies. Consequently, eusocial insects have evolved defenses against parasites both at the individual and the social level. Often colonies face different demands in energy allocation to different life history functions during active season or before hibernation. These seasonal differences create potential changes in trade-offs in e.g. resource allocation between energy saving for hibernation and immune defense, depending on the progress of the season. Especially when resources are scarce, individuals and colonies may be weakened, which may allow infection by opportunistic pathogens. This further accentuates these trade-offs. Here we investigate seasonal differences in the regulation of immune defenses under starvation during different times of the season (summer and fall) in the wood ant *Formica exsecta*. We used bioassays with the analysis of immune-, stress- and storage-related gene expression, and survival analysis, to investigate the seasonal differences in the ants' response to oral infection with the entomopathogenic bacteria *Serratia marcescens* and *Pseudomonas entomophila* under starvation and unlimited food conditions.