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Sensing and signaling in parasitism

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The ability to sense, transduce and respond to extracellular cues is a fundamental property of all life forms. Cues may be derived from an organism's physical surroundings, or they may be produced by other organisms in the environment. In either case, the ability to detect and react to external cues gives each organism the capacity to adapt its biological activities in a way that maximizes survival in a particular environment. Parasitic organisms often must transit through multiple hosts and several diverse and hostile host compartments, thereby transitioning through multiple life cycle stages. As such, signaling and sensing are paramount for parasite transmission and survival and consequently these processes constitute important determinants of disease pathogenesis. However, relatively little is known about sensing and signaling mechanisms in parasitic organisms, particularly compared to the wealth of information we have on signaling mechanisms in other organisms.

This special issue of MBP presents several reviews highlighting our current understanding of sensing and signaling in parasitic organisms. The 5 papers explore signal transduction mechanisms (Carvalho *et al.*), modes of cell-cell communication (Roditi; Gang and Hallem) and physiological roles for parasite signaling and sensing (Coakley *et al.*), and put these processes into context with bacterial systems (Michie *et al.*). The combined works reveal that parasite biology is influenced by a wide variety of signaling molecules, including metabolites, proteins, glycans and nucleic acids. In some cases, these signals come from host organisms, while in other cases they are produced by other parasites or other members of the host microbiome. Furthermore, beyond possessing sophisticated systems for sensing extracellular cues, parasites have also evolved diverse mechanisms for packaging and export of their own molecules. These systems include export of extracellular vesicles harboring bioactive macromolecules that may directly influence host activities.

Signaling and sensing in parasitism are emerging areas that are ripe for study and further efforts to understanding these processes in parasitic organisms will undoubtedly enhance our understanding of fundamental features of parasite biology, while also illuminating novel targets for therapeutic intervention.