Interspecies Chemical Signaling in a Privileged Protozoan

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Abstract: *Capsaspora owczarzaki* is a single protozoan species that holds secrets both to controlling a neglected tropical disease *and* to revealing the earliest animal cell-cell signaling mechanisms. However, little is known about this organism at a chemical level. *Capsaspora* lives inside the blood of *Biomphalaria* snails, which are the vectors that transmit the parasitic worm that causes schistosomiasis. *Capsaspora* can hunt and kill the parasitic schistosomes, making it a *promising biocontrol agent*. However, no one knows which molecules *Capsaspora* senses within its snail host, nor how it senses its schistosome prey. Furthermore, *Capsaspora* is one of the closest living relatives to animals, with which it shares many signaling and cell adhesion genes. It exhibits reversible cellular aggregation and chemotaxis, reminiscent of human neural crest cells, immune cells, and metastatic cancer cells. Therefore, it is a *phylogenetically relevant model* for how regulated multicellular phenotypes in animals evolved and are maintained in healthy states. However, no one has found which genes regulate *Capsaspora*'s adhesion and chemotaxis phenotypes to determine if its mechanisms are conserved with those in animals. For *Capsaspora* to reach its potential as a biocontrol agent and to reveal insight into the evolution of animal multicellularity, the molecular mechanisms of its interspecies signaling interactions must be uncovered. ***We employ analytical chemistry and biochemistry to determine which aggregation-inducing chemical cues are sensed by Capsaspora and which molecules drive its chemotaxis toward schistosomes.***