

Photoparasitism in the evolution of Apicomplexa

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Chromera velia is a photosynthetic apicomplexan hypothesized to live as a photoparasite of coral larvae. In the photoparasitic hypothesis, I proposed that parasitism in this species and other photoparasites is primarily driven by the need for nitrogen. To investigate the use of various carbon and nitrogen sources by the photoparasite, we generated mixotrophic and heterotrophic cultures of *C. velia* and examined the metabolic fate of labeled glycine and differential expression profiles under different light conditions. We found that mixotrophic *C. velia* grown in light and supplemented with exogenous glycine does not convert the added amino acid to sugars, in contrast to heterotrophic *C. velia* grown in the dark with glycine as the only source of organic carbon. Instead, mixotrophic *C. velia* converts glycine to other amino acids, uses it as a substrate for heme biosynthesis, or stores the organic carbon as lipids. Notably, *C. velia* grown under dark conditions for more than three years significantly overexpresses genes involved in photosynthesis and still contains high amounts of chlorophyll bound to photosystems, even though the *C. velia* plastid genome does not encode DPOR genes indispensable for chlorophyll synthesis in the dark.