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Exploring the Role of Light in Microalgal-Pathogen Interactions

Eukaryotic unicellular photosynthetic organisms (microalgae) are key contributors to CO_2 fixation. Light plays a major role in their life as source of energy and/or as source of information for photosynthesis, their developmental cycles and the entrainment of their circadian clocks. The green biflagellate alga *Chlamydomonas reinhardtii* has severed for decades as a model to study light-driven reactions in microalgae. In *C .reinhardtii*, different sensory blue light receptors (phototropin, a plant and an animal-like Cryptochrome abbreviated as PHOT, pCRY and aCRY, respectively) are involved in the above mentioned processes (Petroutsos *et al*., *Nature* 2016; Zou *et al*., *Plant Physiol* 2017; Müller *et al*., *Plant Physiol* 2017). One of them, aCRY, is also able to absorb in the red region of the visible spectrum. Here, we want to study the potential influence of blue and red light on the interaction of microalgae with bacteria taking *C. reinhardtii* and *Pseudomonas* species that markedly inhibit algal growth as model (Aiyar *et al*., *Nat Commun*, 2017). In nature, microalgae are usually associated with other microorganisms and these interactions can be beneficial for both organisms or antagonistic. Despite the importance of such interactions, relatively little is known about abiotic factors such as chemical mediators or the influence of light shaping microalgal communities. In higher plants, it has been shown recently that blue- and red-light receptors from Pseudomonas are relevant for plant-pathogen interactions. Here, we aim to study if algal and/or bacterial blue- and red light receptors play a role in the microalgal-bacterial interaction. Therefore, we will use photoreceptor mutants of *C. reinhardtii* and *Pseudomonas*. The interactions will be analyzed in a light-dark regime, under constant darkness and constant light as well as under different light qualities and quantities, representing different environmental conditions. Our studies will allow us to visualize the role

of light in microalgal-pathogen interactions.

Publications

Hotter V, Zopf D, Kim HJ, Silge A, Schmitt M, Aiyar P, Fleck J, Matthäus C, Hniopek J, Yan Q, Loper J, Sasso S, Hertweck C, Popp J, Mittag M (2021) A polyyne toxin produced by an antagonistic bacterium blinds and lyses a Chlamydomonad alga. *Proc Natl Acad Sci U S A* 118(33), Details PubMed

Rose MM, Scheer D, Hou Y, Hotter VS, Komor AJ, Aiyar P, Scherlach K, Vergara F, Yan Q, Loper JE, Jakob T, van Dam NM, Hertweck C, Mittag M, Sasso S (2021) The bacterium *Pseudomonas protegens* antagonizes the microalga Chlamydomonas reinhardtii using a blend of toxins. *Environ Microbiol* 23(9), 5525-5540. Details PubMed

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