A biochemical explanation for the success of mixotrophy in the flagellate Ochromonas sp.

Boëchat, Iola G., Guntram Weithoff, Angela Krüger, Björn Gücker, Rita Adrian

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ABSTRACT: We report the influence of different nutritional modes[]autotrophy, mixotrophy, and heterotrophy[]on the fatty acid and sterol composition of the freshwater flagellate *Ochromonas* sp. and discuss the ecological significance of our results with respect to the resource competition theory (rct). Polyunsaturated fatty acids (PUFAs) are the most efficient biochemical variable distinguishing between nutritional modes of *Ochromonas* sp. Decreasing concentrations of PUFAs were observed in the order autotrophs, mixotrophs, heterotrophs. In mixotrophs and heterotrophs, concentrations of saturated fatty acids were higher than those of monounsaturated fatty acids and PUFAs as a result of bacterivory. Stigmasterol was the main sterol in *Ochromonas* sp., regardless of nutritional mode. Mixotrophs showed higher growth rates than heterotrophs, which could not be explained by rct. Heterotrophs, in turn, exhibited higher growth rates than autotrophs, which were cultured under the same light conditions as mixotrophs. Mixotrophs can synthesize PUFAs, which are important for many physiological functions such as membrane permeability and growth. Thus, mixotrophy facilitated efficient growth as well as the ability to synthesize complex and essential biomolecules. These strong synergetic effects are due to the combination of biochemical benefits of heterotrophic and autotrophic metabolic pathways and cannot be predicted by rct.

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