Metabolic Response of *Chlamydomonas reinhardtii* to Anthracene Exposure

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INTRODUCTION. Polycyclic aromatic hydrocarbons (PAH) are pollutants found in a variety of environments and can be hazardous to aquatic organisms. When *Chlamydomonas reinhardtii* cells are grown in presence of anthracene (ANT, a three-ring PAH that exhibit significant acute toxicity), photosynthesis is impaired, growth rate is reduced and reactive species are generated. *C. reinhardtii* is known to have a very flexible metabolism, and can switch rapidly between autotrophic and heterotrophic using alternative carbon source. As ANT disrupts photosynthesis, the algae must find a way to keep up with its energy demands. **OBJECTIVE:** In this sense, an untargeted gas chromatography-mass spectrometry (GC-MS) metabolomics approach was applied to investigate the metabolic response of *C. reinhardtii* exposure to ANT. **MATERIAL AND METHODS:** Cells were quenched using cold methanol and collected by centrifugation. Intracellular metabolites were extracted using methanol:chloroform:water. Metabolites were derivatized using MCF and analyzed in GC-MS. Metabolites were identified using a MCF library and data analysis was performed using MetaboAnalyst platform. **RESULTS AND DISCUSSION**: As results, markedly alterations on the metabolism of three main classes of metabolites were observed, i.e. fatty acids, carboxylic acids and amino acids. Comparative metabolic activity using showed 27 metabolic pathways altered, including a range of pathways from amino acids, carbon, nitrogen, energy, and lipids metabolites. Particularly, glycine serine and threonine metabolism; glutathione metabolism, citrate cycle and the glyoxylate metabolism, exhibited the highest metabolic impact after ANT exposure. Based on general accumulation of metabolites and pathways impacted in photosynthetic disrupted cells exposed to ANT we suggest that glyoxylate pathway plays a central role during stress condition providing carbon incorporation through acetate assimilation and/or starch degradation. **CONCLUSIONS:** Our results support the evidence of general accumulation of metabolites in microalgae facing stress conditions. Additionally, glutathione was present in higher levels when cells were exposed to ANT and glyoxylate cycle pathway may play a key role during stress conditions.

Keywords: Glyoxylate Pathway, Oxidative Stress, Metabolomics
Support agency: FAPESP