Elevated pCO₂ Alters Physiology and Gene Expression in Harmful Algal Bloom Species Heterosigma akashiwo

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Ocean acidification, a decrease in ocean pH resulting from anthropogenic CO₂ emissions, is likely to impact individual marine organisms as well as entire communities and food webs. While some primary producers have been shown to grow better in elevated pCO₂, little is known about how Heterosigma akashiwo, a raphidophyte capable of forming harmful algal blooms (HABs), will be affected by the seawater’s shifting carbonate chemistry. In this study, H. akashiwo were grown at a range of pCO₂ levels (from 200 to 1000 ppmv) and monitored for changes in growth rates, H₂O₂ production, and gene expression. Results indicated that H. akashiwo may grow fastest under pCO₂ between 600 and 900 ppmv, while growth rates decreased when pCO₂ exceeded 900 ppmv. H₂O₂ per cell also increased as growth rates increased. Preliminary analysis of gene expression changes revealed that many genes associated with photosynthesis and metabolism were up-regulated under elevated pCO₂. While further analysis is needed to support these findings, changes in H. akashiwo growth rates and H₂O₂ production may have profound implications for bloom development in coastal systems under future ocean conditions.