HYDROGEN PEROXIDE MEASUREMENTS IN SUBTROPICAL FRESHWATER ECOSYSTEMS AND THEIR IMPLICATIONS FOR CYANOBACTERIAL BLOOMS

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Hydrogen peroxide is widely recognized as the most stable reactive oxygen species (ROS) in natural waters. Its high reactivity in mediating redox transformations can affect aquatic ecosystem functions, including primary production. However, environmental interactions between photoautotrophs, particularly cyanobacteria, and hydrogen peroxide are poorly understood. We aimed to understand the ecological interplay between cyanobacterial blooms and hydrogen peroxide dynamics in southwest Florida. We visited a variety of water bodies to examine the baseline hydrogen peroxide concentrations. In general, hydrogen peroxide levels were associated with cyanobacterial blooms, indicating the potential role of cyanobacteria in hydrogen peroxide dynamics in freshwater. The hydrogen peroxide concentrations were higher at the bloom sites of *Microcystis aeruginosa* compared to the control sites and higher at locations exposed to the sunlight compared to areas in the shade. To determine the hydrogen peroxide biodegradation during sample transportation, water samples were passed through 0.2 μm filters immediately after sampling and compared with unfiltered water samples. We found that filtered water samples retained higher concentrations of hydrogen peroxide than unfiltered samples with a mean biodegradation rate of 44 ± 10.6 nmol/h. Out of a total of 26 samples, only one unfiltered sample showed a higher hydrogen peroxide concentration than the filtered samples. We also determined microscale depth profiles (10-60 mm) of hydrogen peroxide using a hydrogen peroxide microsensor. Micro-profiles showed extremely high hydrogen peroxide concentrations (3.3 to 20.9 μM) in the topmost layer of the lake water in cyanobacterial blooms. Laboratory measurements of hydrogen peroxide production by cyanobacteria conducted in light and dark conditions supported these findings. Overall, we developed the method to measure micro-profiles of hydrogen peroxide in the topmost layer of the lake water using the microelectrode technique and found that cyanobacteria may play an important role in hydrogen peroxide dynamics in subtropical freshwater environments.

PRESENTER BIO: Dr. Urakawa is an aquatic ecologist and professor at FGCU. He has been studying cyanobacteria and hydrogen peroxide dynamics since 2016 in a project supported by the National Science Foundation. He is interested in environmental mitigation and biodiversity.