11TH U.S. SYMPOSIUM ON HARMFUL ALGAE

PHOTOCHEMICAL FATE OF SAXITOXINS IN SURFACE WATERS

The environmental fate of cyanotoxins is of concern due to the widespread increase in harmful algal blooms (HABs). Cyanotoxins may undergo transformations such as biodegradation, sorption to soils and sediments, hydrolysis, and photochemical reactions. Photochemical degradation has been shown to be a significant environmental fate for several classes of toxins including microcystins, cylindrospermopsins, nodularins, and anatoxins. The photochemical fate of saxitoxins, which are produced by both marine dinoflagellates and several genera of cyanobacteria, has yet to be studied. This project evaluated the photodegradation of several analogs including saxitoxin (STX), gonyautoxin (GTX2/3), and n-sulfocarbamoyl-gonyautoxin (C1/2). STX and its analogues were irradiated under a solar simulator in solutions containing dissolved organic matter (DOM). Dark control experiments revealed that direct photolysis does not contribute to saxitoxin degradation. In the presence of DOM, significant degradation of all analogues was observed. Probe compounds and photosensitizers were utilized to evaluate the contribution of reactive intermediates including singlet oxygen (1O2), triplet-state dissolved organic matter (3DOM*), and hydroxyl radicals (•OH). 3DOM* was the greatest contributor, 1O2 accounted for 5.21-5.56% of overall photodegradation, and the role of •OH was insignificant. The kinetics of saxitoxin degradation will be useful to understanding the persistence of these toxins in natural waters and assessing the impacts of HABs.

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