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TITLE: Pseudo-nitzschia(Bacillariophyceae) species, domoic acid and amnesic shellfish poisoning: revisiting previous paradigms

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ABSTRACT:

Lelong A., Hégaret H., Soudant P. and Bates S.S. 2012. Pseudo-nitzschia (Bacillariophyceae) species, domoic acid and amnesic shellfish poisoning: revisiting previous paradigms. Phycologia 51: 168?216. DOI: 10.2216/11-37Pseudo-nitzschia is a globally distributed diatom genus, some species of which produce domoic acid (DA), the neurotoxin that causes amnesic shellfish poisoning. This toxin killed at least three humans in 1987, launching numerous studies concerning the identification, distribution, ecology and physiology of Pseudo-nitzschia spp. Since previous reviews in 1998, knowledge has been gained about the fate of DA, including its accumulation by marine animals and its degradation by light and bacteria. Molecular techniques and more precise microscopy have enabled the description of new Pseudo-nitzschia species, 15 since 2002, including ones that are cryptic and pseudo-cryptic. An increasing number of the 37 identified species, including oceanic and coastal species, have been studied in laboratory culture. The sexual reproduction of 14 species has been documented. Fourteen species have now been shown to be toxigenic, although some strains are not always toxic under the testing conditions. The biotic and abiotic factors that modify DA production are reviewed, with a focus on how new discoveries have changed our original hypotheses about control mechanisms. Recent studies confirm that silicate and phosphate limitation trigger DA production. However, stress by low concentrations of iron or high concentrations of copper are newly discovered triggers, suggesting a trace-metal chelation role for DA. Organic sources of nitrogen (urea and glutamine), as well as changes in pH, CO2, salinity and bacterial concentration, also enhance DA production. Laboratory and field studies sometimes give divergent results for conditions that are conducive to toxin production. Gaps in knowledge include further information about the whole genome of Pseudo-nitzschia (including sexual stages), mechanisms of DA production and decline, presence or absence of a resting stage, heterotrophic ability, impact of viruses and fungi, and a more complete description of the ecological and physiological roles of DA.

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