Novel benzoyl analogs from the dinoflagellate Gymnodinium catenatum: importance of these emerging toxins in seafood safety regulatory programmes

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Résumé

Gymnodinium catenatum is a chain-forming naked gymnodinoid dinoflagellate, notorious for formation of harmful algal blooms (HABs) and production of paralytic shellfish toxins (PSTs), including a wide array of neurotoxic analogs of saxitoxin (STX). G. catenatum is distributed globally, but occurs primarily in temperate and sub-tropical waters. Blooms of this dinoflagellate have caused poisonings of marine fauna and human consumers of mollusks that have accumulated toxins via suspension-feeding upon the plankton. Increased search efforts, linked to improved detection and structural elucidation techniques, have led to discovery of new groups of STX analogs, named GC or benzoyl analogs, in G. catenatum. We fractionated extracts of bulk G. catenatum cultures by column chromatography and analyzed semi-purified extracts by hydrophilic interaction liquid ion chromatography coupled with tandem mass spectrometry (HILIC-MS/MS) and nuclear-magnetic resonance (NMR). We confirmed the presence of 15 of the 18 theoretical benzoyl analogs, in G. catenatum isolates from the Pacific coast of Mexico. Although this group of toxins has been recorded in many strains worldwide, this is the first record of such high richness of these analogs. To date G. catenatum is the unique source organism of benzoyl analogs but they can also accumulate in shellfish. Mammalian toxicity is unknown but some studies suggest neurotoxicity. Benzoyl analogs are not routinely monitored in shellfish and this might be a risk in seafood safety programmes that rely exclusively on chemical analytical methods. Research on these emerging toxins to determine bioactivity, chemical properties, and ecological and human health risks, is therefore imperative.

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Mots-Clés: Gymnodinium catenatum, paralytic shellfish toxins, benzoyl analogs, toxicity.