Prymnesium parvum revisited: relationship between allelopathy, ichthyotoxicity, and chemical profiles in 5 strains - DTU Orbit (02/11/2018)

Bioassay-guided discovery of ichthyotoxic algal compounds using in vivo fish assays is labor intensive, costly, and highly regulated. Since the mode of action of most known algal-mediated fish-killing toxinisis damage to the cell membranes in the gills, various types of cell-based bioassays are often used for bioassay guided purification of new ichthyotoxins. Here we tested the hypothesis that allelopathy is unrelated to ichthyotoxicity and that a microalgal bioassay can be used as a proxy for ichthyotoxicity by comparing the toxicity of five strains of Prymnesium parvum toward rainbow trout (Oncorhynchus mykiss, 10 g) and the microalga Teleaulax acuta. No relationship between median effective concentrations (EC$_{50}$) on fish and median lethal concentrations (LC$_{50}$) on algae was observed in the 5 strains showing that a microalgal bioassay cannot be used as a proxy for ichthyotoxicity. Fish were more sensitive to P. parvum with EC$_{50}$s ranging from $6 \times 10^3$ to $40 \times 10^3$ cells ml$^{-1}$, compared to the test alga where LC$_{50}$s ranged from $30 \times 10^3$ to nearly non-toxic at $500 \times 10^3$ cells ml$^{-1}$. In addition, the cellular concentrations of two recently suggested ichthyotoxins produced by P. parvum, the “golden algae toxins”, GAT 512 and a novel GAT 510, did not show any relationship to either ichthyotoxicity or allelopathy, and are not theologically relevant toxins, but are simply lipids found in algal chloroplasts. Finally, we demonstrated that the recently suggested ichthyotoxin, oleamide, could not be detected in any of the five P. parvum strains above the limit of detection, nor was it found in a $^{13}$C-labeled strain. Instead we document that oleamide can easily be extracted from plastic materials, which may have been the source of oleamide reported previously.

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