Monitoring of DSP Toxins in Small-Sized Plankton Fraction of Seawater Collected in Mutsu Bay, Japan, by ELISA Method: Relation with Toxin Contamination of Scallop

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Diarrhetic shellfish poisoning (DSP) is a severe gastrointestinal disease caused by the consumption of shellfish that are contaminated by DSP toxins. DSP toxins have been believed to be derived from some dinoflagellate species belonging to the genus Dinophysis. From the results of DSP monitorings in Tohoku districts in Japan, however, there have been some cases in which the scallop toxicity increased in the absence of Dinophysis, or in which the scallop toxicity did not increase during blooms of Dinophysis such as D. acuminata and D. fortii. We have recently proposed a working hypothesis that Dinophysis spp. may originally nontoxic and may only become toxic secondarily through the ingestion of toxic small-sized phytoplankton as a result of mixotrophy.

Monitorings were conducted on DSP toxins in mid-gut gland of scallop (mouse assay), cell numbers of toxic species of Dinophysis, and DSP toxins in small-sized (<5 オ m) plankton fraction of seawater collected at surface (0m) and 20m depths at a station in Mutsu Bay, Aomori Prefecture, Japan, in 2000. A specific enzyme-linked immunosorbent assay (ELISA) was employed for the analysis of DSP toxins in small-sized plankton fraction using a mouse monoclonal anti-okadaic acid antibody which recognizes okadaic acid, dinophysistoxin-1, and dinophysistoxin-3. DSP toxins were detected twice in the mid-gut gland of scallops at 1.1-2.3 MU (mouse units)/g on 26 June and at 0.6-1.2 MU/g on 3 July, respectively. Relatively high cell densities of D. fortii were observed on 26 June and 11 September, and may only contribute to the bivalve toxicity during late June to early July. D. acuminata did not appear to be responsible for the toxicity of scallops in Mutsu Bay in 2000. ELISA assay of small-sized plankton fraction in seawater could detect DSP toxins two weeks before the detection of the toxin in scallops, and could do two weeks after the loss of the bivalve toxicity by mouse assay. On 17 July, toxic D. fortii was detected at only small numbers, <10 cells/liter, but DSP toxins were detected by the ELISA assay, suggesting a presence of other toxic small-sized plankton in water samples.

For the purpose of prevention of DSP occurrences, monitorings have been carried out hitherto on DSP toxins of bivalve tissues by mouse assay and on

cell densities of toxic species of Dinophysis. Here we propose a usefulness of ELISA assay of plankton, especially small-sized fraction for possible foods of mixotrophic Dinophysis, as a practical tool for monitoring and predicting DSPs in coastal areas of fisheries grounds of bivalve aquaculture.