Transfer Parameters of Tritium from Seawater to Marine Organisms.

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Abstract

The operation of the commercial spent nuclear fuel reprocessing plant in Rokkasho is accompanied by the release of a certain amount of tritium into the Pacific Ocean. Although most of the tritium released will be diffused and spread widely throughout the ocean, a part of the tritium will be transferred into and accumulated in marine organisms living close to shore areas. Tritium in living things shows two chemical forms, one is free water tritium (FWT) which is directly exchanged with water in the living thing's body and organically bound tritium (OBT) fixed by its metabolic activity. In order to assess appropriately the impact of tritium released into seawater to the public, it is of importance to understand sufficiently the processes of transfer and accumulation of tritium from seawater to marine organisms. However, the data on the transfer of tritium from seawater to marine organisms are quite limited.

In this experiment, the transfer rates of tritium to form OBT in several marine organisms directly from seawater were determined as the first step of the research program to clarify the transfer of tritium from seawater into organisms, using the stable isotope of hydrogen, deuterium (D), as a substitute for tritium. The transfer rate of D from seawater to OBD in phytoplankton (*Chaetoceros gracilis*) was determined to be 0.17 h^{-1}, which was one order of magnitude larger than that in marine algae (*Ulva pertusa* Kjellman) to be 0.009 h^{-1}. This implied that the difference in the transfer rates would be attributed to the photosynthesis activity of these organisms. The transfer rates to OBD in the marine animals, small shrimp（*Ampithoe valida* Smith）and a sea urchin（*Strongylocentrotus nudus*） were also estimated as 0.018 and 0.022 h^{-1}, respectively. However, the OBD observed in marine animals in this experiment is thought to be easily exchangeable with that in seawater, being quite different from OBD in marine algae. Therefore, the process of OBT formation associated with the food chain in marine animals requires further study.

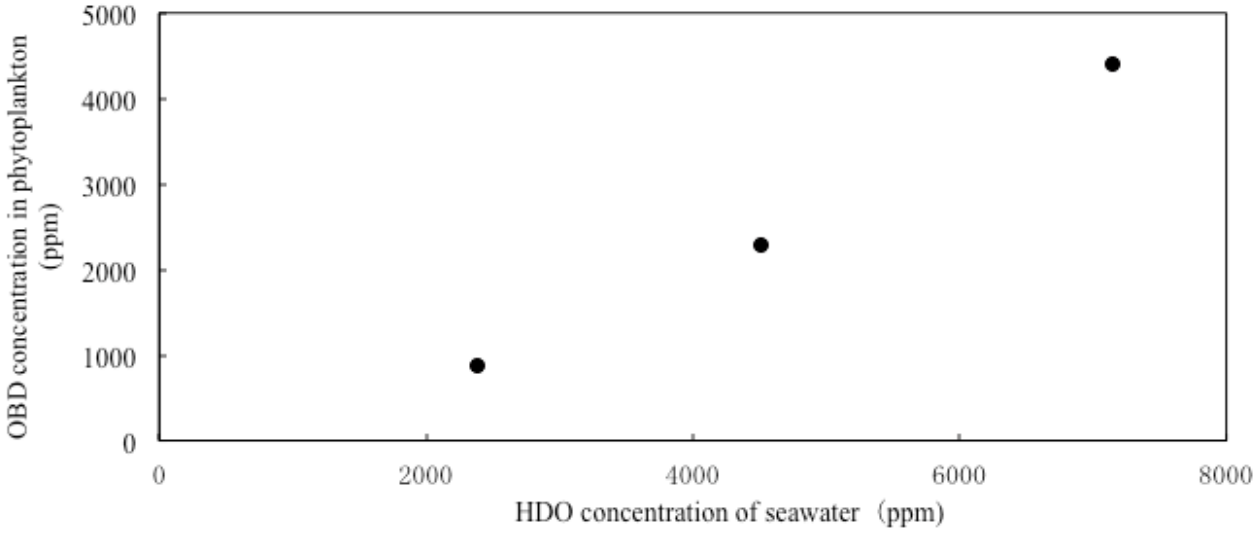

Fig.1 OBD concentrations in phytoplankton (*C. gracilis*) saturated in culture seawater with different HDO concentrations. Each data point indicates the bulk OBD concentration of all phytoplankton in one culture bottle (n=1).

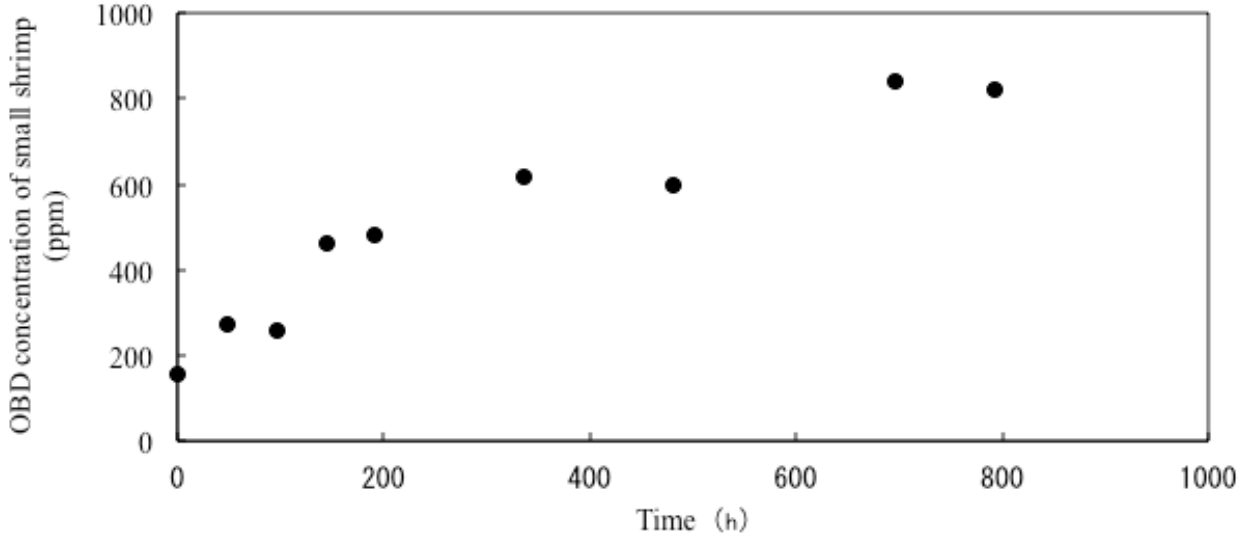

Fig.2 OBD concentrations in small shrimp (*A. valida* Smith) administered with OBD-enriched seaweed. Each data point indicates OBD concentration of one shrimp.