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Total and bioaccessible fractions of trace elements in cultivated oyster tissues by INAA, PIXE and ICP-MS

There is an increasing interest in estimating the total and bioaccessible fraction of elements of both nutritional and toxicological importance in cultivated oysters consumed by Japanese population groups. Oysters are cultivated in Japan by hanging them on an 11-m long rope in the ocean. Levels of 15 elements in oysters cultivated at different depths were investigated by INAA in the present study. Three groups of oyster were collected at 1, 6, and 11 m depths of a single rope. From each group, five oysters were chosen and removed from the shell after washing with tap water. Two groups of organ, namely (i) hepatopancreas and muscle, and (ii) gill and mantle, were separated from soft tissues. These organs were freeze-dried and pulverized. The organs of group (i) are thought to accumulate elements from the ingestion of planktons from sea water while those of group (ii) are simply in direct contact with sea water. One portion of powdered sample was irradiated at the Dalhousie University SLOWPOKE-2 reactor facility in Halifax, Canada for assaying Ag, Br, Cl, Cu, Mg, Na, Se, and V by instrumental neutron activation analysis (INAA) through their short- and medium-lived nuclides. Another portion was irradiated at the Kyoto University Reactor in Osaka, Japan for Co, Cr, Fe, Rb, Sb, Sc, and Zn by INAA using mostly long-lived nuclides. A third portion of the sample was digested in a microwave oven after adding indium solution (for use as an internal standard) and concentrated nitric acid for analysis of more than 20 elements by particle induced X-ray emission (PIXE). Almost all elements except Cd, Cl, and Ni were found to accumulate in soft tissues with increasing depth. The bioaccessible fraction of the elements was estimated by an in vitro enzymolysis method using α-amylase, protease and amylglucosidase followed by ICP-MS. Details of all experiments and results will be presented.

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