"STABLE MOLYBDENUM IN PLANKTON AND PELAGIC FISH FROM THE AEGEAN SEA"

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Abstract A radiochemical method for the determination of Mo in marine samples has been developed and applied in analyzing plankton and two pelagic fish species from the Aegean Sea.

Resume Une méthode radiochimique pour determiner le molybdene dans les échantillons marins, a été dévelopée et appliquée a l'analyse de plankton et deux espéces des poissons de la mer Aegée.

A knowledge of the distribution patterns of trace elements in marine forms is of great significance in order to understand the interaction of the respective radionuclides of these elements with organisms in the marine ecosystem. The presence of stable Mo has been pointed long ago in algae species, but in recent years there is an arising interest for studying the selective accumulation of this element in marine organisms. Radioactive Mo is a nuclear fission product, and ^{99}Mo which is a γ-emitter neutron induced isotope, has been found in the liquid effluents discharged from nuclear power stations using water as a coolant. Although the half-life of ^{99}Mo, is not long enough relatively, this isotope may induce radiation damage to the early stages of life of marine organisms, and this damage is irreversible.

For determining Mo in marine samples we have developed (I. Hadjistelios and C. Papadopoulou) a neutron activation method in conjunction with radiochemical analysis on cationic exchange resin. The features of the method are as follows: after irradiation (30 h in reactor) the sample is wet ashed

with $HClO_4$ and HNO_3. The resulting solution is reduced to 3 ml by evaporation, it is fixed on a Dowex 50Wx8 column and the undesirable radioisotopes are eluted with $HClO_4$ 9N. Then Mo is eluted quantitatively from the column with HNO_3 0.5N and after the establishment of ^{99}Mo to ^{99m}Tc equilibrium (> 36 h), the 140 keV ^{99m}Tc γ-ray activity is measured on a 37 m^3 GeLi detector. The method is accurate and sensitive. It has been tested for precision and accuracy on reference samples (NBS orchard leaves and Bovine liver). The precision is about ±10% and the sensitivity for 30 h irradiation in a 1.7×10^{13}, cm^{-2} sec^{-1} flux, is 6×10^{-9}g.

Within the framework of IAEA/UNEP Med. Pol. VIII project 1998/EP, the pelagic food chain: plankton collected with nets of different mesh size, *Euphausia kronii* and the pelagic fish species *Trachurus mediterraneus* and *Scomber japonicus colias*, were sampled and determination of Mo was performed. *Scomber japonicus colias* specimens were collected from the area S. of Andros island (Aug. 30, 1977). Specimens of *Trachurus mediterraneus* were collected S. of Karistos, Evia island (Aug. 22, 1977) and Skiathos island (Sept. 28, 1977). Plankton samples were also collected from Skiathos island simultaneously with the *Trachurus mediterraneus* specimens. All three areas are typically oligotrophic areas of the Aegean Sea with salinities ranging from about 37.4 to 39.2% and temperatures from 14.2°C to 25.6°C. All samples were lyophilized prior to analysis. Samples along with standards were irradiated for 30 h at the "D" reactor. The method mentioned above was applied for the determination of Mo in plankton (of 250μ net and 500μ net), *Euphausia kronii* and in the flesh and liver of the fish species.

Mo values in the flesh of *Trachurus mediterraneus* ranged from 0.030-0.11 μg/g d. weight (10 specimens). In *S. japonicus colias* collected from Karistow Mo values ranged from 0.030-0.12 μg/g d. weight, while in the specimens collected from Andros were lower ranging from 0.030-0.040 μg/g d. weight. Mo concentration found were higher in the liver than in the flesh of both species (0.44-1.0 μg/g d. weight).

An increased Mo concentration (0.55-1.5 μg/g d. weight) was found in plankton samples collected by nets of different meash size in comparison with the concentration which was found in the two fish species. The highest Mo

concentration factors K were for plankton (14 to 31) and for the liver for both species of fish (30). In the flesh of both fish species studied the Mo concentration was found to be only two. The variation of Mo found among the species is not surprising because such variations were also found for other elements such as As, V, Zn, Co and Cs for the same species collected from the same areas (C. Papadopoulou et al., 1978). Single specimen analysis is therefore indispensable in trace element determination in marine organisms for a statistical treatment of results. The high concentration of Mo found in the liver of the fish should be connected with the relation of this element with the liver enzymes, as has been reported for animals. This might be valid also for marine organisms. The fact that plankton has relatively high concentrations compared to organisms of higher food level points to the fact that plankton should play an important role in the marine biogeochemistry of trace elements. The highest concentrations of Mo were found in the plankton samples. Therefore there is no evidence of food chain magnification. The same was observed for other trace elements from our previous work.

The values of the concentration factors K are more significant in areas where nuclear power plant wastes can leak into the marine environment. Nuclear installations do not exist in Greece at present, but provision is made, for the future, and therefore this factors can be useful for the selection of the right location for the plant in order to avoid environmental pollution.

To the best of our knowledge data concerning Mo concentrations in plankton and fish from the Aegean Sea are non-existent up to now. There is however, a need of a more extensive study of Mo levels in various marine species and for different sea areas.

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Discussion

No comment.