Po-210 (bio)accumulation in the Gulf of Trieste (northern Adriatic Sea)

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Polonium-210 (Po-210; $t_{1/2} = 138.4$ days) is a naturally occurring radionuclide originating from Uranium-238 decay chain as the daughter of Lead-210 (Pb-210; $t_{1/2} = 22$ years). The high radiotoxicity of Po-210 is a consequence of the combination of its high specific activity and its relatively good uptake into soft tissues. In some cases it can represent a serious risk to human health, particularly due to its biological magnification along marine food webs. In the present study, the total activity concentration of Po-210 was determined by alpha-particle spectrometry in various samples collected in the Gulf of Trieste (northern part of Adriatic Sea). Observed levels were: i) up to 23 mBq/L in surface sea water (0-2m), ii) between 40-160 Bq/kg in surface sediments, iii) 239 ± 16 Bq/kg dw in mesozooplankton and iv) 300-400 Bq/kg dw in mussels Mytilus Galloprovincialis, known to be consumed by humans. In surface sea water, around 10% of Po-210 was found in dissolved form. In sediments, the amounts were decreasing with depth and were in positive correlation with the percentages of organic matter (10-20%). The water soluble fraction of mussel cells, representing metabolically the most active part, contained up to 10% of total Po-210. The ratio of Po-210:Pb-210 within organisms increased with each throphic level (plankton to mussels), from 2.5 to 10. This increase reflects a preferential bioaccumulation of Po-210 over Pb-210. In sediments, the ratio was mostly close to 1. Obtained data are important for understanding the biogeochemical cycling of Po-210 and its potential for excerting toxic effects on local and general levels.