



## Experimental studies on the accumulation of polonium-210 by marine phytoplankton

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**ABSTRACT:** Bioaccumulation of polonium-210 ( $t_{1/2} = 138$  d) in marine phytoplankton can introduce this naturally occurring radioisotope into food chains, where it accounts for most of the radiation dose to marine organisms and to human consumers of seafood. Moreover, this isotope could be useful as a tracer of the flux of organic matter in ocean surface waters. We performed laboratory experiments with eight algal species representing six algal divisions to quantify the uptake, cellular partitioning, and retention of  $^{210}\text{Po}$  by algae. Biological uptake was unaffected by temperature or light, and volume concentration factors (VCFs) for these algal species ranged between  $0.5$  and  $3.0 \times 10^4$ . Interspecific differences in VCFs could be explained by considering the surface area to volume ratios of the cells and cellular protein content. Once associated with the cells, between 30 and 60% of the total cellular  $^{210}\text{Po}$  was in the cytoplasm of the different species.  $^{210}\text{Po}$  was not irreversibly bound to the cells but displayed a biological half-life of  $\sim 23$  d. Because  $^{210}\text{Po}$  associates appreciably with organic matter inside cells, unlike other particlereactive nonessential metals, it could have promise as a tracer of sinking organic matter in the ocean.

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