Bioaccumulation of silver-110m, cobalt-60, cesium-137, and manganese-54 by the freshwater algae Scenedesmus obliquus and Cyclotella meneghiana and by suspended matter collected during a summer bloom event

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ABSTRACT: Laboratory experiments were done to assess ^{110m}Ag, ^{60}Co, ^{137}Cs, and ^{54}Mn uptake by two phytoplankton species, the chlorophyte *Scenedesmus obliquus* and the small diatom *Cyclotella meneghiana*. Mn and Co were characterized by similar uptake kinetic rates, 20-30 d^{-1}, whatever the algal species, whereas depuration rates were 3-60 d^{-1}. Silver uptake and depuration rates were very high (144-293 d^{-1}). However, Cs accumulation and depuration were very slow, with kinetic constants of 0.6-5 d^{-1}. Mn, Co, and Ag were more strongly accumulated by *C. meneghiana* than *S. obliquus* and vice versa for Cs. To evaluate the extrapolation of the kinetic rates fitted for *S. obliquus* and *C. meneghiana* to natural conditions, suspended solids were also collected during a bloom event and contaminated. Radionuclide exchange between three distinct compartments among the suspended solids was modeled: the kinetic rates fitted for *S. obliquus* and *C. meneghiana* were used to represent chlorophyte and bacillariophyte contamination, whereas kinetic rates describing a third compartment were estimated when possible. A third compartment was evidenced only for Mn and Co, whereas, for Ag, the chlorophyte and bacillariophyte compartments were sufficient to describe the particulate phase. For Cs, algae kinetic rates could not be used, so a single compartment was fitted. These experiments confirm the low affinity of Cs for phytoplankton and the high bioavailability of Ag. In the case of Co and Mn, several processes acting simultaneously govern the contamination of natural suspended solids.