

A new protocol to evaluate asbestos content in contaminated groundwater samples from Naturally Occurring Asbestos (NOA) rich areas

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Asbestos is a group of inorganic geo-pollutant which can easily migrate in the environment. Asbestos may be released from solid sources (rocks, soils, asbestos containing materials buried in illegal dumps) by weathering, erosion or anthropogenic activities. Fibres could then follow different paths, such as dispersion in air with subsequent redeposition in water or soil, or directly migrate in surface waters or groundwater.

In NW and Central Alps, where Naturally Occurring Asbestos (NOA) rocks are widespread, possible diffusion of asbestos in water has been recently considered as a consequence of interactions with NOA rocks, such as meta ophiolites. Migration through water (particularly groundwater) far away from the pollution source, which was considered negligible in the past, has gained new attention since a recent laboratory study based on columns has highlighted asbestos mobility through porous media under particular conditions (Mohanty et al., 2021); this suggest that the same could happen in the environment.

Consequently, concerning groundwater management in NOA rich areas, asbestos pollution could represent an environmental problem and even constitute a risk for human health. In fact, it could become airborne after water vaporization, particularly dangerous indoor because it increases the possibility of disease outbreaks related to airborne asbestos respiration (e.g. IARC, 2012). On the contrary, potential noxiousness of waterborne asbestos ingestion has not been defined yet (WHO, 2020); therefore, only US-EPA set a Maximum Contaminant Level (MCL) of 7 MFL (millions of fibres per Litre) in drinking water, considering fibres longer than 10 µm and based on TEM analyses. Italian regulations foresee SEM-EDS analyses for asbestos evaluation in water samples but don't set a MCL. No limits are set worldwide on non-drinking waters.

Knowing this background, it's fundamental to define reliable protocols shared by the whole scientific community for sampling and analysis of water, in particular groundwater, with special attention to asbestos occurrence evaluation. Therefore, based on groundwater samples coming from a recent campaign settled in Piedmont (NW Italy), important developments on this topic will be presented. Several observations on the methodology to evaluate asbestos content in water involving both SEM and TEM analyses will be shared, in an attempt to define a reliable procedure suitable for waterborne asbestos evaluation in potentially usable waters.

IARC-International Agency for Research on Cancer (2012) - Monograph on the Evaluation of Carcinogenic Risks to Humans: Arsenic, Metals, Fibres, and Dusts.

Mohanty S.K., Salamatipour A. & Willenbring J.K. (2021) - Mobility of asbestos fibers below ground is enhanced by dissolved organic matter from soil amendments. *Journal of Hazardous Materials Letters*, 2.

WHO-World Health Organization (2020) - Asbestos in Drinking-water. DRAFT Background document for the WHO GDWQ, December 2020, version for public review.