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Extensive characterization of waterborne mineral fibres and study of their possible migration to air in naturally occurring asbestos (NOA) rich settings.

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Asbestos is classified as carcinogenic to humans (Class 1) by IARC because is known that may induce fatal diseases when respired. Consequently, asbestos occurrence is principally monitored in air.

Historically, asbestos had not been investigated in water, but nowadays waterborne asbestos is gaining new attention since it constitutes a non-conventional exposure way: it could be ingested, particularly if it reaches the tap water system, but also be a secondary source of airborne fibres, when asbestos migrates from water to air. Accordingly, it could be considered an Emerging Pollutant in the water matrix because it has not been systematically monitored in the past and it could represent a problem for human health and environment, requiring an accurate risk assessment.

Therefore, two sampling campaigns have been settled on surface waters and groundwater of the Lanzo Valleys and Balangero Plain, in North-Western Alps (Italy): the area is rich in Naturally Occurring Asbestos (NOA) and naturally occurring asbestiform minerals non-asbestos classified containing rocks and sediments which can release fibres in the water system when subjected to weathering and erosion. An extensive electron microscopy study (by SEM-EDS and TEM-EDS) of waterborne mineral fibres is currently in progress to define how many and which type of fibres can be found in water. As waterborne fibres could constitute a secondary source of airborne fibres, their typical dimensions would be defined to assess possible respirability risk for humans in case of migration from water to air.

Fibres water-to-air migration may occur particularly if asbestos is dispersed in surface moving water, such as in rivers and streams. Fibres can be released in air under collapse of bubbles and foams from polluted waters in natural environment. To study possible asbestos passage from water to air in moving water and evaluate possible related risk, an experimental setup was created, in which chrysotile polluted water subjected to bubbling was placed in a close system.

Four tests were run with nil, low, mid and high concentration of waterborne chrysotile and consequent airborne concentration was measured.

Waterborne fibres were analysed as well to verify if chrysotile sample may undergo transformation when present in moving water and to define typical dimensions for waterborne fibres, in order to evaluate if they could be a risk for humans in case of water-to-air migration. In addition, an attempt has been made to define a limit of waterborne chrysotile which could generate an alarm situation in air, corresponding to 1 fibre per Litre (f/L).

Data regarding real samples and laboratory studies will be presented to shed light on mineral fibres occurrence in the water system of the study area, to describe fibres types and abundancy in relation with local geology and hydrogeology. This is to better characterize and monitor asbestos (and asbestiform) fibres occurrence in surface waters and groundwater flowing in NOA rich areas.

The results of this study are expected to have high impact on regulatory aspects, particularly in the definition of a Maximum Contaminant Level for waterborne asbestos, which is not provided by Italian legislation at present.