Toxic elements in serpentinite-derived soils: Potential for Human Exposure, Southern Italy

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The aim of the present study was to investigate the concentration levels of toxic elements in 12 serpentinite-derivative soils samples developed within San Severino Lucano village (Basilicata Region, Southern Italy), in order to understand their possible contribution to the health problems caused by asbestos exposure. Indeed, asbestos minerals, for different structural reasons, have an high capability to host a large number of toxic elements and some researchers claimed that asbestos fibers may play a passive role in producing diseases as carriers of trace elements [1]. The human health risks are based on the potential fibres inhalation, when they become airborne through rocks (e.g., serpentinite) weathering or human activities producing dust. An association with neighbourhood exposure to asbestos and an increased risk of deaths from lung diseases has been documented among the persons who live near naturally occuring asbestos (NOA) deposits around the world including in Basilicata region (Italy). Agricultural soil samples have been collected mainly within to urban center and characterized by using different analytical techniques such as XRF, XRPD, TEM/AEM, TG/DSC. Results pointed out as all the collected soil samples contain asbestos minerals (e.g., chrysotile asbestos, tremolite-actinolite) clay minerals, plagioclase and oxides in various amounts. The values of trace metals in our soils samples are very high, five elements (Cr, Co, Ni, V) exceeds the regulatory thresholds for public, private and residential green use. A high amount of Cr and Co were present in chrysotile while Ni was predominantly found in asbestos tremolite. It is generally accepted that none of the theories alone is adequate to explain the pathogenic mechanism of asbestos. These data suggest that the cytotoxicity of asbestos may be also related to the minor and trace elements present as impurities in their structure.

[1] Bloise A, Barca D, Gualtieri A F, Pollastri S, Belluso E (2016) Trace elements in hazardous mineral fibres. Environ Pollut 216: 314-323