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As a consequence of the well-documented asbestos cancerogenicity, most European Countries have banned all forms of asbestos employed commercially (crocidolite, amosite, tremolite, actinolite, anthophyllite and chrysotile). In Italy asbestos have been banned in 1992, but fibers-containing materials are still widespread in dismissed mines and factories and in large areas of asbestos bearing rocks. In this latter case, besides the six minerals officially banned, other asbestiform minerals (such as balangeroite), not regulated by the current legislation, have been discovered.
In Balangero (Piedmont, Italy) there is the largest dismissed chrysotile mine in Western Europe, closed in 1990. In 1983 balangeroite, an asbestiform contaminant of chrysotile from that mine, have been recognized as a new mineral (Compagnoni et al., 1983); these fibers are strictly associated with long fiber chrysotile and sum up to 0.2-1% by weight of the chrysotile extracted. As an epidemiological study detected an increased risk of pleural mesothelioma in workers at the Balangero mine (Piolatto et al., 1990), the aim of the study was to investigate at what extent chrysotile and balangeroite might be implicated in the development of asbestos related diseases. Cytotoxicity and ability to alter the redox metabolism in human lung epithelial cells have been investigated, after a 24 h incubation with chrysotile from Balangero or balangeroite. Results have been compared to that obtained, at the same experimental conditions, with UICC A chrysotile and UICC crocidolite.
Tremolite [Ca2, Mg5Si8O22(OH)2] is a fibrous silicate which belongs to the amphiboles. It has limited industrial applications, but it can be often found as a contaminant of other minerals. Moreover, environmental exposure to tremolite has been reported in different countries, since such fibers have been widely used as whitewash. Exposure to tremolite has been associated to the development of pleural calcifications, asbestosis and malignant mesothelioma. In Piedmont, tremolite asbestos in rock surfacing was reported in Upper Susa Valley; this can probably be associated to the develpoment of pleural and peritoneal cancers (Mirabelli & Cadum, 2002). In order to evaluate the asbestos risk in Western Alps, human lung epithelial cells A549 have been incubated with three tremolite samples: fibers from Lanzo Valleys, from Susa Valley and a sample from Ossola Valley, used as a positive control. The results have been compared to those obtained with crocidolite.
The carcinogenicity of asbestos is well established; several physico-chemical features of the fibers appear implied, such as fibrous habit, size, cristallinity, morphology, and surface active metal ions. Iron is not a stoichiometric component of chrysotile, but is present as a contaminant. To determine the role played by contaminating ions, a stoichiometric chrysotile devoid of iron and with constant structure and morphology was synthesized (Falini et al., 2002). Cytotoxicity of synthetic fibers and their ability to alter the redox metabolism in A549 cells have been compared to that elicited by natural UICC A chrysotile. Synthetic chrysotile nanofibers doped with controlled amount of iron have also been prepared (Foresti et al., 2005) and their cytotoxicity and genotoxicity have been evaluated.