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Le geoscienze fra passato e futuro



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Occupational and anthropogenic environmental exposure during asbestos-cement production by FIBRONIT in Broni (Pavia): assessment of asbestos lung burden by SEM-EDS

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Despite the relation between occupational exposure to asbestos and asbestos related diseases (ARD) is well documented, many issues concerning the etiopathogenesis of ARD are still debated. For example, the role of fiber species and dimension (length and thickness), the importance of exposure dose and the dose-response effect are still questioned.

Moreover, the synergic collaboration between mineralogists and pathologists for a multidisciplinary assessment of the diagnosis of ARD helps to investigate the complex pattern of legal, social, and political issue.

The aim of this study is to put together the mineralogical and medical knowledge in order to investigate a cohort of 188 subjects, some of whom worked at Fibronit (Broni, Pavia, Italy), an important asbestos cement factory (active between 1932 and 1993), and others lived in the surrounding area, in order to clarify the role of asbestos in the etiopathogenesis.

Different issues have been addressed: the latency time before the diagnosis, survival time since the diagnosis, effect due to cigarette smoking, relationship between the concentrations of asbestos fibers in lung tissue and ARD, kind of exposure (occupational and anthropogenic environmental), possible gender differences.

To carry out this complementary investigation, a group of 40 subjects was selected from a larger series of autopathic lung samples; specifically: 20 males with occupational exposure (10 died for mesothelioma and 10 for asbestosis), and 20 subjects with anthropogenic environmental exposure (10 men and 10 women died for mesothelioma).

The inorganic residue of a portion of lung tissue of each subject was investigated by scanning electron microscopy with energy dispersion spectroscopy (SEM-EDS). The following information concerning asbestos fibers were detected: length and width, mineralogical species, and concentration per gram of dry tissue (Belluso, 2006). In addition, typical asbestos bodies were also counted, because hallmark of exposure to asbestos.

Most of the asbestos fibers detected have been identified as crocidolite and amosite.

The data show that, a considerable number of subjects with occupational exposure and high burden of crocidolite and amosite (high dose exposure) did not develop mesothelioma; and that there are subjects with anthropogenic environmental exposure and low burden of crocidolite and amosite (low dose exposure) that developed and died owing to mesothelioma. This fact is consistent with a different predisposition between individuals of the series, probably explained by a genetic substrate.

The present data appear to support the hypothesis that even an exposure to a very low amount of asbestos can cause mesothelioma in hypersusceptible subjects.

Belluso E., Bellis D., Fornero E., Capella S., Ferraris G. & Coverlizza S. (2006) - Assessment of Inorganic Fibre Burden in Biological Samples by Scanning Electron Microscopy – Energy Dispersive Spectroscopy. *Microchimica Acta*, 155 (1), 95-100.