Monitoring of fluoro-edenite fibre pollution through the study of sheep lymph nodes as a model of a biological indicator

A significantly increased standardised rate of mortality from pleural mesothelioma, comparable to that reported in asbestos exposed cohorts, has been recorded in Biancavilla (SW slope of Mt Etna, Sicily) and attributed to exposure to fluoro-edenite, a fibrous amphibole found in the inert material extracted from a nearby stone quarry.

It is well known that sheep lung is anatomically and physiologically comparable to human lung, and lymph nodes are considered better indicators of previous asbestos exposure than lung parenchyma.

We therefore measured the concentration of fluoro-edenite fibres in the lymph nodes (tracheobronchial and one middle mediastinal node) draining the lung lobes of sheep habitually grazing 3 km from the town using histology (haematoxylin-eosin and Perls method), light (LM) and scanning electron microscopy (SEM), as well as an energy dispersion spectrometry x-ray analysis apparatus in order to assess the pollution due to airborne dust material.

Sixty healthy sheep randomly selected from six flocks (10/flock) and 10 control sheep were sacrificed. Histology showed hyperplasia of lymphoid follicles, which had large reactive cores. Numerous paracortical macrophages noted among clusters of lymphoid elements contained grey-brownish amorphous particulate with elements with a fibril structure.

SEM analysis of digested nodes evidenced some naked fibres with the crystallochemical features of fluoro-edenite. Fibre length (range 8–41 mm) and diameter (range 0.4–1.39 mm) were similar to those described in the lung of a Biancavilla housewife who died from pleural mesothelioma.

Fibres were found in all exposed animals, but never in control nodes. The mean number of fibres (0.08±0.04×106 fibres/g dry tissue) did not differ significantly among exposed animals.

Results are preliminary and document the risk of inhalation of fluoro-edenite fibres a few kilometres from the town. Similar data have been reported by DeNardo and co-workers, who however studied solely lung tissue from sheep with a shorter (roughly half) time of exposure which had been grazing in a limited area around the town.

Data show that sheep can be effective biological indicators of this type of pollution; assessment of fluoro-edenite fibres in lymph nodes therefore appears to be a helpful tool to conduct its environmental monitoring.

References

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