

# Mesotelioma: il ruolo delle fibre ultrafini e conseguenti riflessi in campo preventivo e medico legale

G. CHIAPPINO

Università degli Studi di Milano, Centro di Studi e Ricerca sugli Effetti Biologici delle Polveri Inalate

## KEY WORDS

Mesothelioma aetiology; m. pathogenesis; ultrashort and ultrathin fibers

## SUMMARY

**«Mesothelioma: the aetiological role of ultrathin fibres and repercussions on prevention and medical legal evaluation».** **Background:** *Mesothelioma has until now been considered to be a manifestation, occurring in the pleura and/or peritoneum, of the carcinogenic action of the total burden of inhaled asbestos fibres, in the same way as lung cancer. Because of the pathogenic potential of very low exposure levels, the fact that the onset of the neoplasm always occurs in the parietal pleura, and the absence of any synergism with smoking, which is typical in the case of carcinoma, it was suspected that aetiopathogenetic differences existed but the reasons for such differences still could not be explained. In the past experimental results indicated the oncogenicity of very thin fibres but mesothelioma in practice was not exclusively linked to this specific dimensional size class.* **Objectives:** *The paper proposes to take full advantage of the significant knowledge that must have emerged from research carried out in recent years and use this knowledge to reconstruct the mosaic of the aetiopathogenesis of mesothelioma. Due consideration will also be given to the consequent new approach required in the field of medical-legal evaluation of cases and in the field of prevention.* **Results:** *The most important knowledge that must today be taken as certain is the fact that mesothelioma is not caused, as is the case for asbestosis, by all the fibres that are inhaled but only by the ultrathin fraction of these fibres, having diameter of 0.2  $\mu\text{m}$  and length of only a few  $\mu\text{m}$ . Only fibres of this class of size can cross the pulmonary-pleural barrier and are, therefore, the causal agent of mesothelioma and other benign pleural manifestations (plaques). Moreover the ultrathin fibres that translocate from the lung to the pleura are not distributed casually on the parietal and visceral surfaces but move over the surfaces, to concentrate around the lymphatic reabsorption stomata situated on the parietal pleura. Due to their shape, the fibres cannot easily be absorbed into the stoma via the lymphatic flow and so remain clustered for an indefinite period of time among the mesothelial cells that surround the stoma. The concentration of ultrathin fibres in punctiform areas of the parietal pleura and the extremely long biopersistence of the amphiboles now finally explain how very low exposures can cause mesothelioma in susceptible subjects and why the neoplasm always occurs on the parietal pleura.* **Conclusions:** *In medical-legal assessments of cases of mesothelioma the etiological importance of the ultrathin fraction of fibres means that any assumption of the disease being avoidable must be discarded, at least up to the second half of the 1980's because until then this class of fibres, which today must be considered as the true causal agent of the neoplasm, was not visible under the optical microscope, nor could such fibres be measured or eliminated from the atmosphere of working environments. The filter materials available both for fixed ven-*

*tilation systems and for individual protective masks were not able to block the ultrathin fibres and were therefore only efficacious for the prevention of asbestosis and probably pulmonary carcinoma. It was only with the use of highly efficient HEPA filters and "absolute" filters towards the end of the 1980's that efficacious protection against all size classes of respirable fibres became possible in industrial plants. Preventive measures in the public hygiene area must also take account of the aetiological role of ultrathin fibres by making full use of electron microscope investigations and by using "absolute" filters for domestic purposes, in ventilation systems and above all in the filter systems of the mechanical devices used in town street cleaning operations.*