

## Asbestiform zeolite fiber internalization in a human cell model in vitro

Sara Salucci<sup>1</sup>, Michele Betti<sup>1</sup>, Michele Mattioli<sup>2</sup>, Laura Valentini<sup>1</sup>, Matteo Giordani<sup>2</sup>, Giuseppe Pignataro<sup>1</sup>, Debora Burini<sup>1</sup>, Pietro Gobbi<sup>1</sup>

<sup>1</sup> Università degli Studi di Urbino Carlo Bo, Dipartimento di Scienze Biomolecolari, Urbino, Italia

<sup>2</sup> Università degli Studi di Urbino Carlo Bo, Dipartimento di Scienze Pure ed Applicate, Urbino, Italia

Exposure to fibrous zeolite erionite, a strong mutagen, more carcinogenic than asbestos fibers in man and rodents, may induce chronic respiratory diseases, including malignant pleural mesothelioma.

Here, erionite effect, at different time points and dosages, has been studied in a human monocyte cell line [1].

Morphological characterization of erionite, using an Environmental Scanning Electron Microscope equipped with an Energy Dispersion Spectroscope, confirmed the expected distribution of the fiber size and the mean diameter because of their potential carcinogenic risk. Erionite is characterized by an extremely fibrous habit with wooly fibers, having a diameter of about 1  $\mu\text{m}$  and variables lengths, with fibrils of about 0.1  $\mu\text{m}$  diameter. Their small size could favor the deep penetration in the biological system. The found Si/(Si+Al) ratio is in the range 0,77-0,78 is slightly higher than the interval for the erionite from basaltic cavities.

TEM observations reveal cell ability to internalize fibrous mineral which shows low cytotoxicity at the lowest times and concentrations. After 36/48h of treatment at the highest dosages, erionite can be found both in the cytoplasm and in the nucleus, where it appears as curvilinear fragments, located mostly in vacuoles. In these experimental conditions, a diffuse number of long microvillous processes with frequent branching or plasma membrane protrusions can be observed. Moreover, mitochondria alterations and a thickening of the nuclear envelope, if compared to control cells, can be revealed. Few cells in secondary necrosis or necrotic death appear. In conclusion, erionite shows low cytotoxicity for what concerns cell death induction. However, a significant number of dysfunctional mitochondria can be detected after fiber exposure, suggesting an oxidative stress involvement which will be further investigated.

### References

- [1] Cangiotti et al. (2018) EPR, TEM and cell viability study of asbestiform zeolite fibers in cell media. *Colloids Surf B Biointerfaces* 161:147-155.

### Key words

Erionite cell internalization, morphological analyses.