

Raw and thermally treated cement asbestos exerts different cytotoxic effects and Nitric Oxide production in vitro

Armanda Pugnalon¹, Guendalina Lucarini¹, Marco Tomasetti¹, Elisabetta Strafella¹, Alessandro F. Gualtieri²

¹Dipartimento di Scienze Cliniche e Molecolari, Università Politecnica delle Marche, Ancona

²Dipartimento di Scienze Chimiche e Geologiche, Università di Modena e Reggio Emilia, Modena

Raw cement asbestos (RCA) undergoes a complete solid state transformation when heated at high temperatures (1200 °C). The secondary raw material produced, high temperature-cement asbestos (HT-CA) is composed of newly-formed crystals in place of the original asbestos fibres present in RCA. Our previous studies (1) showed that HT-CA exerts cytotoxic effects of lower grade compared to RCA, concerning cell viability, apoptosis induction, ROS production and cell proliferation index. In the present study we investigated inducible nitric oxide synthase (iNOS) immunohistochemical expression and nitric oxide (NO) production by the Griess method. NO, generated specifically during inflammation via iNOS, is a primary initiator of reactive nitrogen species (RNS), that sustain chronic inflammation in lung and contributes to a substantial part of environmental carcinogenesis. Cytotoxic potential of RCA and HT-CA is also related to iron (from environmental contamination) whose content was detected by SEM/EDS investigations, known to play a role in asbestosis, lung cancer and mesothelioma. In RCA, chrysotile itself contains a small amount of iron easily releasable in culture medium. In inertized cement-asbestos iron was found in Fe₂O₃ crystals (2) as thermal treatment involved a global structural rearrangement (recrystallization) that account for a poorly release in media. In this study we found that RCA treatment of A549 endothelial cells increases iNOS expression and NO release in culture media compared to control and HT-CA treated cells. Our findings confirm that HT-CA can be considered a transformed phase exerting direct lower cytotoxic and inflammatory potential compared to RCA on biological systems and should be considered an environmentally friendly alternative solution to landfill disposal.

References

[1] Giantomassi et al. (2010) *Toxicol In Vitro* 24:1521-1531.

[2] Viani et al.(2013) *J Hazard Mater.*248-249:69-80.

Keywords

iNOs, NO, asbestos inertization, recycling asbestos materials.