Kazan Medical Journal 2021 vol.102 N4, pages 501-509

Comparative characteristics of various fibrous materials in in vitro experiments

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Abstract

Aim. Comparative assessment of the effect of fibrous materials on cell cultures RAW264.7 and BEAS-2B. Methods. The effects of various fibrous materials - single-walled carbon nanotubes of two types (SWCNT-1 and SWCNT-2), differing in morphological characteristics, and chrysotile asbestos as a positive control - was assessed on two cell lines macrophages RAW 264.7 and human bronchial epithelium BEAS-2B cells. The studied materials' concentration range for experiments on cells was selected taking into account the SWCNT content in the air of the working area and the subsequent modeling of SWCNT deposition in the human respiratory tract. Suspensions of the studied materials were prepared based on cell culture media by ultrasonication. Cytotoxicity assessment after 48 hours of incubation was performed by using the MTS colorimetric assay. The expression level of apoptosis markers was assessed by immunoblotting using the corresponding monoclonal antibodies. Visualization of SWCNT-1, SWCNT-2 and chrysotile asbestos in BEAS-2B cell cultures was carried out by improved dark-field microscopy. Results. According to dark-field microscopy, all the studied fibrous materials were found on the surface or cytoplasm of the cells. SWCNT and chrysotile asbestos did not have a direct cytotoxic effect in the MTS assay and did not induce apoptosis according to the results of Western blotting in cell cultures of RAW264.7 macrophages and BEAS-2B bronchial epithelium. In the cells of the bronchial epithelium (BEAS-2B) that showed greater sensitivity, a slight increase in the expression of pro-apoptotic protein PARP, which was more pronounced for shorter SWCNT-2, was revealed. Conclusion. Both types of SWCNTs, despite the differences in morphological characteristics, demonstrated similar effects in in vitro experiments; this result, with its further verification, can have an important practical application in justifying approaches to determining the safety criteria for single-walled carbon nanotubes as a class of nanomaterials of the same type.

http://dx.doi.org/10.17816/KMJ2021-501

Keywords

Bronchial epithelial beas-2b cells, Darkfield microscopy, Raw264.7 macrophages, Single-walled carbon nanotubes

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