Evaluación de genotoxicidad de nanopartículas de carbón usando células V79

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RESUMEN

La exposición crónica al material particulado derivado de la actividad minera se asocia con graves consecuencias clínicas. Los estudios han vinculado esta exposición con neumoconiosis, bronquitis crónica, enfisema, fibrosis y cáncer pulmonar en mineros de carbón, además de alteraciones en parámetros biológicos en las poblaciones aledañas. Sin embargo, establecer una causalidad directa es complejo debido a múltiples variables características de los modelos de exposición crónica. En orden de explorar los efectos de la exposición a nanopartículas de carbón proveniente de una de las minas cercanas a La Loma-Cesar, el presente trabajo buscó caracterizar el contenido de hidrocarburos aromáticos policíclicos (HAP) de las nanopartículas (NP) usando Cromatografía de Gases acoplada a Espectrometría de Masas (GC/MS) y se evaluaron los efectos de la exposición *in vitro* a diferentes concentraciones de NP en células de fibroblastos de pulmón de hámster chino (V79) usando el ensayo cometa alcalino y modificado con enzimas EndoIII y FPG. Dentro de los resultados obtenidos se destaca la presencia de HAPs en las NP tales como fluoranteno, naftaleno, antraceno, 7H-benzo[c]fluoreno, fenantreno, pireno, benceno[a]antraceno, criseno y algunos derivados alquilados. En el análisis de genotoxicidad de las NP sobre células V79 se encontró un efecto dosis-respuesta ante las concentraciones usadas. Estos datos respaldan la

hipótesis de que las nanopartículas de carbón derivadas de la actividad minera tienen un impacto en la integridad genética y pueden llevar a muerte celular programada. Estos resultados pueden direccionar futuras investigaciones y estudios adicionales para profundizar en la comprensión de los efectos, los cuales sean punto de apoyo para explorar estrategias de mitigación o de reducción de los riesgos asociados con la exposición a nanopartículas de carbón.

Palabras clave: Nanopartículas de carbón, genotoxicidad, estrés oxidativo, hidrocarburos aromáticos policíclicos, células V79.

ABSTRACT

Chronic exposure to particulate matter derived from mining activity is associated with serious clinical consequences. Studies have linked this exposure to pneumoconiosis, chronic bronchitis, emphysema, fibrosis, and lung cancer in coal miners, in addition to alterations in biological parameters in surrounding populations. However, establishing direct causality is complex due to multiple variables characteristic of chronic exposure models. In order to explore the effects of exposure to carbon nanoparticles from one of the mines near La Loma-Cesar, the present work sought to characterize the polycyclic aromatic hydrocarbon (PAH) content of the nanoparticles (NP) using Gas Chromatography coupled to Mass Spectrometry (GC/MS) and the effects of in vitro exposure to different concentrations of NP in Chinese hamster lung fibroblast cells (V79) were evaluated using the alkaline comet assay and modified with EndoIII and FPG enzymes. Among the results obtained, the presence of PAHs in the NPs stands out, such as fluoranthene, naphthalene, anthracene, 7H-benzo[c]fluorene, phenanthrene, pyrene, benzene[a]anthracene, chrysene and some alkylated derivatives. In the genotoxicity analysis of the NPs on V79 cells, a dose-response effect was found with the concentrations used. These data support the hypothesis that carbon nanoparticles derived from mining activity have an impact on genetic integrity and can lead to programmed cell death. These results can direct future research and additional studies to deepen the understanding of the effects, which can serve as a basis for exploring mitigation or reduction strategies for the risks associated with exposure to carbon nanoparticles.

KeyWords: Carbon nanoparticles, genetic damage, oxidative stress, polycyclic aromatic hydrocarbons, mining activity, V79.

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