Efecto genotóxico y susceptibilidad genética asociada a la exposición crónica a partículas emitidas de la minería de carbón en la Loma-Cesar

Nombres y apellidos
Ornella del Rosario Fiorillo Moreno
Código estudiantil: 20182558100041

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Tutor(es):
PhD. Grethel León Mejia
PhD. Milton Quintana Sosa

RESUMEN

La exposición al polvo de la minería del carbón representa un riesgo sustancial para la salud de las personas debido a la compleja mezcla de componentes liberados durante el proceso de extracción entre los que se emiten a la atmósfera grandes cantidades de cenizas, metales, óxidos y de hidrocarburos aromáticos policíclicos (HAP) lo que tiene diversos efectos a los ecosistemas naturales y las poblaciones humanas circundantes. Este estudio evalúo los efectos genotóxicos, longitud de telómeros y susceptibilidad genética asociada a la exposición crónica a partículas emitidas de minería de carbón en la Loma-Cesar. En esta investigación se incluyeron 150 personas expuestas al área de influencia a las minas de carbón de la Loma-Cesar y 120 personas que, por su tipo de trabajo, no están expuestas a fuentes industriales de actividad minera de carbón de la Ciudad de Barranquilla. Los resultados obtenidos en el ensayo cometa

demuestran un mayor daño oxidativo en la población expuesta de la Loma-Cesar comparado con el grupo control; en el análisis de micronúcleos en linfocitos de sangre periférica fue encontrada una mayor formación de micronúcleos en el grupo expuesto, además, se evidenció telómeros significativamente más cortos en el grupo expuesto de la Loma-Cesar comparado con el grupo control. Se analizó mediante genotipificación por espectrometría de masas Maldi Tof, el polimorfismo *ERCC2 Asp711Asp (rs1052555)* de la vía de reparación de escisión de nucleótidos (NER), el polimorfismo del metabolismo *AHR Arg554Lys (rs2066853)*, y los proinflamatorios *IFNɣ G>A (rs2069705), Il-12B T>G (rs3212227), CXCL8 A>T (rs4073).* Así mismo, fue encontrado en el grupo expuesto una significativa correlación entre la presencia del polimorfismo del gen *ERCC2 Asp711Asp* y el daño oxidativo detectado con el ensayo cometa; los genes *IL1-β-31T>C* y *ERCC2 Asp711Asp* con la frecuencia de micronúcleos en linfocitos*;* y los genes *IL1-B-31T>C, INFɣ G>A, CXCL8 A>T* y *AHR Arg554Lys* en la longitud de telómeros. En los resultados del grupo control solo hubo una correlación significativa entre la presencia del polimorfismo del gen *ERCC2 Asp711Asp* y *CXCL8 A>T* y los niveles de daño oxidativo detectados con el ensayo cometa.
Estos hallazgos pueden contribuir significativamente a la comprensión de los impactos de la minería del carbón en la salud humana y subrayan la importancia de estrategias preventivas y de intervención, lo cual a su vez tendría un impacto significativo en la salud pública y la calidad de vida de las personas expuestas.

Palabras clave: *Carbón, emisiones de partículas de minas, daño oxidativo, telómeros, polimorfismos, material particulado.*

ABSTRACT

Exposure to coal mining dust represents a substantial risk to human health due to the complex mixture of components released during the extraction process among which large amounts of ash, metals, oxides and polycyclic aromatic hydrocarbons (PAHs) are emitted into the atmosphere with diverse effects on natural ecosystems and surrounding human populations. This study evaluated the genotoxic effects, telomere length and genetic susceptibility associated with chronic exposure to particulate matter emitted from coal mining in Loma-Cesar. This research included 150 people exposed to the area of influence of the coal mines of La Loma-Cesar

and 120 people who, due to their type of work, are not exposed to industrial sources of coal mining activity in the city of Barranquilla. The results obtained in the comet assay show a greater oxidative damage in the exposed population of Loma-Cesar compared to the control group; in the analysis of micronuclei in peripheral blood lymphocytes, a greater formation of micronuclei was found in the exposed group; in addition, significantly shorter telomeres were evidenced in the exposed group of Loma-Cesar compared to the control group. The ERCC2 Asp711Asp (rs1052555) polymorphism of the nucleotide excision repair (NER) pathway was analyzed by Maldi Tof mass spectrometry genotyping, the AHR metabolism polymorphism Arg554Lys (rs2066853), and the proinflammatory IFNɣ G>A (rs2069705), Il-12B T>G (rs3212227), CXCL8 A>T (rs4073). Likewise, a significant correlation was found in the exposed group between the presence of the ERCC2 Asp711Asp gene polymorphism and oxidative damage detected with the comet assay; the IL1-β-31T>C and ERCC2 Asp711Asp genes with the frequency of micronuclei in lymphocytes; and the IL1-B-31T>C, INFɣ G>A, CXCL8 A>T and AHR Arg554Lys genes in telomere length. In the control group results there was only a significant correlation between the presence of the ERCC2 Asp711Asp and CXCL8 A>T gene polymorphism and the levels of oxidative damage detected with the comet assay. These findings may contribute significantly to the understanding of the impacts of coal mining on human health and underline the importance of preventive and intervention strategies, which in turn would have a significant impact on public health and the quality of life of exposed individuals.

KeyWords: Coal, mine particulate emissions, oxidative damage, telomeres, polymorphisms, particulate matter.

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