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Evaluación del citoma de linfocitos y metales en sangre de una población del Cesar expuesta a minería de carbón

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RESUMEN

El carbón es un mineral mundialmente usado, sin embargo, a pesar de sus múltiples beneficios no se puede desconocer los efectos en la salud y los efectos ambientales que conlleva la explotación de este mineral. Durante las actividades de minería se liberan partículas micrométricas, lo suficientemente pequeñas para ser inhaladas, llegar a los bronquios y alcanzar los alvéolos pulmonares. El objetivo del presente estudio fue evaluar el citoma de linfocitos y elementos inorgánicos en sangre de una población del Cesar expuesta a minería de Carbón.
Para alcanzar estos objetivos se incluyeron 70 personas expuestas que viven en zonas aledañas a las minas de carbón de la Loma-Cesar y 70 personas no expuestas (controles, no tuvieron exposición a minería de carbón) de la Ciudad de Barranquilla. Se utilizó ensayo del citoma de micronúcleos con bloqueo de la citocinesis (CBMN-Cyt) para evaluar los efectos citotóxicos y genotóxicos en linfocitos de sangre periférica de la población general y se analizaron factores como la influencia de la edad, sexo y factores de estilo de vida (tabaquismo, consumo de alcohol, exposición a medicamentos y radiación diagnóstica, antecedentes familiares de cáncer, entre otros). En los resultados obtenidos de los diferentes biomarcadores del CBMN-Cyt se observó un aumento significativo en la frecuencia de micronúcleos (MN), BROTE, PUENTE, necrosis (NECR) y apoptosis (APOP) en el grupo expuesto en comparación con el no expuesto; sin embargo, al analizar el índice de división nuclear (NDI) no se observaron diferencias significativas. En cuanto a los factores relacionados con el estilo de vida, observamos una correlación

significativa entre el consumo de vitaminas y carnes muy grasosas con la formación de BROTE; de igual forma, se correlaciona significativamente el consumo de carnes y alcohol con la formación de MN y la presencia de apoptosis con la ingesta de alcohol. En el análisis de las concentraciones de elementos inorgánicos mediante el método PIXE, se encontraron concentraciones significativas de aluminio (Al), azufre (S), potasio (K), hierro (Fe) y cromo (Cr) en el grupo expuesto comparado con el grupo no expuesto. De manera interesante fue encontrada una correlación significativa entre la formación de MN y el aumento de la concentración de Fe y Cr en el grupo expuesto. Los resultados obtenidos en el daño en el ADN y muerte celular pueden estar asociados con el daño oxidativo generado debido a la exposición a residuos de carbón de la zona y demuestran la utilidad de los biomarcadores del CBMN-Cyt para biomonitoreo humano en poblaciones expuestas.

Palabras clave: Biomarcadores, CBMN Cyt, Carbón, PIXE, muerte celular.

ABSTRACT

Coal is a mineral used worldwide, however, despite its multiple benefits, the health and environmental effects that the extraction of this mineral entails cannot be ignored. During mining activities, micrometric particles are released and are small enough to be inhaled, therefore, they reach the bronchi and the pulmonary alveoli. The objective of this study was to evaluate the cytome of lymphocytes and the presence of inorganic elements in the blood of a population of Cesar exposes to a coal product of mining.

For this, 70 exposed people living in areas surrounding the Loma-Cesar coal mines and 70 unexposed people (controls, who had no exposure) from the City of Barranquilla were included. The Cytokinesis-Block Micronucleus Cytome Assay (CBMN-Cyt) was used to assess cytotoxic and genotoxic effects on peripheral blood lymphocytes from the general population and the influence of age, gender, and lifestyle factors (smoking, alcohol consumption, medication and diagnostic radiation, family history of cancer, among others). In the results obtained from the different biomarkers of the CBMN-Cyt, a significant increase in the frequency of MN, NBUD, NPB, necrosis (NECR) and apoptosis (APOP) was observed in the exposed group, compared to the unexposed group. In respect of the nuclear division index (NDI), no significant differences were observed. Regarding the factors related to lifestyle, we observed a significant correlation between the consumption of vitamins and very fatty meats with the formation of NBUD. In the same way, the consumption of meats and alcohol were significantly correlated with the formation of MN and the presence of apoptosis, with alcohol intake. In the analysis of the concentrations of inorganic elements using the PIXE method, significant concentrations of aluminum (Al), sulfur (S), potassium (K), chromium (Cr), and Iron (Fe) were found in the exposed group compared to the unexposed group. Interestingly, a significant correlation was found between MN formation and increased Fe and Cr concentration in the exposed group. The results obtained in DNA damage and cell death may be associated with the

oxidative damage generated due to exposure to coal residues in the region and demonstrate the usefulness of CBMN-Cyt biomarkers for human biomonitoring in exposed populations.

Keywords: Biomarkers, CBMN Cyt, Coal, PIXE, cell death.

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