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Assessment of exposure, genotoxic and genetic susceptibility in an occupational exposed population to coal mining residues

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Abstract

Colombia in South America has one of the world's largest coal reserves, been the fifth thermal coal exporter in the world. In open-cast coal mining extraction, large amounts of dust particles and heavy metals are released into the atmosphere, where they can develop into complex mixtures, one of the greatest risks for health and safety for occupational exposed workers. In addition, in open-cast mines, the extracted coal is stored in the presence of sunlight, which constitutes an important source of Polycyclic Aromatic Hydrocarbons (PAHs) emission after spontaneous and incomplete combustion. The aim of our study was to evaluate if the *CYP1A1 (Msp1)*, *GSTM1 (nulo)* and *GSTT1 (nulo)* polymorphisms could modify individual susceptibility to adverse coal exposure effects, considering the micronucleus formation (MN) and DNA damage (EnsayoCometa) as genotoxic endpoints. The study population comprised of 100 open-cast coal mining workers occupationally exposed to mining residues and 100 non-exposed controls. The study was conducted in the coal mining area of "El Cerrejón", the world's largest open-cast coal mine, located in Guajira, North Colombia. The MN frequencies and DNA damage from exposed workers were not influenced by polymorphisms in the metabolism genes *CYP1A1, GSTM1* and *GSTT1*. Despite this, we observed an increased relative risk (RR), regardless of the genotypes in the exposed group. These findings suggest that cumulative coal exposure, but not *CYP1A1, GSTM1* and *GSTT1* polymorphisms, were associated with an increase in DNA damage. To our knowledge, this study provides the first data in Colombia about the genotoxic risk associated to coal residues exposure in mining activities.