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Genetic and oxidative damage of peripheral blood lymphocytes in workers with occupational exposure to coal

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Highlights

- This study involved 71 workers occupationally exposed to coal and 57 in non-exposed group.
- An increased genotoxic effect was observed in workers due to coal exposure.
- Exposed individuals presented lower levels of TBARS and CAT, and higher SOD levels.
- A hematocrit analysis demonstrated higher levels to the exposed groups presented.
- These evidences demonstrate the need for monitoring educational programs.

Abstract

Coal is an important fossil fuel used to generate energy. Coal dust is constituted primarily of hydrocarbons and metals. During coal extraction, large quantities of coal dust particles are emitted, contributing to environmental pollution. Coal miners are constantly exposed to coal dust and its derivatives. The goal of this study was to evaluate the potential genotoxic effects of coal and oxidative stress in individuals from Candiota who were exposed to coal as part of their occupation. The comet assay and micronucleus (MN) test were used to assess these effects. This study involved 128 male participants of whom 71 reported work that included exposure to coal (exposed group) and 57 reported working at different jobs (unexposed group). The exposed group had a significantly increased damage index and damage frequency, as assessed using the comet assay, and increased MN and nucleoplasmic bridge frequencies, as assessed using the MN assay, compared with unexposed individuals. Significant and positive correlations between MN frequencies in the lymphocytes and buccal cells of control and exposed individuals were observed. The exposed individuals presented lower average levels of thiobarbituric acid reactive substances (TBARS) and catalase activity (CAT), while the mean superoxide dismutase activity (SOD) levels were higher in this group. The exposed group also had higher hematocrit levels. No correlation between DNA damage and inorganic elements, as identified using PIXE, was found; however, there was a correlation between the damage index and zinc. The evidence that exposure to coal and its derivatives presents a genetic hazard demonstrates the need for protective measures and educational programs for coal miners.

Keywords

Coal; Occupational exposure; Comet assay; Micronucleus; Oxidative stress

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