

HUMAN INHALATION STUDY WITH ZINC OXIDE: ANALYSIS OF ZINC LEVELS AND BIOMARKERS IN EXHALED BREATH CONDENSATE (EBC) AND ZINC LEVELS IN BLOOD

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Employees in the zinc production are exposed to a complex mixture of particles and gases, including zinc oxide (ZnO) that can affect human health. In addition to the examination of the effects of short-term controlled exposure to nano-sized ZnO on airway and systemic inflammatory markers in healthy volunteers, we aimed to determine the influence of ZnO inhalation on the concentration of zinc and biomarkers (pH, 8-iso-PGF_{2α}, leukotriene B₄ (LTB₄), peptido-leukotrienes (LTC₄/D₄/E₄) and prostaglandin E₂ (PGE₂)) in exhaled breath condensate (EBC) and zinc levels in blood. Sampling of exhaled breath condensate (EBC) is also non-invasive and offers a matrix for assessing inflammation and oxidative stress. The aim of this study was to evaluate whether EBC biomarker analyses and zinc levels in blood appear suitable as a preventive measure for estimating exposure of inhaled ZnO.

Sixteen subjects (8 females, 8 men, non-smokers) were exposed to filtered air and ZnO nanoparticles (0.5, 1.0 and 2.0 mg/m³) for 4 hours. EBC and blood samples were collected according to a specific scheme.

All measurements of the peptide-leukotrienes were below the limit of quantification (LOQ). ZnO exposures showed no detectable effect on the other EBC parameters in the group comparisons. Total levels of Zn in EBC were unaffected by ZnO inhalation at any concentration. Inhalative ZnO exposure up to 2.0 mg/m³ seems not to affect homeostatic controlled zinc levels in blood. In our study, the additional determination of EBC parameters did not result in an advantage for assessing the effect of zinc exposure.