

European Respiratory Society Annual Congress 2012

Abstract Number: 7031

Publication Number: P4345

Abstract Group: 6.2. Occupational and Environmental Health

Keyword 1: Occupation **Keyword 2:** Monitoring **Keyword 3:** Biomarkers

Title: Increased markers of oxidative stress in workers exposed to nanoparticles

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Body: INTRODUCTION Possible adverse health effects of nanoparticles are little understood. Pilot study was performed in workers exposed to TiO₂ aerosol. METHODS Dynamics of aerosol number size distributions at the workplaces was monitored by SMPS and APS spectrometers in size range 15 nm-10 µm. Spatial distributions of total concentrations were determined using monitors of particle number (P-TRAK) and mass concentrations (DustTRAK DRX). Pre-shift and post-shift FeNO and markers in exhaled breath condensate (EBC) were measured in 20 workers, and 17 controls. Malondialdehyde (MDA), 4-hydroxy-trans-nonenal (HNE), 4-hydroxy-trans-hexenal (HHE), 8-isoProstaglandin F_{2α} (8-isoprostane), 8-hydroxy-2-deoxyguanosine (8-OHdG), 8-hydroxyguanosine (8-OHG), hydroxymethyl uracil (HMeU), o-tyrosine (o-Tyr), 3-chloro-tyrosine (3-Cl-Tyr), nitrotyrosine (NO-Tyr), C6-C13, and leukotrienes (LTs) were analyzed by liquid chromatography-electrospray ionization-mass spectrometry. RESULTS Total aerosol concentrations in the production plant varied in space and time; number concentrations 1x10⁴-2x10⁵ particles/cm³, mass concentrations 0.1-30 mg/m³. In the workshops, 90% of particles were under 100 nm in diameter. All pre-shift markers, except LTD₄ and FeNO, were increased in workers. Markers of lipid oxidation were elevated (p<0.01): MDA, HNE, HHE, 8-isoprostane and C6-C13. Markers of oxidation of nucleic acids and proteins were higher (p<0.001): 8-OHdG, 8-OHG, HMeU, 3-Cl-Tyr and NO-Tyr. Elevated was o-Tyr, LTB₄, LTC₄ and LTE₄. No difference was noted for post-shift EBC and FeNO. CONCLUSION This first study of EBC in workers suggests deleterious effects of TiO₂ exposure to aerosol particles with nano-sized fractions. P28/1LF/6.