IMPACTS OF AIR POLLUTION ON OXIDATIVE DNA DAMAGE

Vlasta Svecova

Department of Genetic Ecotoxicology, Institute of Experimental Medicine AS CR, v.v.i.
Videnska 1083, 142 20 Prague 4
Tel.: +420 241 062 669, fax.: +420 241 062 785, e-mail: svecova@biomed.cas.cz

This thesis deal with impacts of air pollution on human health. The biomarkers of biologically effective dose, biomarkers of oxidative damage to DNA, lipids and proteins, were studied. We aimed at importance of individual pollutants, measured the personal exposure to these pollutants and analyzed the biomarkers of oxidative damage to macromolecules.

c-PAHs (carcinogenic polycyclic aromatic hydrocarbons) bound to airborne PM2.5 (particulate matter ≤ 2.5 μm) and volatile organic compounds (benzene, toluene, ethylbenzene and m,p,o-xylenes, BTEX) were studied as ones of the biologically most important pollutants. Personal and outdoor concentrations of c-PAHs together with personal exposure to BTEX were measured. The concentrations of pollutants were correlated with biomarker levels in different seasons and localities. Bus drivers in Prague, 6-10 years old children from Teplice and Prachatice and policemen with office workers from Ostrava region were the model populations.

Oxidative damage to DNA were measured by 8-oxodeoxyguanosine (8-oxodG), 15-F2t-isoprostanes (15-F2t-IsoP) were used to measure oxidative damage to lipids and carbonyl groups for protein oxidation. Oxidative damage to DNA correlated with PM10 and PM2.5 exposure. As the best biomarker to see the impacts of air pollution seemed to be 15-F2t-IsoP in blood plasma, was significantly influenced by personal exposure to c-PAHs, benzo[a]pyrene, benzene, toluene and m,p-xylene. The protective effect against oxidative damage to DNA had vitamins C and E. Expression of XRCC1 were connected with higher levels of vitamin C, could support base excision repair and result in better removal efficiency.

Detailed time activity and life style questionnaires during personal monitoring were used to assess factors significantly affecting personal exposure to c-PAHs and BTEX. As main factors affecting personal exposure to c-PAHs were evaluated outdoor air pollution, traffic, ETS (environmental tobacco smoke), home heating fuel of coal, wood or gas, frequency of exhaust fan use, cooking and commuting by car. The main determinants of BTEX personal exposure were indoor environment, ETS, cooking, home heating fireplace or gas stove, automobile use and being in a restaurant. Concentrations of benzene in outdoor air were a significant factor for study participants in Ostrava.