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New Findings from the Study “Healthy Ageing in an Industrial Environment

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The molecular epidemiological study as part of the Project of Excellent Research “Healthy Aging in Industrial Environment” addressed the effect of selected environmental factors on the health and aging of the population.

The Moravian-Silesian region of the Czech Republic was identified as the study site based on the hot spot of air pollution in Central Europe. The South Bohemia region, which is being used as control locality, is considered as the region with the lowest air pollution level in the Czech Republic. The study cohorts included 500 mothers who long-lived in the regions and their newborns; 125 city policemen who worked mostly in streets with higher levels of pollution; and 400 recreational runners who may be negatively impacted by running in polluted air.

Biological material (venous blood, umbilical cord blood, plasma, urine, maternal dietary samples and breast milk after delivery) was collected from the volunteers. A series of biochemical and epigenetic tests were performed in all cohorts (oxidative damage, micronucleus test, DNA methylation level, miRNA expression profiles, contaminants in diets, etc). The study also hypothesized the adaptation to environment in city policemen. In city policemen from industrial region, biomarkers of early effects (=CpG sites) participating in regulation of genes involved in neurodegeneration, diabetes and respiratory diseases were found by performed DNA methylation analysis. In newborns born in polluted region frequent occurrence of demethylated sites in autoimmune diseased such as asthma, allergy and general disorder of immune functions.

By analysing the diet of mothers before child birth, insufficient intake of vegetables, dairy products and fibers was found. Concentration of PAHs in food is higher in air-polluted locality. Birth weight was higher with higher protein intake and maternal body weight. Oxidative damage in newborns was lower with protein intake in the mothers' diet. In recreational runners, the highest number of deregulated miRNAs was detected in female runners from a low pollution area compared to non-runners.

Analysis of micronuclei proved their significantly lower frequency in policemen from polluted area which confirms the earlier analysed trends that's suggested hypothesis on adaptation of population chronically exposed to high concentrations of the air pollutants. This study was supported by the European Regional Development Fund under Grant HAIE (CZ.02.1.01/0.0/0.0/16_019/0000798).

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