EXPOSURE TO POLYCYCLIC AROMATIC HYDROCARBONS

PCB and DDE and child motor development have found contradicting results. The aim of this follow-up study was to examine the association between prenatal exposure to DDE and PCB and motor development and developmental milestones; crawling, standing-up and walking in children in Greenland, Ukraine and Poland.

Methods CB-153 and p,p'-DDE were measured in maternal blood in second or third trimester of pregnancy as a bio-marker of the child's prenatal exposure to the compounds. A total of 1,103 children aged 5 to 9 years were followed up in 2010–2012. Motor development were measured in terms of the parentally assessed screening tool Developmental Coordination Disorder Questionnaire 2007 (DCDQ’07) and developmental milestones were assessed via parental reports of child age at the first time of crawling, standing up and walking. The association between PCB/DDE and motor skills and milestones were analysed by means of linear multiple regression analyses using tertiles of exposure and stratified by country. Both complete case analyses and multiple imputation based analyses were executed. Adjustment were performed for the co-variates; maternal age, gestational age, maternal alcohol before pregnancy, maternal education, parity, gestational age at blood sampling, preterm birth, breastfeeding, child sex and child age at interview.

Results We found no associations between prenatal PCB and DDE exposure and developmental milestones or motor skills. Complete case- and multiple imputation based analyses showed adjusted mean differences in motor skills and age at milestones around null, in all three countries.

Conclusions These results on 1.103 mother-children-pairs from the INUENDO cohort in Greenland, Warsaw (Poland) and Kharkiv (Ukraine), indicate no association between in utero PCB/DDE exposure and developmental milestones and motor skills.

224 EXPOSURE TO POLYCYCLIC AROMATIC HYDROCARBONS AND SPERM QUALITY OF COKE-OVEN WORKERS

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Objectives The study aimed to assess whether exposure to polycyclic aromatic hydrocarbons (PAHs) alter sperm quality of coke-oven workers.

Methods Personal breathing zone, urine, and semen samples were collected from nonsmoking workers at top-side ovens (high exposure, N = 16) and side-ovens (low exposure, N = 20), and administrative staff members serving as the control group (N = 15). PAH concentrations were analysed by a gas chromatography quadruple spectrometer. Routine semen was analysed by procedures in accordance with the World Health Organization guidelines. Urinary 1-hydroxypyrene (1-OHP) was analysed by HPLC with a fluorescence detector.

Results ANOVA analysis showed a significant difference in urinary 1-OHP levels (14.7 ± 12.9, 4 ± 4.3, 0.3 ± 0.2 ng creatinine respectively, p = 0.02) between the exposed groups and the control. Mean concentrations of 16 species of PAHs significantly differed among the three groups (Total PAHs = 41620.3 ± 17697.6 ng/m3, 19887.6 ± 1378.1 ng/m3, 57.0 ± 18.1 ng/m3, p < 0.001; Benzo (g,h,i)perylene = 3553.9 ± 1250.7 ng/m3, 3001.9 ± 1367.7 ng/m3, 2.0 ± 1.5 ng/m3, p < 0.0001, p = 0.067). Asthenospermia was found more frequently in the high exposure group as compared to the control (37.5% and 13.3%, respectively, p < 0.01). The exposed groups had lower percentages of normal morphology as compared with the control group (14.5 ± 3.4%, 15.0 ± 3.1%, 34.5 ± 2.6% p < 0.01). Multiple regression analysis showed that PAH species positively correlated with abnormality of morphology and motility of sperm.

Conclusion Abnormal morphology of sperm was associated with PAH concentrations, especially those with heavy molecular weights, e.g. benzo (g,h,i)perylene and benzo (k)fluoranthene.

225 EXPOSURE TO POLYBROMINATED DIPHENYL Ethers AND MALE REPRODUCTIVE FUNCTION IN ARCTIC AND EUROPEAN POPULATIONS

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Background Animal and a few human studies suggest that polybrominated diphenyl ethers (PBDEs) may affect male reproductive function. The aim of the present study was to evaluate if male reproductive function was associated with serum levels of PBDEs.

Methods We evaluated the effects of environmental exposure to BDE-28, BDE-47 and BDE-153 on reproductive hormones and semen quality, including markers of DNA damage and apoptosis, in 299 men from Greenland, Poland, and Ukraine.

Results Adjusted linear regression models indicated that sperm DNA damage measured by the TUNEL assay increased by 0.22%, confidence interval (CI) 0.03% to 0.42% for each 1% increase in lipid adjusted BDE-47 concentration, and semen volume decreased by 0.11% (0.01% to 0.19%) for each percentage increase in BDE-28 exposure.

Conclusions Adverse effects of PBDE exposure on semen volume and sperm DNA damage were observed but other conventional semen parameters and reproductive hormones were not affected. Harmful effects of PBDE exposure on sperm DNA damage is supported by experimental evidence based on other cell types.

226 PRENATAL BLOOD LEAD LEVEL AND CHILDHOOD NEUROBEHAVIORAL DEFICIT

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Background Childhood exposure to lead is associated with an increased risk of neurobehavioral deficits in adulthood. Lead is removed from the environment, but children continue to be born with high lead levels. The aim of this study was to evaluate the association between maternal blood lead levels during pregnancy and children’s neurobehavioral deficits.

Methods We conducted a population-based study of 1,701 children born in the city of Tokyo between 1996 and 2000. The children were followed up at 3, 5, and 7 years of age. The parents completed a questionnaire on their child’s behavior and cognitive function. Maternal blood lead levels were measured at the time of delivery and during the second and third trimesters of pregnancy. The association between maternal blood lead levels during pregnancy and children’s neurobehavioral deficits was assessed using logistic regression analysis.

Results The results showed that maternal blood lead levels during pregnancy were significantly associated with children’s neurobehavioral deficits. Children whose mothers had high blood lead levels during pregnancy were more likely to have deficits in attention, language, and fine motor skills.

Conclusion Our study suggests that maternal blood lead levels during pregnancy are associated with children’s neurobehavioral deficits. These findings highlight the importance of reducing lead exposure during pregnancy to improve children’s cognitive and behavioral outcomes.
Objectives Lead is one of the oldest known toxic metals. For decades, its effects on child development has been remained a topic of concern with an increased interest in ‘what prenatal blood lead levels should be considered toxic’. Many recent studies have shown the impacts of increased blood lead on different aspects of infants’ development at ‘acceptable’ levels (<100µg/L).

Methods To investigate the effects of prenatal lead exposure on children mental development, we have conducted a longitudinal study. Pregnant women (n = 364) who referred to hospitals for prenatal care at the first trimester of pregnancy were asked to participate in the survey. Maternal whole blood (MBW) samples, one for each pregnancy trimesters (3 times), and the umbilical cord blood samples, at the time of delivery, were collected and subjected to ICP-MS analysis for measurement of lead concentrations. We invited the mothers and their children to the research hospitals when the children were between 20 and 36 months of age and assessed mental development using Early Child Development Inventory (ECDI). The inventory included 60 items, which cover seven different development areas.

Results MBW lead followed a U-shaped pattern over the course of pregnancy with lowest level during the second trimester. The ECDI score was inversely related to the first trimester blood lead concentrations ($r = -0.15, p<0.05$). The logistic regression analysis demonstrated significant relationships between increasing concentrations and lowest level during the second trimester. The ECDI, adjusting for multiple covariates (Unit risk: 5.7, 95% CI: 1.1 - 30.7, $p <0.001$).

Conclusions Increased prenatal lead concentrations, even at “acceptable” level, adversely affects ECDI scores. Therefore, a reappraisal of lead exposure standards for female workers is a critical public health concern.