Effects on maternal health

In this guide

102. Wang et al. (2022) conducted a case-control study with 84 participants in China. Logistic models were used to estimate odds ratios for preeclampsia (PE) risk and birth outcomes according to maternal blood Hg levels. Elevated BHg levels were found and associated with increased risks of mild PE (aOR, 7.03; 95% CI, 1.61, 30.62; $P < 0.01$) and severe PE (aOR, 47.55; 95% CI, 5.27, 429.05; $P < 0.05$). Increased blood Hg levels were also associated with low birth weight (aOR, 1.12; 95% CI, 1.00, 1.25; $P < 0.05$) and preterm birth (aOR,

1.22; 95% CI, 1.08, 1.38; P < 0.05).

103. McClam et al. (2023) investigated associations between blood concentrations of Pb, Cd, Hg, and their mixture and infertility and long-term amenorrhea in women aged 20-49 years using the US National Health and Nutrition Examination Survey (NHANES) 2013-2018 cross-sectional survey. A total of 1,990 women were included for the analysis of infertility and 1,919 women for long-term amenorrhea. The blood concentrations of Pb and heavy metal mixtures were significantly higher in ever-infertile women than pregnant women, but the concentrations of Cd and Hg were comparable. After full adjustment, multiple logistic regression analyses revealed a significant and dose-dependent positive association between blood Pb concentrations and women's historical infertility, a negative association between Cd and women's long-term amenorrhea, and no associations between Hg and heavy metal mixture and women's infertility or long-term amenorrhea.

104. Zhang et al. (2023) measured whole blood metal(loid)s in women at preconception, 16, 24 and 32 weeks of gestation and in cord blood in 100 mother-newborn pairs. the Mean concentrations of Hg, Pb, Rb, Mn, and Fe were lower during early-, mid-, and late-pregnancy than at preconception. Concentrations at preconception were correlated with those during pregnancy for all examined metal(loid)s. Maternal Hg, Pb, and Se concentrations at late pregnancy were correlated with those in newborn cord blood in various degrees (correlation coefficients: Hg 0.66, Pb 0.29, Se 0.39). The estimated placental transfer ratio for toxic metal(loid)s ranging from 1.68 (Hg) to 0.18 (Cd). The authors concluded a high degree of transplacental passage was observed in toxic metals Pb and Hg which may pose hazards to the developing fetus.

105. Wang et al. (2019) studied 1442 mother-child pairs recruited at birth and followed up to age 15 years from the Boston Birth Cohort in the United States. Maternal blood Hg levels were found to positively associate with child overweight or obesity (OWO) from age 2-15 years, independent of maternal pre-pregnancy OWO, diabetes, and other covariates. The relative risk (RR = 1.24, 95% CI 1.05-1.47) of child OWO associated with the highest quartile of Hg exposure was 24% higher than those with the lowest quartile. Maternal pre-pregnancy OWO and/or diabetes additively enhanced Hg toxicity. The highest risk of child OWO was found among children of OWO and diabetic mothers in the top Hg quartile (RR = 2.06; 95% CI 1.56-2.71) compared to their counterparts.

106. Yu et al. (2019) chose from a prospective birth cohort of 3201 women in Shanxi Province, China to study associations between spontaneous preterm

birth (SPB) and As, Cd, Cr, Hg, and Pb maternal serum concentrations. The study found no significant associations of the serum concentrations of the five concerned toxic metals with the SPB likelihood.

107. Sakamoto et al. (2018) compared maternal and cord blood concentrations of biochemical substances, total Hg and Se, vitamin E, DHA, and other elements, fatty acids, and amino acids in 54 Japanese mother– newborn pairs to elucidate the foetal risk of MeHg toxicity. Cord blood had higher haematocrit and amino acid values and lower concentrations of lipid components, including fatty acids compared with maternal blood. THg levels in cord blood (7.26 ng/g) were 1.9 times higher than levels in maternal blood (3.79 ng/g). Se concentrations in cord blood (176 ng/g) were slightly higher than concentrations in maternal blood (156 ng/g). Levels of vitamin E (0.31 mg/dL) and DHA (58.8 µg/mL) in cord blood were much lower than levels in maternal blood (1.38 mg/dL and 147 µg/mL, respectively). Therefore, the ratios of Se/THg, vitamin E/THg, and DHA/THg in cord blood were lower than ratios in maternal blood. As Se, vitamin E and DHA are thought to be protective factors against MeHg the lower ratios of these against THg in cord blood suggests that foetuses are at higher risk of MeHg toxicity.

108. Molina-Mesa et al. (2022) investigated deposits of four heavy metals (Pb, As, Cd, and Hg) in the placentas of women who gave birth at term in their setting. 103 placentas were studied, obtained by consecutive sampling, of women that delivered in the Regional Maternity Hospital of Malaga between March and June 2021. Detectable concentrations of mercury were found in 100% of placental samples (mean 38.1 ng/g, SD: 30.4) compared to 14.56%, 44.6% and 81.5% of samples for As, Cd, and Pb, respectively. The mean placental Hg concentration, 38.1 ng/g, is high compared to mean and median values from populations that consume less fish reported at 1.4 ng/g (Iowa United States, n = 38), 4.99 ng/g (Six rural counties of Northern China, n = 140), 10 ng/g (Upper Silesia Region in Poland, n = 40) (Pitkin et al., 1976; Tong et al., 2020; Kozikowska et al., 2013).

109. Bocca et al. (2019) assessed the concentrations of selected toxic (As, Cd, Cr, Hg, Ni, Pb) and essential trace elements (Co, Cu, Mn, Se and Zn) in blood and urine samples of delivering women at different periods of gestation and in cord blood, as well as to evaluate the placental permeability for these elements. A total of 53 women participating in the HEALS-EXHES (Health and Environment-wide Associations based on Large population Surveys -European Exposure and Health Examination Survey) study were enrolled (conducted in Spain). Specifically, 48 blood samples from 1st trimester of pregnancy, 40 blood samples at delivery, and 31 cord blood at delivery were collected. Mothers’ urines were

sampled at the 1st (53 samples), 2nd (53 samples) and 3rd trimester (49 samples) of pregnancy. Results showed that Hg and Mn levels in cord blood were about 2.0 times higher than in maternal blood, suggesting that these elements may be transferred from mother to fetus. Correlation between paired maternal and cord blood samples for As, Hg and Pb was statistically significant indicating that the foetal body burden may reflect the maternal exposure. Maternal urinary concentrations of trace elements, including As, Cr, Cu, Hg, Se, and Zn decreased along pregnancy, which may cause variations in foetal exposure. The authors concluded “the levels of toxic and essential elements in maternal blood and urine, as well as in cord blood, were for most elements at the lower end of the ranges found in the scientific literature not being of special concern for pregnant women and the unborn”.