

EFFECTS OF ARSENIC EXPOSURE ON CHILD IMMUNE RESPONSE AND COGNITIVE DEVELOPMENT

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Background and Aims: Inorganic arsenic, a potent toxicant and carcinogen, is frequently present in drinking water, but little is known about consequences of early-life exposure. Our on-going large mother-child cohort study in rural Bangladesh, where arsenic concentrations in drinking-water and food vary considerably, aims at evaluating health effects of pre- and postnatal arsenic exposure. Initially, prenatal arsenic exposure was found to be associated with low birth weight and increased risk of infant mortality and morbidity. Arsenic-related impaired thymus development indicated immunosuppression, why we follow the children's health and development.

Methods: We measured arsenic metabolites in urine twice in pregnancy (first and third trimesters) and twice during childhood (1.5 and 5 years) in 2000 mother-child pairs. Placenta and cord blood at delivery (sub-sample) were analysed for immune (immunohistochemistry) and inflammatory markers (multiplex cytokine assay). Cord blood T cell receptor excision circles (TRECs) were measured by Real Time-PCR. We assessed child development of about 1700 children at 5 years using Wechsler Preschool and Primary Scale of Intelligence (IQ) and morbidity by 14 days recall.

Results: Immunosuppression of arsenic was indicated by reduced number of T cells and increased expression of inflammatory cytokines in the placenta, and altered TRECs and cytokine levels in cord blood. We also found that arsenic exposure was significantly negatively associated with verbal and full scale IQ (multivariable-adjusted models) in a sex-dependent manner. A urinary arsenic concentration of 100 µg/L was associated with decrements of 1-3 points in VIQ and FSIQ in girls, but not in boys.

Conclusion: Early-life arsenic exposure adversely affects children's immune function and cognitive development. Many children continue to be exposed in Bangladesh, in spite of extensive mitigation efforts, and we plan to follow-up these children at an older age.

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