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Late effects of early life exposure to arsenic

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Inorganic arsenic is frequently present at elevated concentrations in ground water. Chronic arsenic exposure causes multiple health effects, including various forms of cancer. The effects are mostly documented at adult age, and little is known about variations in susceptibility depending on e.g. time of exposure. Arsenic readily passes the placenta, giving rise to similar exposure levels in the fetus as in the mother, but little is excreted in breast-milk. There is increasing evidence that prenatal exposure causes adverse effects on health and development in utero and in early childhood. As early life environment is known to be critical for development of various health effects later in life, it is plausible that prenatal arsenic exposure contributes to such effects. In fact, recent epidemiological studies indicate that exposure since birth results in elevated risk of lung disease later in life, but slightly lower risk for arsenic-related skin effects. There is an increasing body of data showing dose- and gender specific mechanisms of arsenic, in particular epigenetic effects and interactions with multiple hormonal systems. Arsenic is known to inhibit several S-adenosylmethionine (SAM) dependent methylation reactions, including DNA methylation, and several enzyme systems, which have critical roles in the imprinting processes and growth regulation. Arsenic metabolism via reduction and methylation is known to modify the susceptibility to arsenic toxicity in adult life. However, there is little information on the fate of arsenic in young children and how the metabolism affects the susceptibility to arsenic-induced toxicity in utero and early childhood.