

# Rising global health issue regarding arsenic contamination: Gestational arsenic exposure impacts on neuroimmune markers and anxiety in F1 offspring

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## ABSTRACT

**Introduction:** Arsenic is a developmental neurotoxicant and drinking water contaminated with arsenic is a still global health issue. However, little is known about the effect of arsenic exposure on anxiety-like behavior. This study aimed to detect the effect of gestational arsenic exposure on anxiety-like behavior and related gene expressions in F1 female mice. **Materials and methods:** Pregnant C3H/HeN mice (F0) were given drinking water containing 85 ppm sodium arsenite from gestational day 8 to 18. The control mice were given tap water only. 74-week-old F1 female mice were examined by open field test. Expression of neuroimmune markers and apoptosis-related genes in the prefrontal cortex was determined by real time RT-PCR. This protocol was approved by the Ethics Committee of National Institute for Environmental Studies, Japan (AE-22-12). **Results and conclusion:** The arsenic-exposed F1 female offspring showed decreased number of entries into center and shortened time spent in the center compared to the control mice. Down-regulation of brain-derived neurotrophic factor (BDNF) and upregulation of caspase-3, nuclear factor kappa-light-chain-enhancer of activated B cells (NF- $\kappa$ B), interleukin 1 $\beta$  (IL-1 $\beta$ ), cyclooxygenase 2 (COX-2), Bcl2-associated X protein and microglial marker ionized calcium-binding adapter molecule 1 (IBA1) mRNAs in the prefrontal cortex were observed in the arsenic-exposed F1 offspring. BDNF plays a key role in the neuronal survival and anxiety. Our findings indicate that gestational arsenic exposure induces intergenerational effect on behavior and neuroimmune markers in the later life of F1 offspring. Government concerns should aware and develop cost-effective technologies for prevention of arsenic contamination in the community.

**Keywords:** Arsenic, Gestational exposure, F1 female mice, Anxiety, Apoptosis