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Functional imaging examination of adolescents with different levels of developmental neurotoxicant exposures

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Background: Developmental exposures to methylmercury and polychlorinated biphenyls (PCBs) are associated with deficits in cognitive, sensory, motor and other functions as measured by behavioural tests. To explore possible structural changes, we applied functional magnetic resonance imaging (fMRI) in children with different levels of developmental neurotoxicant exposures.

Methodology: Twelve adolescents from the Faroese cohort assembled in 1986-1987 were recruited based on widely differing prenatal exposures to methylmercury and PCB. All underwent fMRI scanning during behavioural challenges. Averages were computed for three children in each of four groups with high/low methylmercury/PCB exposure.

Results: Children with low exposure levels showed normal patterns of fMRI activation during visual and motor challenge tasks. Children with high mixed exposure showed activation in more areas of the brain and different patterns of activation than the low exposure group. High PCB exposure and intermediate methylmercury exposure showed similar, though less marked patterns of deviations from normal.

Implications: MR imaging of the functioning brain in healthy adolescents reveals aberrations in brain activation associated with increased exposures to methylmercury and PCBs. This methodology has potential utility in documenting and visualizing structural neural system determinants of exposure-induced behavioural dysfunction.