Increased risk of attention-deficit/hyperactivity disorder associated with exposure to organophosphate pesticide in Taiwanese children.

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Abstract

Attention-deficit/hyperactivity disorder (ADHD) is male predominated, and the etiology of this disorder remains unclear. Past studies have assessed the association of low-level organophosphate pesticide exposure with childhood ADHD cross-sectionally and prospectively. However, the results have been inconsistent. A first case-control study was performed to investigate the relationship between organophosphate pesticide exposure and ADHD with adjusted covariates. We recruited 97 doctor-diagnosed ADHD cases and 110 non-ADHD controls who were 4-15 years of age. Exposure was assessed using urinary levels of dialkylphosphate metabolites, which are biomarkers of OP pesticide exposure. Blood lead levels and polymorphisms of two commonly verified dopaminergic-related genes (the D4 dopamine receptor gene DRD4 and the dopamine transporter gene DAT1) were also analyzed. The sociodemographics and lifestyles of the children and of the mothers during pregnancy were collected using a questionnaire. The blood lead levels of both groups were similar (1.57 ± 0.73 vs. 1.73 ± 0.77 μg/dL, p = 0.15). Significant urinary concentration differences in one of the six dialkylphosphate metabolites, dimethylphosphate (DMP), were found between ADHD and control subjects (322.92 ± 315.68 vs. 224.37 ± 156.58 nmol/g cr., p < 0.01). A dose-response relationship was found between urinary concentrations of DMP and ADHD in both crude and adjusted analyses (p for trend<0.05). Children with higher urinary DMP concentrations may have a twofold to threefold increased risk of being diagnosed with ADHD. We report a dose-response relationship between child DMP levels and ADHD. Organophosphate pesticide exposure may have deleterious effects on children’s neurodevelopment, particularly the development of ADHD.