Abstract: Urinary Pesticide Metabolites in School Students from Northern Thailand

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We evaluated exposure to pesticides among secondary school students aged 12–13 years old in Chiang Mai Province, Thailand. Pesticide-specific urinary metabolites were used as biomarkers of exposure for a variety of pesticides, including organophosphorus insecticides, synthetic pyrethroid insecticides and selected herbicides. We employed a simple solid-phase extraction with analysis using isotope dilution high-performance liquid chromatography tandem mass spectrometry (HPLC-MS/MS). A total of 207 urine samples from Thai students were analyzed for 18 specific pesticide metabolites. We found 14 metabolites in the urine samples tested; seven of them were detected with a frequency17%.

The most frequently detected metabolites were 2-[(dimethoxyphosphorothioyl) sulfanyl] succinic acid (malathion dicarboxylic acid), para-nitrophenol (PNP), 3,5,6-trichloro-2-pyridinol (TPCY; metabolite of chlorpyrifos), 2,4-dichlorophenoxyacetic acid (2,4-D), cis-and trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-1-carboxylic acids (c-DCCA and t-DCCA; metabolite of permethrin) and 3-phenoxybenzoic acid (3-PBA; metabolite of pyrethroids). The students were classified into 4 groups according to their parental occupations: farmers (N=60), merchants and traders (N=39), government and company employees (N=52), and laborers (N=56). Children of farmers had significantly higher urinary concentrations of pyrethroid insecticide metabolites than did other children (p<0.05). Similarly, children of agricultural families had significantly higher pyrethroid metabolite concentrations. Males had significantly higher values of PNP (Mann–Whitney test, p=0.009); however, no other sex-related differences were observed. Because parental occupation and agricultural activities seemed to have little influence on pesticide levels, dietary sources were the likely contributors to the metabolite levels observed.

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