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Urine metabolomics revealed complex pesticide exposure in farmers in Chinese

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Metabolomics was conducted in urine using HPLC-quadrupole time-of-flight mass spectrometry (QTOF-MS). Pesticide-related metabolic biomarkers were investigated by comparing 76 farmers in the agricultural area with 30 office workers as long-term exposure to low level pesticides research. Comparison of urine metabolites of 76 farmers before and after spraying with pesticides as acute exposure research was carried out. A series of metabolites were analyzed using multivariate analysis. To further find discrepant metabolites reflecting metabolic characteristics between controls and exposure groups both in long-term and acute exposure study, principle component analysis (PCA) and partial least-squares discrimination analysis (PLS-DA) were implemented. High resolution MS/MS analyses, METLIN and MASSBANK database system were performed for the identification of the metabolites of interest. Finally, the most statistically significant changes in long-term exposure were observed for kynurenine and glycine significantly increased while dopamine, 5-hydroxytryptamine, tryptophan, hippuric acid, taurine, and citrate decreased among the farmers. 5 metabolites were identified as potential urinary biomarkers of acute pesticide-induced toxicity including dopamine, serotonin, tyrosine, tryptophan, taurine and hippuric acid (downward trend), and canine urea and creatine (upward trend). To discuss the mechanism of the different ways of pesticide exposure, oxidative stress (as determined by urinary 8-oxo-deoxyguanosine levels) and inflammatory markers were elevated in individuals with long-term pesticide exposure, supporting the hypothesis that xenoestrogen accumulation was causing mitochondrial dysfunction. These changes of metabolites in acute exposure may relate with the nervous system and liver function damage. This study demonstrated that metabolomics could be used to investigate pesticide-related biomarkers causing metabolic changes.

Biography

Yan-xin Zhang is pursuing PhD at the School of Chemical Engineering & Technology, Harbin Institute of Technology, China. She has been engaged in the study of metabolomics in Chinese Academy of Agricultural Sciences for two years. The research is to evaluate the hazards of pesticides and pesticide additives on the body by using metabolomics, supported by the special program for basic work of the Ministry of Science and Technology of China. In order to fully complete the study, she has participated in the training of high resolution mass spectrometry by AB SCIEX and multivariate analysis (SIMCA software) by UMETRICS.

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Notes:

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