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Press information

Analysis of metabolic fingerprints of pregnant women living in proximity to cereal farming areas

An exploratory study published today by Sylvaine Cordier and her team ("Health, Environment and Work Research Institute", a mixed Research Unit with input from Inserm, the Université de Rennes 1 and the Ecole des Hautes Etudes en Santé Publique) and researchers from Inra in Toulouse, suggests that environmental exposure to complex pesticide mixtures could lead to metabolic disturbance in pregnant women. Observations indicate that concentrations of elements, such as amino acids or other organic acids, were modified in the urine of the pregnant women, suggesting an oxidative stress and a modification of the energy metabolism. The study was performed on 83 pregnant women from the PELAGIE cohort (Brittany), who were split into three groups, according to the areas of land dedicated to agricultural cereal activities in their town of residence. Details of the research are published in the [PLOS ONE](#) review.

Using pesticides can lead to the contamination of different environmental media (air, water, soil, food). As a consequence, exposure of the general public is possible, as shown by the presence of some pesticides in biological fluids and tissues. In addition to dietary exposure, exposure of the general public may result from the use of pesticides at home (use of household and gardening insecticides, etc.) and in proximity to the home. Pesticides used by professionals are dispersed into the atmosphere and could be a source of population exposure at varying distances from the area treated.

During pregnancy, the foetus is particularly vulnerable to environmental factors and low doses of toxic substances could be responsible for development disorders and trans-generational health effects. Although the toxicity in high exposure conditions of several pesticides is well documented, questions remain about the effects of low doses of these molecules (environmental). Furthermore, as yet little is known about the impact of a combination of these exposure types. In addition to studies into the presence of pesticide residue in human biological fluids, one of the possible approaches to take account of these multiple exposures is to study the biological modifications in the exposed organism. The objective is to improve understanding of the mechanisms involved in exposure to pollution. The modifications can be identified by performing an overall analysis of metabolites in biological fluids (metabolic fingerprinting). Metabolites are small molecules involved in the functioning of the organism to sustain cell growth, balance and functions. Examples of metabolites are amino acids, small-sized organic acids (citric acid, hippuric acid), sugar, simple fatty acids, hormones, polyphenols, vitamins, alkaloids, minerals, etc.

This exploratory approach was implemented in 2004 using a sample of 83 pregnant women, taken from the PELAGIE (Endocrine disruptors: longitudinal study into pregnancy anomalies, infertility and childhood) mother-child cohort, which has been run by Inserm in Brittany since 2002. Three groups of women were composed in accordance with the proportion of cereal farming in their town of residence. The metabolites in the urine of these women, sampled during the first trimester of pregnancy, were characterized using a spectroscopic analysis technique (nuclear magnetic resonance) combined with a statistical method used to

distinguish the three groups. The technique thus identified the metabolites for which the level of expression is modified between the three groups.

The first results of this study suggest modifications to the concentration of some metabolites in the urine of pregnant women living in towns with high levels of cereal farming; in particular, metabolites that may be involved in oxidative stress mechanisms and in the modification of the energy metabolism. These elements led the researchers to suggest that environmental exposure to complex mixtures of pesticides, such as those used in 2004 on cereal crops, could lead to metabolic disturbances in pregnant women, for which the clinical significance, for the woman or her child, is yet to be assessed.

This is the first exploratory study conducted by Inserm Unit 1085 (IRSET) in Rennes, the Université de Rennes 1 and the Ecole des Hautes Etudes en Santé Publique (EHESP), in partnership with INRA in Toulouse (Toxalim). The study is part of a global research project that combines epidemiological research with toxicology studies to better understand metabolic pathways modified during multiple and complex exposure to pesticides (METABOLE project, www.irset.org). Ultimately, these elements could be used to better understand the effects of pesticides on health.

For further information:

➤ **Source**

“Metabolomics tools for describing complex pesticide exposure in pregnant women in Brittany (France)”

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