Pesticide exposure measurable through sewage water

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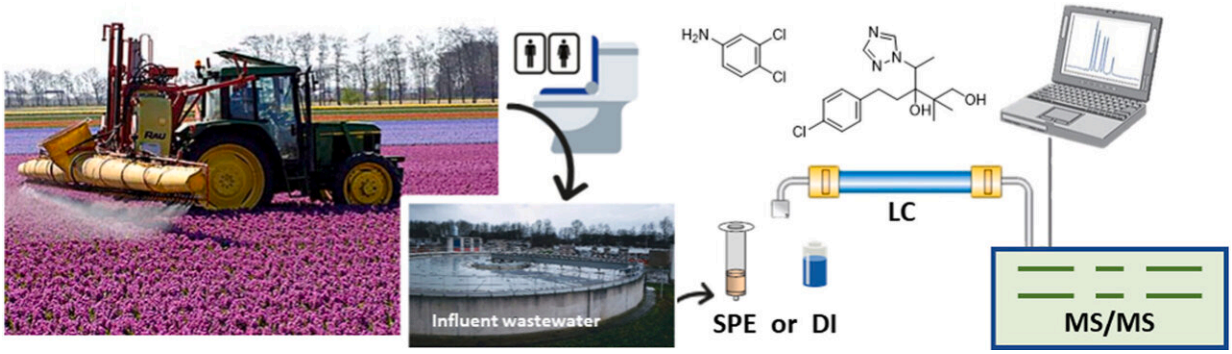

Graphical abstract. Credit: *Chemosphere* (2022). DOI: 10.1016/j.chemosphere.2022.135684

For the first time, scientists from the University of Amsterdam and a Spanish university have developed a method to quickly determine the exposure of people to pesticides via the analysis of wastewater. The researchers published their work in the scientific journal *Chemosphere* this Summer.

The analysis of sewage water and application of wastewater-based epidemiology is already done for drugs such as cocaine and for viruses such as COVID-19. Now, a reliable and accurate method has been added of tracing the exposure to pesticides of a population living for example near flower bulb fields.

Flower bulb and fruit cultivation

Chemical analyst and expert in wastewater-based epidemiology Lubertus Bijlsma says that "in flower bulb cultivation, local residents can ingest pesticides by breathing it in, after which they end up in the human body. But the pesticides are also used in, for example, fruit cultivation and are part of their daily diet"

Until recently, Bijlsma was a postdoctoral researcher at the Institute for Ecosystem Dynamics (IBED) at the University of Amsterdam (UvA) and is now working at the University Jaume I in the Spanish coastal city of Castellón. The new method is therefore a collaboration with this Spanish institution.

One measurement for 200,000 inhabitants

The reason for setting up the new analysis was the news in 2019 that residents of Dutch bulb fields had pesticide residues in their urine. Bijlsma says that "we measure the so-called metabolites, the substances that are created when the pesticide is converted in people's bodies. Urine samples from people living close to and further away from a bulb field, as well as scientific literature, had shown which 14 metabolites, serving as biomarkers, remain as residues of agricultural pesticides after they have been excreted by the human body."

But that method requires so much cooperation with local residents that it cannot be used on a large scale. "For example, you would have to take 200 measurements of urine samples for 200 local residents. We examined which of the 14 substances from previous research are suitable for use in a faster and larger-scale method. Now, with one measurement we can monitor for example 200,000 inhabitants of a middle large city, and we can find out the extent to which they have been exposed to

pesticides. We have now identified 10 metabolites and one pesticide that can be used for waste water research."

Robust, validated method

The researchers are working with minimal amounts of poison found in sewage. "We work at trace level i.e., nanograms per liter," says Bijlsma. "It's great that we were able to set up a robust, validated method from this in the lab via chromatography and mass spectrometry. In the near future we will be able to publish the results of an applied study on the exposure of residents of various areas in the Netherlands to pesticides, together with a risk analysis."

More information: Marina Campos-Mañas et al, Analytical research of pesticide biomarkers in wastewater with application to study spatial differences in human exposure, *Chemosphere* (2022). DOI: 10.1016/j.chemosphere.2022.135684

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