

# June, 25th 2021 Food compliance explained by Bayer researchers



From field to fork, the tests and analyses carried out by Bayer on plant protection products help to assess any risk to consumer health.

Organized on June 18 during the National Agricultural Days, the virtual visit of the residue analysis laboratory located in Lyon shows the rigor of the protocols followed to guarantee food safety in Europe. The guiding principle of each operation? Absolute traceability.



"Here in Lyon, at the Bayer research site, we weigh molecules!" Equipped with connected glasses, Philippe Méresse, LifeHub Lyon and Dialogue Manager at Bayer, points to the row of mass spectrometers installed in the heart of the residue analysis laboratory. With him, at their computers, 28 participants registered for National Agriculture Days on June 18 follow the track of a sample of ground carrots until the final analysis.

From one of these machines will come the answer to such an essential question: is the quantity of residues of a molecule that is a candidate for registration approval contained in this sample safe for the health of the consumer?

### **Quantity of molecule residues below the approved limits**

To qualify for approval, the quantity of residues found in analyzes carried out on the harvested raw material must be below a regulatory limit. The analyses also concern processed food products. "The objective is to rebuild the consumer's diet," adds Adeline Mousques, specialist in consumer risk assessment at Bayer. For example, in the case of a crop protection product developed for the protection of wheat, we must precisely measure the residues in flour and bread but also in eggs, milk, fat, meat, because the animals are fed with cereals. Different extraction methods are therefore set up in the laboratory to quantify the residues in these very complex matrices. "

The quantification level for residues is set by regulation at 0.01 mg / kg, which is equivalent to looking for the sugar molecules of 4 pieces of sugar dissolved in an Olympic-size swimming pool! In other words, these machines know how to find a needle in a haystack.

For each molecule, a "maximum residue limit" (MRL) must be determined, that will guarantee that the future crop protection product does not pose a risk to the health of the consumer. It determines the conditions of use of the future product which will be written on the label, when the marketing authorization has been granted by the European Commission and, in France, by ANSES.

## **M** Residue analyses are conducted according to a strict regulatory protocol

Until this step in a GLP laboratory, the molecule has already successfully passed all agronomic and ecotoxicological tests. Since GLP means "Good Laboratory Practices", only a visit to such a site shows all the rigor of the regulatory protocols to be met at this stage. "The essential tool for every analyst is the hand-held device!" emphasizes Philippe Méresse, pointing out the bar codes that appear on the various bottles, tubes and boxes of samples. This scanning is done to ensure traceability and rigorous procedures. A sample will have the same barcode throughout its cycle, from the field to the results recorded in the final reports. This way, we can provide proof of the proper conduct of all our analyzes during the inspections required every 2 years by the French Accreditation Committee (Cofrac). Its task is to assess the

competence and integrity of the laboratory. » Only the certificate of conformity issued by the Cofrac inspectors validates all the studies of the registration documentation carried out since the last inspection.





Bayer's residue analysis laboratory quantifies traces of pesticide residues in food samples from various of the company's European field trial sites.

## Tracking a food sample through the lab to quantify the residues of crop protection compounds

The sample of carrots comes from trials carried out under strict conditions of application of crop protection product, which must be declared on the product label if it is approved.

Immediately frozen when leaving the field, the samples are homogenized in the Monheim Research Center in Germany, stored below -18 ° C, then shipped to Lyon. Between collection in the field and their analysis, up to several months can pass. The samples must keep this temperature throughout this time of transport and storage.

The tolerance of weight variation in a sample is very small, +/- 0 1%. For a sample of 5 g of carrot for example, the weight should be between 4.95 and 5.05g. Throughout the process, weighing the samples requires high precision because the final result is expressed in the quantity of residues per kg of food.

Traceability also concerns the employees. Trained and qualified according to the principles of GLP (Good Laboratory Practices), the lab tracks who does what at each step of the process.

Residues are extracted from the samples using a specific solvent, which has been developed by researchers in Monheim, Germany. This specific solvent must extract all the residues of the parent product but also those generated after the degradation of this product in the plant. The sample liquid will also contain chemical compounds generated by

#### the plant, for example carotene for carrots.

A label applied to each device shows an identification number, the very precise measurement technique and the various inspections. Only qualified equipment can be used for this quantitative analysis. Every two years, COFRAC inspectors come to check that the analyses are carried out correctly and interview the employees. From the collection of the sample to the results recorded in the final reports, the inspectors can verify that all the operations have been carried out under the strict conditions that we have just described.

Liquid chromatography analysis (LCMS) is a two step process. The chromatography column purifies the product and serves as a filter. It contains several hundred molecules. Only the desired molecules and the metabolites are kept. They are then brought into the device which will weigh them.





A fundamental element in this first step of residue analysis: the freezing of samples. The weight of the sample must be the same before and after freezing, until it is analyzed.



The weighing of the sample needs to be very precise because the quantity of residues is calculated per kg of food



EXTRACTION



EXTRACTION 2

Different systems are used to extract the residues from the sample, here from carrot.



The solvents are prepared in an isolated room to avoid contamination.



The centrifuge separates the solid matrix from the liquid to be analyzed.





Clearly marked equipment, such as pipettes, is calibrated regularly.









Liquid Chromatography Coupled Mass Spectrometers (LCMS) are the machines that measure the quantity of residues. These highly specific and ultra-sensitive machines, also frequently calibrated, isolate and then weigh the molecules (parent product and its metabolites) to be quantified.



### Pesticide residues in food, a world of trace analysis

How do we measure the residues of registered plant protection products in our food? Each year, the European Union quantifies the pesticide residues present in 100,000 food samples. With this monitoring, it answers an essential question: is our diet safe for our health? Fruits and vegetables, processed foods of plant and animal origin, and wines, are subject to random and targeted controls in order to assess compliance rates. The benchmark? The Maximum Residue Limit (MRL). Established by the European Commission based on the scientific opinion issued by the European Food Safety Authority (EFSA), it relates to an active substance for a particular food product. "Our studies determine a level of residues per kg of food," explains Adeline Mousques, specialist in consumer risk assessment at Bayer. It must be lower than the maximum residue limit set for each crop protection product and each food. Note that the MRL is not the threshold at which a product becomes dangerous, there are exposure-related safety coefficients that have been applied. The MRL is an indicator of good agricultural practice. "

In Europe, the food compliance rate is over 95%. In more than half of the cases, traces are found that are less than 0.01 mg / kg. In France, the Fraud Detection service (DGCCRF) takes these samples from the food chain which are then analyzed by independent accredited laboratories.



Adeline MOUSQUES

Philippe MERESSE

Virtual guided tour of the Bayer residue analysis laboratory on June 18, by Philippe Méresse, LifeHub Lyon manager and Adeline Mousques, consumer risk assessment specialist. This initiative is part of the National Agricultural Days.

The La Dargoire research center in Lyon has an international reputation. It represents 5,000 m<sup>2</sup> of greenhouses and laboratories, including that of residue analysis. 25 to 30 patents are obtained per year from 30,000 molecules evaluated. 200 employees work on this site.

Bayer would like to thank the organizers of the National Agricultural Days for this initiative, which enables consumers to learn about food safety in Europe.