It looks genuine but it's not

Chemical fingerprints can be used to check food and feed composition. The respective methods should protect consumers from health risks.

In 2008, the issue of food adulteration gained huge publicity when around 300,000 babies in China needed medical treatment because of adulterated powdered milk. At least six infants died. The cause was infant formula to which melamine was added to feign higher quality. Melamine is a basic substance for synthetic resin and damages the kidneys.

Adulterated food and feed can also be found in Europe. For this reason, the BfR has been addressing authenticity issues for several years. Are substances added to a paprika spice to enhance the colour? Does a forage maize really originate from Ukraine? Does the wine really contain what the label promises? "Food authentication plays an important role in consumer protection," says Dr. Carsten Fauhl-Hassek, who heads several research projects on authentication at the BfR. It is about deception – nobody wants cheap sparkling wine from expensive champagne bottles – and health risks, as in the infant formula case.

A distinctive profile is created

Reliable methods have been developed to detect melamine and other substances that have been used in the past for adulteration. The problem is that you can only find what you are looking for. You can only search for known means of adulteration. The challenge is

detecting adulterations without knowing what they are beforehand. Scientists at the BfR are conducting research on precisely these non-targeted analytical methods (see BfR2GO 1/2017).

The three-year research project "FoodAuthent", which ended in December 2019, provided a scientific approach. The BfR and its partners put the chemical-analytical method here to the test with hard cheese, edible oil and spirits, collecting up to 100,000 pieces of individual information per sample. The data were used to generate a unique, distinctive profile comparable to a fingerprint. According to the concept, it can then be compared with other food samples (reference data). If the images do not match, this indicates an adulteration. The next step involves checking the tracing documents or an analysis for known substances.

Complex IT infrastructure needed

For the fingerprint approach to work unequivocally, reliable food and feed profiles must be collected in databases. Here, fluctuations must be taken into account since the same types of food may differ slightly in their composition. Likewise, laboratories provide slightly different profiles, even if the same instruments are used. For this reason, it is important to standardise analytical methods, says Fauhl-Hassek. "Only then can the data sets be compared and stored in inter-laboratory data collections."

Creating adequate databases also involves purely practical challenges: "We generate a lot of data that has to be collected, managed and analysed in a structured way," says Dr. Susanne Esslinger, project manager of "FoodAuthent". Databases, software and servers are required. In the future, it should be possible to store the information securely and exchange it between institutions, such as manufacturers, laboratories, retailers and authorities. "FoodAuthent" has demonstrated how this can be done in practice with a concept for open source software: "fAuthent". It might be easier to detect unknown adulterations perspectively in the future with the help of these kinds of databases and the profiles stored in them. However, it is unclear when they will be ready to be put into practice. "We will definitely need another ten years," expects Fauhl-Hassek.

Illegal animal additives

Besides this, the BfR is conducting research on authenticity in other projects. An interdisciplinary junior research group has been working on this topic for five years. In the completed EU project "FoodIntegrity", the BfR collected and assessed various analytical methods. With "Animal-ID", the BfR focuses on developing and validating tests for tracing and authenticating animal proteins. In doing so, the corresponding additives in food and feed can be better identified.

The challenge is in detecting adulterations without knowing what they are beforehand

Other activities at the BfR

Within the framework of the EU MEDIFIT project, which began in June 2020, Carsten Fauhl-Hassek's research group is focusing on developing routine-capable fingerprint procedures. It is focusing on traditional Mediterranean food. In the course of this, issues relating to the authenticity of honey, such as the unauthorised addition of sugar syrup or a false declaration of origin, are examined. ◘

More information:
www.bfr.bund.de/en
> FAQ: Food fraud and authenticity testing

www.foodauthent.de/en