

Food analytics – applied consumer protection

Consumers – in other words, all of us – rightly expect to be supplied with healthy, high-quality and safe foods. However, over the past few years, food scandals have frequently hit the headlines. They are brought to light in laboratories that have a huge arsenal of methods and procedures to analyse food. Although the media would have us believe otherwise, the vast majority of foods are safe and very rarely hazardous to human health. This is in large part due to the food industry which has a vital, and more importantly, economic, interest in the analytically-based quality control of the food it sells.

As an applied science, food analytics forms the basis for examining and assessing the quality and safety of the food we eat. In the broader sense, this also includes animal feed as it is part of our food chain. The determination of food quality focusses on two areas: the presence of ingredients that are important for human health, and, conversely, the absence of unwanted constituents (anti-nutritive factors, pesticides, heavy metals, toxins and microbiological contaminations such as the EHEC contamination that occurred in 2011). Foods are essentially mixtures, aggregations and dispersions of a broad range of chemical compounds.

An unlimited variety of foods

Access to anything at any time from all over the world: the supply of food is not only becoming more global, the number of different plant and animal foods, countries of origin, production standards related to plant and animal protection and agricultural technology is also growing. What's more, in addition to traditional goods, markets are being supplied with novel, dietary, functional and genetically modified foods. In their 2011 Annual Report (p. 120), the Baden-Württemberg food control and animal health authorities (CVUAs) concluded: the constant updating of the analytically detectable substance spectrum along with the use of state-of-the-art analysis equipment is becoming increasingly important."

That said, food business operators are primarily responsible for the safety of the food they produce or sell. This requires establishing measures that guarantee that food conforms with all relevant safety and quality requirements. Official control and inspection measures are carried out regularly to check the effectiveness of a food company's internal controls, meaning that the public authorities inspect the businesses' internal controls.

From farmers to takeaways

Detection of microbes in government laboratories.

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Inspection extends to all stages of food manufacturing: producers, manufacturers, storage, transport and sale of the food as well as the gastronomy sector. Authorities ensure that the composition of the products conforms with legal guidelines, that they do not pose a risk to human health and that they are correctly labelled. Laboratories look for the potential presence of pathogens and other unwanted substances that might have entered the food

without human intervention. These so-called contaminants are found in the environment from where they can enter a food item, either during the cultivation of plants and the rearing of animals, manufacture, processing, preparation, treatment, presentation, packaging, transport or during storage. A contaminant is therefore any potentially undesirable substance, including heavy metals, drug residues, dioxins, polycyclic hydrocarbons, mycotoxins and other environmental toxins. The foodstuffs are also examined for the presence of substances used during food production, including agricultural pesticides and food animal medications which are unwanted in food for human consumption.

The German states are responsible for monitoring in-house controls in Germany

Numerous authorities and institutions on different levels – from municipal authorities to the World Health Organisation – are tasked with ensuring food safety. In Germany, the responsibility for official food control and inspection lies with the federal states. Food inspection and veterinary offices in urban and rural districts carry out the monitoring programmes drawn up by the relevant state ministries, take samples and carry out regular checks of food business operators. On the federal level, two

authorities have coordinating capacities.

These two authorities were established in the aftermath of the food scandals in the late 1990s (e.g. BSE) with the objective of making the protection of consumer health more transparent. The Federal Office of Consumer Protection and Food Safety (BVL) is in charge of risk management (administration), and the Federal Office of Risk Assessment (BfR) is in charge of scientific risk assessment. Political responsibility lies with the German Federal Ministry of Food, Agriculture and Consumer Protection (BMELV).

The BVL was established for the purpose of improving coordination between the federal government and the federal states and improving the communication of risks. It coordinates several working groups, including the Work Panel of Food Chemistry Experts, and it is the German national contact point in the European Rapid Alert System for Food and Feed (RASFF). Both the Federal Office for Risk Assessment and the Federal Office for Consumer Protection and Food Safety are agencies that fall within the BMELV's remit.

The German food control and animal health authorities inspect around 500,000 food business operators per year. In the majority of German states, food safety control is done on three levels: on the top level, the competent state ministry coordinates official food control and inspection; the competent district authorities then coordinate official monitoring in the rural and urban districts, and on the third level, the food control and veterinary offices of districts and towns with independent administration inspect food business establishments.

Highest priority: the protection of human health

The results of Stiftung Warentest, a German consumer organisation involved in investigating goods and services in an unbiased way, are reputable, independent and benefit from a high level of public acceptance. The foundation also investigates sauces, like those shown in this photo.
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In Baden-Württemberg, the Ministry of Rural Areas and Consumer Protection (MLR) is responsible for food monitoring and the protection of consumer health. The ministry is particularly focussed on protecting consumer health as well as protecting consumers against any improper economic advantage arising from misleading statements and deception. The MLR supervises four district authorities which in turn coordinate the work of the food control and veterinary offices of the state's 44 districts and towns that take samples and inspect food business operators. They ensure that any discrepancies are dealt with and they can prosecute offenders if necessary. Food inspections are conducted by appropriately qualified food inspectors and official veterinarians, sometimes accompanied by experts from the fields of veterinary medicine, food chemistry and human medicine. Offenses are notified to the public prosecution service.

The qualified inspectors take samples which are forwarded to one of four CVUAs (Investigative Office for Food Control and Animal Health) in Freiburg, Karlsruhe, Sigmaringen or Stuttgart. The samples are then investigated and assessed by food chemists, veterinarians and experts from other disciplines (pharmacists, biologists). Samples are requested and collected in agreement with the relevant food control and inspection authorities; however, the number of food safety regulation violations is not representative and only allows limited conclusions to be drawn on the quality of foodstuffs. The food inspectors take foodstuff samples at all stages of production, processing and trade, although the task is slowed down by the shortage of qualified inspectors (see interview with Martin Müller, chairman of the Association of Food Inspectors; *Lebensmittelzeitung*, 8th March 2012).

Division of labour in the laboratory

Large numbers of samples need to be analysed in government laboratories in a relatively short time, which is why specialist laboratories focus on different aspects. The investigation of samples for the presence of trace amounts of pollutants and contaminants such as dioxins, pesticides, veterinary drugs and mycotoxins is a rather complex and time-consuming process and is carried out in special, central laboratories. Specialised federal research institutions that come under the auspices of German ministries are organised in a similar way. Food business operators who do not carry out quality controls in-house commission external testing laboratories to do the job for them (more information about the German Association of Independent Testing Laboratories is provided through the link in the right-hand corner).

Baden-Württemberg is home to three European Union Reference Laboratories (EU-RL): the EU-RL for dioxins and PCBs in food and feed and the EU-RL for pesticides in foods of animal origin and commodities with high fat content are located in the CVUA Freiburg, and the Stuttgart-based CVUA houses the EU-RL for residues of pesticides. Most reference laboratories are located in the Berlin-based BfR.

According to the Baden-Württemberg food control and animal health authorities' 2011 Annual Report¹, Baden-Württemberg is home to around 230,000 food business operators, including 63,000 agricultural businesses. Of the 107,000 inspections carried out in 2011, more than 25% of the businesses were found to have violated existing food safety regulations, resulting in

391 criminal proceedings, 2,450 administrative offence proceedings and the immediate closing down of 1,595 businesses due to inappropriate hygiene standards.

The government laboratories investigated around 50,000 samples – carrying out chemical, physical and microbiological analyses (45,000 food items, 1,700 wines). 17 percent of the foodstuffs tested were found to have contaminations. 100 samples (0.2 percent) were rated as harmful to human health, largely due to the presence of bacterial pathogens (*Listeria monocytogenes*, *Bacillus cereus*, *Salmonella*, verotoxin-forming *Escherichia coli*), high levels of histamine (toxin produced by bacterial growth, the ingestion of which can lead to symptoms similar to allergic reactions) and extremely high capsaicin levels. According to the 2011 Annual Report, the proportion of fresh vegetable samples from third countries with pesticide levels higher than the maximum permissible levels was as high as 14 percent. 0.3% of all animal feed samples were found to be contaminated with higher than the maximum permissible levels of undesirable substances such as dioxins and heavy metals.

2013 had only just begun when toxic effects from mould (from Serbia) were detected in animal feed, and horsemeat (from Romania) was detected in beef products, causing major concern among the general public and testing laboratories to run extra shifts. Since February 2013, the Sigmaringen-based CVUA has been in charge of conducting all beef meat analyses in Baden-Württemberg; horsemeat was discovered in 20 of a total of 400 samples tested (including lasagne and tortellini). Regular inspections and the use of modern analysis methods are necessary in order to be able to identify and withdraw contaminated foodstuffs from circulation and ensure the safety of consumers.

Publication:

1) Baden-Württemberg Ministry of Rural Areas and Consumer Protection. (2011). *Annual report 2011: Überwachung Lebensmittel · Bedarfsgegenstände · Kosmetika · Trinkwasser · Futtermittel*. Retrieved from https://mlr.baden-wuerttemberg.de/fileadmin/redaktion/dateien/Altdaten/202/120727_Jahresbericht_2011_Lebensmittel_und_Futtermittelbueberwachung.pdf

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