

Chemicals in food 2015



Overview of **Data Collection Reports**

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Introduction

Chemicals are essential building blocks for practically everything in the world. All living organisms – including people, animals and plants – consist of chemicals. And also all food is made up of chemical substances.

The chemicals in our food are largely harmless and often desirable – for example, nutrients such as carbohydrates, protein, fat and fibre are made up of chemical compounds. These chemicals contribute both to a rounded diet and to our eating experience. Chemicals occur naturally in the food chain and also as a result of, for example, farming, food processing and transportation.

Safe levels of chemicals in food

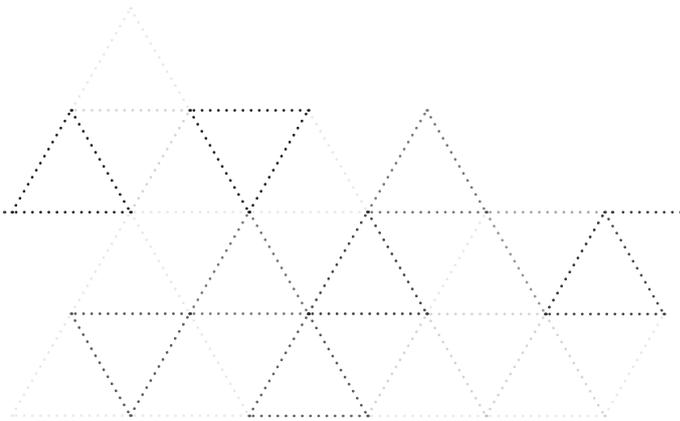
Chemicals can, however, have a variety of toxicological properties, some of which might cause effects in humans and animals. Scientists help to safeguard against potential harmful effects of these substances by establishing safe levels for their presence in food. Safe levels may apply to a one-off/short-term high intake of a chemical substance (“acute exposure”) or to their accumulation in the body over time (“chronic exposure”).

This scientific advice informs decision-makers who are responsible for consumer safety by regulating the use of chemicals in food or by seeking to limit their presence in the food chain.

To carry out this work, reliable scientific information about the occurrence levels of chemicals in food is needed.

EU-wide monitoring of chemicals in food

Across Europe efforts are made to collect, monitor and analyse information on levels of chemicals in plants, animals, food and drinks. This work helps national and European authorities to be aware of the situation on the ground and to measure the impact of existing controls. It can also help to understand if new safety assessments or control measures are needed and to set priorities for future research funding and data collection activities. These data can also be used in risk assessments of individual substances.



Because EFSA acts as an information hub for several activities in this area it has been asked by the European Commission to produce a yearly report on Chemicals in Food for the general public. The report will highlight EFSA's role and link its findings to the way chemicals in food are sometimes portrayed by media.

At the request of the Commission the report gives a targeted snapshot of EFSA's data collection activities on the occurrence of chemicals in food during a defined period, rather than a full overview of the Authority's work in this area. EFSA's annual report on pesticide residues in food and its report on veterinary drug residues in animals and foods will feature in each Chemicals in Food report. Summaries of ad hoc reports on occurrence levels of certain chemical contaminants sometimes found in foods will supplement these core topics.

This first issue contains an overview of EFSA's most recent data collection work from 2014-2015: two annual reports (pesticide residues and veterinary drug residues) as well as two ad hoc reports published during this period: on arsenic in food and drinking water, and on ethyl carbamate in spirit drinks.

Pesticide residues in food

Food containing pesticide residues may pose a risk to public health. A comprehensive legislative framework has therefore been established in the European Union for approving the chemicals used in pesticides, and for setting levels of pesticide residues that are acceptable in food. EFSA provides scientific advice during the assessment of pesticides; EU Member States use this information when deciding the conditions under which pesticides may be marketed in their territories. This legislative framework is complemented by an **annual pesticides monitoring programme**. Every year EFSA publishes an overview of this programme, which is carried out by EU Member States plus Iceland and Norway.



Pesticides and the law

The EU's approval and authorisation system for pesticides aims to ensure a high level of protection for European consumers. Manufacturers of pesticides are obliged to provide a wide range of scientific studies to support the risk assessment of their products and the estimation of the nature and magnitude of residues in food. Scientists of the national food safety authorities in Member States together with EFSA scrutinise the data and assess whether expected residues in food are likely to pose a health risk to consumers. Legal limits, so-called **maximum residue levels (MRLs)**, have been established and Member States are obliged to carry out controls to ensure that food placed on the market is compliant with these legal limits. The aim of MRLs is to keep levels of pesticide residues in food as low as possible. MRLs can be exceeded – for example, if pesticides are used outside the authorised conditions (leading to actions by Member States); however, the residue levels may still be below those that raise a health concern. For this reason, in addition to reporting exceedances, EFSA assesses the threat to consumers by conducting a risk assessment which covers both short- and long-term health concerns (see *So is there a threat to humans?*).

2013: what's the picture?

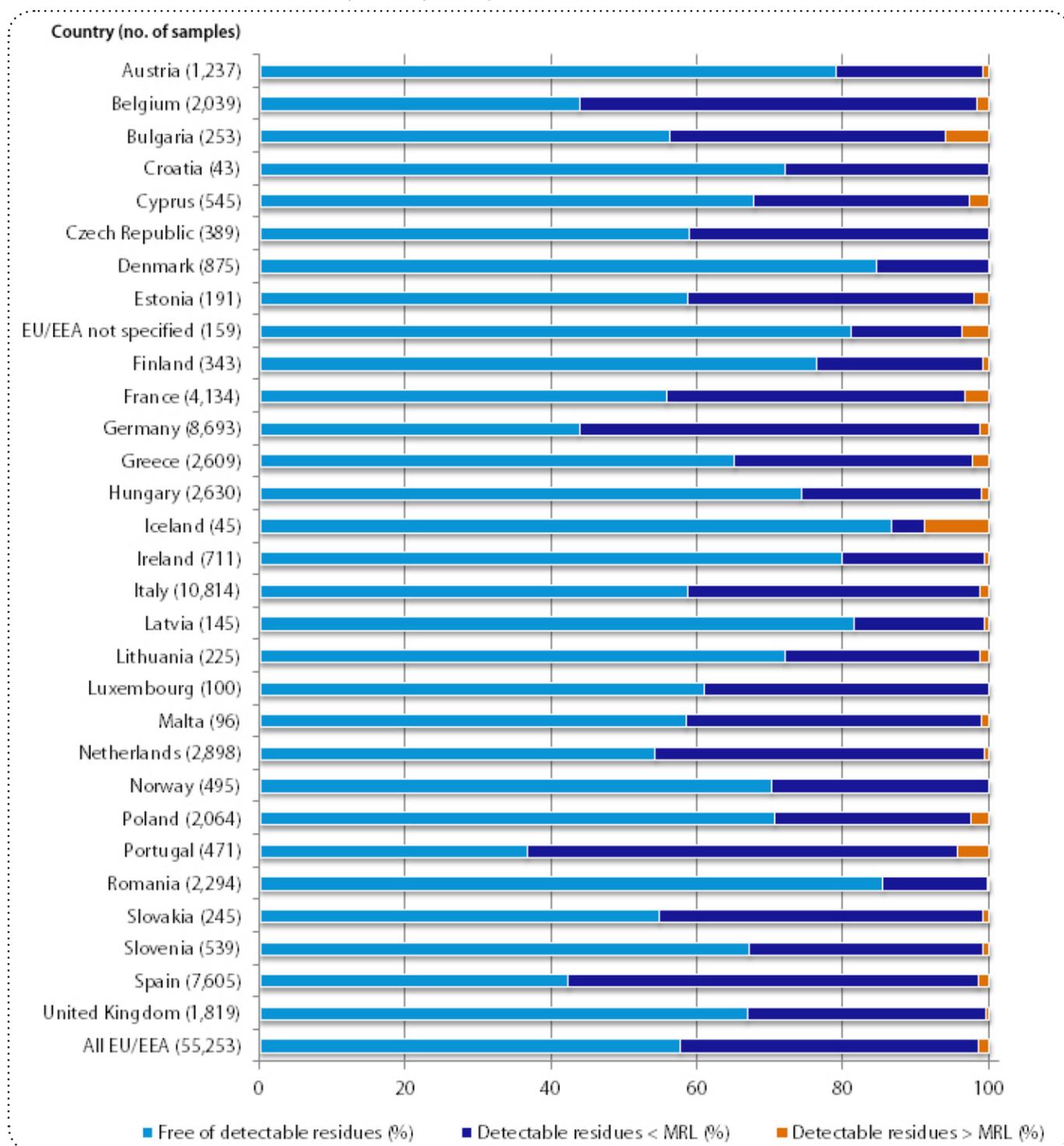
In 2013, the reporting countries analysed 80,967 samples for 685 pesticides. The majority of samples (55,253 samples, 68.2%) originated from the EU and two European Free Trade Association (EFTA) countries (Iceland and Norway); 22,400 samples (27.7%) were from products imported from third countries. For 3,314 samples (4.1%) the origin of the products was not reported. The main results are:

- 97.4% of the samples analysed fell within the legal limits. This represents a year-on-year increase in compliance since 2012 (from 97.1%);
- 54.6% were free of detectable residues;
- 1.5% of samples clearly exceeded the legal limits, taking into account the measurement uncertainty.

Among the samples from EU/EEA countries, 57.6% were free of measurable residues, and 1.4% contained residues that exceeded legal limits (see table below). The percentage of samples from third countries free of detectable residues was 46.2%, with 5.7% clearly exceeding legal limits.



EU/EEA countries: Residue detection by country of origin



Some foods were over the limit...

MRL exceedances for unprocessed products were most frequently noted in 2013 for guava, lychee, passion fruit, tea leaves, okra, basil, parsley, spinach-type vegetables, turnips, papaya, cassava, leafy vegetables and pomegranates. Processed products most frequently exceeding legal limits were wild fungi, tea leaves, peas with pods, peppers, herbal infusions, tomatoes, beans with pods, pomegranates, table grapes, rice, grapefruit and rye. It is important to note that some of these foods are the subject of import controls and therefore the results may be biased due to the samples being targeted in border inspections.

... and others were well below

No MRL exceedances were reported for unprocessed sweet corn, hazelnuts, watermelon, peanuts, rhubarb, beetroot, pumpkin, avocado, parsnip, linseed, and a number of products of animal origin such as poultry and bovine liver, goat milk, swine and goat meat.

Processed foods with no detected residues were pineapples, cocoa beans, sunflower seeds, beans (without pods), rape seed, sweet corn, soya beans, buckwheat, carrots, oats, dates, apples, linseed, peas (without pods), barley, plums, figs, apricots, potatoes, pears, pumpkin seeds.



What about organic food?

Pesticide residues within the legal limits were detected in 15.5% of organic products (717 of the 4,620 samples analysed) whereas 0.8% of the samples exceeded permitted levels. In most cases the detected residues were related to pesticides that are permitted for organic farming, historic contamination by persistent environmental pollutants, or residues of substances that are not necessarily related to the use of pesticides but which may come from natural sources.

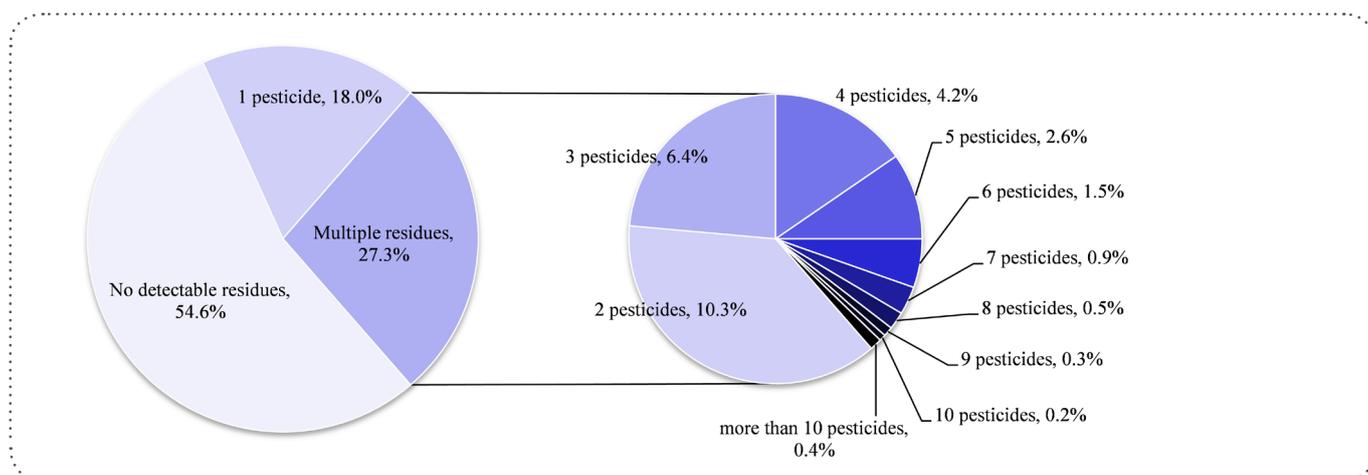
Baby food and animal products

92.7% of samples of baby food were found to be free of detectable residues; 11 samples (0.7% of the 1,597 samples analysed) exceeded legal limits. The majority of samples of animal products (88% of 8,257 samples) were free of measurable residues.

Multiple residues

Residues of more than one pesticide (multiple residues) were found in 27.3% (22,126) of the samples; multiple MRL exceedances were found in 385 samples (0.47%). Multiple MRL exceedances were mainly found in tea (83 samples), peppers (46 samples) and beans with pods (32 samples). Multiple residues in a single sample may result from the application of different types of pesticides on a crop or from pesticide formulations that contain more than one active substance. Multiple residues may also be due to mixing of lots with different treatment histories, contamination during food processing, uptake of persistent residues via soil, or spray drift in the field. The presence of multiple residues in a sample is not an infringement of MRL legislation as long as the individual residues do not exceed the individual MRLs.

Multiple residues detected in samples



Like for like

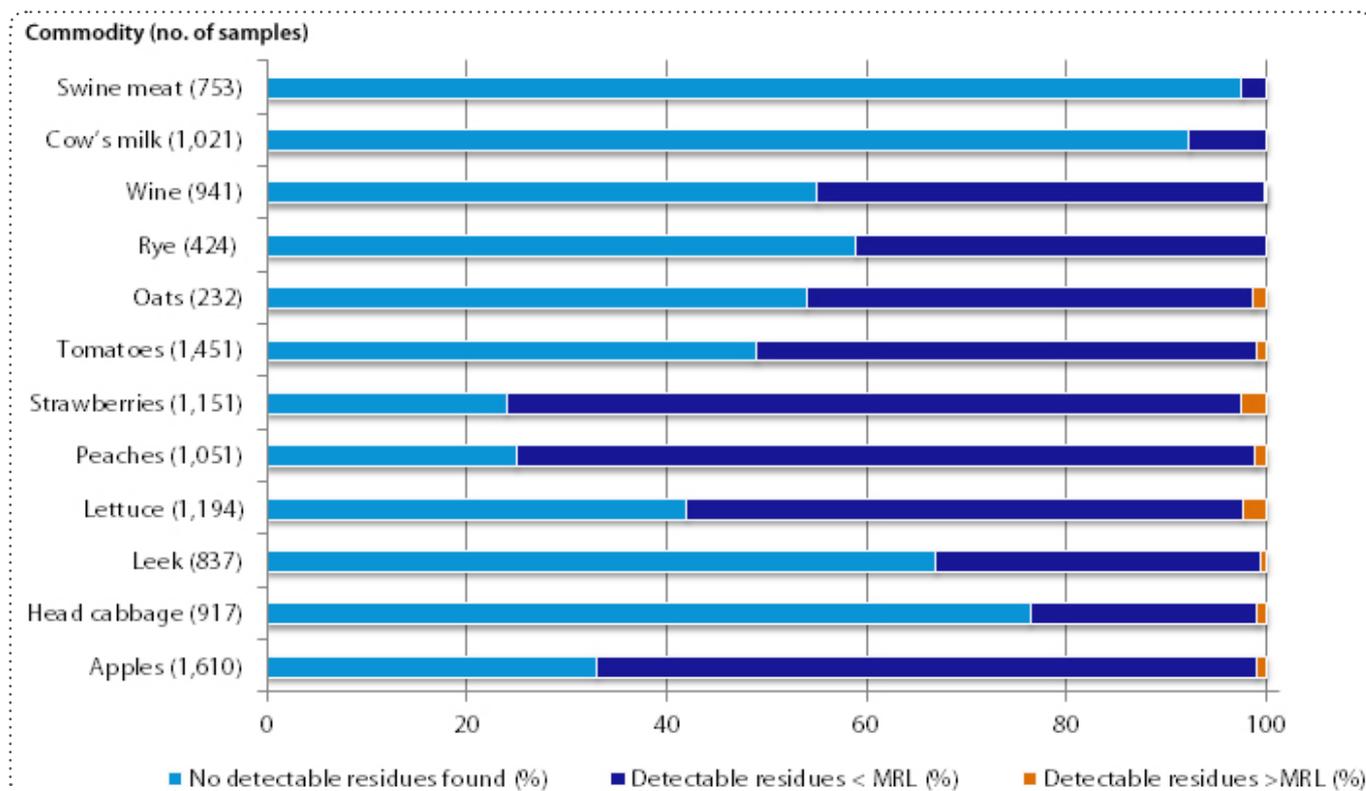
As well as in its own national programme, each EU Member State (plus Iceland and Norway) takes part in the EU-coordinated control programme (EUCP). One of the purposes of the EUCP is to generate comparable data that, when combined with data on food consumption held by EFSA, can be used to estimate exposure among European consumers. Each year reporting countries are asked to analyse the same basket of 12 food products. In 2013 these consisted of 11 raw food products (apples, head cabbage, leek, lettuce, peaches, rye, oats, strawberries, tomatoes, cow's milk and swine meat) and one processed product (wine).

The same food products were analysed in 2010 as in 2013 with the exception of wine, which was analysed in 2013 for the first time. The exceedance rate in 2013 was lower or equal than in 2010 in all products analysed.

Sources

- **The 2013 European Union report on pesticides in food**, 12 March 2015 (<http://www.efsa.europa.eu/en/efsajournal/pub/4038.htm>)

2013 EU co-ordinated programme: Product by product



So is there a threat to humans?

EFSA uses a model called PRIMo (the Pesticide Residue Intake Model) to estimate exposure of European consumers to pesticide residues. The expected exposure is then compared with guidance levels for acceptable exposure, known as toxicological reference values.

Short term (acute)

For the 12 food products covered by the EUCP, it was concluded that the probability of being exposed to pesticide residues at levels that pose a health risk is **low** in the short term.

Long term (chronic)

The long-term exposure estimations were negligible or within the toxicologically acceptable dose. For one pesticide, dichlorvos, the initial conservative calculations were refined to take account of the fact that the pesticide is no longer authorised in the European Union. In conclusion, residues of these pesticides, according to the current scientific knowledge, are **not likely to pose a chronic health risk**.

Veterinary drug residues in animals and food



Traces or “residues” of both authorised and prohibited veterinary drugs, as well as contaminants are sometimes detected in live animals and in foods derived from animals, including meat, fish, eggs and dairy products. These residues can pose a risk for public health if they are present in food.

Across the EU monitoring of the levels of these residues in food-producing animals and animal-derived foods takes place annually. The substances can be grouped into six broad categories: hormones, beta-antagonists, prohibited substances, antibacterials, other veterinary drugs, and other substances/environmental contaminants. The animals and foods monitored are bovines, pigs, sheep and goats, horses, poultry, rabbit, farmed game, wild game, aquaculture, milk, eggs and honey.

Substance groups and most commonly affected animals/foods

Substances	Description	Animals/foods of affected samples
Hormones	This includes stilbenes, antithyroid agents and steroids, which are almost all banned from use in food-producing animals except for well-defined therapeutic purposes and under strict veterinary control. Examples include the steroid nandrolone and the antithyroid agent thiouracil.	bovines (thiouracil), pigs (steroids)
Beta-agonists	Muscle smoothers that cause muscle growth at high doses. Banned from use in food-producing animals except for well-defined therapeutic purposes and under strict veterinary control. A frequently cited example is clenbuterol (also known as ‘angel dust’).	bovines (clenbuterol)
Prohibited substances	These are substances used in non-food-producing animals but banned for food-producing animals. Examples include chloramphenicol, nitrofurans such as semicarbazide, and nitroimidazoles.	bovines (semicarbazide), pigs (chloramphenicol)
Antibacterials	Antibacterial substances including sulfonamides and quinolones.	honey (streptomycin, tetracycline)
Other veterinary drugs	This includes several sub-groups classified by the type of effects: anthelmintics (anti-parasites), anticoccidials (used to fight disease caused by microscopic parasites called ‘coccidia’), carbamates and pyrethroids (insect repellants), anti-inflammatory drugs, and ‘other pharmacologically active substances’ (including corticosteroids).	sheep/goats (anthelmintics), bovines (corticosteroids)
Other substances and environmental contaminants	Organophosphorous / organochlorine compounds (e.g. PCBs), chemical elements (mainly metals such as cadmium, lead, mercury and copper), mycotoxins (produced by fungi, aflatoxin is the most cited example), dyes, others.	wild/farmed game, horses, pigs (metals), milk (aflatoxin), aquaculture (dyes)

An annual overview

Each year, EFSA publishes a report on residues of legal veterinary drugs in live animals and animal products and also gives an overview of prohibited substances and contaminants. In June 2014, EFSA published its latest report in this series, covering information from 2012 on residues found in bovines, pigs, sheep and goats, horses, poultry, rabbit, farmed game, wild game, aquaculture, milk, eggs and honey.

What the report does – its main purpose is to indicate how many samples are taken each year across the EU and show how often the results exceed the limits (where they exist) for each group of substances and each animal/food type. This is called the “non-compliance rate”. (See *Complying with EU limits – how data collection and monitoring helps*.)

What the report doesn't cover – these reports do not show by how much the non-compliant results are over the limit. Nor do they assess potential health risks for consumers. This work is done separately in evaluations of individual substances or groups of substances.

Complying with EU limits – how data collection and monitoring helps

The EU sets maximum limits for authorised veterinary drug residues in animals and in animal products (prohibited substances should not be present at all). There are also maximum limits for some but not all contaminants. Products exceeding these limits are not allowed on the market.

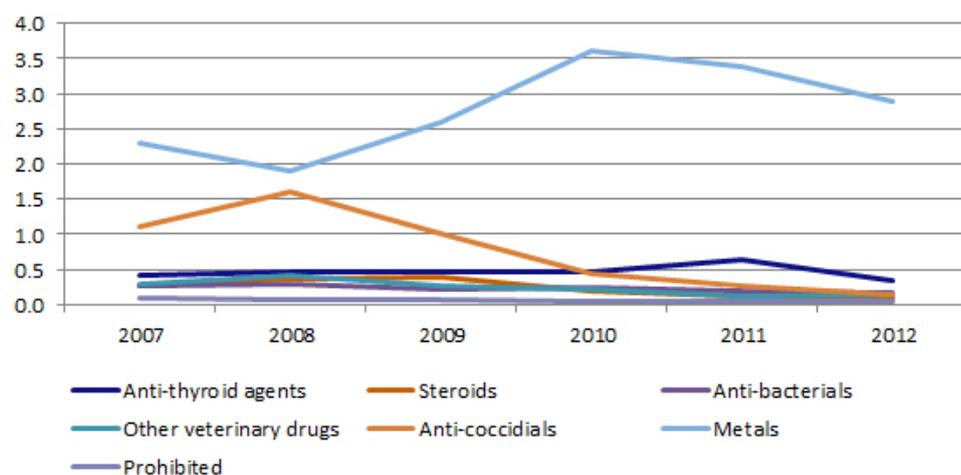
To help enforce compliance with the limits and understand the overall picture, EU Member States, the European Commission and EFSA work together every year to monitor and report on these residues.

National laboratories carry out mandatory tests on animals and animal-derived foods to detect these substances. Legislation dictates how many tests are performed for each animal/food group as a percentage of overall production. In some countries, no tests are performed because of culinary traditions (for instance, horse and rabbit meat are consumed widely in some Member States, but only rarely in others).

The results are compiled at national level and then added to an EU database managed by the European Commission. The final report follows EFSA's analysis of a summary of the data.

This cooperation helps to support efforts to enforce the limits and measure the impact of prevention and control measures, ultimately to **reduce the potential risks** for consumers.

Percentage of non-compliant samples and in selected categories 2007-2012



Overall, non-compliance is steady or falling

The horsemeat episode in 2013 increased media attention on the safety of meat and one issue that emerged was the use of veterinary drugs in food-producing animals. The data seem to indicate that the situation is largely under control.

In 2012, there were just over 1,000 non-compliant samples, or 0.25%, from over 425,000 total samples (these were “targeted” samples, i.e. those intentionally taken to test for illegal substances or substances above legal limits). This is the second year in a row that non-compliance has fallen as a percentage, and since 2007 the general trend is downward. The total number of samples varies year by year depending on production volumes in each animal/food category, but generally the number of samples has been steady since 2009.

Animals and animal products



Bovines – just under 0.5% of all bovines produced for food (including meat and dairy) were tested in 2012 (this is a high rate compared with other animals). Only 262 or 0.2% of over 130,000 samples tested were non-compliant. Heavy metals accounted for 78 non-compliant samples in bovines followed by antibacterials with 61 (12 of which were the antibiotic oxytetracycline). Steroid-based anti-inflammatory drugs (corticosteroids) accounted for 44 samples.

Some media coverage during this period refer to cattle testing positive for thiouracil and clenbuterol. Cabbage, cauliflower or other “cruciferous” vegetables present in fodder can produce similar test results to the anti-thyroid agent thiouracil and may explain the 29 bovine samples “contaminated” by this steroid. Also, across the EU only four non-compliant samples in bovines were for clenbuterol.

Pigs – huge numbers of pigs are produced in the EU annually (246 million in 2012 compared to, for example, 26 million bovines) and 0.05% of them were tested for residues. Of the 130,000 samples taken from pigs, 279 were non-compliant (0.21%). Heavy metals accounted for 149 of them, the majority of which were for copper. There were 60 samples with non-compliant levels of antibacterials, of which sulfamides were the most frequent substances reported. There were 31 non-compliant samples for steroids including the growth hormone nandrolone. Some media coverage has reported on pigs testing positive for antibiotics.



Sheep and goats – some 36.5 million sheep and goats were produced in 2012 with 0.06% of animals being tested and over 23,000 samples taken. There were 88 non-compliant samples, or 0.38% of the total, mainly reported against antibacterials (37 samples, mainly sulfonamides) and heavy metals (21 samples, mainly cadmium). There were also 11 non-compliant samples for anthelmintics, which are commonly used to fight worms.

Horses – horse production in 2012 was close to 273,000, with 1.54% of animals being tested and approximately 4,000 samples being taken. Fifty samples or 1.3% were non-compliant. Heavy metals (mainly cadmium) accounted for 36 samples while most of the others were non-steroid anti-inflammatory drugs.



Poultry – some 13 million tonnes of poultry were produced in 2012. The number of samples taken reached 68,770, and just 54 samples (0.08%) were non-compliant. Antibacterials accounted for 23 (mainly doxycycline) and 13 were for anticoccidials, some of which were reported in the media.

Rabbit meat – production in 2012 topped 170,000 tonnes and 3,471 samples were taken. Five samples were non-compliant without any noticeable trend.

Farmed game – production swung widely between 2007 and 2012; in 2012 the EU produced 25,000 tonnes and 2,334 samples were taken. There were 24 non-compliant samples mainly for heavy metals (cadmium, mercury, and lead).





Wild game – production was close to 210,000 tonnes in 2012. Of the 2,600 samples taken, there were 164 non-compliant samples. The vast majority of these were for heavy metals (cadmium, lead and mercury). Lead poisoning, in particular, is a common topic of media attention on wild game.

Aquaculture – the EU produced over 630,000 tonnes of farmed fish and seafood in 2012. Out of the 8,264 samples taken, 51 (0.62%) were non-compliant. Most of these (39 samples) contained non-compliant levels of dyes, particularly malachite green and crystal violet varieties. In aquaculture, these dyes are sometimes used as fungicides.

Milk – in 2012, over 149 million tonnes of milk were produced in the EU and over 30,000 samples were taken, with 27 being found non-compliant. The majority of non-compliant samples were reported for antibacterials (nine), anthelmintics (five) and mycotoxins (nine).

Eggs – the EU produced 6 million tonnes of eggs in 2012. From the 12,500 samples taken 23 were found to be non-compliant, of which four were for antibacterials, 13 were for anticoccidials and six were for dioxins and PCBs.

Honey – 4,820 samples were taken from 215,101 tonnes of honey produced in 2012. There were 44 non-compliant samples, of which 31 were for antibacterials such as streptomycin (one media outlet mistakenly referred to this substance as a “tree pesticide”).

Limitations of the report

There are several uncertainties which make comparisons across years or between animal and food categories challenging. Firstly, there are more samples for certain groups of substances within certain animal/food categories than for others. In part, this is because the sampling is based on prescriptions for veterinary drugs during previous years. This can affect the overall emphasis of the results between substance groups and between the animal/food groups.

Also, data collected using different measures were combined, and this does not allow for an in-depth analysis. (In 2014, the European Commission agreed to gradually hand this task over to EFSA over the next few years so that more detailed analyses are possible, similar to the work EFSA does, for example, on pesticide residues in food.)

Overall, however, the figures give a representative snapshot across the EU of an extremely complex issue, which appears to be largely under control or slowly downward.

Sources

- **Report for 2012 on the results from the monitoring of veterinary medicinal product residues and other substances in live animals and animal products**, 13 June 2014 (www.efsa.europa.eu/en/supporting/pub/540e.htm)



Arsenic in food and drinking water

Arsenic is a semi-metal, or “metalloid” (a chemical with properties somewhere between a metal and non-metals). It is a widely found **environmental contaminant** that occurs both naturally and as a result of human activity. It appears in many forms, which can be either organic – i.e. containing carbon – or inorganic, which is more toxic. Food and drinking water are the main sources of exposure to arsenic for the general population in Europe. Arsenic enters food and drinking water through contaminated soil and/or ground water.



EFSA's recent work on arsenic

In 2014, EFSA updated its analysis of arsenic levels in food in Europe and its **estimates of exposure** to inorganic arsenic in food and drinking water.

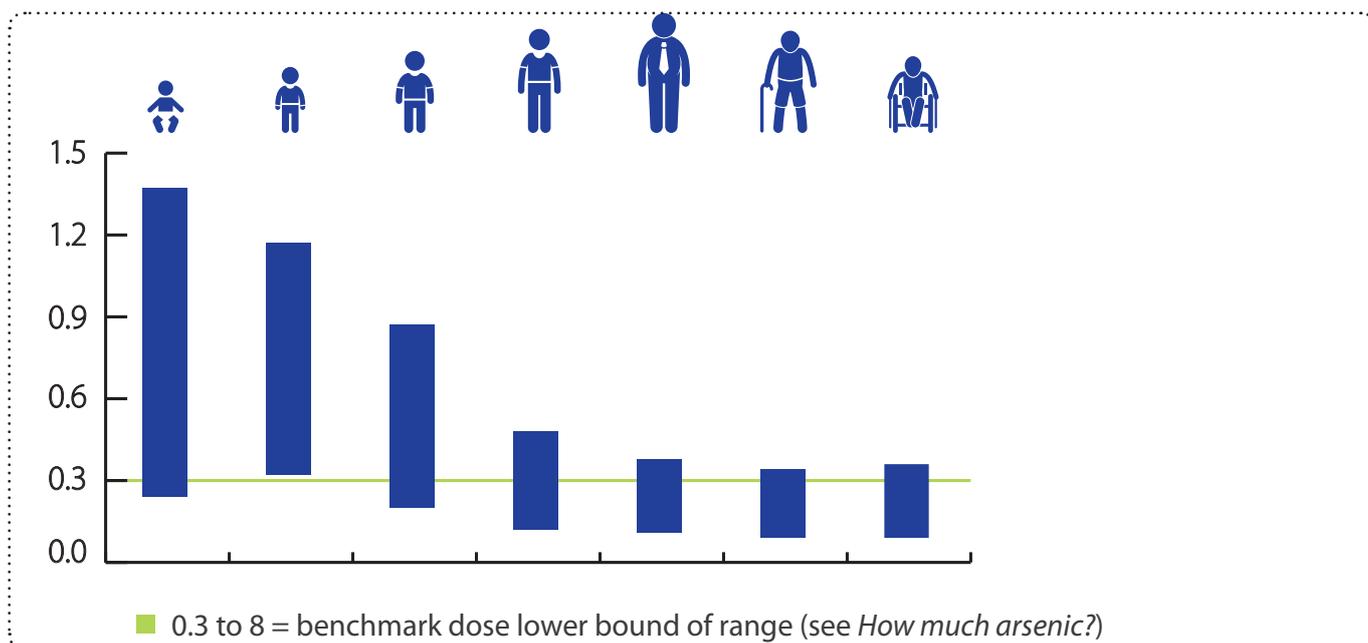
Overall, the new estimates of dietary exposure to inorganic arsenic are lower than reported in 2009; however, the upper estimates sometimes exceed the reference point for potential health effects indicated by EFSA in 2009 (*see How much arsenic?*).

Specifically, dietary exposure for infants, toddlers and other children was the highest of all the groups. Average exposure ranged from 0.20 to 1.37 micrograms per kilogram of body weight per day ($\mu\text{g}/\text{kg}$ bw/day), with high exposure from 0.36 to 2.09 $\mu\text{g}/\text{kg}$ bw/day.

Average dietary exposure among adults ranged from 0.09 to 0.38 $\mu\text{g}/\text{kg}$ bw/day. This includes the “elderly” (65-75 years old) and the very elderly (75+). Estimates of high exposure for adults ranged from 0.14 to 0.64 $\mu\text{g}/\text{kg}$ bw/day.

Arsenic levels found in each food type and the consumption levels for these foods, among the various age groups, are the main factors influencing dietary exposure. In addition, dietary exposure is calculated on a body weight basis, which is an important reason why children often have the highest exposure levels to arsenic and other chemicals in food.

Average dietary exposure ($\mu\text{g}/\text{kg}$ bw/day)



How much arsenic?

Long-term intake of inorganic arsenic has been associated with a range of health problems, including skin lesions, heart disease and some forms of cancer.

Under EU law total arsenic in drinking water should not exceed 10 micrograms per litre ($\mu\text{g/L}$). This is used as a reference value for permissible arsenic levels in tap water. Suppliers of natural mineral water products must ensure arsenic levels in their products do not exceed this maximum level.

Currently, there are no specific limits on arsenic in food at EU level, although some Member States have national guidelines. However, in February 2015, the European Commission and Member States agreed to set maximum levels that will enter into force in 2016. (The limits are likely to be published in the course of 2015.)

In a 2009 scientific opinion on arsenic in food, EFSA scientists concluded they could not set a safe level of arsenic in food. However, they estimated the dose range within which arsenic is likely to cause a small but measurable effect on a human body organ. This is called the **Benchmark Dose (BMD)** and was set at 0.3 to 8 micrograms per kilogram of body weight per day ($\mu\text{g/kg bw/day}$) for an increased risk of cancer of the lung, skin and bladder, as well as skin lesions.

This reference range is not a “safe level” for arsenic in food as such but it helps the reader to understand that the figures on arsenic levels in food and dietary exposure in the EU should be as much as possible below the lower end of this range.

Which foods contain arsenic?

For all the age groups except infants and toddlers, the main source of dietary exposure to inorganic arsenic was **grain-based processed products**, in particular, wheat bread and rolls. Other food groups that were important contributors were rice, milk and drinking water. Dairy products were the main contributor for infants and toddlers.

Generally high consumption of wheat bread and rolls, milk, beer and drinking water increases the contribution of these foods and beverages to dietary exposure to inorganic arsenic. Despite lower consumption of rice among the general population, the higher levels of arsenic in rice increase the estimates for arsenic exposure from this food.

Estimated inorganic arsenic levels in some foods and drinking water, and human dietary exposure based on high consumption of these foods

Foods and drinks	Estimated levels in food ($\mu\text{g/kg}$)*	Arsenic intake in food ($\mu\text{g/kg bw/day}$)*
<i>Highly consumed foods</i>		
Liquid milk	4.1	0.05
Wheat bread and rolls	14.3	0.06
Soft drinks	6.9	0.13
Beer	6.8	0.25
Drinking water	2.1	0.08
<i>Foods with higher arsenic levels</i>		
White rice	88.7	0.23
Brown rice	151.9	0.38
<i>Selected other foods</i>		
Fish meat	11.3	0.03
Crustaceans	36.2	0.06
Molluscs	50.9	0.10

* Key: Estimates may vary by +/-40% in most food categories but by less, around +/-10%, for rice. These figures are derived from samples using a statistical tool called the “substitution method”.



Rice and wheat

Rice is a common topic of media coverage on human exposure to arsenic through food. Rice, particularly brown rice, contains among the highest levels of inorganic arsenic of all food categories. This finding is particularly strong as the data on arsenic levels in rice included in EFSA's report were among the most comprehensive for any food category.

EFSA's report includes some tips on how to reduce arsenic levels in rice, thus potentially reducing exposure. Thoroughly rinsing rice before boiling or steaming may wash off some arsenic. Also, in areas with high arsenic

concentrations in soil and ground water, boiling rice in abundant water is preferred to steaming (during which the rice may absorb more arsenic from the water) as this can reduce the arsenic concentrations. Of course, rinsing and boiling can affect the texture of the final cooked food, which is a particular concern for slow-cooked traditional dishes like Spanish *paella* and Italian *risotto*.



Drinking water

Levels of inorganic arsenic in drinking water (tap water and bottled mineral water) are generally very low. Almost 98% of the samples of drinking water collected by EFSA contained amounts of arsenic that were below the limit established at EU level.

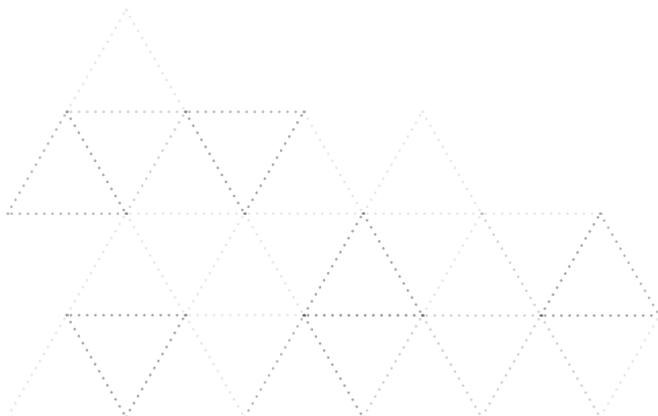
There are occasional exceptions especially in countries with mineral-rich volcanic soils where checks on arsenic levels in tap water sometimes exceed EU limits. These cases are often picked up by local and national media.



Fish and seafood

Previous assessments had indicated fish and seafood as important dietary sources of arsenic. More accurate data available for EFSA's latest assessment show that most arsenic found in fish and seafood is **less harmful "organic arsenic"**.

Whereas until recently, national and regional media coverage of arsenic in fish did not reflect this difference, some news stories issued since EFSA's report have recognised this important new piece of information.



More and better data improves quality of EFSA's reporting

Since EFSA's previous assessment in 2009, there has been a significant increase in the amount and quality of data available on levels of arsenic in food (among them around 3,000 samples with data on inorganic arsenic). There were over 700 samples with data on inorganic arsenic in rice, which give a more comprehensive picture of contamination of this staple foodstuff. Some 20% of the samples were for drinking water (bottled and tap water).

Also, EFSA scientists refined estimates of long-term exposure to inorganic arsenic in food using information from the latest version of the EFSA Food Consumption Database. A less well-developed version had been used in 2009. The better-quality occurrence and consumption data combined with a more detailed classification of food categories reduced several of the uncertainties in the previous dietary exposure assessment.

Sources

- **Scientific report on dietary exposure to inorganic arsenic in the European population**, 6 March 2014
(www.efsa.europa.eu/en/efsajournal/pub/3597.htm)
- **Scientific opinion on arsenic in food**, 19 October 2009
(www.efsa.europa.eu/en/efsajournal/pub/3597.htm)



Ethyl carbamate in spirit drinks



Ethyl carbamate, also known as “urethane”, occurs in alcoholic beverages including wine, beer and spirits, particularly in brandies made from stone fruit (mainly plums, cherries, mirabelles and apricots). Fermented foods such as bread, soy sauce and yoghurt may also contain ethyl carbamate. It forms when other chemicals present in these foods and drinks are naturally broken down during food processing and/or storage.

In 2014, EFSA reported on ethyl carbamate levels in food and drink in Europe, based on the analyses performed in the Member States in the years from 2010 to 2012. The report did not assess the risks for consumers as this had been tackled in previous work by EFSA and also by other food safety assessors, including the UN’s Food and Agriculture Organization and World Health Organization. (see *How much ethyl carbamate?*).

How much ethyl carbamate?

Ethyl carbamate is genotoxic (it damages DNA) and causes cancer in animals. The International Agency for Research on Cancer states that ethyl carbamate can probably cause cancer in humans too.

In 2006, the FAO/WHO Joint Expert Committee on Food Additives concluded that exposure to ethyl carbamate considering only food is a “low concern”. However, it becomes a concern if consumption of alcoholic drinks is included. EFSA came to a similar conclusion in a 2007 scientific opinion stating that dietary exposure to the chemical is “a health concern, particularly with respect to stone fruit brandies”.

In the European Union there is no maximum level for ethyl carbamate in food. However, in 2010, the European Commission recommended monitoring of the levels of ethyl carbamate in stone fruit spirits, introducing a Code of Practice for producers and setting a **target level of 1,000 micrograms per litre (µg/L)** in stone fruit spirits. Producers who detect levels above the target following distillation are encouraged to voluntarily apply measures to reduce the ethyl carbamate content to a level below the target.

Ethyl carbamate levels in selected foods and drinks*

Food/drink	Average levels in food*
Spirits (from stone fruits)	698
Spirits (from other fruits)	317
Liqueur	215
Fortified/liqueur wines (sherry, vermouth, etc.)	72
Spirits (non-fruit)	55
Food & non-alcoholic drinks	3

Levels in alcoholic drinks

Overall, more than 80% of the results in ‘Spirits made from stone fruits’ were below the target of 1,000 micrograms per litre (µg/L), with an average of 698 µg/L. More than 95% of the results for ‘Spirits made from fruits other than stone fruits’ were below the target, with an average level of 317 µg/L. Stone fruit spirits are therefore the alcoholic drink category with the highest average levels of ethyl carbamate, though these are mainly well below the target of 1000 µg/L. However, a limited number of samples contained concentrations up to three times the target.

Ethyl carbamate was also found in liqueurs and fortified wines, but at lower levels.

* Micrograms per litre (µg/L).



A slight downward trend

The report hints at a moderate initial reduction in the levels of ethyl carbamate in these alcoholic drinks in Europe when comparing the average levels reported by EFSA in 2007 (850 µg/L for spirits from stone fruits and 650 µg/L for spirits from other fruit) to the figures for 2010-2012 in EFSA's latest report. In the last two years covered by the analysis, 2011 and 2012, the levels remained very stable.

Press coverage

Media across Europe sometimes report on chemical contaminants in alcoholic drinks. In recent years, there has been almost no attention in the European press to ethyl carbamate as a contaminant with most reports dating from the late 1980s up to 2006 when FAO/WHO issued its opinion. This is probably also because ethyl carbamate is mainly a concern for high consumers of a limited type of strong alcoholic drinks. Of course, alcohol itself is poisonous when consumed excessively.

Sources

- **Scientific report on evaluation of monitoring data on levels of ethyl carbamate in the years 2010-2012**, 28 March 2014 (www.efsa.europa.eu/en/supporting/pub/578e.htm)
- **Scientific opinion on ethyl carbamate and hydrocyanic acid in food and beverages**, 20 September 2007 (www.efsa.europa.eu/en/efsajournal/pub/551.htm)





TM-AU-15-001-EN-N