

BfR2GO

ISSUE 1/2023



ANIMAL FEED

From the trough to the plate

THE SCIENCE MAGAZINE OF THE GERMAN FEDERAL INSTITUTE FOR RISK ASSESSMENT (BfR)

Insects
FOOD
ON SIX LEGS

**Hormonally active
substances**
SPERM IN DISTRESS?

Laboratory animals
AVOIDING
SURPLUS ANIMALS



FOODIES WANTED

Vegan, vegetarian, pescetarian or a mixed diet: how do these diets affect our health? This is what the COPLANT study is investigating on a large scale. Researchers are looking for around 6,000 people across Germany to participate. Interested?

More information: www.bfr.bund.de/en/coplant-study.html



ANIMAL FEED


**“Anything an animal eats
can enter its bloodstream
and from there end up in
its meat, eggs or milk.”**

“Carry-over” effect





Tea made of a basis of hemp leaves or flowers naturally contains tetrahydrocannabinol, or THC for short, one of the best-known cannabinoids. THC has a psychoactive effect and can cause mood swings or fatigue. The concentration varies depending on the type of hemp and environmental factors. In the past, little data was available on how much THC passes into the tea infusion. Therefore, the risk assessment provisionally assumed a complete transfer from the bag into the drink. However, new studies carried out by the BfR show: in the case of an ordinary infusion with boiling water, less than 1 % of THC passes into the tea water on average. Furthermore, the studies also showed that the precursor substance tetrahydrocannabinolic acid (THCA), which also occurs, was not significantly converted into THC during tea preparation. THCA itself is not psychoactive.

 **More information**



BfR-FAQ
"Health risks of food and feed
containing hemp"

Editorial



Dear readers

Let's talk about food – not the food that we humans like, but the diet of cattle, pigs and chickens: animal feed. In Germany, animals are fed almost 200 million tonnes of feed every year. Worldwide, figures range in billions of tonnes. It is difficult to overestimate the importance of animal feed. This applies to nutrition as well as to the health of animals and humans. Contaminants, chemicals or pathogens can find their way from the trough into the animal and from there onto consumers' plates. Our institute recognises the great importance of feed, which is why it has made it the focus of the current BfR2GO issue.

A case in point is the study on hemp silage for cows. Researchers at the BfR were able to show that the cannabinoids ingested with the feed affect the animals and that these substances transfer into the milk. The study caused a worldwide stir and was even reported in the *New York Times*, the *Washington Post*, *Science Magazine* and the *New Scientist*.

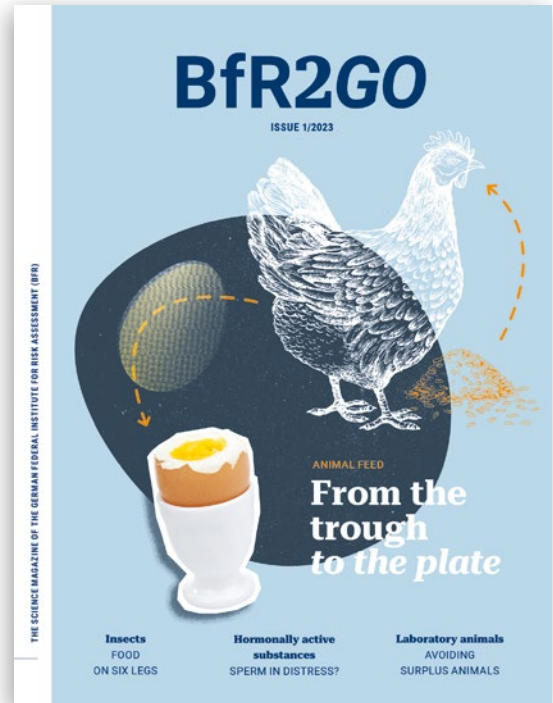
Enjoy reading and bon appétit!

Professor Dr Tanja Schwerdtle
BfR Vice President

**Research.
Assessment.
Communication.**

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From the trough *to the plate*



What livestock eat can end up in their meat, eggs or milk. The BfR investigates which undesirable substances end up in foods of animal origin and to what extent.

In the early 19th century, a mysterious disease drove settlers in the western USA to despair. Thousands of people died, but nobody knew why. A few years later, the physician Anna Pierce Hobbs Bixby found out that the cause was white snakeroot, a plant eaten by cows and

sheep. The animals remained healthy, but the toxin tremetol evidently passed from the feed to the milk and meat. Those who drank or ate them fell ill with the dreaded “milk sickness”. The consequences: loss of appetite, vomiting, coma – and even death. The best-known victim was Nancy Hanks Lincoln, mother of former US President Abraham Lincoln.

PFAS

Per- and polyfluoroalkyl substances (PFAS) are often part of industrial processes due to their special chemical properties and are used in numerous products, such as paper, textiles and non-stick pans. PFAS are resistant to degradation and thousands of different compounds of its kind accumulate in the environment and in the food chain. Many of the PFAS studied so far affect the immune system, lipid metabolism and the liver.

Cannabinoides

are contained in the leaves and flowers of the hemp plant. One of the best-known of these psychoactive (intoxicating) substances is tetrahydrocannabinol – THC for short. Even small amounts of THC can affect the central nervous system and the cardiovascular system. Possible consequences include mood swings and fatigue.

Alkaloids

In addition to vitamins, minerals and dietary fibre, plants produce phytochemicals, such as alkaloids, which repel potential predators. Alkaloids deter pests, but they can also be harmful to human health. There are thousands of different alkaloids that can be found in potatoes, lupine seeds and weeds.

Bixby's findings were not published until 1928. Consequently, milk sickness remained unknown to the medical community for more than a century. Today, it only rarely occurs. Scientific findings, strict controls and numerous laws have strengthened the safety of feed and food. However, despite all efforts along the supply chains, animal feed can occasionally become contaminated with undesirable substances, including plant and fungal toxins, and other environmental contaminants, such as per- and polyfluoroalkyl substances, or PFAS for short (see box).

The German Federal Institute for Risk Assessment (BfR) uses feeding studies with agricultural livestock to investigate whether these substances can also pass into food. The aim is to assess the health risks posed by these substances to humans and animals. "If important data on these substances is missing with regard to their occurrence in animal feed, metabolism in animals or transfer, for example, into milk, it is our task to close any such knowledge gaps," says Dr Robert Pieper, who is responsible for topics related to safety in the food chain at the BfR.

INTOXICATING SUBSTANCES IN MILK

Reliable data on feeding effects was also missing when reports emerged more than ten years ago that some farmers in Europe wanted to feed industrial hemp to cows. Although the European Food Safety Authority (EFSA) had evidence that cannabinoids (see box) – especially the intoxicating tetrahydrocannabinol (THC) – could pass into milk, it was unclear how much, and what this meant for human and animal health.

The BfR investigates which substances pass from feed to meat and milk.



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This is why the BfR began studies in 2016. The first clear results came from a pilot study with only one dairy cow that was fed industrial hemp silage. Silage is feed preserved by fermentation. “We saw that the cow reacted. She became tired and her ears drooped,” says Dr Robert Pieper. The BfR explored this lead in a large-scale study with ten dairy cows.

The result of the study was published in a renowned international scientific journal: even when being fed industrial hemp with relatively low THC concentrations (below 0.2 percent), the animals experienced behavioural changes and health impairments. Their breathing and heart rate slowed. The cows became sleepy, unsteady, ate less and gave less milk. It demonstrated that even a small addition of industrial hemp silage to a dairy cow’s rations leads to cannabinoids passing into the milk.

“The cow became tired and her ears drooped.”

DR ROBERT PIEPER, BFR



How much of a substance in feed can reach foods of animal origin depends on the substance in question.

© Budimir Jevtic/adobestock

ABSORPTION, ACCUMULATION, EXCRETION

In general, anything an animal eats can enter its bloodstream and from there reach the meat, eggs or milk. This depends on how the substance in question is absorbed in the animal's gastrointestinal tract, then metabolised and excreted again. "There are big differences between substances," says Dr Jorge Numata, who works on mathematical modelling of substance transfer from feed to foods of animal origin at the BfR.

For example, lupine alkaloids (see box on previous page) are broken down and excreted very quickly. If they are no longer present in the feed, they stop appearing in the milk after a short time.

The situation is different with cannabinoids: for THC, it takes a few days after stopping the feeding for the concentration to drop noticeably. Further, some PFAS remain in the body for a very long time – they can be detected in animal-based food for weeks, even though the animals have already stopped eating contaminated feed.

WEB APP FOR MONITORING AUTHORITIES

The findings from the feeding experiments are also the basis for predictive mathematical models. For example, if a monitoring authority learns that maximum levels in food were exceeded, the causes must be investigated and the next steps carefully considered. To support monitoring



© Pig: KOSIM, trough: ia_puma, plate: Esin Deniz, hook: emilio100 @adobestock

and risk management in such cases, the research team around Pieper and Numata has developed the web app “ConTrans” from the feeding studies and predictive models derived from them. ConTrans can estimate the transfer of undesirable substances from feed into food and can be used as a decision-making tool.

GROWING WORLD POPULATION AND CLIMATE CHANGE

However, it is not just a matter of preventing acute crises. Experts at the BfR are looking further into the future to assess whether animal feed will still be safe in 20 years and what can be done to ensure this. “Competition for food between humans and animals will increase and influence agricultural

production and animal farming,” says BfR President Professor Dr Dr Andreas Hensel (see interview next page) Therefore, it is becoming increasingly important to survey what is edible for humans: where do we stand in competition with animals? What can still be used as food, and what as animal feed? Are there health risks?

To meet the challenges of globalisation, a growing world population and climate change, animal farming systems must be further developed. Settlers in the past did not yet have this foresight. When feed became scarce because there was not enough rain and the pastures dried up, they let their cattle roam freely in the forests – where they came across the white snakeroot. —

More information

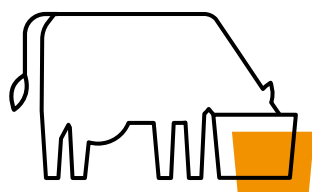


Wagner, B. et al. 2022. **Transfer of cannabinoids into the milk of dairy cows fed with industrial hemp could lead to Δ^9 -THC exposure that exceeds acute reference dose.** Nature Food 3, 921–932. DOI: 10.1038/s43016-022-00623-7



BfR information
“Animal feed”

BfR survey: Animal feed



BfR online survey of 1,000 consumers and 251 farmers in Germany, survey period 30 August to 13 September 2022.

More than 60 % of the consumers questioned believe that feed may pose health risks to them. Antimicrobial resistance (22 %), exposure to undesirable substances (16 %) and allergy risks (13 %) are mentioned most frequently. Of the farmers questioned, only 14 % have this opinion.

More than 90 % of the farmers questioned and more than 60 % of the consumers questioned rate the safety of feed that comes from the farms’ own products or from Germany as safe or very safe. Conversely, feed purchased from other EU countries is considered less safe by both groups.

19 % of the farmers questioned suspect that the specified maximum levels for pesticide residues in feed are frequently or very frequently exceeded. In contrast, more than 60 % of the consumers questioned assume that this is the case.



“A single ingredient
can spoil feed
throughout Europe”

BfR President Professor Dr Dr Andreas Hensel on safe and accessible feed in times of global change.

Mr Hensel, the human population is constantly growing. Are we about to compete with animals for food?

Competition is bound to increase and it will influence agricultural production and animal farming. It is becoming more important to gauge all things edible for humans: what can we still use as food or animal feed?

Are there any products in Germany currently used as animal feed even though humans could eat them?

Yes – barley, for example: not spring barley for brewing beer, but winter barley. We are using almost 100 percent of it as animal feed because nobody likes to eat it. However, barley is an integral part of Polish or Ukrainian cuisine like borscht, for example.

What will animal feed look like in the future?

I am curious to see whether animal feed will continue to be mainly based on corn, grain and soy, or whether we will make better use of agricultural by-products. For example, harvesting and processing crops produces large amounts of biomass, including stems, leaves and husks. Ruminants can efficiently utilise exactly these kinds of substances as feed, but humans cannot. For example, it takes around four kilograms of soybeans to produce one kilogram of tofu. This means that there are three kilograms of “leftovers” that can well be used as feed. These remaining soy parts may originally be indigestible for humans, but if fed to livestock, can help to produce high-quality food such as yoghurt, eggs, and meat.

To a large extent, feed is traded globally. Which challenges does this entail?

We need to know where animal feed comes from and what it contains. This means both undesirable substances like dioxins or fungal toxins (see box) and healthy ingredients, such as vitamins and minerals.

Can compound feed, which often contains ingredients from different countries, pose a problem?

The challenge is that individual components of compound feed can act as a kind of “super-spreader”. Here is an example: a ship packed with soy meal sails from South America to Europe, and on the way, condensation drips from the ceiling of the cargo hold. As the weeks-long journey goes on, pathogenic *salmonellae* multiply unnoticed

“Global flows of goods and regional structures must be clear.”

PROFESSOR DR DR ANDREAS HENSEL,
BFR PRESIDENT

in the meal. Through delivery to compound feed plants, which in turn supply numerous livestock farms, a single contaminated ingredient can spoil feed for various animal species throughout Europe.

When feed comes from all corners of the globe, how do you keep track?

Global flows of goods and regional structures must be clear. The BfR conducts research and collects data on production and transport for the transparency of product chains: what cargo passes through a deep-sea port terminal each day? What is the scale of the goods transported? How far does a lorry travel? We are developing detection methods and computer tools to facilitate traceability and to assess the health risk for humans and animals.

What are the BfR’s scientific goals in this context?

The safety of food and feed is fundamental to consumer protection. In the event of contamination, authorities must be able to react quickly. This is why the BfR prepares, tests and assesses analytical procedures on the chemical composition and origin of agricultural produce. For example, we have tested whether corn from Peru can be distinguished from corn from the USA or Ukraine. Within the field of animal-based foods, the BfR carries out special transfer studies and develops prediction models from them. These help to determine which animal-based foods may pose health risks to consumers in the event of contamination. Our research strengthens food and feed safety. —

250 mg

are a quantity closely associated at the BfR with the nutrient **magnesium**. The BfR assesses health risks of vitamins and minerals and recommends – where indicated, based on health considerations – maximum levels. For example, in the case of magnesium: for food supplements **250 mg magnesium per daily dose** of an individual product, preferably distributed over two or more portions; for fortified solid foods: 31 mg per 100 g; and for beverages: 8 mg per 100 ml.

More information



The BfR's recommended maximum levels "Vitamins and minerals" (pdf)



COOL *** PICNICS

Whether at the park, the lake or the pool – the right snacks are part of a successful day out. Important for all food taken along: keep it cool. If perishable foods such as meat, sausage, cheese, fish, deli salads or antipasti are not kept refrigerated, pathogens can multiply and lead to illness. Therefore, the food should also be refrigerated on excursions until it is consumed. The same applies to pre-cut fruit and vegetables, especially melon pieces.

More information



BfR FAQ "Correct cooling"



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WHAT'S MUM EATING?

The BfR conducted a survey in which 890 pregnant women in Berlin were asked about their diet before and during pregnancy: did they follow a mixed, vegetarian, vegan or pescetarian (vegetarian plus fish) diet? Had they changed their diet during pregnancy? Did they take supplements?

The result: around 90 % of the women included meat in their diet both before and during pregnancy. 24 women switched from a meat-free to a mixed diet containing meat, and nine women switched from a mixed diet to a vegetarian/pescetarian diet. A purely vegan diet was rare. Food supplements were used by almost 95 % of all pregnant women, most notably folic acid, iodine and iron.



“The enemy of my enemy is my friend”

DR JENS HAMMERL,
MICROBIOLOGIST AT THE BfR

In its lighthouse project “Phages, Bacteria and One Health”, the BfR demonstrates how phages can be used to combat bacteria – and even save lives.

More information



BfR lighthouse project
“The enemy of my enemy is my friend”

BMMF – what’s behind this?

No beef and no cow’s milk for babies – this notion arose in February 2019 when the German Cancer Research Centre (DKFZ) presented findings on novel infectious agents called “Bovine Meat and Milk Factors”, BMMF for short. They are said to be present in meat and dairy products from European cattle and lead to the later development of colon and breast cancer through consumption in infancy. The BfR and the Max Rubner-Institute (MRI) looked at the data. The result: BMMF are already known DNA sequences. There is no evidence thus far that they are harmful to human health. Various studies also show that BMMF are found in almost all animal- and plant-based foods.

More information



BfR opinion
“New findings concerning ‘Bovine Meat and Milk Factors’ (BMMF)” (pdf)



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Aerosoles@home

3D printing releases considerable amounts of nanoparticles from the plastic filaments used, especially at high printing temperatures. This is the result of an experimental study with 3D printers and 3D printing pens at the BfR. The data represents a first step towards assessing the health risks of these devices, especially 3D printing pens, where printing enthusiasts usually have their heads close to where the particles are released.

More information

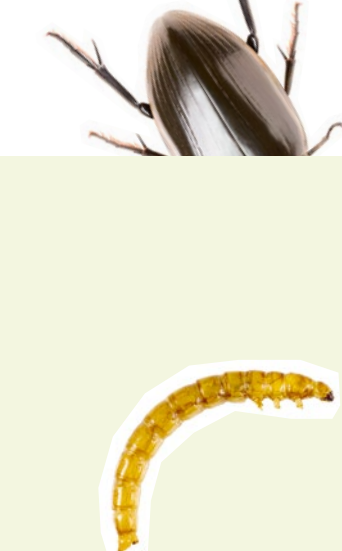


Romanowski et al. 2023. **Summary and derived Risk Assessment of 3D printing emission studies.** Atmospheric Environment: 294. DOI: 10.1016/j.atmosenv.2022.11950


Food on six legs



© Beetle with wings: Cheattah, bamboo worm: tropper2000, black beetle: Anton, plate: Suradech@adobeStock, other: BFR



An alternative to conventional meat products for some, an imposition for others: insects in food. Will eating them cause health problems?



Lesser mealworm larvae. For many people, this does not sound like the most appetising food. But *Alphitobius diaperinus*, to use its technical name, is one of the handful of insect species currently approved as food in the European Union. The yellow mealworm (*Tenebrio molitor*), the migratory locust (*Locusta migratoria*), and the house cricket (*Acheta domesticus*) may also be marketed as food throughout the EU. Further authorisation procedures are in progress.

Eating insects may seem exotic in Germany, but it is not uncommon elsewhere in the world: globally, insect consumption involves around 1,900 species of insects, according to estimates of the Food and Agriculture Organisation of the United Nations (FAO). In fact, according to many experts, there are several reasons to put six-legged creatures on the menu more often in the future.

LOTS OF FEET, SMALL FOOTPRINT

For one thing, breeding insects is considered more environmentally friendly than conventional animal farming: it requires less land and water, and releases fewer greenhouse gases. Despite their large number of legs, insects' ecological footprint is significantly smaller than that of cattle or pigs. Secondly, insects convert their food very efficiently into protein that is nutritionally valuable to humans. They are also rich in fat, vitamins, fibre, and minerals.

But are they safe to eat? "Insects may carry a number of undesirable substances," says PD Dr Karen Ildico Hirsch-Ernst, who works, among other things, on nutritional risks at the German Federal Institute for Risk Assessment (BfR). "These can be substances they produce themselves, such as repellents. Or undesirable substances from their feed, but also microbial contaminants." Various EU regulations apply to minimise the resulting health risks, for example, regarding the feed used to breed the insects.



FOOD SECURITY

In some countries, insects are eaten directly from nature, for example, in Kenya. Researchers in the ContamInsect project are investigating whether insects frequently eaten there – grasshoppers, crickets, termites or dung beetles – are contaminated with undesirable substances, including dioxins, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) or mycotoxins. “In this way, the BfR is making a contribution to food safety and food supply,” says BfR scientist Dr Stefan Weigel. In another part of the project, experts are investigating whether the larvae of the black soldier fly (*Hermetia illucens*) can be fed on mouldy grains without mycotoxins passing into the insects. “Inedible grain could be transformed into usable protein in this way,” explains the chemist. After evaluating the data, he and his team will develop guidance for insect farmers in Kenya.

More information



BfR communication
“Research Project on the Safety Aspects of Edible Insects” (pdf)



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Insect protein is considered an alternative to protein from animal-based foods.

Insects as novel foods are subject to the rules of the EU Novel Food Regulation. “Novel” foods are those that have not been consumed in the EU to a considerable extent before May 1997 and may only be marketed in the EU after they have been approved. Part of the authorisation process is a health risk assessment by the European Food Safety Authority (EFSA). “EFSA examines the respective novel foods for potential health risks,” explains Hirsch-Ernst. “Authorisation by the EU Commission is only possible if EFSA’s health risk assessment does not reveal any safety concerns regarding the proposed conditions of use of the novel food.” No adverse health effects are expected when eating insects that have been approved in the EU, provided that the insects and the products made from them comply with the requirements of food safety law.

LABELLING

Insects may also sometimes be found in bakery products, biscuits or pasta, for instance, in ground or powdered form. This should be apparent to consumers. That’s why the insects’ German and Latin names for the foods that have been approved so far appear on the list of product ingredients, as well as the form in which they are added, such as dried or powdered. Finally, a note is required that refers to the risk of allergic reactions in people with allergies to crustaceans, molluscs and dust mites.

No health problems are expected when eating insects approved in the EU.



ALLERGY POTENTIAL LARGELY UNCLEAR

However, it has not yet been conclusively investigated exactly how allergenic insect-based foods are. “We know that particularly those who are allergic to crustaceans or dust mites may have an allergic reaction when eating these foods,” explains BfR scientist Dr Matthias Peiser. “This can be put down to the high degree of similarity between individual proteins of the different animal species.” Some further questions are still open, for example, whether certain insect species are more problematic than others, how processing influences the potential of a food to cause allergic reactions or how strong allergic reactions can be.

For the time being, the EU Commission is making do with obliging manufacturers to print an allergy label (see box below left) – and emphasises the necessity for more research. The BfR has been running several projects on this topic for quite some time. For example, a team led by biochemist Dr Peiser is working on the development of a test to study the allergenic potential of different insects. “An established test system that can answer any open questions regarding consumer protection does not yet exist.”

ALLERGIC REACTIONS IN CELL CULTURES

The research focuses on tropomyosin, a protein with a high allergenic potential that is widely distributed in the animal kingdom. In the test, it is added to dendritic cells from healthy donors’ blood samples. These cells act as an essential interface in the control of immune response and are significantly involved in the development of an allergic reaction. “We measure the changes in certain surface molecules on the dendritic cells as well as the release of cytokines, which act as inflammatory mediators,” explains Peiser. “The test works very well. As the allergen concentration increases, the cells also react more strongly.” In the next step, the team wants to study dendritic cells from the blood of those with allergies and check whether the reactions differ.

A team led by BfR scientist Dr Cristiano Garino is involved in the Allergen-Pro project, a group of a total of seven partners from Germany and Switzerland. They are working on methods to detect

“Particularly those who are allergic to crustaceans or dust mites may have an allergic reaction.”

DR MATTHIAS PEISER, BFR

and analyse insect allergens in food, including in highly processed products, such as biscuits. For this purpose, the researchers baked biscuits using insect flour and produced sausage and canned meat with insect protein.

NEW TEST FINDS LESSER MEALWORM

The next step involved the team developing a special test that can detect tiny traces of the genetic material of the lesser mealworm. There was no genetic detection method for this insect species thus far. “The test is theoretically ready for routine applications, such as food inspection,” reports Garino. The researchers have also established a method that can be used to simulate digestion processes in the laboratory. “The hypothesis is that proteins that survive digestion unharmed are more likely to trigger an allergy,” says the molecular biologist.

“The insect-based food market is still a niche segment,” says Hirsch-Ernst. In the future, the number of products is likely to increase because insect protein is a welcome alternative to protein from conventional animal products, such as meat, milk or eggs. “This is why it is so important that we understand the health risks better.” —

More information



BfR information
“Insekten” (in German)



Raw food



Many people consider unprocessed foods to be healthy. However, the consumption of raw animal-based foods, and even fruit and vegetables, can lead to infections.

Refreshing melon pieces and pre-packaged salads, carpaccio as something savoury and bread on a stick by the campfire – what sounds like a carefree summer picnic with lots of delicious food can come to an unpleasant end. The cause: pathogens that are normally killed when food is heated. If animal-based foods such as meat, fish, eggs or milk are eaten (almost) raw, not cooled sufficiently or if pathogens are transferred to other ready-to-eat foods during preparation, foodborne infections can occur. Fruit and vegetables can also be contaminated with pathogens.

INVISIBLE THREAT

Even though raw foods are a regular part of many people's diets, the health risks are often underestimated. This is shown by a representative survey carried out by the BfR. In particular, there is a perception of a (very) low health risk associated with popular foods such as raw sausage, raw ham, unpasteurised soft cheese, cold-smoked fish and frozen berries. Since pathogens do not usually lead to food spoilage, they cannot be seen, smelled or tasted.

Around 100,000 illnesses are reported in Germany each year that may have been caused by bacteria, viruses or parasites in food. The number of unreported cases is probably much higher. Foodborne infections are usually associated with stomach cramps, diarrhoea and vomiting. Most of the time they are self-limiting. However, in extreme cases, they can be life-threatening for small children, people with previous illnesses, the elderly and unborn children. An entire department

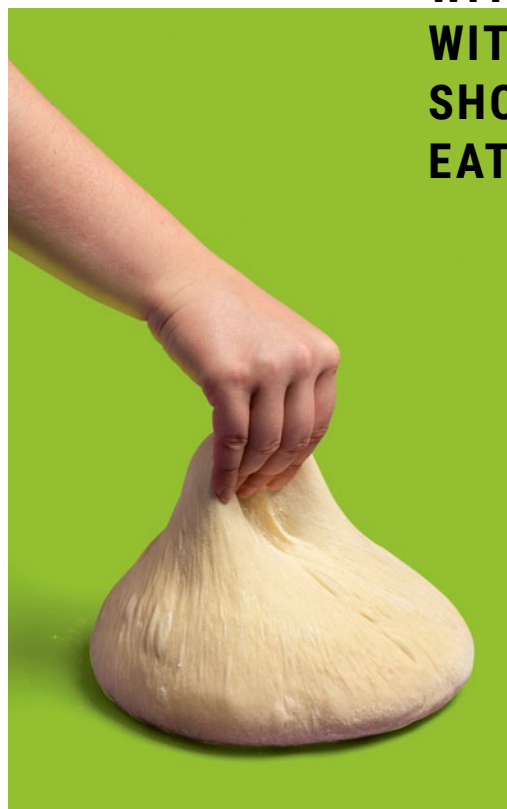
at the German Federal Institute for Risk Assessment therefore deals with the detection, health assessment and ways to combat microbial risks in food.

Salmonella, *listeria*, norovirus, to name but a few, can be present in many foods. While the majority of the population is familiar with these pathogens, there is a lack of knowledge about other foodborne pathogens. Particularly surprising: campylobacteriosis has been the most frequently reported bacterial foodborne disease in Germany and Europe for years, and yet only just under a quarter of people have heard of the pathogen that causes it – *Campylobacter*. The same applies to EHEC, particularly dangerous *Escherichia coli* bacteria (also known as STEC or VTEC).

SNACKING WITHOUT REGRETS?

If perishable food is stored without refrigeration, existing pathogens can multiply very quickly and endanger health if the food is not heated sufficiently before consumption. In the case of bread on a stick, which is popular in summer, both sources of trouble can come together. If dough, made with egg, is not refrigerated and remains raw on the inside when cooked over the fire, even when it is browned on the outside, *salmonella* infections can occur. Furthermore, children like to lick raw dough off their fingers.

**DOUGH,
WITH OR
WITHOUT EGGS,
SHOULD NOT BE
EATEN RAW.**



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FROZEN BERRIES CAN BE CONTAMINATED WITH VIRUSES THAT LEAD TO GASTROINTESTINAL ILLNESSES AND LIVER INFLAMMATION.



© YesPhotographers/adobeStock

“Although it can be tempting: when preparing dough, with or without eggs, you should not taste the raw mixture. The reason for this are possible STEC bacteria in the flour,” explains Dr Matthias Fischer, veterinary microbiologist at the BfR.

Caution is also advised when choosing a topping for your bread roll at the dining table. Ready-to-eat foods that are not heated during production can also contain pathogens. These include raw meat and meat products, such as minced meat and Teewurst, as well as soft cheese derived from unpasteurised milk and cold-smoked fish, such as smoked salmon. People from the at-risk groups mentioned should therefore only eat animal-based foods if they have been sufficiently heated before consumption.

WHY FRUIT AND VEGETABLES ARE NOT ALWAYS HEALTHY

Fruit and vegetables usually contain many valuable ingredients. However, it is possible that they become contaminated with pathogens during cultivation and on their way from field to plate. Examples include frozen berries, melons and ingredients for raw vegetable salads. Frozen berries can be contaminated with viruses, among other things, that can lead to gastrointestinal diseases and liver inflammation. Fans of the sweet fruits should therefore heat them up before consumption, preferably to at least 90 °C.

BfR survey: Raw foods



Online survey of 1,004 people in Germany, survey period 1 to 11 September 2022.

73 % eat raw sausage or raw ham at least 1 to 3 times a month, followed by unpasteurized soft cheese (57 %), raw meat (38 %), cold-smoked fish and frozen berries (both 33 %).

23 % are familiar with *Campylobacter*, the causative agent of the most frequently reported bacterial foodborne infection in Germany and Europe.

4 von 5 respondents (79 %) associate frozen berries with a (very) low health risk. In their raw state, fish and seafood (73 %), meat and eggs (both 72 %) are considered (very) risky.

With melons, pathogens adhering to the skin can get onto the pulp during preparation. “*Salmonella*, *listeria* and EHEC can easily multiply on the low-acid pulp, when the outside temperature is warm,” explains Dr Heidi Wichmann-Schauer, an expert for food safety at the BfR. Therefore, cut melon should be eaten quickly or refrigerated until consumption.

Pathogenic *listeria* can get onto vegetables and lettuce during cultivation and processing. “The moist and nutrient-rich environment in packs of pre-cut mixed lettuce provides favourable conditions for the multiplication of pathogens,” says Wichmann-Schauer. The risk of infection can be reduced, especially for risk groups, by preparing raw salads from thoroughly washed and not chopped ingredients just before consumption. —

More information



BfR FAQ
“Protection against foodborne infections in private households” (pdf)



BfR Consumer Monitor Special
“Raw food” (pdf)

People from risk groups should heat animal-based foods sufficiently before consumption.



BFR260

Boil raw milk before consumption.



© YesPhotographers / adobeStock

TIPS

Avoiding foodborne infections

Wash your hands thoroughly with soap and dry them before preparing food. This recommendation also applies between individual work steps if your hands come into contact with raw food.

Observe kitchen hygiene rules so that pathogens from raw food are not transferred to other food. To protect against cross contamination, only thoroughly cleaned kitchen utensils, such as chopping boards and cutlery, should be used for food that is not reheated before consumption.

Maintain the cold chain and store perishable food in the refrigerator at 2 °C to a maximum of 7 °C. If perishable food is offered over a longer period of time at barbecues, picnics or garden parties, it must also be sufficiently cooled.

Heat raw animal-based food before consumption so that all parts of the product reach at least 70 °C for 2 minutes. Warm dishes should be kept sufficiently hot (at least 60 °C in all parts of the food) or cooled to below 7 °C within a few hours for longer storage. Larger amounts of food can be divided into several flat containers for this purpose.

© YesPhotographers / adobeStock

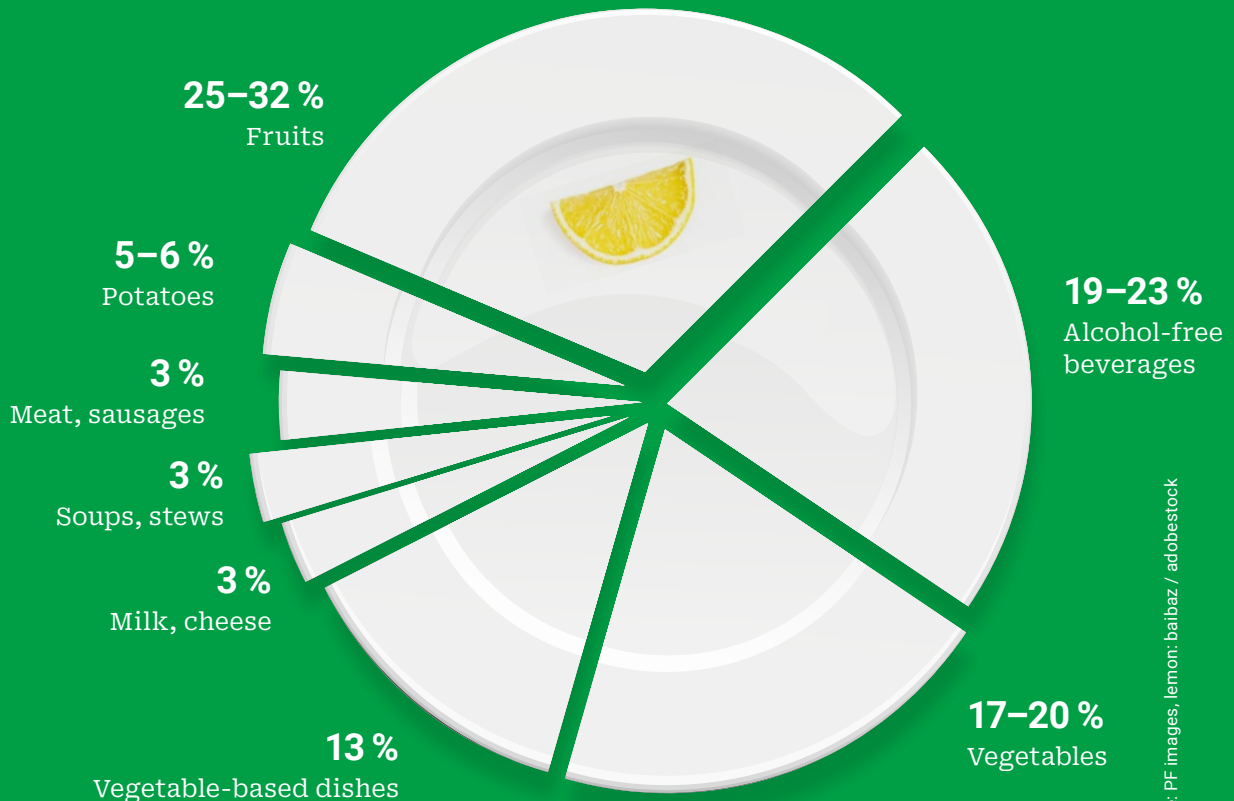
VITAMIN C

Many people take ascorbic acid, also known as vitamin C, to try to protect themselves from colds. But what is vitamin C, how much do we need of it and where do we get it from? A fact sheet.

... Why do we need vitamin C?

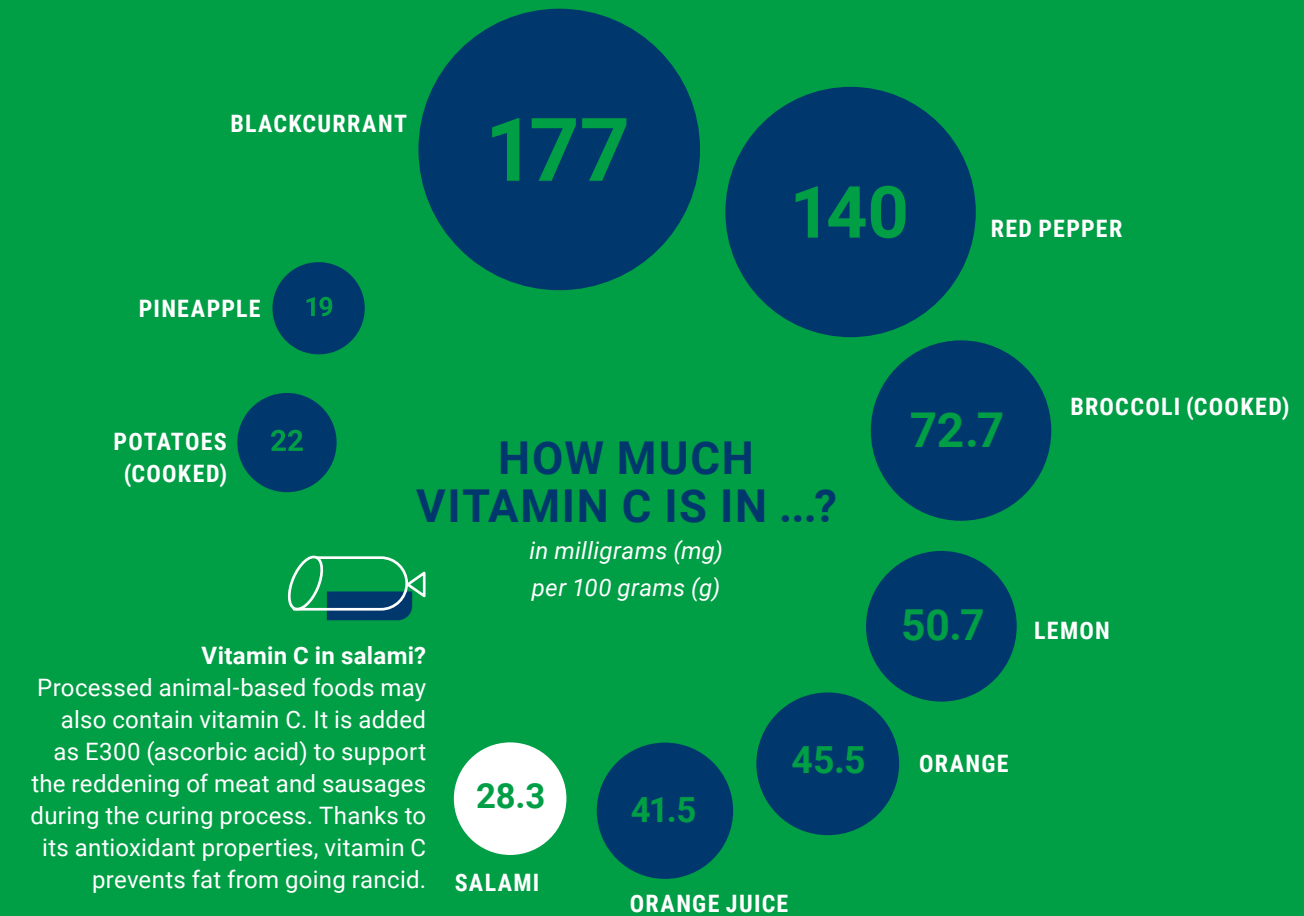
Our body needs vitamins for vital functions. We get them from foods. Vitamin C, also called ascorbic acid, fulfils various metabolic functions. These include contributions to the development of connective tissue, tissue repair and immune defence. It also improves iron absorption from plant-based foods.

Main sources of vitamin C

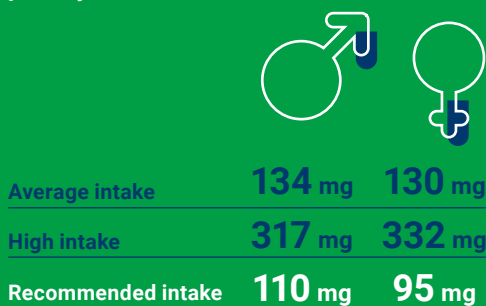


Source: National Food Consumption Survey II (NVS II)

© Plate: PF Images, lemon: baibaz / adobestock



Vitamin C intake from food
per day



With a **balanced diet**, healthy individuals do not need vitamin supplements or fortified foods to meet their vitamin C requirements.

Source: National Food Consumption Survey II (NVS II)

Recommendations for persons with increased vitamin C requirements
per day



Source: European Food Safety Authority (EFSA) and German Nutrition Society (DGE)

More information



The BfR's recommended maximum levels "Vitamins and minerals" (pdf)

IN GOOD FAITH



© David Trood / gettyimages

Research requires trust. However, there are indications that distrust is undermining its credibility – especially in the wake of the coronavirus pandemic. So, what’s happening to science’s reputation?

Can we still trust each other? Or are many public areas too often shrouded in suspicion? Do we actually live in an age of distrust, as some claim, an age in which suspicion and accusation are all around, in which evil intentions and sinister interests are suspected behind many things? This picture may be exaggerated. But there are some indications of a climate in which institutions that rely on trust, such as science, are in fact struggling. For the German Federal Institute for Risk Assessment (BfR), this is a topic that is worth dealing with and on which it seeks scientific exchange.¹

If public institutions cannot be believed, then this impacts science in particular. Distrust of their findings can lead to politicians no longer using the best available knowledge as a basis for decision-making, says Professor Dr Dr Andreas Hensel, President of the BfR. As a result, scientific and technical innovations are dispensed with. "Innovations are rejected in Germany, welcomed elsewhere," criticizes Hensel. Science, like other social institutions, is accused of self-interest, dishonesty and corruptibility. The loss of trust weighs heavily, since the foundation for the work of institutions such as the BfR is impartiality and independence.

SCIENCE PROVES ITSELF IN A CRISIS

On the other hand, the coronavirus pandemic has shown that a large segment of the population did trust publicly funded research. This is confirmed by the Science Barometer, a regular survey by "Wissenschaft im Dialog", an organisation that represents Germany's major research institutions. In 2017, every second respondent stated that they "completely" or "somewhat" trust science and research. In April 2020, when the topic of the "coronavirus" began to dominate public discourse, this figure shot to a proud 73 % and then later levelled off at around 60 %.

"Impartiality and independence are the basis for institutions like the BfR."

PROFESSOR DR DR ANDREAS HENSEL,
BFR PRESIDENT

As the Science Barometer shows, the audience is particularly receptive of publicly funded research institutions such as state universities. Research within business and industry is met with greater distrust. According to this survey, trust in media and politics is even lower. A reason for distrusting scientists is that they are often said to be dependent on their sponsors – although with a decreasing tendency at the beginning of the coronavirus pandemic, as Ricarda Ziegler reports in "Wissenschaft im Dialog" (see interview on page 30).

IN AN EMERGENCY, WE RALLY AROUND THE FLAG

When it comes to its generally positive relationship to science, Germany is not unique among western industrial nations. "Trust will carry us through the crisis," was the optimistic statement of Norwegian Prime Minister Erna Solberg during the pandemic. And indeed, the country came through comparatively well. Norway is a "high-

FOUR KINDS OF TRUST

according to Professor Michael Siegrist,
ETH Zurich

Interpersonal trust – based on direct personal contact between people

Confidence – refers to the perceived reliability of objects and products (car brand, washing machine, energy system)

Social trust – concerns trustworthy people or institutions (e.g., politicians or authorities)

General trust – tendency to trust strangers, according to Siegrist the "lubricating oil of society"

¹ The article is based in part on presentations given at the 2nd BfR Knowledge Dialogue. It took place under the title "Trust in times of crisis" on November 8, 2022 at the Magnus-Haus in Berlin.

trust society,” says Lisbet Fjæran from the University of Stavanger. In fact, approval of the state’s coronavirus management rose briefly to 91 % in Norway during the first half of 2020. The “rally round the flag” effect known from political science certainly contributed to this – in times of crisis, people pull together and submit to authority, at least temporarily.

Fjæran contradicts the thesis of the “post-trust society”, in which state institutions are exposed to the permanent suspicion of the population. Her ideal is a citizen who, instead of obeying blindly, “trusts critically”. He or she is generally positive about the state, but maintains a critical distance when it comes to how effective and independent its institutions are. For its part, the state must be willing to rely on the public’s ability to manage risk and uncertainty. Trust is not a one-way street.

TRUST – OPIUM FOR THE PEOPLE?

For Professor Michael Siegrist from ETH Zurich, trust is neither good nor bad in itself. The psychologist, a member of the Scientific Advisory Board of the BfR, not only sees the good “lubricating oil” function of trust (see box on the previous page) but also its downside: Trust can become “the opium of the people”, lulling them into a false sense of security and leading to poor political decisions. “During the coronavirus pandemic, less blind trust and more critical questioning might have led to better decisions,” says Siegrist.

For him, the coronavirus showed that self-responsibility should play a greater role in dealing with risks. Or, to reverse the famous quote from Vladimir Ilyich Lenin, the founder of the Soviet Union: control is good, trust is better. —

More information



BfR YouTube channel @bfr_bund
“Videos of the BfR Knowledge
Dialogue” (in German)

“Germany tends

Surveys do not confirm that Germans are generally hostile towards research, says political scientist Ricarda Ziegler from “Wissenschaft im Dialog”.

Ms Ziegler, it is said that science is having a difficult time here in Germany. You have been conducting an annual public opinion survey since 2014 with the “Science Barometer” to determine how much support research enjoys. Can you confirm the assumption that Germany has anti-scientific views?

The results have been quite stable over the years for many issues. More than 50 percent indicate that they have a great or very great interest in scientific topics. The benefits of science and research are also rated positively. From 2017 to 2019, half of the respondents said they trust science and research. This figure rose to 73 percent at the start of the coronavirus pandemic. These figures tend to reject the assumption of Germany being hostile towards science.

How does Germany compare to other countries?

According to Eurobarometer, a regular opinion survey conducted on behalf of the European Commission, Germany is in the midfield or even upper midfield. In spring 2021, 33 percent of the respondents in the EU average were very interested in new scientific discoveries and technical developments. In Germany, the figure was 40 percent. Across the EU, 86 percent see the influence of science and research as rather or very positive; this figure is 88 percent in the Federal Republic. In the EU, a quarter of people say they do not

not to be hostile towards science”

benefit from scientific developments; in Germany, only 15 percent say this.

Research and technology are evaluated differently by the population. On the one hand, people fear green genetic engineering while on the other hand enthusiastically welcoming every new mobile phone model. Nuclear energy is first condemned, then championed. How can such contradictions be explained? Or are they not contradictions at all?

These views have only partly to do with a general position towards science and research. They overlap to some extent, reflecting other facets of a personality as well. You may ask yourself: how do certain research results affect my everyday life? How do they align with my values? What experiences have I had so far with new developments through research and technology? It doesn't necessarily have to be a contradiction if I embrace a technical development in one area and see it rather critically in another.

What about the relationship between science and politics? How close should they be?

The Science Barometer also provides information on this. It shows that a large part of the population expects science-based politics. Researchers should be involved in political decision-making processes and, according to half of the respondents in the 2021 Science Barometer, also recommend decisions. However, many researchers would say: that's not our job. I think we should be aware of these expectations for public communication with regard to science, even if we are unable to meet them. It also has to be clear where science can provide answers and where scientific policy advice ends. —

 More information



Wissenschaft im Dialog
"Science Barometer"

© Wissenschaft im Dialog



“A large part of the population expects science-based politics.”

RICARDA ZIEGLER,
"WISSENSCHAFT IM DIALOG"

Worth the risk?

Nicotine pouches are new, tobacco-free products. When placed under the lip they slowly release nicotine. The BfR is investigating the health risks.



NICOTINE POUCHES OR "ALL WHITE" PRODUCTS

are small fabric pouches that contain a powder from nicotine salts and substrates – but no tobacco. They are placed between the lip and the gum so that the nicotine is released from the pouch when it is exposed to saliva. The nicotine then enters the body through the oral mucosa while some of the ingredients are also swallowed. Nicotine pouches are not currently on sale in Germany. However, they can be found on the internet. They are not the same as the oral tobacco snus, which is widely used in Sweden.

Nicotine floods into the brain within 10 to 20 seconds – proven for smoking – and the reward system is activated: dopamine is released and a sense of well-being sets in. With nicotine pouches, this biochemical process begins as soon as they are placed under the lip, but without the tobacco and combustion process. A research team at the German Federal Institute for Risk Assessment (BfR) is investigating whether nicotine pouches are actually as harmless as they seem to some.

The focus is on assessing the health risks of this new product group. The little data that is available mostly comes from the product manufacturers themselves. Important questions that the BfR wants to answer are: how much nicotine do the pouches contain? How much of it reaches the body? Do the pouches contain other substances that are harmful to the consumer's health? The BfR therefore is conducting experimental studies to close the data gaps.

HOW MUCH NICOTINE AND NITROSAMINES ARE IN THE POUCHES?

Many products lack clear information regarding the nicotine concentration. In addition, statements on the packaging about nicotine strength are often actually misleading as terms like easy, ultra, danger, strong, brutal lack consistent definitions. The research team analysed 44 nicotine pouches from different manufacturers. The result: nicotine concentration in the products ranges from 1.79 mg to 47.5 mg per pouch. "The nicotine concentration in some pouches is alarmingly high," says Dr Nadja Mallock-Ohnesorg with regard to the findings. She is head of the experimental investigations at the BfR.

Even if the pouches do not contain any tobacco, BfR scientists want to know whether impurities, such as tobacco-specific nitrosamines, are present in nicotine pouches. These impurities are formed from nicotine and other tobacco alkaloids during tobacco fermentation. Tobacco-specific nitrosamines were found in more than half of the pouches analysed. Two representatives of these substance groups, 4-(methyl-nitrosamino)-1-(3-pyridyl)-1-butanone (NNK) and N'-nitrosonornicotine (NNN), have been classified as group 1 carcinogens (carcinogenic to humans) by the International Agency for Research on Cancer (IARC). There is no safe limit threshold for them, which is why any ingestion should be avoided. Contamination with potentially harmful tobacco-specific nitrosamines can be avoided through the manufacturing process.

REFRESHING, SPICY, SWEET – TRACING THE TASTE

"We carried out an unknown screening with 50 pouches to identify flavouring substances," explains Dr Mallock-Ohnesorg. 186 different chemicals were detected. Among the ten most common flavourings are menthol, linanool, limonene and eucalyptol. Some of the identified flavouring can be allergenic. Even though individual substances are permitted in food, it is unclear whether they can lead to allergic reactions when used repeatedly and over a longer period of time in the same place under the lip, as is often



"Placed between the gums and the lip, nicotine enters the body through the oral mucosa."

NICOTINE

is an alkaloid that occurs naturally in tobacco leaves, but also in other plants. It stimulates the nervous system and can trigger a number of reactions in the body, such as strong cardiovascular effects including increased heart rate and high blood pressure. As an addictive substance, nicotine docks on to receptors in the brain, causing the release of hormones, such as dopamine and endorphins. In doing so, it stimulates the reward system. Regular consumption dulls the neural reward circuits, meaning that the amount of nicotine to achieve the same effect must be increased. A few mild cases of poisoning with nicotine pouches have been reported to poison information centres since 2020. Symptoms are nausea, vomiting, diarrhoea. Cases of severe poisoning can cause a slowing of the heartbeat or even respiratory arrest.

the case with nicotine pouches. The health risk posed by flavourings in nicotine pouches cannot be assessed at present, especially because of the high number of substances used.

HOW MUCH NICOTINE ENTERS THE BLOOD?

The BfR also looked at the question of how nicotine pouches compare to cigarettes with regard to the health risk from nicotine. To answer this question, an experimental study was carried out in which the nicotine blood level was measured after the consumption of nicotine pouches. 15 test persons put pouches with different nicotine concentrations from 0 mg to 30 mg from different manufacturers under their lips for 20 minutes. The



“Nicotine carries a risk of addiction. Therefore, nicotine pouches could be a gateway drug.”

DR NADJA MALLOCK-OHNESORG, BfR

nicotine concentration in the blood, the blood pressure, the heart rate and changes in the oral mucosa were then measured. For comparison, these studies were also carried out after cigarette consumption. The study was carried out in cooperation with the special outpatient clinic for tobacco addiction at the Ludwig Maximilian University of Munich (LMU). The result: in the case of high-dose (30 mg) nicotine pouches, nicotine levels were even higher than after smoking conventional cigarettes. "This indicates that high-dose nicotine pouches have a similar addictive effect as what is known from cigarettes," explains PD Dr Thomas Schulz, who also works on the health risk assessment of nicotine pouches at the BfR. Furthermore, the heart rate increased significantly and

irritation of the oral mucosa could be observed. "It is interesting that all products – even the nicotine-free one – reduced the test persons' urge to smoke," adds Schulz.

NICOTINE IS STILL NICOTINE

Whether with or without tobacco – people who ingest nicotine cannot negate the associated health risks. Nicotine concentrations and ingredients should generally be recognisable by consistent information on the packaging. "Nicotine carries a risk of addiction. Therefore, nicotine pouches can be a gateway drug for young people," explains Mallock-Ohnesorg. Pregnant women should avoid the pouches, as nicotine can harm their unborn baby. —

NOT AVAILABLE TO BUY IN GERMANY

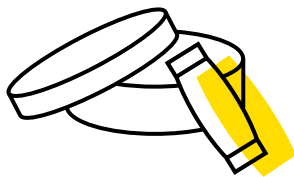
Since nicotine pouches are consumed by placing them in the mouth, the federal states' monitoring authorities classify them as novel food under food law. Since food must not pose a health risk, nicotine pouches are not available to buy in Germany.

More information



BfR opinion
 "Health risk assessment of
 nicotine pouches" (pdf)

**BfR survey:
 Nicotine pouches**



BfR online survey of 4,022 persons in Germany in May 2022.

3 in 4
 respondents have never heard of nicotine pouches.

2 %
 of people in Germany regularly use nicotine pouches, 14 % have already tried them.

85 %
 do not think they will use nicotine pouches in the future.

77 %
 feel that they do not know enough about possible health risks linked to nicotine pouches. In contrast, 19 % feel that they know enough.



Sperm in hormonal trouble?

Endocrine active substances from the environment are the deemed culprits for a variety of health disorders in humans. However, whether that is really the case is disputed. Illustrations: André Gottschalk

What is it with the sperm? This question was asked not so long ago by Nicholas Kristof from the "New York Times" just to immediately provide the answer himself: that it is in decline. The prominent author referred to a scientific study from the year 2017, according to which in the western world sperm counts indicated an up to 59 percent decline in viable sperm over a period covering the years 1973 to 2011. In the media studies like these regularly cause a great stir. There is talk of a sperm crisis, even of "spermageddon". Kristof stated some cells to have two heads while others swam around in circles to conclude that something alarming is happening between our legs.

Some scientists and journalists are quick to claim hormonally active substances to be the cause for such reports. According to them, it is the uptake of hormonal active substances from the environment that causes disruption of sensitive hormonal control loops, for example, by imitating or blocking natural hormonal action. In cases where such action causes bodily harm one speaks of endocrine disruptive chemicals, EDCs for short. Examples of much discussed hormonally active substances are Bisphenol A or phthalates used for the production of plastics or as plasticisers respectively. These can act similarly to oestrogen, the female sex hormone, if sufficiently high concentrations are present.

A LONG LIST OF SUFFERING

The list of health issues supposedly triggered by EDCs also includes, besides the aforementioned reduced sperm counts, thyroid disorders, diabetes, obesity, among others. The list of ailments seems almost as long as that of the suspicious substances. Yet these kinds of claims should be taken with a pinch of caution as the

case is not that clear. The connection between physical illness and hormonal cause is often based on mere assumption rather than an established fact. Even the supposedly clear cut linkage between "feminising" hormonally active substances and declining sperm counts is less clear than it might appear at first glance. Amongst the difficulties encountered when trying to establish a real or alleged sperm crisis is that the number of ejaculated sperm cells can be subject to tremendous individual fluctuations. Normal counts can cover a range between 15 million to 200 million sperm per millilitre of seminal fluid. What is more, different laboratories count differently, counts can be subject to large regional differences and many of the corresponding studies are subject to methodological deficiencies. It gets even more complicated once chemical substances are included. A recent assessment of the scientific evidence regarding sperm quality and production provides a

more cautious conclusion by stating: "Overall, the available data do not allow us to conclude that human semen quality is deteriorating worldwide or in the western world, but that a trend is observed in some specific areas."

A CONCLUSION BASED ON CONFUSION

"We have to take potential EDCs seriously," says biologist and toxicologist Dr Tewes Tralau from the German Federal Institute for Risk Assessment (BfR). His take of why this topic has so many people concerned is that many of the purported conclusion are based on epidemiological observations, which are difficult to interpret, particularly for laymen. Such data are often used for trying to establish potentially harmful effects of chemical substance exposure on public health. This then produces buzzwords like the one about the sperm crisis. However, there is a problem with this. In many instances, the corroborated links between cause and effect are postulated rather than scientifically validated. Although epidemiological studies can provide hints about possible correlations, they cannot determine cause and effect. Failing to acknowledge this will cause confusion instead of conclusion.



"Many of the chemicals that are important to humans are scientifically assessed with regard to whether and to what extent they could have an effect on the hormone system," says Tralau. This includes pesticide active substances, biocides as well as industrial chemicals produced in large amounts that require testing according to the European REACH legislation. Also toys, cosmetics, food contact materials and medical devices are examined and evaluated accordingly. For example, for materials with food contact there are set limit values of how much migration of a given substance is tolerable. If these values are observed there is no health risk to be expected.

NOT ALL HORMONAL ACTIVITY IS HARMFUL

Not every hormonally active substance is harmful. The fact that a substance affects the endocrine system does not mean that it necessarily causes health effects. It may be, for example, that the effect in question is only minor or that the body can effectively compensate for it. In some instances the effect might even be desired. "The crucial point about an endocrine disruptor is that the respective substance has an unwanted impact on human health and that this effect cannot be compensated for anymore," says Tralau.

The scientist is convinced that in Germany there already is a very high level of protection with little risk for consumers of being exposed to established endocrine disruptors at



“In Germany there is already a very high level of protection. Nevertheless there is a need for research.”

DR TEWES TRALAU, BFR

harmful levels. Nevertheless, there is still need for research. "Hormonal effects are not always easy to detect," Tralau points out. "While test systems exist for sex hormones and crucial aspects of the thyroid axis, there is need for better coverage of the hormonal aspects of the immune system, metabolism as well as the developmental system."

New methods and models for endocrine disruptor assessment are also the focus of the EDCMET project. The abbreviation stands for the large-scale EU project "Metabolic effects of Endocrine Disrupting Chemicals: novel testing METHods and adverse out-

come pathways" which was launched in 2019. Within this project the BfR is establishing methods for the early detection of liver damage. "We fill knowledge gaps," Tralau says. "This is crucial, even if it is not the fate of humanity that is at stake." —

More information



BfR FAQ
"Endocrine disruptors"



BfR YouTube channel @bfr_bund
Dr Tewes Tralau on endocrine
disruptors

Period panties: usually safe?

For many women, menstrual lingerie is a welcome alternative to tampons and the like. Whether it is harmless to health depends on the ingredients.

High waist, briefs or body shorts – menstrual lingerie comes in all shapes and colours. In the crotch, the lingerie pieces have a multi-layered insert that absorbs the blood. Manufacturers point out the sustainability of these products. The German Federal Institute for Risk Assessment (BfR), on the other hand, draws attention to insufficient data and, thus, a lack of health assessments on some ingredients.

PENDING RISK ASSESSMENTS

Some manufacturers use biocides such as silver chloride or zinc pyrithione to prevent unpleasant odours or bacteria from multiplying. “However, it is known that biocidal active substances can lead to allergic reactions and affect the bacterial flora of the skin,” explains Dr Vera Ritz. She is in charge of the evaluation of biocides at the BfR. “As long as there is no evaluation of either the health risks or the efficacy of the various substances – especially after repeated washing – their use in panties should be viewed critically,” adds Suna Nicolai. She works at the BfR on the risk assessment of chemicals in textiles. At EU level, the extent to which biocides can affect health is assessed by the European Chemicals Agency (ECHA). For this purpose, a large number of studies are used to analyse whether biocides cause skin irritation, impair reproduction or have a carcinogenic effect, for example. The European Commission then decides whether, in what concentration, and for what purpose a substance may be used.

SPECIAL REGULATIONS FOR EXISTING ACTIVE SUBSTANCES

The European Biocide Regulation classifies many of the biocidal active substances currently on the market as existing active substances because they were already used before the year 2000. However, at that time there was no assessment. This is now being made up for by subjecting these existing active substances to an approval procedure for their use in various types of products. For example, a distinction is made as to whether biocides are used in menstrual lingerie to protect health or to inhibit odours, i.e. as antibacterial agents. They are tested for their efficacy, safety to health and harmlessness to the environment. As long as the approval procedures are ongoing, the substances may be used in period panties within the framework of national transitional regulations. Even during this time, manufacturers have the obligation to provide a safe and efficacious product. However, they do not have to submit documentation or tests to monitoring authorities to prove this.

Meanwhile, manufacturers are already advertising biocide-free period panties. Europe-wide biocide legislation also has the sustainable use of substances in mind. With the knowledge of resistance development, the question of alternatives is coming into focus. The more frequently and widely antimicrobial substances are used, the more resistant germs become. The substance then loses its efficacy. —

WHEN SUBSTANCES MIGRATE

We use food and kitchen utensils when handling food, confident that they do not pose any health risks. However, if used incorrectly, there are materials that can leave traces in our food that are harmful to our health.

Hot, cold, sour, sweet, salty, greasy, moist – our food is diverse and must be packaged and handled in different ways. Which materials are suitable for this is a science in itself because they should not transfer any harmful substances to our food.

Manufacturers of everyday utensils are given guidelines and recommendations on how to meet this general requirement, for example, in the EU Plastics Regulation and the “BfR Recommendations on food contact materials”. These ensure chemical substances passing onto food do not pose a health risk.

However, there is not one substance from which all food contact materials can be made, just as there is not one intended application, temperature or food. Material diversity is technically necessary depending on the product. Therefore, instructions and restrictions are required so that consumers know how to use the items safely. Important: consumers must pay attention to the “intended use” and use the items correctly to protect their health.



BEESWAX CLOTHS

Beeswax clothes are popular packaging alternatives to aluminium foil and cling film. However, there are a few things to consider when making them. The cloth must be suitable for food contact, otherwise it can release components e.g. from the dye. Unsuitable dyes may contain carcinogenic primary aromatic amines. The beeswax must meet the EU purity criteria as a food additive. Otherwise, it may contain mineral oil residues or pesticides, which then transfer to the food. Greasy foods dissolve out wax and the jojoba oil sometimes contained in the cloths. The data on the latter is currently insufficient for a comprehensive risk assessment. It is therefore better to pack only fruit, vegetables or bread. Beeswax cloths cannot be cleaned at high temperatures. Do not pack raw, animal-based foods in them to avoid transferring germs that are hazardous to health.

More information



BfR FAQ
“Beeswax cloths: what should you look out for?”

© akf/adobestock



More information



BfR FAQ
"Aluminium in food and products intended for consumers"

ALUMINIUM FOIL

Aluminium has been used in the food industry in various forms for decades, but using it correctly is very important. Aluminium foil is not suitable for contact with salty and acidic foods, such as sliced apples, tomatoes, rhubarb, pickled herring, marinated meat or cheese. These can dissolve aluminium ions from the material, which are then eaten with the food. It is important that grill or menu trays made of aluminium are coated; otherwise, the same applies to them.

BEER CAN CHICKEN

The trend of roasting chicken using a beverage can and putting it on a barbecue or in the oven is concerning from a health perspective. The exterior of commercially available beverage cans is usually printed with inks. Tin plate or aluminium, from which the can is made, serves as a barrier between the beverage inside and the external ink and paint coating. It is not intended for these kinds of cans to be used as a "platform" for grilling meat. Heat destroys the can and may cause substances from the ink and paint to transfer to the chicken.



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More information



BfR communication
"BfR advises against beer can chicken" (pdf)

More information



BfR communication
"BfR advises against preparing food in pop-it fidget toys" (pdf)

POP-IT FIDGET TOYS

"Pop-it fidget toys" are colourful, differently shaped silicone toys to squeeze and "pop", passing the time and training dexterity. But can they be used to bake cakes or shape ice cubes and pralines? Preferably not. What may seem like a clever trick at first may actually be a risk to your health – if undesirable substances from the silicone pass into the food. If a manufacturer does not explicitly label its fidget toy with the note "For food contact" or with the cup-fork symbol, it should not be used for food preparation. The reason: toys may be made of substances that are not suitable for contact with food. "Foreseeable use" must also be accounted for, but baking and other contact with food is usually a step too far.

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BAMBOO TABLEWARE


Mugs, bowls and children's cups: ecologically trendy reusable crockery includes materials such as stainless steel, glass or plastic and also "bamboo tableware". Bamboo tableware is made of the plastic melamine-formaldehyde resin to which bamboo fibres have been added as a filler. Bamboo tableware is now de facto banned in the EU but can still be found in many households. At temperatures above 70 °C, formaldehyde and melamine can be released and transferred to food – and in quantities that can be

harmful to health if ingested over a longer period of time. Formaldehyde damages the stomach, among other things; melamine damages the urinary tract and kidneys. Therefore: do not heat crockery and bamboo tableware made of melamine-formaldehyde resin in the microwave and keep the beverage temperature in cups below 70 °C.

More information



BfR FAQ
"Tableware and kitchen utensils made of melamine-formaldehyde resin"



Even the surplus animals count

Most laboratory animals are not used in experiments at all. What can be done to reduce their number?



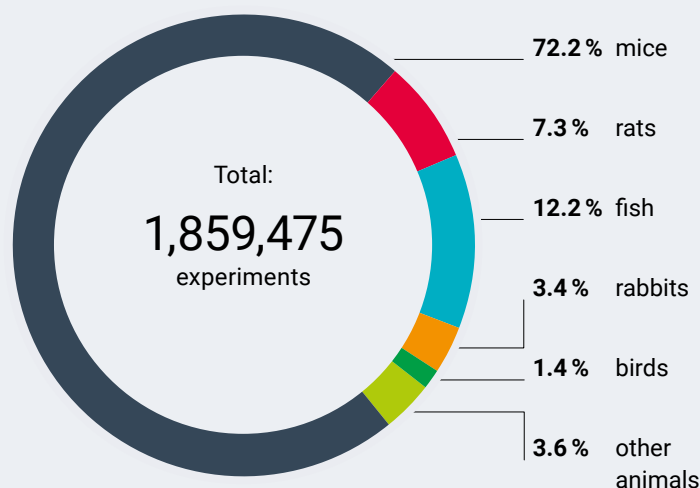
Cancer is the destructive proliferation of the body's own cells. The cause is fundamental changes in the cells' genetic material. These mutations have to be researched if the disease is to be understood and fought successfully.

One approach to this is genetically modified mice. They make it possible to study the development of cancer and prepare the development of new therapies and drugs. To put it simply: it is hard to imagine modern cancer treatment without animal experiments. However, not all genetically modified mice bred for experimental purposes are suitable. One reason is that, according to Mendel's laws of inheritance, only a quarter of the offspring are homozygous for a desired genetic trait, meaning three out of four mice in this scenario are "surplus". There is often no further use for them in scientific work.

This example is just one of many reasons on the subject of surplus laboratory animals not used in an experiment. Others include the animal being the wrong sex or an unsuitable age. Until now, surplus laboratory animals have mostly been killed. "The scientific community and the public are only gradually becoming aware of the issue," says Professor Dr Gilbert Schönfelder, head of the German Centre for the Protection of Laboratory Animals (Bf3R) at the German Federal Institute for Risk Assessment (BfR). This is responsible for summarising and publishing laboratory animal numbers in Germany. "More solutions are needed so that fewer surplus animals are produced," says Schönfelder.

Animal experiments

Numbers for 2021



SURPLUS ANIMALS ARE IN THE MAJORITY

For the first time in 2022, the BfR published the numbers of surplus laboratory animals or animals killed for other reasons for the reporting year 2021. The animals are mainly mice (86 percent), zebrafish (twelve percent) and rats (1.5 percent). With around 2.6 million animals, their number exceeds the animals actually used in experiments and for scientific purposes (2.5 million). From now on, the BfR will summarise and publish these figures, which are reported annually by the German federal states ("Laender") – an important step towards transparency, Schönfelder believes. The EU only publishes relevant information every five years. According to the most recent survey, around 12.6 million surplus animals were killed here in 2017, significantly more than in experiments (9.4 million). It is not known how high the number is worldwide (or in large nations such as the USA and China). One thing is certain: surplus animals are in the majority.

How we deal with laboratory animals reflects the social changes of previous decades. During this time, there has been increased awareness of the fact that vertebrates can feel pain and suffer. In Germany, this appreciation has led to animal welfare enjoying constitutional status for the last 20 years by being included in Article 20a of the Basic Law. This means that animals are recognised as a creature worthy of protection and possessing an "intrinsic value". For science, this means committing to animal welfare together with society.

The fact that animal welfare is playing a growing role is illustrated by a ruling made by the Federal Administrative Court in 2019. It bans the killing of day-old, male chicks that are unsuitable for egg and meat production, which is a common practice in poultry farming. The court refers to the German Animal Welfare Act. It protects the life and well-being of every animal as a fellow creature. And what's more: the law also does not allow pain, suffering or harm to be inflicted on the animal if there is no "reasonable cause" to do so.

A "REASONABLE CAUSE" – ALSO TO KILL

A "reasonable cause" must be valid, comprehensible and supported by a legitimate interest that outweighs the animal's interest in its integrity. Anyone who violates the law faces imprisonment of up to three years or a fine. However, there is no clear definition of what exactly constitutes a reasonable cause. It must be examined on a case-by-case basis. As in the case with the day-old chicks. The court saw no reasonable cause for their death.

"This unclear situation (...) may lead to Germany having a competitive disadvantage when it comes to research."

PROFESSOR DR GILBERT SCHÖNFELDER, BFR

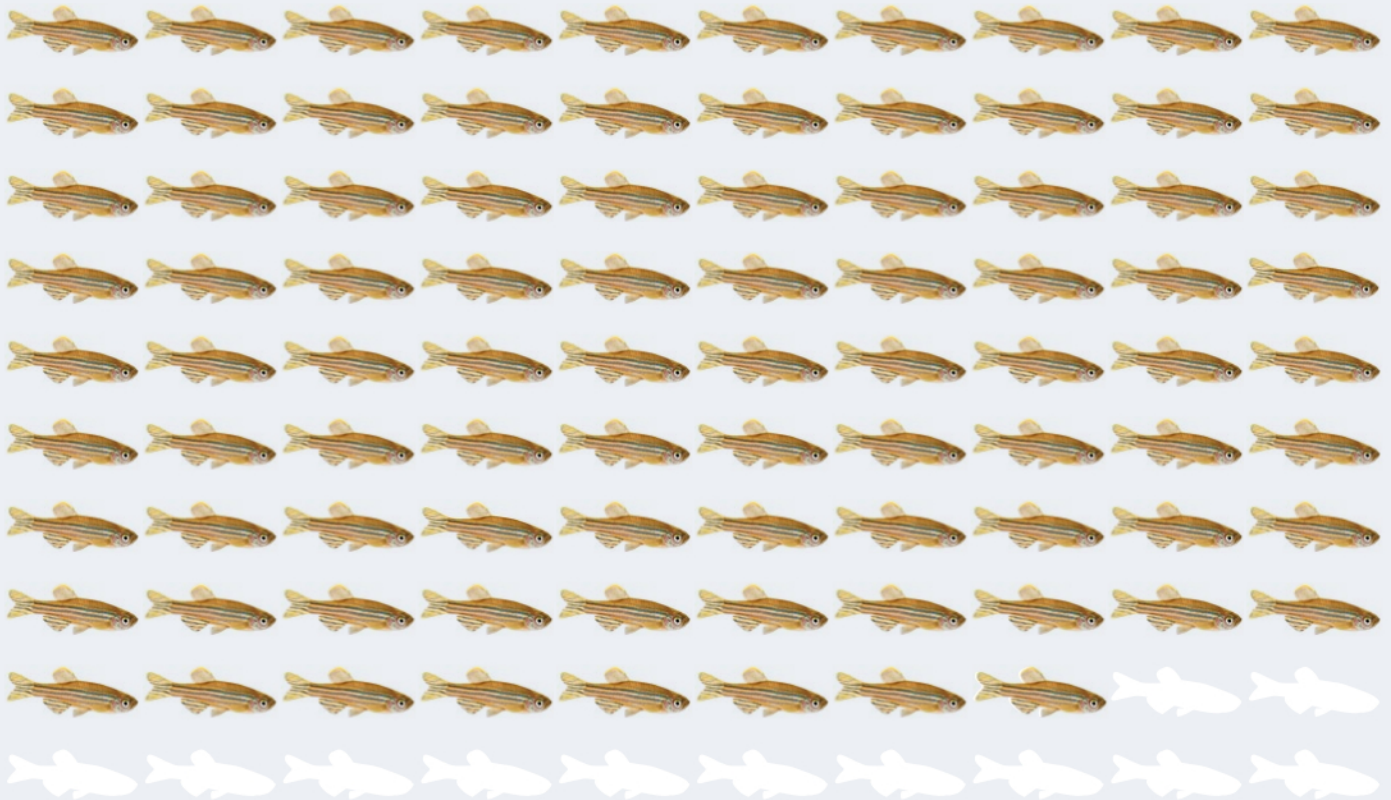
Killing chicks has been banned in Germany since 2022. This raises the question: what actually happens to surplus laboratory animals? What is the reasonable cause for killing them? Motivated by the ruling on killing chicks, German animal welfare organisations have gone to court and filed charges against various laboratory animal facilities. The accusation: violation of the German Animal Welfare Act since no reasonable cause exists.

"This unclear situation creates uncertainty in the scientific community," says Schönfelder. "It may lead to Germany being at a competitive disadvantage in research, to scientists leaving the Federal Republic or moving their experiments to other countries." He refers to the fear that surplus laboratory animals kept until the natural end of their life could lead to high resource consumption and a research blockade.

WAYS TO REDUCE THE SURPLUS

A retirement home for mice? Schönfelder emphasises that the focus should not be on this kind of solution. He suggests measures to reduce surplus laboratory animals in institutions (see box on the right).

"Another possibility is vertebrate-free experiments, for example, on the nematode *C. elegans* or the fruit fly *Drosophila*," says Schönfelder. "And, of course, exper-



In the case of zebrafish, 12 percent are surplus animals; for mice (previous page), only one in seven laboratory animals is used

iments with cell cultures and novel ‘organ chips’, such as miniature kidneys or livers, may also be more effective in the future.” Despite the developments in alternative methods and breeding techniques, it will not be possible to completely avoid surplus animals. So, what should we do with them? Apart from permanent housing, they could be given to interested parties or used as animal feed. However, in the case of genetically modified animals, the latter is hindered by considerable regulatory hurdles in the EU and is, therefore, not practised. Still, the discussion around surplus laboratory animals is ongoing. And that’s what counts. —

FEWER SURPLUS ANIMALS? WHAT CAN HELP

- Keep animal colonies (e.g. of mice) as small as possible
- Freeze eggs and sperm so that animals are produced only when needed
- Genetic testing of gametes so that only animals with the required genetic material are bred
- Use of new techniques such as the CRISPR/Cas9 “gene scissors”, with which targeted genetic changes are possible
- Experiments should not only be carried out with male animals, but also with females
- Older laboratory animals could also be used

More information



Wewetzer, H. et al. **The fate of surplus laboratory animals**. EMBO reports. E56551. DOI: 10.15252



BfR FAQ
“Alternative methods and laboratory animals”

INTERNATIONAL NEWS



Cooperation with US sister agency FDA

Following the inaugural meeting for the cooperation between the BfR and the U.S. Food and Drug Administration (U.S. FDA), joint areas of work have been defined as well as other long-term projects. Four topics are currently in focus: foodborne disease outbreaks, whole genome sequencing, tattoo inks and new

animal-free testing methods in risk assessment.



EFSA visits Berlin

In December 2022, the European Food Safety Authority (EFSA)'s second Risk Assessment Research Assembly (RARA) took place in Berlin, with the BfR playing a significant role in organising the agenda. The exchange between experts from the scientific community, risk management and politics focused on en-

hancing cooperation in research and international risk assessment in the field of food safety.

Humboldt scholar visits the BfR

Dr Abeni Beshiru has been working at the BfR as a visiting scientist for two years since March 2023 as part of the Alexander von Humboldt Foundation's Georg Forster Research Fellowship for Sustainable Development. The scientist from Western Delta University in Nigeria is researching the influence of biocides and environmental factors on horizontal gene transfer. This type of gene transfer between two organisms plays an important role in the spread of antibiotic and biocide resistance genes.

PUBLICATIONS



BfR Online World Food Safety Almanac

The BfR's World Food Safety Almanac has been online since 2022 and has since been viewed by many users around the world. The Almanac

provides an overview of the structure of public food safety institutions in each participating country. It contains 37 country profiles so far. The BfR is planning to expand the project to other nations in the coming years.

More information: <https://worldfoodsafetyalmanac.bfr.berlin>

Handbook for risk communication

The coronavirus pandemic and heavy rain events have shown how important it is for society to address risks, take precautionary measures and make recommendations with regard to conduct. The BfR and the Federal Office of Civil Protection and Disaster Assistance (BBK) have published a joint handbook to support authorities and civil protection organisations in this task and to develop strategies for practical, successful risk communication.

More information:



Risk communication handbook (in German)

Safe tattoo inks

In autumn 2022, the BfR appointed a committee for tattoo inks to assess and reduce health risks from tattoos even more comprehensively. An independent expert panel has nominated 23 international experts as honorary members. Discussions focus on the composition of tattoo inks, their analysis as well as methods for the toxicological testing of pigments contained in them. The inaugural meeting, at which the chairpersons were elected, took place in March.

Ukraine Fellows am BfR

The BfR has accepted three scientists from Ukraine as part of its own Werner Baltes Fellowship Programme for 2022 – 2023. An appeal for donations has enabled the BfR to provide two guest houses. This allowed three fellows, two of them with their families, to live in Berlin and work at the BfR in their fields of expertise.

EVENTS



Risk communication in times of crisis

From 13 July to 15 October 2023, the exhibition “#Krisenalltag – Kommunikation in der Pandemie” at the Berlin Museum for Communication will show the challenges of risk and crisis communication using the example of the COVID-19 pandemic. These are based on initial findings from the BfR-led network project on “Optimising risk and crisis communication by governments, authorities and health security organisations – MIRKKOMM”, which is funded by the Federal Ministry of Education and Research with around two million euros.

➔ **More information:** www.mirkkomm.de (in German)

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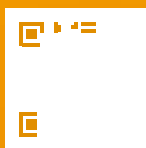
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