BfR2GO

ISSUE 2/2025

SWEETENERS

Artificially sweet, naturally controversial

MEAL PREP
PREPARING MEALS?
THE PROPER WAY!

MICROPLASTICS
STUDIES – WHAT'S
IT ALL ABOUT?

PFAS
NON-STICK
NO MORE?

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

Risiko

On poisons, hazards, and health

On the internet you find warnings everywhere: plasticisers in sunscreens, microplastics in our bodies, and contaminants in foods. What's the truth about these supposed hazards? We cover such issues in our German-language science podcast "Risiko" (German for "Risk"). New episodes of "Risiko" are released about once a month. In relaxed conversations, the hosts discuss real and imagined health risks posed by foods, chemicals, and consumer products. "Risiko" is produced by the German Federal Institute for Risk Assessment (BfR).

More information: https://podcast.bfr.bund.de/

Today, sweeteners can be found in a variety of ready-to-eat products. These sugar alternatives are a polarising issue among the general public. What does science say?

Main topic
Sweeteners

Editorial

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Dear readers,

Tough times for those with a sweet tooth: Nowadays, sugar gets a lot of bad press. It is considered a cause of weight gain and diabetes. Those who still want to experience the tempting aroma often choose low-calorie or zero-calorie sweeteners. However, there are also suspected health impairments. What this is all about and whether these suspicions are true will be discussed as the main topic of this issue.

Animal testing is always a topic of heated debate. Ten years ago, the German Centre for the Protection of Laboratory Animals was founded at the BfR. Here, animal welfare and science are combined together. In this issue, we take stock of this success story while also considering what the future might hold.

I would like to draw your attention to two other hot topics covered in this issue of BfR2GO. Microplastics in food are a source of concern for many people, as we know from the BfR Consumer Monitor. We explore why these concerns (and headlines) are so prominent. Foodborne infections are a very real risk in every scenario involving food and drinks. We present new, genome-based methods for tracking down pathogen sources more quickly.

I wish you a sugar-free yet nutritious read!

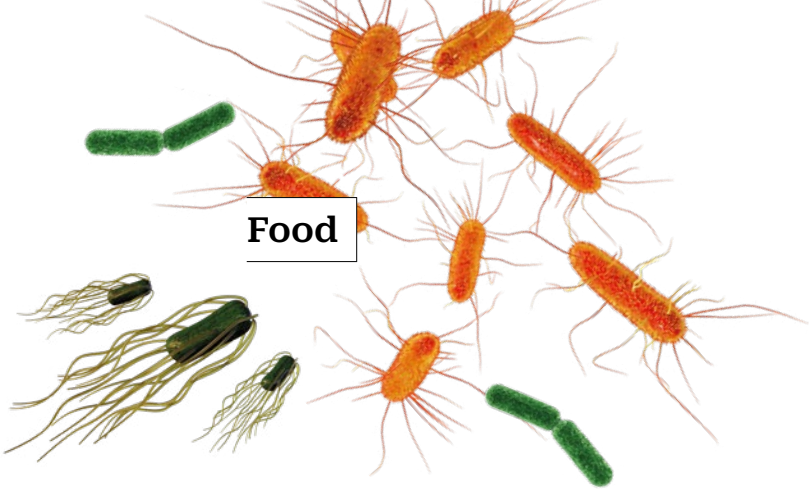
Professor Dr Dr Dr h. c. Andreas Hensel
BfR President

Assessment.
Research.
Communication.

Contents

Main topic

Headings



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Food

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INTERVIEW

Products & chemicals

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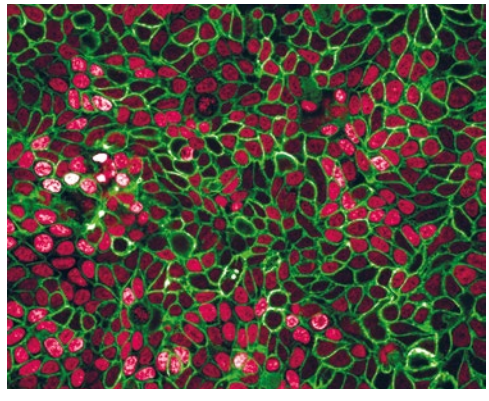
Protection of laboratory animals



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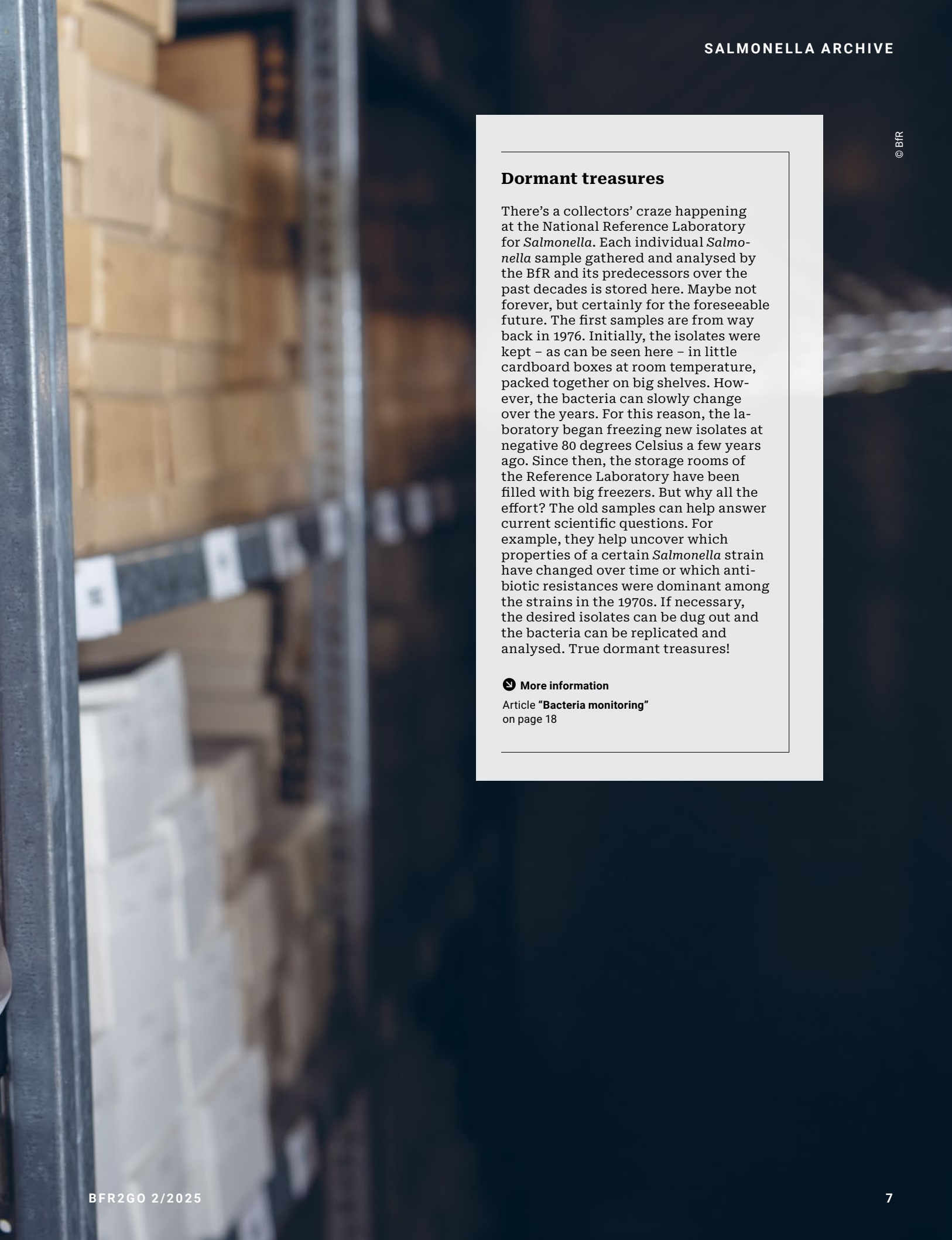


Dormant treasures

There's a collectors' craze happening at the National Reference Laboratory for *Salmonella*. Each individual *Salmonella* sample gathered and analysed by the BfR and its predecessors over the past decades is stored here. Maybe not forever, but certainly for the foreseeable future. The first samples are from way back in 1976. Initially, the isolates were kept – as can be seen here – in little cardboard boxes at room temperature, packed together on big shelves. However, the bacteria can slowly change over the years. For this reason, the laboratory began freezing new isolates at negative 80 degrees Celsius a few years ago. Since then, the storage rooms of the Reference Laboratory have been filled with big freezers. But why all the effort? The old samples can help answer current scientific questions. For example, they help uncover which properties of a certain *Salmonella* strain have changed over time or which antibiotic resistances were dominant among the strains in the 1970s. If necessary, the desired isolates can be dug out and the bacteria can be replicated and analysed. True dormant treasures!

More information

Article **"Bacteria monitoring"** on page 18

Artificially sweet, naturally controversial

Illustrations:
André Gottschalk

Sweeteners are increasingly replacing sugar in processed foods. But do these sweet substances harbour health risks?

We are born with a taste for sweet things – even breastmilk is sweet. But in a society with constantly available calories, having a sweet tooth can become a challenge. Studies have linked "free sugars" to an increased risk for nutrition-related chronic diseases such as dental caries, obesity, and type 2 diabetes. The World Health Organisation (WHO) recommends reducing the intake of "free sugars" to less than 10 percent of one's daily energy intake. For adults, this equates to no more than 50 grams per day. In Germany, the actual average intake is about 70 grams.

SWEET, ZERO CALORIES, (UN)COMPLICATED

How can sugar intake be reduced? Mindful food choices can be a way to avoid sugar, but so can lowering levels of sugar in (processed) foods. In order to promote a healthy diet, the German Federal Government passed the "National Reduction and Innovation Strategy" (NRI) in 2018. The strategy involves food

"Free sugars"

All types of sugars which are added to food and drinks and sugars which occur naturally in honey, syrups, fruit juice concentrates and fruit juices.

Polyol sweeteners *are sugar-like substances with less sweetening effect and fewer calories than sugar. Chemically, these substances are sugar alcohols (polyols), including polyglycitol sirup (E964) as well as sorbitol (E420), mannitol (E421), isomalt (E953), maltitol (E965), lactitol (E966), xylitol (E967), and erythritol (E968). In larger amounts, sugar substitutes can have a laxative effect.*

The group of low/no calorie sweeteners comprises very different substances which have barely any calories or none at all and which taste several times sweeter than sugar. Most of them are synthetically manufactured. Currently, 13 low/no calorie sweeteners are allowed in the EU: These include acesulfame K (E950), aspartame (E951), cyclamate (E952), saccharine (E954), sucralose (E955), aspartame-acesulfame salt (E962), neotame (E961), and advantame (E969). Some low/no calorie sweeteners are plant-based, such as thaumatin (E957) or neohesperidine DC (E959). Three substances are steviol glycosides (E960 a, c, and d), which are derived from the leaves of the stevia plant.

manufacturers committing themselves to reducing not only fats and salt, but also the amount of added sugar in their processed foods. Some companies have switched to relying more on sweetening substances, which provide almost no (low/no calorie sweeteners) or less calories (polyol reduced calorie sweeteners) (see box on the left).

Sweeteners are now present in many ready-to-eat products. This includes everything from soft drinks to yoghurts and from cornflakes to ketchup. Among the broader public, these sugar alternatives are polarising. A survey by the German Federal Institute for Risk Assessment (BfR) found: 34 % of those surveyed consider sweeteners harmless, while 13 % find them very concerning.

Currently, 21 sweeteners are allowed to be used within the European Union (EU). They have been subjected to safety assessments, are authorised, and must be listed in the list of ingredients on the product packaging (see box on page 12).

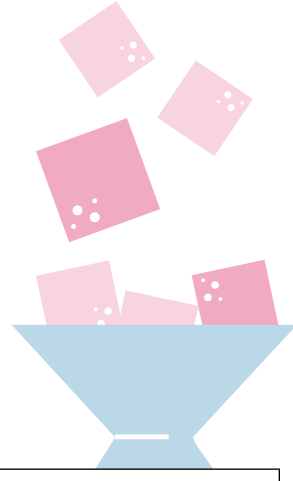
Our love of sweet things is innate. But consumption of “free sugars” is linked among others to an increased risk for conditions such as being overweight.

How does the scientific community go about conducting assessments for the effects of these substances on health?

"The crux of the matter is that the individual sweeteners have totally different chemical structures," explains Dr Britta Nagl, who has been involved in the health risk assessment for sweeteners at the BfR. This means that they are not all metabolised in the same way. Some are not broken down at all, while others are broken down and processed by the body. Additionally, dietary studies pose a particular challenge: Human subjects are inherently opaque, and a wide variety of factors such as lack of physical activity, smoking, and genetics can also influence body weight and health. "In the end, it is almost impossible to determine actual causative relationships. Particularly, because usually there is a combination of many factors involved, and diseases often develop over years," says Nagl. For the BfR assessment, the nutritional scientist and her colleagues at the BfR spent months combing through hundreds of studies and analysing whether and how the extended and the combined use of low/no calorie sweeteners might affect the risk of obesity, diabetes, stroke or dementia. Another issue addressed was a potential negative effect on the gut microbiome. The researchers concentrated on the five most commonly used low/no calorie sweeteners sucralose, acesulfame K, saccharine, aspartame, and cyclamate.

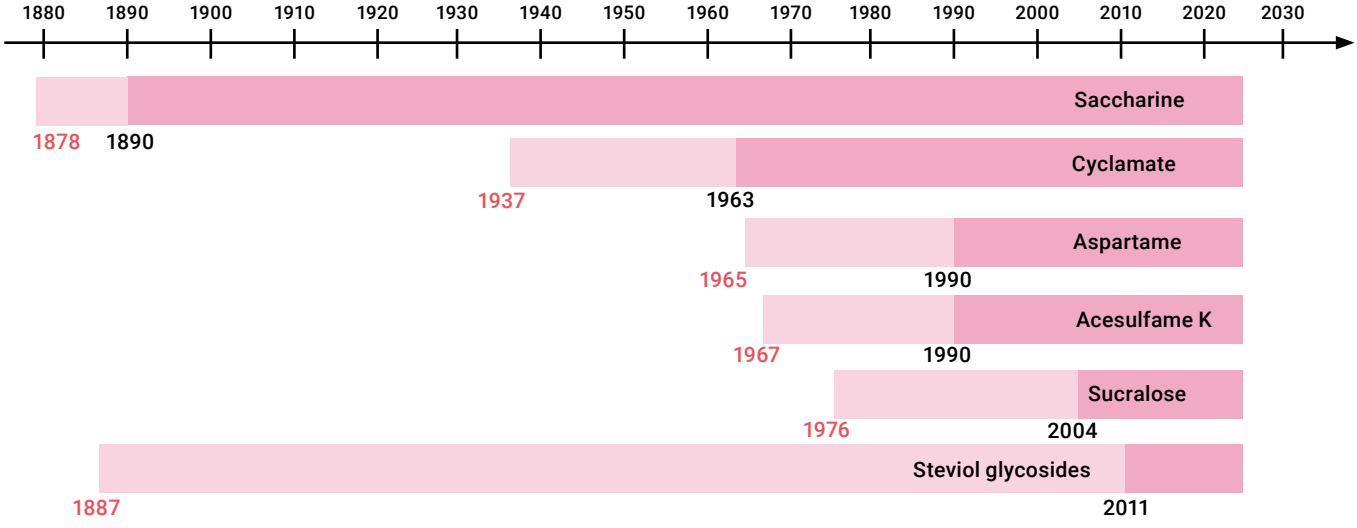
CONTROVERSIAL SWEETENERS

One of the studied sweeteners has been a subject of criticism for many years. "A persistent discussion about aspartame and cancer has led to this sweetener being one of the best-studied sweeteners," says Nagl. Scientific assessments



Popular low/no calorie sweeteners – **long since discovered and used**

Year of discovery, year of authorisation in Germany



THE LEGISLATION AROUND SWEETENERS – AND WHO ASSESSES THEIR SAFETY

Currently 21 sweeteners are allowed in the EU. All of them must be labelled on the ingredients list by name or with their E number. They may only be used for certain food products, such as for sugar-reduced or non-carcinogenic foods. Before they are authorised, all sweeteners (as well as all other food additives) are subjected to a health risk assessment by an Expert Panel from the European Food Safety Authority (EFSA). Nine sweeteners are currently being reassessed. For the other 12, this process has already been completed. One prerequisite for the authorisation of sweeteners is that they are considered to be safe to health.

More information

EFSA re-evaluation **"Sweeteners"**

performed by the BfR, the European Food Safety Authority (EFSA), and other scientific institutions have so far not been able to confirm such a risk of cancer. Accordingly, the data assessed do not give rise to health concerns, as long as the acceptable daily intake (ADI) value is not exceeded.

Regarding sucralose, one thing should be borne in mind: If this sweetener, which has been authorised as safe, is heated to above 120° C, compounds with carcinogenic potential can be formed. Temperatures between 120° C and 150° C are possible in industrial food production and can also occur at home during baking, deep-frying or roasting. As of yet, there are not enough data to conduct a conclusive health risk assessment. Until these become available, the BfR recommends to not heat foods containing sucralose to such high temperatures.

87 of 92

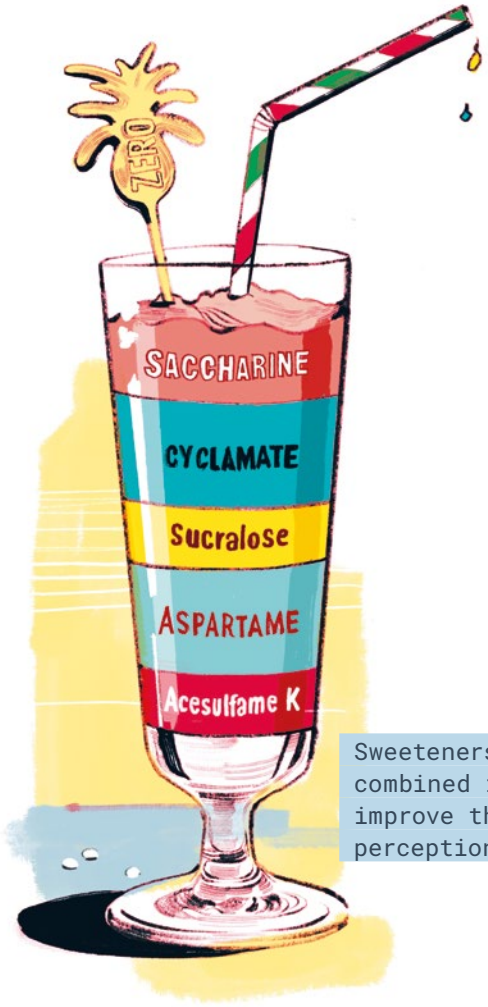
calorie-reduced soft drinks contain more than one sweetener. The levels vary greatly.

- Result of the BfR MEAL Study

QUESTIONS ABOUT DOSE AND COCKTAIL EFFECTS

As a rule, all sweeteners authorised in the EU are currently considered safe to health as long as the acceptable daily intake amount of the respective sweetener is not exceeded. This denotes the amount of a substance which can be consumed daily for a lifetime without health impairments being expected. As the world of science acquires new knowledge though further studies, systematic reassessments must be carried out regularly. Currently, there are ongoing EFSA revisions for individual sweeteners.

A challenging aspect is that there are currently insufficient data regarding the total amounts of sweeteners consumed in Germany. There are only estimates based on a wealth of data on consumption amounts and sweetener levels of relevant foods. Additionally, sweeteners are often used in combination in order to improve sensory perception and achieve increased sweetness. For instance, saccharine is far sweeter than cyclamate, but has a metallic aftertaste, which can be reduced by cyclamate. Moreover, foods consumed may also contain different sweeteners. The BfR MEAL Study showed that the majority of the investigated soft drinks contained more than one low/no calorie sweetener.



Sweeteners are often combined in order to improve the sensory perception.

The possible long-term effects of low/no calorie sweetener combinations have not yet been extensively researched. Theoretical considerations based on data from animal studies on individual low/no calorie sweeteners indicate that certain mixtures might lead to the occurrence of combination effects in the kidneys and urinary tract. Due to the lack of robust studies, it is currently unclear how relevant possible combination effects may be for humans. International expert panels have thus not yet been able to consider this aspect in toxicological assessments and in the EU authorisation process.

THROUGH THICK AND THIN

It has been repeatedly called into question whether low/no calorie sweeteners really help with weight loss or if they may even cause the opposite. Under strictly controlled study conditions, research has shown that low/no calorie sweeteners used as sugar substitutes in foods and drinks can support weight reduction. However, these studies were mainly conducted as part of intervention programmes for weight reduction with calorie-reduced diets and involved nutritional counselling. The results therefore do not allow conclusions to be drawn regarding the transferability of these effects under everyday conditions.

It seems like a paradox: Despite increasing numbers of sugar-reduced products, the number of overweight people is increasing. Low/no calorie sweeteners

contain virtually no calories, so why doesn't their usage have an effect on this development? Researchers are divided on whether low/no calorie sweeteners may have a long-term effect on appetite, metabolism, or energy balance. Data from animal studies can only be applied to humans to a limited extent and the available data from humans is limited. But there's one thing that science knows: Sugar is only one of many factors that can influence the risk for becoming overweight.

Behaviour may be another factor. "People who consume calorie-free products may eat more of other things, thus negating the calorie-saving effect," Nagl suspects. Lifestyle factors such as physical activity also play a role. Weight loss only works when more energy is expended than is consumed.

"People who really want to do something good for their health should maintain an active lifestyle and follow a balanced and varied diet," says Nagl. To achieve this, it may be helpful for people to be critical of their craving for sweet foods and to gradually wean themselves off added sugar. After all, "individual taste can be trained," says Nagl. —

More information

BfR information page **"Sweeteners"**

"People who want to do something good for their health may want to be critical of their craving for sweet foods and gradually wean themselves off added sugar."

Dr Britta Nagl, Department Food and Feed Safety in the Food Chain at the BfR

“While shopping, it’s worth taking a closer look”

© Max Rubner-Institut

At the Max Rubner-Institut (MRI), Dr Corinna Gréa observes changes in the levels of sugar, salt, and fat in processed foods – and whether more sweeteners are used. The data from this product monitoring help the BfR to determine the health risks of sweeteners more accurately.

With its “National Reduction and Innovation Strategy”, the German federal government aims to reduce sugar, salt, and fat in processed foods. The MRI is carrying out an accompanying product monitoring to analyse the nutrition declaration provided on the packaging of certain products in order to track changes in the levels of sugar, fats, and salt over time.

Ms Gréa, for which products do you monitor the sugar content?

Because we cannot monitor all foods, we define specific product groups. For sugar, these include soft drinks, biscuits and other fine bakery products, sweetened curd and yoghurt products, breakfast cereals, cold sauces like ketchup, pasta sauces, and different kinds of muesli, sports, and fruit bars.

What changes are you seeing?

Overall, the sugar level is decreasing in many product groups. This is particularly evident for breakfast cereals. For products targeted at children, the average sugar level even reduced by 38.5 %. For bars, too, it went down by more than 30 %. In other product groups, such as sauces, we have not yet seen relevant changes. At the same time, we are seeing an increase of the fat levels in products like breakfast cereals and bars. This shows that in many processed foods with multiple ingredients individual components cannot simply be reduced or omitted.

What about sugar and sweeteners in soft drinks?

Between 2018 and 2024, the proportion of soft drinks containing only sugar decreased. Simultaneously, the share of products containing only sweeteners rose slightly, particularly for infused water, cold tea products, and energy drinks. For soft drinks targeted at children, the use of sweeteners is decreasing.

Does that mean that sugar is being replaced with sweeteners?

That seems to be the case. Sweeteners are increasingly present in soft drinks, but so far this has mainly been in combination with sugar in order to preserve the sweet taste while also reducing calories. Nevertheless, most soft drinks still do not contain sweeteners.

How can sugar and sweeteners be identified in products?

While shopping, it’s worth taking a closer look. First, check the nutri-score for a general impression. Then examine the nutrition declaration for the sugar content. And finally, look at the list of ingredients to check for sweeteners. This is not straightforward, as sweeteners often carry names which are hard to decipher. Depending on the length of the list, you may need a little patience. —

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SOCIAL, SAVOURY, SINISTER?

When it's cold outside, we love a certain kind of festive food: meat and vegetables roasted on raclette pans or at the end of fondue skewers. When preparing the ingredients, proper kitchen hygiene is particularly important. Otherwise, potential pathogens can be transferred from raw ingredients to the food, which is eaten without being cooked again. Proper practices include strict separation of raw meat (especially poultry) from foods which are eaten without being cooked further. Additionally, after contact with raw animal food products, hands, kitchen utensils, and work surfaces should be thoroughly cleaned before processing other meal components.

More information

BfR FAQ
"Preventing foodborne infections in private households"

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RISKY MAKE-UP?

Cosmetic products such as foundation or lip and eyeliner may contain certain per- and polyfluoroalkyl substances (PFAS). The safety assessment required for cosmetic products ensures that these substances are not expected to lead to any negative health effects. PFAS do not break down in the environment, which is why certain PFAS which are harmful to health, as well as their precursors, are banned in the EU. A study conducted by the European Chemicals Agency (ECHA) found no banned PFAS on the ingredient lists of 96 % of the assessed cosmetic products. Almost all non-compliant products contained perfluorononyl dimethicone, a polymer which is unlikely to be absorbed through the skin due to the large size of its molecules. However, it can release PFAS into the environment which may be harmful to human health.

E is for Eating

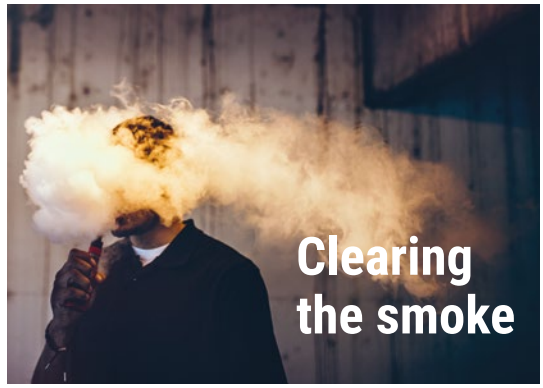
According to the BfR Consumer Monitor, food additives are among the food-related health risks most concerning to the general public. They are often added to foods, for example in order to prolong their shelf life or to intensify flavour. On the list of ingredients present on packaged foods, they can be identified by their E number. Additives are only authorised if their use has been deemed harmless by a health risk assessment conducted by the European Food Safety Authority (EFSA). Since January 2025, the new European Union Reference Laboratory for Food Improvement Agents (EURL FIA), headquartered in Belgium, has been helping to monitor levels of additives in foods, for instance by improving methods of analysis.

IMPROVED NETWORKS

Products classified as harmful to health are often complex mixtures of substances. Improper use or accidents can lead to potential hazards to our health. Manufacturers are legally obligated to report these kinds of products to the BfR. The BfR, in turn, sends this information to the Poison Centres of the German federal states ("Laender") for medical emergency advice in case of poisoning. The monitoring authorities of the federal states check whether or not manufacturers comply with their notification obligations. Since February 2025, they have been able to check the BfR platform "Produktmitteilungen-online" (product notifications online) to see whether notifications on certain products are available. This allows them to identify non-compliant manufacturers.

More information

BfR information page
National product register



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In their updated FAQ on e-cigarettes, the BfR provides information about negative health aspects, including those stemming from e-liquids. For instance, regular consumption of high concentrations of certain synthetic cooling agents in the vapourised liquids can pose health risks. Additionally, the cool sensation in the user's mouth elicited by the cooling agents can make consumption more appealing and thus lead people – particularly those who are inexperienced – to increased nicotine consumption and higher levels of dependency. According to a BfR survey, only four percent of those surveyed who associate vaping with health risks expect impairments from e-liquids. There are still many unanswered questions, particularly regarding long-term effects. The BfR continues to conduct its own research and provide information on the topic.

More information

BfR FAQ
"E-cigarettes: anything but harmless"

COME ON, MAN!

A vegan, vegetarian, pescetarian or mixed diet: what are the effects on health? The COPLANT study is conducting research into these questions. Together with their partners, the German Federal Institute for Risk Assessment (BfR) is looking for around 6,000 people between 18 to 69 to participate. In particular, they're looking for men who follow a pescetarian diet, meaning "vegetarian plus fish".

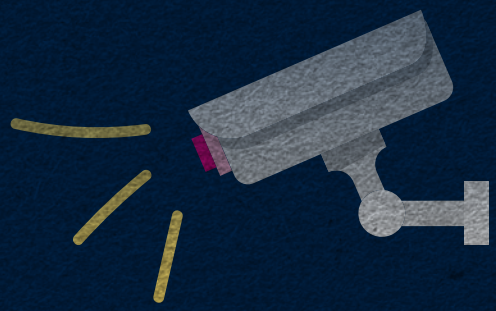
COPLANT

More information

Website
coplant-studie.de/en

Bacteria monitoring

Genome analysis helps identify the source of foodborne infection. Real-time monitoring of potential pathogens is planned for the future.



Some foods would not exist without the presence of bacteria, including yoghurt and cheese. However, most germs are not desirable in foods. These include *Salmonella, Campylobacter*, and *Listeria*. They can cause illness and are particularly dangerous for small children, pregnant women, and sick or elderly people. Pathogens can spread quickly along production and distribution chains, leading to disease outbreaks in areas far apart from each other.

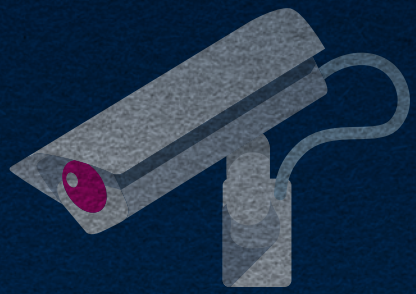
If two or more people fall ill (likely) due to the same food or if corresponding illness cases are more frequent than expected, this is termed a foodborne disease outbreak. Outbreaks are comparatively easy to identify when they occur in a single location, for instance following an event. If several people complain of nausea, vomiting, diarrhoea, and abdominal cramping, it is probable that a contaminated food is the cause. However, for individual illness cases occurring at different times in different parts of the country, it is far more difficult to identify the source.

LOOKING FOR A MATCH

If an outbreak is suspected, it is important to identify the pathogen responsible for the infection as well as the contaminated food as fast as possible. This is no simple task, as became evident with the recent enterohaemorrhagic *E. coli* (EHEC) outbreak which began in Mecklenburg-West Pomerania. The search for the source of infection included laboratory diagnostic research into the characterisation of the pathogens, in particular methods of full genome sequencing. Put simply, the genetic material of a pathogen is identified piece by piece.

“We compare the genome sequences of pathogen isolates from food with those taken from sick people,” explains Dr Burkhard Malorny from the German Federal Institute for Risk Assessment (BfR). “If a match is found, i.e. if the sequences are identical or almost identical, this is often the first indication of the contaminated food. This allows us to further close in on the source of the disease outbreak.” Only a few years ago, these methods were too complicated and expensive to be used in common research in government institutions and not just in high-level research. That has changed. “Today, around two thirds of the authorities responsible for food monitoring in the German federal states (“Laender”) use these methods,” says Malorny. He heads the National Study Centre for Sequencing in Risk Assessment, which assists the states’ authorities in establishing use of these methods.

Full genome sequencing has also become more prevalent in the National Reference Laboratories (NRLs) at the BfR, which regularly looks at pathogen isolates collected from food and feed, including from national monitoring and prevention programmes. With the help of the study centre, the NRLs were among the first institutions to scope out the potential of new genome analysis methods. Now, they use them for early detection of new pathogen variants and can estimate their illness-causing



potential and their spread. “These methods are far more precise than the previous ones,” says Dr Sylvia Kleta from the NRL for *Listeria monocytogenes*.

TARGET: IDENTIFY THE SOURCE OF THE OUTBREAK

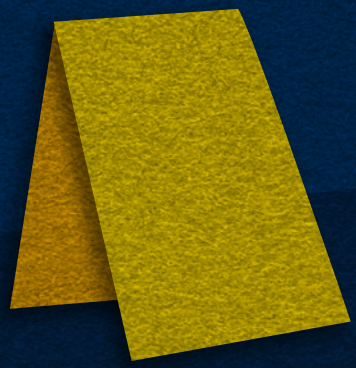
The NRL for *Salmonella* has a high workload. It receives around 3,000 *Salmonella* isolates from food each year, both from public and from private laboratories and universities. The NRL for *Listeria monocytogenes* receives around 2,000 isolates annually. In 2024, about half of these isolates were sequenced in the two NRLs, i.e. the isolates which were not sequenced by the official laboratories themselves. If a match is found when comparing an isolate with reference sequences of foodborne disease outbreaks, a notification is delivered to the sender. The authorities of the states then have the opportunity to more precisely examine the source of the outbreak and to initiate countermeasures. “When the typing indicates a particular food, the authorities can more closely identify the source of the infection and ask those affected whether they ate the suspected food,” Kleta explains. At the same time, product distribution patterns and the like can be studied, meaning the origin of the food can be traced and targeted measures can be implemented by the manufacturer in order to eradicate the source of infection.”

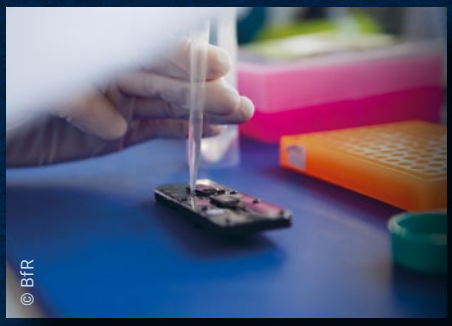
“The idea is to, in the future, have a single database with all sequencing data which we can then compare with each other.”

DR BURKHARD MALORNY, NATIONAL STUDY CENTRE FOR SEQUENCING IN RISK ASSESSMENT

The monitoring of the outbreak conducted in the German federal states took place in close collaboration with the German Federal Office of Consumer Protection and Food Safety (BVL), which is home to the point of contact for foodborne disease outbreaks. Outbreak analyses are typically initiated by and performed in cooperation with the Robert Koch Institute (RKI), which is tasked with preventing infectious diseases.

The relevance of full genomic analysis in the context of foodborne infections is undeniable.





Finding the food suspected of causing the disease outbreak involves laboratory diagnostic research into the characterisation of pathogens.

Regarding the efficiency and the use advantages, however, there is still room for improvement. “We have to move beyond reactive outbreak analysis and get to a point of prospective analysis,” says Malorny. “The idea is to, in the future, have a single database with all sequencing data – from food and feed and from sick people – which we can then routinely compare with each other. As soon as the comparison leads to a match, we will know where to take a closer look. Even before suspicion is raised. This way, outbreaks can be prevented or at least minimised.”

This kind of national database is already being built, spearheaded by a federal and state working group led by the German Federal Ministry of Agriculture, Food and Regional Identity (BMLEH). The BfR, specifically the National Study Centre, is a part of this collaboration and is working to develop a tool for data collection and analysis. “We’ve discussed it all. Now we have to implement it.” —

Se
SELENIUM

Selenium occurs in soils, rocks, and water. Because the human body cannot synthesise this essential mineral on its own, it must be consumed through food. However, supplementation is generally not necessary.

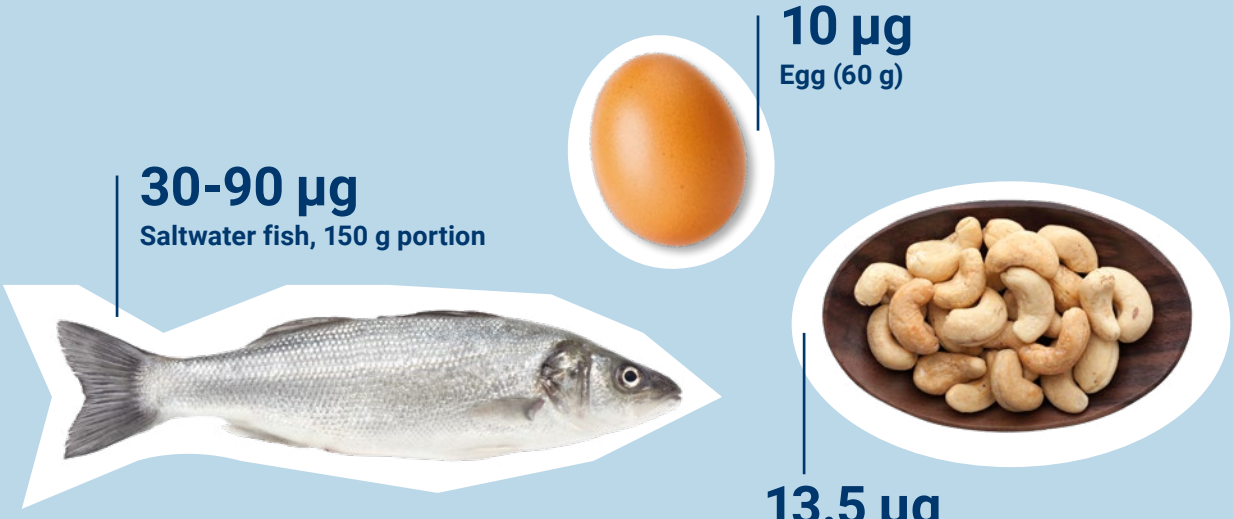
Which foods contain selenium?

In Germany, the best sources of selenium are animal food products: fish, meat, sausage, or eggs. This is because selenium is also used as an additive for animal feed, as selenium is not only essential for humans, but for animal health as well. People following a plant-based diet can best consume their share of selenium through different cruciferous vegetables such as broccoli or white cabbage, as well as from bulb vegetables, mushrooms, asparagus, and pulses.

People eating a **balanced diet** typically consume sufficient amounts of selenium.

Vegetarians and especially vegans should keep an eye on their intake.

Good sources of selenium



One microgram (µg) is one millionth ($1x10^{-6}$) of a gram

Estimated values for adequate daily intake*

for persons from 15 years of age

70 µg

Boys/men

60 µg

Girls/women/ pregnant women

75 µg

Breastfeeding women

Reliable data on selenium intake among the general population is not available. However, there is no indication of clinically relevant symptoms of insufficient selenium supply in Germany.

* Source: The German Nutrition Society (DGE)

Why does the body need selenium?

Selenium is an important component of certain proteins, named selenoproteins. These are involved in a variety of physical functions. For example:

→ protecting cells from oxidative damage

→ regulating cell growth and proliferation

→ supporting normal thyroid function

What are the effects of too much or too little selenium?

If selenium intake is too low over a longer period of time, for instance due to an illness, the formation of selenoproteins can be disrupted. This may lead to impairments of the immune system or of muscle function. In case of a suspected selenium deficiency, consumers should, however, not begin taking selenium supplements on their own. Instead, they should consult their doctor. This is because too much selenium, after all, can also lead to health problems. An early sign of this is hair loss.

Healthy people following a normal balanced diet do not need to be concerned about selenium deficiency or excess. Food supplements are thus unnecessary.

Consumption of food supplements with extremely high amounts of selenium or improper dosing (misuse) of supplements can also lead to acute poisoning. Possible symptoms include vomiting, respiratory distress, cardiovascular problems, and in rare cases even organ failure.

In the view of the BfR, food supplements marketed to people from 15 years of age should not contain more than 40 µg of selenium per daily dose.

More information

Website microco.info **"Selenium"**

© Raluca Gogan/gettyimages

Meal prep – the proper way

Meal prep has become popular. What do you need to consider when preparing meals for several days in advance?

Whether using ingredients from your own garden or the supermarket – preparing meals for several days is popular. You know which ingredients are included and don't have to constantly ask yourself, "What will I cook today?" However, while meal prep is very practical, there are a few rules to be followed.

"With longer storage time of cooked meals, the risk of microbial contamination and thus foodborne diseases increases," says Dr Petra Hiller, whose work at the German Federal Institute for Risk Assessment (BfR) concerns, among other things, the health risks posed by bacterial toxins in food. Some people's immune system may be impaired due to pregnancy, old age, or pre-existing medical conditions. "Meal prep is less suitable for these people," Hiller says.

THE RECIPE FOR HYGIENE

A lack of proper hygiene when dealing with food is the main cause of foodborne diseases. These occur primarily due to pathogens such as bacteria and viruses in food of animal origin such as meat, fish, milk, and eggs that are consumed raw or insufficiently cooked before eating. Raw fruit, vegetables (especially sprouts), lettuce or fresh herbs can also be a source of infection.

It is important to follow a few hygiene rules even at the initial meal-prep stage of preparing the individual components. Fruit, vegetables and fresh herbs should be carefully washed, ideally under running water. Peeling also minimises the risk of infection, especially in the case of certain vegetable types for raw consumption that grow close to the ground, such as cucumbers and carrots. Should raw meat also be washed? "No," Hiller says, "as it may lead to the spread of germs in the kitchen." Dry dabbing the meat with kitchen paper is a better approach.

It is important that pathogens from (generally raw) food do not transfer to other food. Raw and cooked food as well as food that is consumed without additional cooking should thus be consistently separated. Thoroughly washing hands, kitchen utensils, and preparation surfaces after contact with raw animal food products and before preparing other food are also important aspects of food hygiene. When meal prepping, it is a good idea to start with the dishes that will not be cooked prior to consumption, such as salads or desserts.

COOL MEALS CORRECTLY

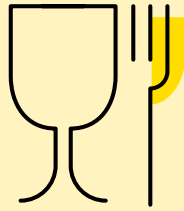
— fridge temperature of no more than 7 °C, though 5 °C is better

— check the temperature at various places in the fridge

— store meal-prep components close to the lower back of the fridge, where it's generally coldest

HEAT-SENSITIVE DANGERS IN DISGUISE

Many pathogens cannot be detected with the naked eye or by smelling. However, most pathogens can be killed by cooking. It is therefore important to cook and reheat meals thoroughly and evenly enough so that all parts of the food reach temperatures above 70 °C for at least two minutes. Frozen berries should be heated to about 90 °C to inactivate heat-resistant viruses.



Whether plastic, glass or stainless steel – the "food safe" symbol indicates whether a container is suitable for contact with food.

© valiantsin suprunovich/gettyimages

HEAT-STABLE SURVIVAL ARTISTS

During the cooling phase, it is important that the temperatures of pre-cooked meals quickly drop from over 60 °C to below 10 °C. Some bacteria form heat-stable spores that can germinate in the warm food and then propagate particularly successfully. In this phase they can form heat-stable toxins, which can cause illness even if the food is sufficiently reheated before consumption.

LIMITED SHELF LIFE

Storing prepared meals in sealed containers or fully covered helps protect them from contamination. Raw meal-prep components such as fruit, vegetables, or lettuce should be packed individually due to the high germ content. “Cooling slows or even stops the growth of most bacteria,“ Hiller says. “Therefore you should store the prepared or precooked meals in the fridge until you intend to consume them.”

How long do precooked meals keep? “There’s no single answer to this. But the lower the germ content, for example due to proper heating, and the cooler the fridge, the longer the food will keep,” Hiller says. Pre-cooked meals should be consumed within two to three days, while dishes with raw components should be consumed after one day at the latest. Precooked (but cooled!) meals keep longer if stored in the freezer. Thawing should take place in the fridge. Proper preparation not only saves time, it also means you can enjoy your food safely. —

More information

BfR FAQ
“Pre-cooking for several days: What should I bear in mind?”

PLANNING IS EVERYTHING

— How much storage space is available, for example in the fridge?

— What possibilities are there for cooling at the place of consumption, for example at work?

— Is it possible to keep the meals cool during transport?

Gluten:

who should (not) avoid it

Due to illness, some people have to avoid gluten or wheat in their diet. However, without a medical reason, people should not cut these foods out.

©The German Coeliac Society (Deutsche Zöliakie-Gesellschaft e. V., DZG)

A circle with a sweeping slash through an ear of wheat: on foods, this symbol indicates that the product contains little to no gluten, which triggers the chronic autoimmune disease coeliac disease. This condition affects around one percent of the population and, if left untreated, is associated with severe inflammation in the small intestine as well as nutrient deficiency among other things.

Grains containing gluten include all types of wheat (including spelt, emmer, einkorn), rye, barley, and oats. "People with coeliac disease must adhere to a gluten-free diet for their whole lives," says Dr Valérie Trendelenburg, who deals with topics including food-related illnesses at the German Federal Institute for Risk Assessment (BfR). Oats, though, are an exception. Most people with coeliac disease tolerate oats as long as it is not contaminated with other gluten-containing grains. For this reason, oats must be labelled as "gluten-free".

The situation is different for people with a wheat allergy. Different protein components of wheat can lead to allergic reactions. They may experience skin rashes, itching, or even life-threatening symptoms. "People with a wheat allergy have to avoid all types of wheat, including, for instance, spelt. However, they can often tolerate other grains containing gluten, such as oats, rye, and barley," Trendelenburg says. Medical associations recommend individualised dietary management for these two diseases.

VOLUNTARY AVOIDANCE NOT RECOMMENDED

Because gluten is also used in the food industry for technological reasons, it can particularly occur in processed foods where one would not suspect it, including sauces, French fries, and sausage. However, use of gluten-containing grains or products made from them must be listed among the ingredients, e.g. "wheat". The term "gluten" is not required.

This symbol means: One kilogram of the product contains no more than 20 milligrams (mg) of gluten. For adults with coeliac diseases, the tolerable daily intake amount is below 10 mg. The symbol may only be used on packaged foods by producers who have been assessed according to the standards of the Association of European Coeliac Societies (AOECS).

People should not follow a gluten-free diet voluntarily, meaning without a medical reason. Grains, particularly whole grains products, are a source of important nutrients such as fibre, vitamins, and minerals and are an important part of a healthy diet. —

More information

BfR opinion
"Low level of public knowledge about spelt being a type of wheat" *(pdf)*

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SMALL PARTICLES, BIG CONCERNS

Whether in the environment, our food, or our water, microplastics are everywhere. The continued release of new study results is causing increasing concern. Checking these results is difficult, but important.

55 %, 64 %, 66 %, 64 %, 68 %, 67 % – the percentage of people who are (very) worried about microplastics in food is consistently high. These are the results of the Consumer Monitor, a representative survey regarding the risk perception within the German population conducted by the German Federal Institute for Risk Assessment (BfR) twice a year. Since 2022, microplastics has been in first place each time, beating out topics like antibiotic resistance and the "forever chemicals" PFAS. The persistent concern that these small particles might have negative health effects is also fostered by a phenomenon that the BfR has been witnessing in ever shorter intervals: "single-study syndrome". This term is based on the observation regarding science communication that a single study and its results can seem to upend the entire pre-existing wealth of knowledge about a given subject.

INFORMATION WHIPLASH

A topic as hotly debated as microplastics can quickly gain momentum due to a mix of many different interdependent factors. The scientific community sees a need for a lot of research, as the small particles play a role in a wide variety of contexts. These include human and animal health, environmental risks, and disposal and replacement. The media report on the topic due to its overall societal relevance and because coverage is consistently read. The tone and style vary, ranging from objective and measured, to cautionary to alarmed. Industrial actors play a role, too. Their advertising and packaging frequently emphasise the lack of microplastics. All of this shapes perception within the general public, as the topic is always present. Returning to the statistics presented in the BfR Consumer Monitor, awareness of the topic among survey participants has been consistently above 90 % over the past years. The public is paying attention and information is available, yet the scientifically backed contextualisation is often lacking.

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Microplastics: scientists see need for research, media sees reader interest

SUDDEN CHANGE?

There are several examples. Since 2022, a claim has been making the rounds that consumers unknowingly ingest around 5 grams of microplastics per week through their food, an amount roughly equivalent to a standard credit card. This gripping little soundbite spread like wildfire and continues to reappear in society's collective perception. Though experts have long since debunked this statistic – the calculation is faulty and the amount is severely overestimated – the misperception remains. In 2024, a study was published that found microplastic particles in deposits in blood vessels that supply the brain with blood. Another study, published in 2025, reported detecting particles in the brains of deceased people, thus creating another controversial starting point for concern. But how meaningful is all of this?

CLOSER LOOK NECESSARY

In order to examine the current state of knowledge and research questions from multiple perspectives, the BfR formed the "Working Group on Microplastics" several years ago. This multidisciplinary team brings together experts from across the institute. The group leads internal discussions and also analyses other studies if they promise new findings or cause a public stir. "For instance, we look at the methodology and the data collection to see if they are appropriate and assess the plausibility of the conclusions," explains Dr Holger Sieg, who heads the working group. However, the claims made in several headlines or abstracts which seemed like breakthroughs have failed to pass scientific scrutiny so far. Holger Sieg adds that "Nevertheless, we consider the increasing amount of research on this topic to be very important. Due to many uncertainties and complexities surrounding this topic, however, a closer look is essential in order to contextualise findings. This is particularly the case for science communication." The message is that, so far, there are no robust toxicological indications that intake of microplastics through food poses health risks. —

More information

BfR FAQ
"Microplastics"

SOMETIMES STUDIES ON ENTIRELY DIFFERENT TOPICS ARE CITED

In their podcast on the WDR network, science journalists and "Quarks Science Cops" ***Jonathan Focke*** and ***Maximilian Doeckel*** tackle scientific nonsense.

Your podcast frequently covers questionable food supplements, strange products with awesome-sounding benefits, and supposedly gentler "alternative" healing methods. Where does "scientific nonsense" begin for you?

Jonathan Focke: There are a whole lot of factors. It starts with charlatans and manufacturers of miracle cures and takes us all the way to politicians trying to minimise the relevance of climate change.

Maximilian Doeckel: The core element is always someone claiming that something is backed up by science, that there are studies. So we take a closer look and often find that there is, in fact, no supporting evidence.

How do you go about debunking nonsense?

Doeckel: The most important step is that we read the cited scientific studies very closely. The abstract – the short summary at the top of the article – often already indicates whether the results are even halfway related to the claims being made.

Focke: Sometimes, studies are cited that are actually about a completely different topic. That's particularly odd. In general, we always look at the methodology. How many participants were included in the study? Was there a control group? Often, animal studies are simply cited, for instance studies on mice or rats, if a small effect was found. Then the claim is often: "Wow, look at that! This effect is surely also the same for humans." But that's false. In most cases, the results from animal experiments cannot simply be transferred to humans.

Why not?

Focke: Animal experiments are important, especially when it comes to potentially harzardous substances or medication. Nobody suggests to immediately test these on humans, but in the end, a mouse or a rat is not a human being. So you simply cannot simply transfer the results one-to-one. The organisms are simply too different. That means you cannot say that if a substance works this way on a rat, it will have the same effect on a human.

"Quarks Science Cops" started in late 2020, during the COVID pandemic. The first episodes therefore often dealt with the pandemic and the virus. Are there things from this initial phase that still render you stunned?

Doeckel: The main thing was the anger and hatred that we were hit with. Just because we said that COVID is a real problem and it's dangerous. The comments we got said things like "You'll be the first ones hanged when the tides turn." Even our families received threats. So that was very shocking to us. Fortunately, that has calmed down a bit now.

That sounds threatening. But it can also be dangerous for the people who believe all the scientific nonsense, right?

Focke: This is the issue with all "alternative medicine" treatments and remedies, which is also something we cover on the show. Homoeopathic remedies or healing salts, for instance. Many of these treatments are not dangerous in the sense that they cause direct harm, they simply do not work beyond the placebo effect. This makes it problematic when serious illnesses like cancer are in play and people decline evidence-based and effective treatments. At that point, it can be a matter of life and death. —

More information

WDR podcast
"Quarks Science Cops"

"Risiko" – the BfR podcast

Listen to the full interview in episode 9 of the BfR science podcast "Risiko" (German for "Risk").

How much can still be in it?

Pesticide residues in food: What do guidance and limit values actually mean?

Limits are intended to protect. But the question where they can be drawn is often not easy to answer. This also applies to consumer health protection, where "limit values" are a key marker. They are intended to provide guidance in the area between "harmless" and "risky", so that apples, lettuce and eggs can be enjoyed without hesitation. In fact, these scientifically determined values are not real limits, but rather guidance values. Deciding where exactly these guidance values should be set is also one of the tasks of the German Federal Institute for Risk Assessment (BfR). An example of this can be seen in the specifications for active substances in plant protection products.

The decisive factor for the determination (or "derivation", as it is called in technical jargon) of a health-based guidance value is a solid scientific basis. Studies are legally required for the approval of a pesticidal active substance. These must be initiated by the applicant and submitted to the authorities. They are largely carried out on mice and rats. Typically, three groups of animals are given different concentrations of an active substance via their feed over a longer period of time. A fourth group receives no active substance and serves as a control. The following section determines whether the active substance under investigation has any effects on the organism.

GUIDE TO THE GUIDANCE VALUE

"The study showing effects at the lowest dosage is then essential for our risk assessment", explains the BfR expert Dr Lars Niemann. "Based on this data we then determine the corresponding NOAEL, the 'No Observed Adverse Effect Level' – that is the highest concentration of an active substance at which no harmful effects were observed in the laboratory animals." The NOAEL thus points the way to the guidance value.

In a second step, the ADI is "derived". ADI stands for "Acceptable Daily Intake". This is the amount of an active substance that a person can consume daily over a lifetime without any appreciable risk to his or her health. "The ADI is not transferred one-to-one from the NOAEL to humans, but is further adjusted by a safety factor, usually 100," explains Niemann. "It is therefore only one hundredth of the NOAEL."

How can the 100-fold "safety margin" be explained? On the one hand, it is scientifically accepted that a factor of ten is sufficient to address a potentially higher chemical sensitivity of humans compared to laboratory animals. And other hand, it is divided by ten to account for the biological differences between humans. Laboratory animals are largely genetically identical and therefore, react very similar to an active substance. Due to genetics, gender, age differences, pre-existing medical conditions and metabolic differences, the range of reactions in humans is much greater.

In addition to the ADI, the "Acute Reference Dose" (ARfD) also plays an important role. The ARfD refers to the amount of an active substance that can be ingested by a person over a period of up to 24 hours through food or drinking water without any appreciable adverse effects on their health. The acute reference dose (ARfD) is therefore the guidance value for a very short period, while the ADI takes a long period of time into account. Unlike the ADI, it is not always necessary

“A PLANT PROTECTION PRODUCT IS NOT AUTHORISED GLOBALLY, BUT FOR APPLICATIONS IN SPECIFIC CROPS.”

to derive an ARfD for an active substance, but only when there is evidence of acute effects.

EXPERIMENT AND REALITY

The unit of the ADI and the ARfD is milligrams (active substance) per kilogram of body weight (mg/kg body weight). Both are experimental values, health-based guidance values. What is still missing is their anchoring in the “real" world, i. e. the actual definition of the limit for the prevalence of an active substance in food. This is done in a third step: when setting maximum residue limits (MRLs) for a pesticidal active substance. These must be low enough to ensure that consumers take up less of the active substance than corresponds to the ADI and ARfD. An MRL indicates the maximum permitted residue level of an active substance in or on food.

“As guidance values, the ADI and ARfD, are the result of the scientific health assessment,” says Dr Jens Schubert, Vice Head of the BfR's “Pesticide Safety” department. “The maximum residue level (MRL), on the other hand, is the legally binding limit for food. If it is exceeded, the affected food product may no longer be sold and must be withdrawn from the market.”

In order to derive a maximum residue level (MRL), the BfR requires information beyond the established ADI and the ARfD. The BfR also requires information about how much of a food product is consumed by different age groups of the population and how much is consumed at most on a single occasion. Both factors play a role in risk assessment. Frequently consumed products such as potatoes, apples or lettuce are weighted differently over a lifetime than fruits that are only eaten occasionally such as pineapple or seasonal vegetables such as asparagus. Higher consumption may also mean the intake of higher residues. The amount consumed in a single day can be much higher than the average amount consumed. For plant protection products which can cause acute health effects, even a single consumption of a large portion of food must therefore be safe. The MRL must be set accordingly low.

FOOD WITH LIMITS

On the other hand, it must be determined how much of an active substance remains in food. One way to determine this is through field trials. In this process, a plant protection product is applied in the same manner and with the same application rate for which authorisation is envisaged on a specific crop (such as apples, grapes or tomatoes). After harvest, the quantity of the active substance is determined that remains in the food product. “A plant protection product is not authorised globally, but for applications in specific crops, for which authorisation was requested,” explains Schubert. “The residue level depends on the crop and whether the plant protection product is applied shortly after sowing or shortly before harvest.”

Taking into account the usual consumption quantities and the active substance concentrations measured in the food products, the maximum residue level (MRL) is set so that it neither exceeds the ADI nor the ARfD. Its unit is milligrams (residue) per kilogram (food product), mg/kg. “The guiding principle here is: as low as reasonably achievable,” comments Schubert.

LIMITS PROTECT

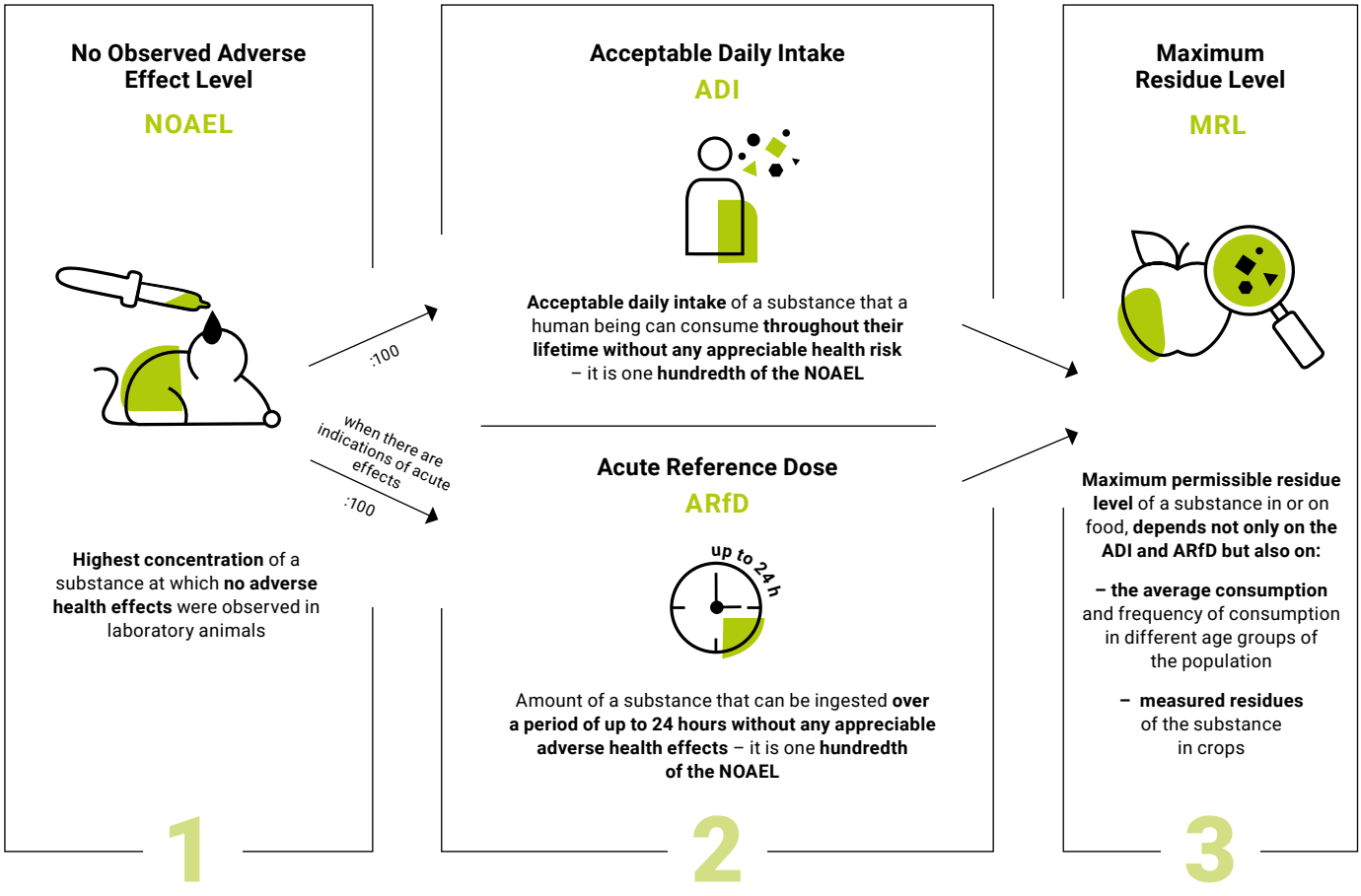
Food products are only marketable if they comply with the maximum residue levels (MRL). Compliance is monitored by federal state testing laboratories, which take regular samples. In addition, retailers maintain testing laboratories and set their own "stricter" standards. But what does it actually mean when a measured residue suggests that a health-based guidance value has been exceeded? Does the guidance value mark the line between what is still safe and what is already unhealthy? "That's too simplistic," says Lars Niemann. "A short-term exceedance of the ADI does not normally indicate a health risk, because this guidance value was set on the assumption of a daily intake over a lifetime." The situation is different if the measured residue is above the ARfD: "In this case, a possible impairment cannot be ruled out from the outset, as even a single dose can have consequences." The risk exists – but that does not mean it will necessarily materialise. —

More information

BfR information
"Plant protection product residues in food"

HOW MUCH IS ALLOWED

Determination of maximum residue levels (MRL) of pesticides



Ewwww, chemicals?!

The BfR wanted to know what chemicals mean to us in everyday life. They found out that we have mixed views and perspectives on the topic.

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Skin cream, children's toys, cleaning and plant protection products: we come into contact with chemical substances through a variety of everyday products. This means that they must be safe to handle. In Germany, the BfR assesses chemical substances based on the European Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation, or REACH for short. In order to properly communicate the risks associated with using chemical products, the BfR also identifies the knowledge and perspectives of consumers regarding everyday chemicals. A new BfR survey offers some insights.

IMAGE NAY, EFFECT YAY

The results of the survey show conflicting views on chemicals used in everyday life. The BfR found that more than half of the respondents perceive chemicals as artificial (54 %) and unpleasant (51 %). For almost half of those surveyed, chemicals were associated with thoughts of potential impairments to health (42 %) and the environment (44 %). Despite these concerns, almost the same percentage of people view the applications of chemicals positively, finding them useful (49 %) and effective (49 %).

If artificial and natural components of chemicals are examined separately, this ambivalent perception becomes more differentiated. Consumers see products with artificial ingredients far more negatively than those with natural ingredients. Around half of respondents find artificial ingredients to be unpleasant (42 %) and believe that they are more harmful to health (48 %) and the environment (55 %) – even if they consider artificial ingredients effective (52 %) and useful (44 %). However, one in two people also find natural ingredients useful (54 %) and effective (48 %). By contrast, only one in five believe that natural ingredients are harmful to health (16 %) and the environment (17 %). More than a quarter see them as pleasant (28 %).

THE MORE COMMON THE USE, THE LOWER THE CONCERN

Concerns regarding chemical products seem to decrease with increasing everyday use of certain articles (see graphic). Respondents are particularly concerned about using products from the hardware store. For cleaning products, there is moderate

AROUND ONE IN TWO PEOPLE IN GERMANY FIND CHEMICALS ARTIFICIAL, UNPLEASANT, AND HARMFUL TO THE ENVIRONMENT AND HEALTH. HOWEVER, THEY ALSO SEE THEM AS USEFUL AND EFFECTIVE.

representative population survey conducted by the BfR in spring 2025, approx. 1,000 people aged 16 and over

concern. This is also the case for toys and children's products. Overall, there is less concern among respondents when it comes to frequently used body care and cosmetic products.

EYE ON LABELS

The most important source of information regarding possible product risks is the packaging. However, the majority of respondents find indications and information on packaging to be poorly legible or not detailed enough. The majority are aware of common hazard symbols, such as an open flame ("slightly or highly flammable") or liquid from a test tube dripping onto a hand ("corrosive"). More than a third say that they pay attention to the hazard and safety information on packaging. Up to three quarters of respondents also say they heed these warnings.

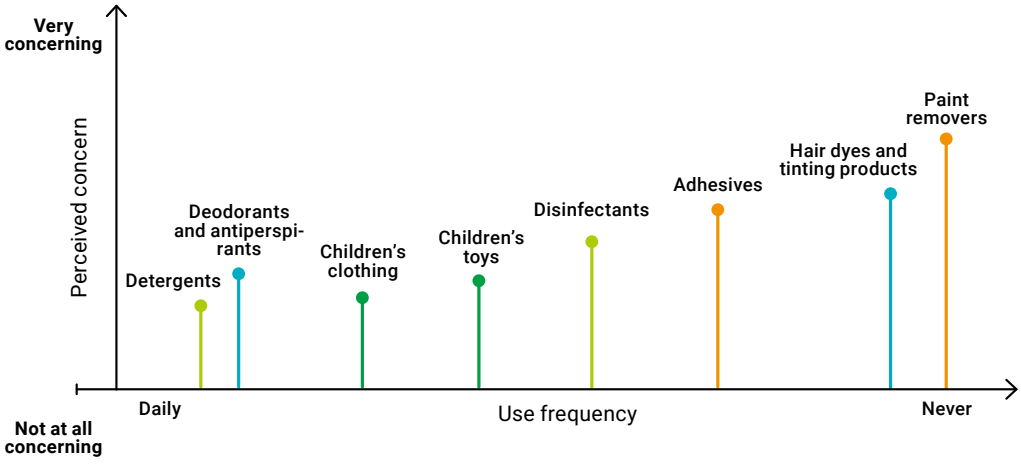
CORPORATE RESPONSIBILITY

Almost all participants see it as the responsibility of the manufacturer to ensure the safety of chemical products. Most also place responsibility with the government and with distributors. The primary responsibility borne by companies was established in the REACH Regulation. However, 86 percent of respondents were not aware of this EU regulation, which has existed since 2007. A similar survey by the BfR in 2008, i.e. shortly after the introduction of REACH, also found the regulation to be largely unknown.

Disgust and fear around everyday chemical products? This feeling appears to be borne out by the data. However, chemicals are everywhere and natural does not necessarily mean harmless. In the same vein, not everything artificial is dangerous. For this reason, the EU has called upon institutions like the BfR within the Member States to assess and educate the public about the health risks of chemical products with which people come into contact every day. —

The more common the use, the lower the concern

Perceived concern and use frequency of selected products



Based on: all respondents (n = 1,004) and for children's products: respondents with children under the age of 18 (n = 215)

Collect data – save lives

In early 2026, the German Poisoning Registry (DVR) will be launched at the BfR. Dr Yuri Bruinen de Bruin, Head of the Registry, explains what it's all about.


© BfR

Mr Bruinen de Bruin, "Poisonings" sound like something from the past in our society. Whom are they affecting?

At first glance, poisonings may seem like a thing of the past, but each year, the Poison Centres (GIZ) handle up to 300,000 enquiries. Many of these calls come from parents whose children have ingested cleaning products or medications. In addition, the German Federal Institute for Risk Assessment (BfR) receives over 8,000 reports annually, including those related to workplace accidents. Therefore, poisonings affect all segments of society.

What is the goal of the German Poisoning Registry?

The German Poisoning Registry (DVR) is a central platform for consultation cases from the GIZ, as well as reports from doctors and accident insurance providers. For the first time, it will provide an overview of poisoning incidents in Germany, enabling targeted prevention and better information for the public and professionals. As an early warning system, it will help save lives in the future.

Why hasn't such a registry existed before?

Until now, there was no legal basis. The GIZ collected poisoning data regionally and separately. Since 2023, the BfR has been tasked with harmonising and consolidating this data. The DVR fills in the existing gaps.

What data is collected, and what happens to it?

The GIZ collects core data with every call, such as age, gender, the substance involved, and the severity of the poisoning. This data is anonymised and transmitted to the BfR, where it is structured and analysed according to various parameters. We monitor the data in such a way that we can detect anomalies early on. Additionally, we respond to enquiries and publish annual reports.

How can the DVR help identify poisoning trends early on?

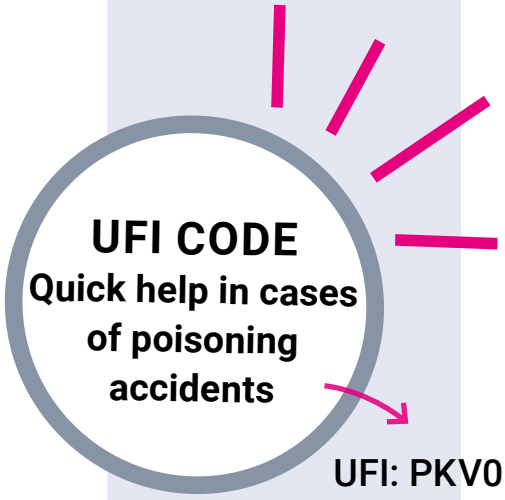
If unusually severe poisonings occur with a product group, such as dietary supplements or detergents, or if more inquiries than usual are received, the system will alert us, allowing quick action to be taken. In the event of a larger incident, such as a fire in a chemical plant with numerous poisoning reports, the BfR will immediately forward this information to the relevant federal and state authorities. In this way, consultation leads to insight, insight leads to prevention, and prevention leads to safety. —

Small print of **major importance**

Have you ever taken a look at the label on your household cleaning agents? Then you may have noticed a 16-digit code. This is the UFI code (Unique Formula Identifier). In case of emergency, it can save lives.

Imagine that a child accidentally or out of ignorance drinks some of this cleaning agent. In such cases, it's important to immediately call one of the seven Poison Centres (GIZ) of the German federal states ("Laender"). Product names can be confusing, but the UFI code enables clear identification. With the combination of product name and UFI the GIZ can quickly and safely identify the product's chemical composition and thus provide the best possible information about poisoning risks and the correct medical treatment.

The UFI is obligatory for all products in the European Economic Area (EEA) that are classified as harmful to health or physically harmful. Companies can generate the code themselves using a platform and then submit a notification including the UFI, product content and information to the responsible authority. The German Federal Institute for Risk Assessment (BfR) fulfils this task in Germany.



More information

BfR FAQ **"UFI code"**

UFI: PKV0-N0AJ-W00A-5T6S

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The European Union (EU) is discussing a broad ban on PFAS, known as “forever chemicals”. This would impact manufacturers and industry – as well as non-stick coatings in many kitchens.

They are in baking paper, outdoor jackets, fast food packaging, and, yes, in non-stick coatings on many pans and kitchen utensils: PFAS, short for “per- and polyfluoroalkyl substances”. The group of PFAS comprises more than 10,000 different industrially manufactured chemical substances, all with particularly practical properties. “For instance, these substances are hydro- and lipophobic, very stable, and many of them can withstand high temperatures and pressure,” Dr Claudia Lorenz explains. Her work at the German Federal Institute for Risk Assessment (BfR) focuses on food contact materials. In addition to the products mentioned, PFAS are virtually everywhere. They can be found in industrial machinery, car motors, and coffee machines as well as in medical products such as pacemakers and blood bags.

EXTREMELY REPELLENT, HIGHLY STABLE

PFAS’ longevity and stability is also what makes them a problem. Once they enter the environment, PFAS essentially do not break down. This is how they

earned the name “forever chemicals”. These substances break down much slower than other artificially manufactured chemicals. They spread globally through air and water and find their way into groundwater and soil as well as into plants and animals. PFAS have even been found in Antarctica.

BAN WHEREVER ALTERNATIVES EXIST

In order to reduce the accumulation of PFAS in the environment, several EU countries, including Germany, are planning to implement broad restrictions on this category of substances. To this end, the German Environmental Protection Agency (Umweltbundesamt – UBA) and the BfR are working together with partner agencies from other EU Member States to prepare a dossier comprising arguments and framework conditions. Certain PFAS are already strictly regulated or have been subject to new bans which are going to enter into force in the coming years. “In the future, production and use of PFAS might become entirely prohibited,” Lorenz explains. “Derogations might only be granted for sectors in which there are no feasible alternatives yet, such as medical products or industry machinery which are subjected to high temperatures or pressure.”

Consumers might also notice a restriction when purchasing kitchenware. After all, classic non-stick coatings, such as in pans, are typically made from polytetrafluoroethylene (PTFE). The substance belongs to the group of PFAS and is better known under the brand name “Teflon”.

HEALTH IMPAIRMENTS NOT EXPECTED FROM COATING

Non-stick coatings on kitchen utensils and associated health risks are a recurrent topic in the media. However, problems are only to be expected if the cookware is heated to temperatures of 360 °C and more, at which point vapours which are hazardous to health can be released. “That’s why an empty Teflon pan should not be placed on a hot stove,” Lorenz advises. “As long as there is water or a watery food in the pan or pot, the temperature cannot rise significantly above the boiling point of 100 °C. If food is fried with oil, the latter starts to smoke before critical temperatures are reached.”

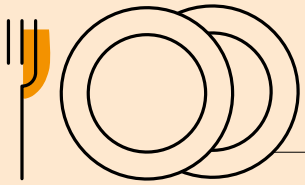
Even if a lack of caution leads to scratches and small pieces of the coating come off and end up in the food, there is no current evidence to suggest health impairments stemming from this. “Like all PFAS, PTFE is highly inert. That’s part of what makes it so practical: nothing sticks to the pan – and nothing happens in the body, either,” Lorenz explains. “It goes in and it comes right back out.”

PFAS BAN MAINLY FOR THE ENVIRONMENT

Outside of the kitchen, however, some other PFAS have long half-lives in the human body and can affect the immune system, lipid metabolism, and the liver. Humans primarily take in these substances through drinking water and foods like fish and seafood. “This is why the manufacture and use of several PFAS is already mostly banned in the EU,” Lorenz says. Studies show that corresponding PFAS levels in human blood have decreased substantially since the mid-1990s. “The universal PFAS restriction currently under discussion is particularly related to accumulation in the environment, as this is the basis for the contamination of drinking water and foods.” An EU-wide decision is expected for 2027.

ALTERNATIVE FRYING

Frying without PTFE-coating will be possible, for instance with pans having ceramic or enamel coating. Stainless steel and cast-iron pans are also options. However, these materials have less of a non-stick effect than cookware coated with PTFE. So far, there is no alternative with all of the properties that PTFE has. However, it will still be possible to prepare tasty dishes in the future. —



COATED COOKWARE – KEEP IN MIND:

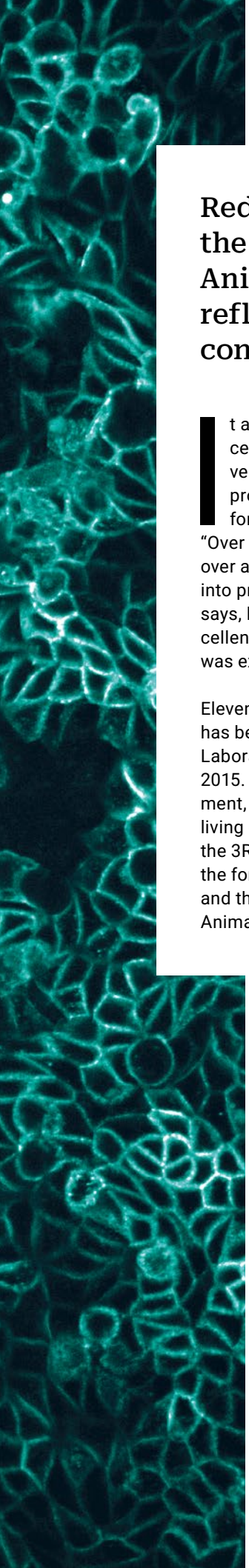
— do not place empty coated cookware onto the stove, only with water or aqueous foods

— heat oil only to a temperature at which it does not smoke

More information

BfR information
“Per- and polyfluoroalkyl substances (PFAS)”

A successful experiment



Reducing, refining, and replacing animal experiments: the German Centre for the Protection of Laboratory Animals (Bf3R) is committed to this "3R" principle. We reflect on what has been achieved in ten years, and consider what lies ahead.

It all starts with an idea. And time is of the essence. The year is 2014, and the German Federal Government has signalled that it wants to do more to protect laboratory animals as part of its initiative for animal well-being. Ideas are needed quickly. "Over the course of one weekend, we sketched out over a few pages how we wanted to put our ideas into practice," the biologist Dr Michael Oelgeschläger says, looking back. "We had the idea of a 'centre of excellence' with various focus points. Once the concept was expanded, policy-makers followed us."

Eleven years later, this idea of a centre of excellence has become the German Centre for the Protection of Laboratory Animals (Bf3R), which was established in 2015. "3R" refers to the three principles: the replacement, reduction, and refinement (improvement) of the living conditions of laboratory animals. "Since 2013, the 3R principle has been anchored in German law, in the form of the amended German Animal Welfare Act and the Ordinance on the Protection of Laboratory Animals," says Oelgeschläger, who was involved in the Bf3R from the very start and is now its acting director.

ONLY WHAT'S TRULY ESSENTIAL

The 3R principle "materialised" in Berlin-Marienfelde, at the premises of the German Federal Institute for Risk Assessment (BfR). The Bf3R is part of the BfR and is rooted in the Centre for Documentation and Evaluation of Alternatives to Animal Experiments (ZEBET), which was itself founded as part of the BfR back in 1989. Limiting animal experiments to what's truly essential, and affording laboratory animals the best possible protection is the main task that the Bf3R has "inherited" from the ZEBET.

ADVICE AND TRANSPARENCY

The centre's role puts it in a challenging position. It has to mediate between animal rights

The 3R principle explained

REPLACE

Develop new methods to replace animal experiments

REDUCE

Develop new methods to reduce the number of animal experiments

REFINE

Research methods to reduce the pain and suffering of laboratory animals

associations, some of which are completely opposed to animal experiments, and researchers who for various reasons consider such experiments necessary. The topic is also important to consumers, businesses, and policy-makers. The Bf3R thus has to inform, advise, and educate. These activities represent one of the Bf3R's three pillars.

In order to inform the general public about animal experiments in Germany, an easily comprehensible and freely accessible summary of every planned animal experiment must be published. Since 2014, this has been done in the Bf3R database AnimalTestInfo.

IMPROVEMENTS AND ALTERNATIVES

In 2019, the database animalstudy-registry.org went online. Here, researchers from all over the world can register their idea for an animal-based experiment in advance. "The aim is to make the research more transparent, reproducible, and better, and thus reduce superfluous animal experiments," says vet and Bf3R employee Dr Bettina Bert.

In addition, the Bf3R has compiled and published the official German animal experiment statistics since 2021. Ever since, the number of laboratory animals bred for research purposes but not actually used ("surplus laboratory animals") is published each year. "Surplus or necessity?" The Bf3R held a discussion forum on these "surplus" animals in 2023. In the same year, the laboratory animal statistics showed a 22 percent drop (from 1.77 million to 1.37 million) in this group. "The Bf3R also needs to give voice to controversial topics," Bert says. "And perhaps we helped bring about the considerable drop in the number of these animals." To ensure that German animal experiment legislation is consistently interpreted and applied in the country, the National Committee for the Protection of Animals at the Bf3R creates scientific statements and expert reports, and advises animal protection committees and approval authorities. A pool of external experts supports it in this task.

PRIZE-WORTHY RESEARCH

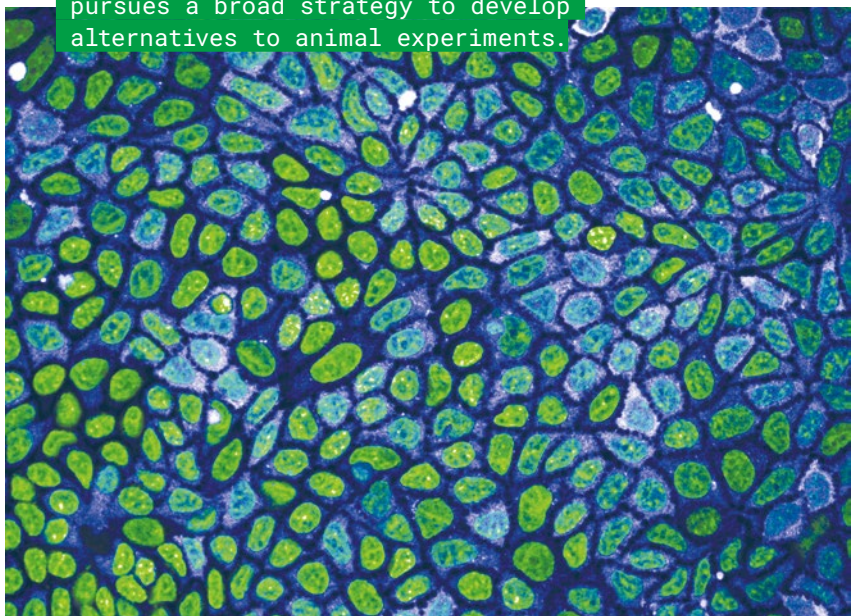
The Bf3R's funding for research was established in 2017. It supports scientific research that complies with the 3R principle. Additionally, the centre organises the Animal Protection Research Prize of the German Federal Ministry of Agriculture, Food and Regional Identity (BMLEH). As of 2025, the prize has greatly expanded in scope (see info box on the prize winners).

BETTER CONDITIONS FOR LABORATORY ANIMALS

Improving the conditions under which laboratory animals are kept ("refinement") is the second pillar of the Bf3R. What possibilities are there to create improved and more varied conditions for laboratory animals? This is being examined, for example, with respect to mice, whose (cage) environments should provide more variety. Refinement is also a realistic approach. After all, animal experiments, for example with respect to drug development, are unavoidable even in the longer term.

The Bf3R's third pillar follows a broad strategy to develop alternatives to animal experiments ("replacement"). From experiments on cell cultures and microscopically small, organ-like "organoids" to

From experiments on cell cultures to research on threadworms, the Bf3R pursues a broad strategy to develop alternatives to animal experiments.



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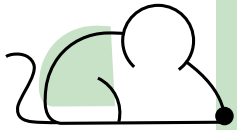
2025 ANIMAL PROTECTION RESEARCH PRIZE



Miniature organs and use for "3R"

In 2025, the prize from the German Federal Ministry of Agriculture, Food and Regional Identity opened to international applicants for the first time. The award winners:

***Professor Dr Hans Clevers** is the head of drug research and early-stage development at the Swiss pharmaceuticals company Roche. The physician is a pioneer in the development of organoids, which are tiny, organ-like tissue structures that are often bred from an organ's stem cells (for example from the stomach, intestine, liver, kidneys). With similar properties to "real" organs, they can help with the study of diseases and with drug development. They have the potential to replace animal experiments.*

***Professor Dr Adrian Smith** represents Norway's centre for 3R research, Norecopa. As a joint undertaking of the government, business, science and animal rights organisations, Norecopa provides extensive information on 3R (the replacement, reduction, and refinement of animal experiments). As an international lighthouse project, Norecopa has made a key contribution to the protection of laboratory animals.*

research on threadworms, fish, and shrimps: many paths are pursued, even if some only indirectly serve the end goal.

Since 2024, the search engine SMAFIRA ("SMArt Feature-based Interactive RAnking") enables researchers to find suitable alternative methods to a specific animal experiment in the scientific literature.

One key challenge is to establish alternative methods as internationally recognised test procedures – as a test guideline of the Organization for Economic Cooperation and Development (OECD). For this purpose, the reliability and applicability of the methods must be demonstrated in what is termed a validation process. Only after it is "validated" can a new method actually replace an animal experiment and thus become "standard". The OECD test guideline represents the seal of approval for a new method.

ALTERNATIVE METHODS: SPOILT FOR CHOICE

"There are already many alternative methods," Oelgeschläger says. "But the biggest problem is finding one that is worth validating." The researcher coordinates the introduction of new test methods in Germany on behalf of the OECD. A national validation centre with a pragmatic focus on specific goals could accelerate the process. "A centre of this sort, in cooperation with other European institutions, would guide the development of a procedure," Oelgeschläger says. "We could achieve a lot with relatively little money."

Oelgeschläger sees the "European Partnership for the Assessment of Risks from Chemicals" (PARC), which was launched in 2022, as an additional important undertaking. Supporting new methods for testing chemicals without the use of laboratory animals is a PARC focus point in which the BfR is involved. "We jointly develop new strategies in order to generate precisely the data we really need," Oelgeschläger says.

The German Centre for the Protection of Laboratory Animals will clearly have plenty to keep it occupied for another ten years at least. —

More information

BfR information page
"German Centre for the Protection of Laboratory Animals (Bf3R)"

INTERNAL AFFAIRS

Freshly appointed Scientific Advisory Board
For the sixth appointment period (2025–2029), 18 scientists from different universities and non-university research institutions were appointed to the Scientific Advisory Board at the BfR. They work in various fields, including food chemistry, food hygiene and food analysis, nutrition, toxicology and epidemiology, as well as psychology, communication sciences, statistics and animal welfare. Professor Dr Monika Pischetsrieder from the University Erlangen-Nuremberg is the chairperson.

The committee provides expert scientific advice to the BfR in questions of strategic development and filling department leadership positions. It also supports evaluations conducted by the Science Council and advises the BfR on the appointment of renowned scientists to the committees located at the Institute.

More information

Scientific Advisory Board at the BfR

INTERNATIONAL NEWS

BfR World Food Safety Almanac

Updated World Food Safety Almanac
Which institutions around the world are in charge of regulating food and feed safety in their respective countries? How do they fulfil their tasks? The World Food Safety Almanac of the BfR provides an overview over the respective administrative structures. The online portal has been updated and now includes an improved filter and search function. Currently, the almanac profiles 39 countries.

More information

BfR World Food Safety Almanac

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Conclusion of the BfR Tunisia project
An event in Tunis in November marked the conclusion of the five-year project “Strengthening food safety and consumer health protection in Tunisia”. The BfR and the German Federal Office of Consumer Protection and Food Safety (BVL) jointly coordinated the project. Thanks to scientific conferences, workshops, train the trainer programmes, and a year-long leadership programme, over 550 Tunisian experts and leaders from eight ministries, subordinate authorities, and universities and research institutions benefited from training measures on risk management and risk assessment.

More information

Tunisia project flyer *(pdf)*

Risk assessment training platform
xORA is ensuring a Europe-wide overview of approved educational offers in the field of risk assessment. The EFSA-funded platform, which has been available since the beginning of 2025, brings together training providers and learners. A certificate of quality guarantees that training formats are of the highest quality. The BfR is involved in the platform’s implementation.

xORA
EXCELLENT ONE HEALTH RISK ASSESSMENT EDUCATION

EVENTS

The BfR comic universe at the 2026 Grüne Woche

© BfR

Lupins, insects, lab-grown meat: how safe, healthy, and sustainable are alternative protein sources as food and feed? Visitors to the BfR stand at the 2026 Grüne Woche will receive answers to these questions. Those visiting will also meet the characters from the BfR comic series "What does science say?". These characters invite readers to discover highlights like the protein scanner or the protein power meter. A wall of photographs and a show kitchen complete the experience.

When? 16 to 25 January 2026.
Where? Messe Berlin, Hall 3.2
"EventFarm", Stand 307

More information

All issues of the BfR science comic

INTERNATIONAL NEWS

German-Korean symposium for alternative methods to animal experiments

In early November, experts from Germany and Korea met in Berlin to discuss scientific progress regarding the development of alternative methods to animal experiments as well as to expand international scientific collaboration. The aim was to develop and apply new methods for biomedical research and chemical assessment derived from human induced pluripotent stem cells, organoid cultures, organ-on-a-chip systems, and similar innovations. Funding was provided by the German Research Foundation (DFG) and the Korean Research Foundation (NRF).

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