BfR2GO

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

FOODBORNE INFECTIONS

Kitchen Hygiene Matters

MICRONUTRIENTS
HIGH-DOSE FOOD SUPPLEMENTS

TOXICOLOGY
THE WORLD OF POISONS

CUTTLEFISH
SPECIAL SKILLS – SPECIAL PROTECTION

A FOOD SAFETY ADVENTURE

Two children, Maya and Luis, discover the realm of viruses and bacteria together with Fred, the friendly germ. They quickly learn that not all of those microorganisms are as helpful as Fred and many can, in fact, make people sick. The trio soon follows the trail of a bacterial villain that leads them from the sink directly to the crime scene – the dark refrigerator...

In order to introduce children to the topics of food safety and kitchen hygiene, the BfR has published the adventure story “Luis and Maya’s adventure in the BfR’s shrinking laboratory: searching for clues in the kitchen” (in German).

Read it directly online or order a copy to be delivered to your home at: ***www.bfr.bund.de/de/bfr-kinderbuch.html*** (in German).

Campylobacter are the most common cause of foodborne infections in Germany. Despite that, the bacteria are not well known.

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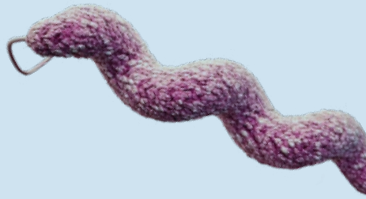
Focus on
kitchen hygiene



Editorial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Dear readers,

When it comes to bacteria in foods that can cause illness, most people think of *Salmonella*, norovirus or *Listeria*. And yes, they are common culprits. But the most common cause for infections are the far less well-known *Campylobacter* bacteria. A good reason to take a closer look at this great unknown of kitchen hygiene and pay it a visit – at the BfR's National Reference Laboratory for *Campylobacter* in Berlin-Marienfelde. For those of you who read our report on our main topic "kitchen hygiene", the microorganism will no longer be a stranger, even if it still presents us with some mysteries and curiosities.

Speaking of food: Snow White was famously poisoned by an apple. Luckily, the bite caught in her throat and allowed her to be saved. That attack is, of course, a case fit for the science of poison, also known as toxicology (also the basis for every health risk assessment). It gives us an opportunity to take a stroll through the world of investigative science, where we will see methods, tools, and theoretical principles. After reading the article, you'll realise that modern toxicologists would have been able to determine what the poison was. But I don't want to give too much away...

Have an enlightening read!

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

Assessment.
Research.
Communication.

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Main topic

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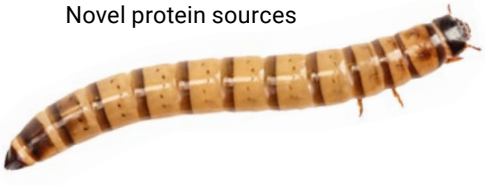

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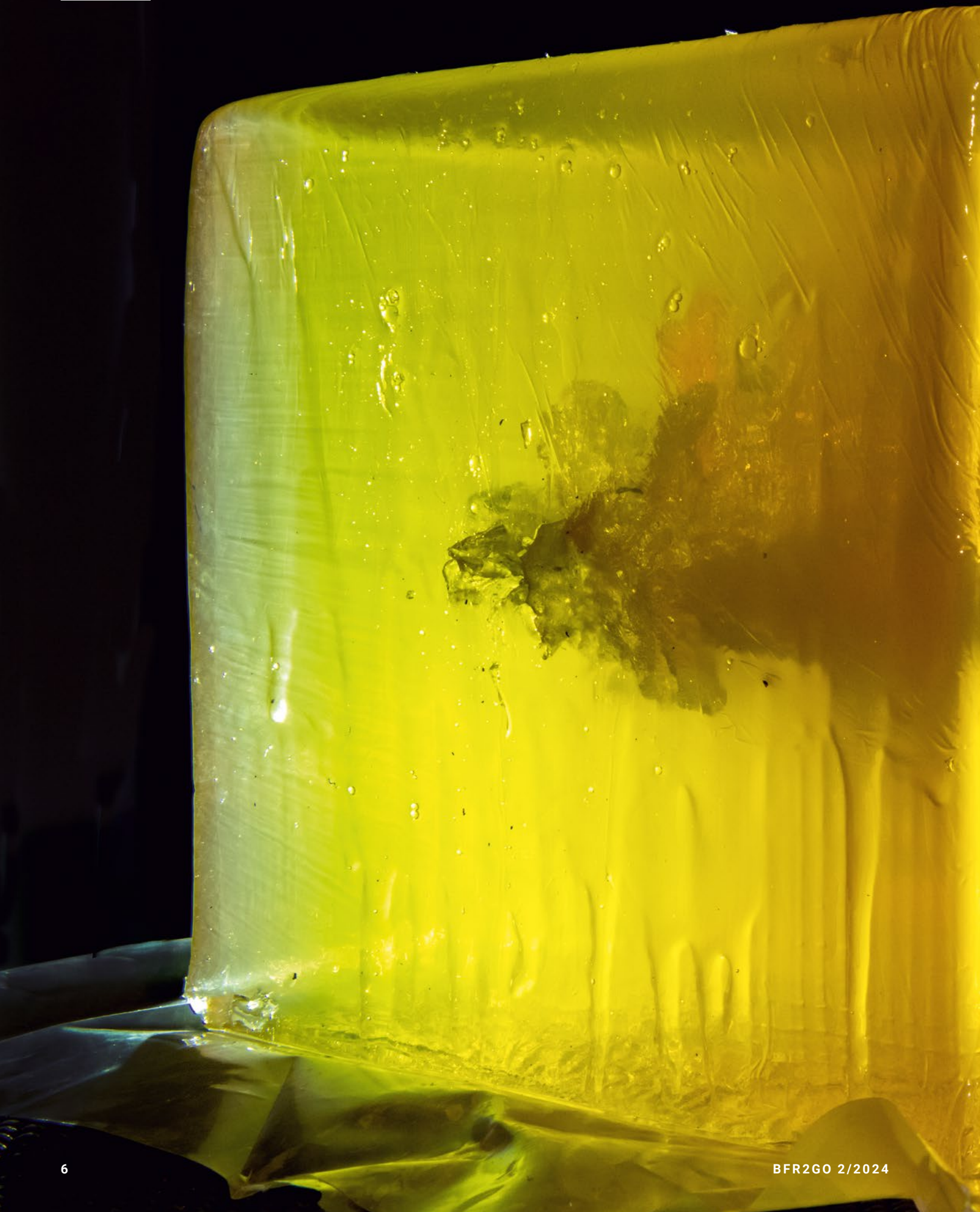


Good aim

Occasionally shots are fired for the BfR – but only at blocks of soap and gelatine. This is how the BfR is conducting research on the effects of various hunting bullets as well as on how the presence of metal fragments from ammunition in game meat can be reduced. The goal is to minimise health risks associated with the processing and consumption of game meat. The BfR is also determining which undesirable substances red deer, roe deer, and wild boars ingest nutritionally from their environment and the presence or absence of pathogens. In one of the institute's research projects, the BfR is exchanging insights into the food safety of game meat and into production chains in Europe.

More information

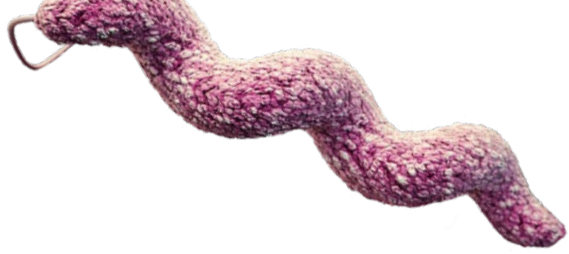
BfR information
"Game"

BfR research project
COST Action CA22166
SafeGameMeat

KITCHEN HYGIENE MATTERS

How should chicken be properly processed? – The way people handle food plays a major role in whether the food will have undesired effects. Each year, roughly 100,000 illness cases are reported in Germany which might be caused by the presence of bacteria, viruses, and parasites in food. The real number is likely far higher. One of the main culprits is the *Campylobacter* microorganism, the central character in this issue's main focus. The ABCs of kitchen hygiene provide answers to resolve the back and forth about the correct way to handle food.

Kitchen hygiene predominantly involves water, soap, heat, and cold – find out more in the fold-out poster.



Disease-causing corkscrews

Despite being the most common pathogen causing bacterial foodborne infections, *Campylobacter* is not particularly well known among the general public: a visit to the *Campylobacter* National Reference Laboratory at the BfR.

THE MICROSCOPICALLY TINY "CORKSCREWS" ARE POTENTIALLY ILLNESS-INDUCING BACTERIA OF THE *CAMPYLOBACTER* GENUS. THEY ARE MOST FREQUENTLY TRANSMITTED VIA CONTAMINATED FOODS.

Looking through the microscope, there initially does not appear to be much to see. More specifically, one sees only blurry, pale fibres. Can those really be the microbes? Only after adjusting the microscope do they begin to take form. Initially just vague shapes, they grow clearer and more defined. Wow! Like tiny worms, they wriggle and team across the field of view. Some of them appear to be in a particular hurry and disappear as quickly as they appeared.

"They're very special," says Dr Kerstin Stingl with a note of admiration in her voice. "Even just the way they're shaped: they look similar to corkscrews and that shape is what makes them faster and more flexible." The microbiologist's affection for what are actually quite unpleasant entities is purely professional. After all, the microscopically small corkscrews dancing so cheerfully through the world are the potentially pathogenic bacteria of the *Campylobacter* genus. They are typically transmitted via contaminated foods and cause watery and sometimes even bloody

diarrhoea. In rare cases, there may even be complications as serious as Guillain-Barré syndrome, chronic inflammation of the nervous system. In total, 48 species of *Campylobacter* are currently known.

AN ESTIMATED 40,000 CASES PER YEAR

The public is less familiar with *Campylobacter* infections than those caused by, for example, *Salmonella*. Perhaps this is partly due to the complicated name. However, the bacterium is the most common cause of foodborne diarrhoea illnesses. Each year, around 40,000 to 50,000 cases are reported to the Robert Koch Institute. The species *Campylobacter jejuni* accounts for 80 to 90 percent of infections, with *Campylobacter coli* coming in second (roughly eight percent).

Dr Kerstin Stingl and her deputy Dr Janine Heise lead the National Reference Laboratory (NRL) for *Campylobacter* at the German Federal Institute for Risk Assessment (BfR). The laboratory monitors the microorganism, including its spread, timely detection, and its resistance to antibiotics. Its work also encompasses research into different species and variants of the pathogen as well as the development of laboratory standards. When it comes to “Campy”, the NRL sets an important standard for Germany.

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EVERY SECOND CHICKEN IS "CONTAMINATED”

Campylobacter species live in the intestines of many animal species and typically pose no danger to them. They tend to only stay inside humans for a short time. The main risk stems from contaminated chicken. “*Campylobacter jejuni* or *Campylobacter coli* are in every second chicken,” says biologist Dr Janine Heise. “During slaughter, they can be transferred from the intestine to the muscle meat and can infect human consumers in this way.” Cross contamination is one of the greatest risks. This involves bacteria from raw chicken being

Disinfectants

They should generally not be used to clean kitchens. Typically, they offer no additional benefits compared to classical cleaning products and can contribute to the development of resistant bacteria. Disinfectants should only be used if recommended by a doctor or the Health Department in case of illness.

Kitchen sponge

Keep dry and replace it regularly in order to limit multiplication of microorganisms.

transferred to other foods, such as salad, due to a lack of caution. However, the risk can be greatly decreased by following the rules of kitchen hygiene (see interview in this issue).

What if there were efforts to start with the chickens themselves in order to lower the risk of an infection? "Several attempts have been made to keep *Campylobacter* out of farms," says Heise. "But that has so far proved to be very difficult, because the bacteria enter their hosts through a variety of ways, including insects." Stingl adds that the European Union has been trying since 2018 to reduce the amount of contamination in chicken during processing by introducing tests and criteria for monitoring of chicken skin for *Campylobacter*. "Unfortunately, I don't think we'll manage to get *Campylobacter* out of the food chain any time soon." One of the contributing reasons is the fact that it is not currently possible to vaccinate chickens against the bacterium.

ONLY LITTLE OXYGEN

Campylobacter not only uses oxygen, but also nitrate, fumarate, and other substances to generate energy. This flexibility is vital when it comes to surviving in animal intestines, a low-oxygen environment. However, the bacterium cannot fully do without

CROSS CONTAMINATION IS ONE OF THE GREATEST RISKS. THIS INVOLVES BACTERIA FROM RAW CHICKEN BEING TRANSFERRED TO OTHER FOODS, SUCH AS SALAD, DUE TO A LACK OF CAUTION.

CAMPYLOBACTER JEJUNI OR CAMPYLOBACTER COLI ARE IN EVERY SECOND CHICKEN.

© Juan Moyano/Stocksy/adobestock

oxygen, as the process of replicating its genetic information is dependent on it. It is difficult to grow the bacterium, because it can thrive in neither normal air nor strictly anaerobic conditions. In the specific incubators of the NRL and with special nutrient media, however, it is possible to keep the microorganisms alive and to multiply them in order to study their characteristics and also use them for laboratory proficiency tests (PTs). Laboratories working in the field of food safety participate in these PTs in order to verify the quality of their performance of detection methods.

And there is one more peculiarity that characterises these microbes. They do not only use the typical "vertical" gene transfer via cell division. *"Campylobacter* have an extraordinary capacity to perform horizontal gene transfer," explains Stingl. "This means that the bacterium can pick up genetic information excreted or left behind by other bacteria and incorporate it into its own genome." *Campylobacter* recognizes the genetic information of related species which provide a special kind of biochemical decoration for their DNA and thus identify themselves. Such a "gene donation" increases the diversity of the population and thus the chances of survival, for instance through increased resistance against antibiotics. At the NRL, research is conducted to understand the underlying processes of genetic exchange.

Sometimes, the extended genetic "refreshment" with other species renders species identification difficult. The bacterium seems to place no value on a pristine pedigree. A fast and well-camouflaged master of transformation, one might caution to "never judge a book by its cover." But that is, of course, an unscientific perspective.

Kerstin Stingl and Janine Heise conclude by reiterating that "they are certainly very special microorganisms." —

More information

BfR information
"Campylobacter"

Raw? Please don't!

Poultry should never be consumed raw. Instead, it should always be cooked through. The same is true for other raw meat. The BfR also discourages the drinking of raw milk.

“Many Foods are good for longer”

© BfR

Things to take to heart when it comes to kitchen hygiene: an interview with Dr Niels Bandick.

Mr Bandick, what are the most common hygiene mistakes made in domestic kitchens and how can they be avoided?

Consuming raw or insufficiently cooked foods of animal origin such as meat, eggs, or innards and especially chicken, poses the greatest risk. They may be contaminated with illness-causing microorganisms which can enter into the body. It can also happen when bacteria from contaminated meat are transferred to uncooked foods such as salads. Therefore, animal food products should always be prepared with separate kitchen utensils, surfaces such as cutting boards and counters should be cleaned thoroughly, and hands should be washed regularly. Better hygiene means fewer foodborne infections.

What else should be kept in mind?

Easily perishable foods should be properly refrigerated. After grocery shopping, the cold chain should not be broken. To start, they should be transported in insulated bags when temperatures are particularly high. The refrigerator should be cold enough. This is not a place to be stingy. We recommend a maximum temperature of seven degrees centigrade.

What about the expiration date on packaged foods?

Here, we have to make a distinction. Products have either a “best before” date or a use-by date. The “best before” date is far more common. This denotes the time period for which the manufacturer guarantees the shelf life of the product. But many foods are good for longer, particularly those in sealed packaging. Dairy products such as yoghurt and cheese come to mind here. In these cases, the consumer can examine the appearance, smell, and taste of the product to determine whether or not they still wish to eat the food. This is different from the use-by date, which is provided for packaged, quickly perishable foods such as raw poultry or ground meat. This denotes the specific date by which a product should be consumed and it should not be exceeded.

How should one deal with mould?

Mould should be fundamentally avoided. On the one hand, mould forms poisonous substances and on the other hand, inhaling mould spores is hazardous to health. So dispose of mouldy foods like bread. Containers in which these foods are stored should also be thoroughly cleaned. There are a few exceptions such as some hard cheeses in which the fungi do not spread to the inside of the cheese. But anyone who isn’t an expert should err on the side of caution. —

“Better hygiene means fewer foodborne infections.“

DR NIELS BANDICK

Be aware when buying leather

Leather products go through several production steps before reaching the market. One of these steps is tanning. Both within and outside the EU this involves the use of, among other things, chromium (III) sulfate. The leather is preserved and strengthened by chemically crosslinking the fibres. Under certain conditions, chromium (III) can chemically change into chromium (VI) during and after processing. Skin contact can lead to allergic contact dermatitis in people who react sensitively to chromium (VI). People at risk can protect themselves by opting for chromium-free tanned leather or foregoing leather products entirely.

A GREATER SAY FOR EVERYONE

In citizen participation processes, citizens jointly develop and express viewpoints, for example regarding new technologies. Researchers from the BfR and other research organisations are analysing how opinions can influence each other and either promote or hinder consensus. They investigated the past BfR Consumer Conference on Genome Editing to answer questions such as: What is the influence of participants with stronger opinions? How can all citizens be involved? How can the processes be improved? A German Parliament citizens' council on nutrition is also being examined to answer the question of how linguistic abilities and educational background influence decision-making, and how the process can be made more inclusive. This also takes risk analysis in a European context into account.

More information

Dendler, L., Morais, M., Hargart, J. N. et al. 2023. **Participatory versus analytic approaches for understanding risk perceptions: a comparison of three case studies from the field of biotechnology.** Journal of Risk Research, 26(8), 866–882. DOI: *10.1080/13669877.2023.2197615*

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COW-FREE — AND RISK-FREE?

Whether in coffee or muesli, plant-based drinks made from soy, oats, or almonds are popular alternatives to cow milk. But what is the situation regarding undesirable substances with these vegan alternatives? The Max Rubner Institute analysed plant-based drinks and detected mould toxins (mycotoxins) in some of the samples. The BfR assessed the results with respect to a particularly sensitive group – children aged six months up to six years. Many almond drinks contained small amounts of aflatoxin B1, which can cause health impairments if consumed regularly. Oat drinks often contained the toxins T2 and HT2. Soy drinks were found to contain mould toxins less often and in lower amounts. However, due to limited data, further research is needed.

More information

BfR opinion
"Mycotoxins in plant-based drinks: more data required" *(pdf)*

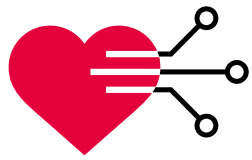
IT'S ALL IN THE MIX

Fat-dissolving, foaming and fragrant – dishwashing detergents have many effects. To give products certain properties, manufacturers deliberately 'mix' substances with each other in many everyday products. Manufacturers must guarantee the safety of their products when they are used as intended, but also in the case of "foreseeable misuse" – for example, when dishwashing detergent is occasionally used for washing one`s hands. The health effects of mixtures are also part of the risk assessment in other areas, such as pesticides or cosmetics.

More information

BfR-FAQ
"Chemical mixtures"

New digital trust



How is trust established in trading systems that employ emerging digital technologies, specifically blockchain, when said systems are no longer under the control of central institutions, but rather digitally controlled by a multitude of participants, such as companies, and consumers? In order to investigate this topic, the BfR and University of Stuttgart have thus embarked on a three-year research project. The research will concentrate on two principal areas: firstly, the impact of digital technologies on the construction of trust within the global food supply chain; and secondly, the protection of consumer health.

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More information

Roth, B. 2024. **Blockchain-enabled Consumer Engagement: An Emerging Pandora to Safer Food and Enhanced Consumer Trust?** Science and Technology of Cereals, Oils and Foods 32(4), 24 - 32. DOI: 10.16210/j.cnki.1007-7561.2024.04.003

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Tiny particles with a large effect?

An Italian research team has demonstrated the presence of microplastics in blood vessel plaque. The research compared two groups in their study about the influence of microplastics on human health. The results show that people with microplastics in their plaque had more heart attacks and higher inflammation values than those in whom no microplastics were found. However, the study merely shows a connection, rather than claiming a causal link. In other words, it does not prove that microplastics increase the risk of vessel diseases and the resulting heart attacks or strokes. Further research is needed to determine whether and how microplastics lead to plaque formation.

More information

BfR communication
"Do microplastic particles increase the risk of a stroke?" *(pdf)*

Misleading myths & dangerous dares

Illustrations:
Susann Stefanizen

A whole of host of unsettling or even alarming claims and trends related to health are spreading online. However, most of them don’t hold up to scientific scrutiny.

We all know helpful tips and tricks that come in handy for annoying everyday problems. Many of them are well-intentioned and, should they prove useless, are disappointing but not dangerous. But there are also dubious claims and trends making the rounds that, if taken seriously, could lead to negative effects on our health. By the time they are picked up by traditional media, they tend to have already spread far and wide on social media.

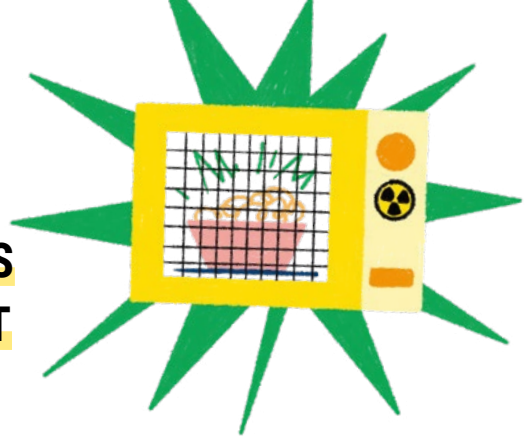
INCOMPLETE AND PROBLEMATIC ADVICE

Microplastics are everywhere: the environment, our food, our bodies. Though current information does not suggest that they cause health problems in our cells, they still place within the top three most feared substances in the survey results of the BfR Consumer Monitor. But the alleged secret solution to this dilemma has long been circulating on social media: just drink lemon oil and the microplastic will dissolve in the body. An apparently simple solution for a complex problem that otherwise makes consumers feel powerless? That goes down easy – much like oil. Unfortunately, it is not true.

Aside from "life hacks" like this one, there are also several warnings being spread about supposedly unknown problems, which cause uncertainty because they highlight aspects which are either false or taken out of context. For instance, there is a claim making the rounds that the dyes being used to achieve the orange colour of a certain apéritif are carcinogenic. The dyes in question are sunset yellow FCF (E 110) and Ponceau 4R (E 124), both of which are permitted for use in certain food products across the EU. One substantial prerequisite for approval is that a substance does not pose a health risk. This is assessed by the European Food Safety Authority (EFSA). EFSA concluded that there are no concerns regarding carcinogenic potential for these dyes.

CONGLOMERATION OF MICROPLASTICS, DYES, & OTHER INGREDIENTS

Olive oil is supposedly diluted with mineral oil for bigger profits, chocolate is supposedly allowed to contain a certain amount of animal excreta, and the reason that older people are more likely to have cancer is supposedly due to exposure to radioactive irradiation of food in the microwave. These claims are often accompanied by all sorts of unsubstantiated promises of salvation through use of superfoods and food supplements – often instead of consultation with a medical professional. Given all the false and distorted information, the question inevitably arises as to who is making these claims and why?



THE BFR FELT THAT IT WAS NECESSARY TO HIGHLIGHT THE HEALTH RISKS OF BOTH “DARES”.

What they all have in common is that the scientific community is under pressure to classify or correct these claims in ever shorter spans of time.

HOT CHIPS, COLD DEODORANT

In the summer of 2023, two versions of another internet phenomenon, social media challenges, caused an international stir among adolescents, ultimately leading to a variety of emergency medical interventions. Thanks to the “hot chip challenge”, video clips of people eating an extremely spicy maize chip and then visibly struggling with the consequences spread like wildfire. The chilli ingredient capsaicin causes various symptoms, ranging from a burning sensation in the intestinal tract to nausea and circulatory problems. The ingredient was also present in amounts which carry an increased risk of damage to the stomach lining. After being banned in several German federal states ("Laender"), the manufacturer ended up withdrawing the product from the market. In the “deodorant challenge”, people sprayed deodorant on the same spot on their skin for as long as they could stand. The drop in temperature down to as low as -30 °C within a few seconds can cause serious skin damage. An even more dangerous version of the challenge involved intentionally inhaling the spray, which can lead to loss of consciousness, heart failure, and respiratory paralysis. The media has already drawn a connection between the “deodorant challenge” and the deaths of several adolescents. The German Federal Institute for Risk Assessment (BfR) felt that it was necessary to highlight the health risks of both of these “dares”.

CHALLENGE FOR COMMUNICATION

Thankfully, these extreme examples are not representative of the majority of challenges. Most of them involve dancing, singing, or engaging in athletic activity. When it comes to the particularly egregious cases such as the aforementioned misuse of deodorant or the deliberate chewing of laundry detergent gel pods, most people’s sense of personal risk prevents them from taking part in such challenges. Depending on the type of claim being made or the action being taken, providing scientific clarification can be more complex especially when there is a lack of data or studies on the matter in question. The speed at which such content goes viral poses a challenge for risk communication too. Regardless, in addition to general media literacy of consumers and reliable information, proper risk communication is an important building block for finding a healthy medium amid the masses of tips, tricks, myths, and dares. —

More information

BfR communication
“Extremely spicy food”
(pdf)

More information

BfR communication
“Deodorant challenge”
(pdf)

The dark side of liquorice

© Victor Moussa / adobestock

The thought of liquorice makes many people's hearts beat faster. However, consuming too much of it can also increase blood pressure.

In medical contexts, liquorice has long been used to alleviate stomach issues or colds. But the extract derived from the Glycyrrhiza glabra plant is best known for something else: it's what gives liquorice its distinct taste. What is less well-known is that consumption of larger amounts of it could increase blood pressure.

The effect is caused by glycyrrhizinic acid, an ingredient of liquorice extracts. It can alter the mineral metabolism, which may lead to oedema in tissue and muscle weakness in addition to hypertension. Therefore, the German Federal Institute for Risk Assessment (BfR) advises pregnant women, people with hight blood pressure, and those with cardiovascular diseases and diabetes not to exaggerate consumption of liquorice.

Consumers generally can't determine how much glycyrrhizinic acid is in a given product, as this information isn't required to be listed on the packaging. For higher levels, though, the product must at least bear a warning: starting from a concentration of glycyrrhizinic acid or its ammonium salt of 100 milligrams (mg) per kilogram (kg), the packaging must say "contains liquorice." The exception is if the term "liquorice" is already in the list of ingredients or included in the name of the food. For salty liquorice with a concentration of 4 grams per kg, there is an additional recommendation that people with hypertension should avoid excessive consumption.

LIQUORICE DURING PREGNANCY

The claim that high levels of liquorice consumption during pregnancy can impair the mental and physical development of the unborn child is not considered by the BfR as being substantiated given the data currently available. This fear was first raised by a Finnish study. For instance, it is unclear how much liquorice the women examined in the study actually consumed during pregnancy, as the amount was only determined once and in hindsight. It is also uncertain if the effects observed can be traced back to the mothers' liquorice consumption or if there might be other reasons. The BfR is of the opinion that further studies would be needed to assess the health risk in this respect. —

More information

BfR communication
"Does the consumption of liquorice by pregnant women impair the mental and physical development of children?"
(pdf)

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Answers to a cold case

How chilly is the cold heart of German households? A study by the BfR and MRI sheds light on refrigerator temperatures and cooling habits.

© Kira/adobestock

Properly cooling food slows down or even stops the proliferation of most bacteria. This helps reduce the risk of foodborne infections. Every year there are around 100,000 registered cases of illness in Germany that may have been caused by microorganisms (especially bacteria, viruses, or parasites) in food. For people whose immune system is either not yet fully developed or else compromised (small children, pregnant women, elderly persons or those with pre-existing medical conditions), such illnesses may, in extreme cases, even be life-threatening.

Therefore, proper refrigeration is important. It is crucial to adhere to the storage temperatures indicated on food packaging, which are often between 4 and 8 degrees Celsius (°C). However, if the domestic refrigerator does not display the temperature, it can be hard to get right. "The study showed that less than half (41%) of refrigerators in Germany display the temperature or have a separate thermometer," says Martina Hoffmann, psychologist and head of the study at the BfR. "This means many consumers have no means of knowing what the actual temperature of their refrigerator is." Only around a third (34%) of the refrigerators allow users to set a specific temperature, while the vast majority offer only temperature levels (for example, using numbers).

COOL TRENDS

To achieve more clarity around the topic, the German Federal Institute for Risk Assessment (BfR) and the Max Rubner Institute (MRI) monitored the refrigerator location, temperature, load, and time spent open in almost 1,400 representatively chosen households over the course of a year. For the first time nationwide and in each household for a period of one month. In addition to measuring actual temperatures and collecting protocols of refrigeration usage, the survey also examined opinions about temperatures and ways of dealing with food that is meant to be kept cool.

The results show that most people in Germany have the same habits when it comes to refrigerator location, use, and temperature settings. Almost all households (94%) keep their refrigerator in the kitchen. A few households keep their refrigerator in the utility room, the pantry or storage room, or the living room (2% respectively in each case) or hallway (1%).

EIGHT DEGREES AND GETTING COLDER

In around half of the households surveyed, adjacent devices might influence the refrigerator temperature. In a quarter (24%) of households, small electronic devices such as a microwave, coffee machine, or toaster are located directly next to the refrigerator. In 18 percent of households surveyed there is an oven and in 11 percent a cooker directly next to the refrigerator.

The temperatures recorded show that 80% of households maintain a refrige-

rator temperature of between 4 and 10 °C. In the majority (32%) the temperature is between 6 and 8 °C, in a quarter (24%) between 8 and 10 °C. The mean value is 6.6 °C.

These findings correspond to some degree with the opinions of respondents. More than half (63%) of respondents indicated that the ideal refrigerator temperature is between 4 and 7 °C. Almost a quarter (22%) assumed it was 8 °C or above. Only 4 percent claimed the ideal refrigerator temperature was below 4 °C. "The BfR recommends setting the refrigerator temperature at a maximum of 7 °C and to regularly check the temperature at various places in the refrigerator," says Martina Hoffmann. "As a rule, you should always follow the temperature recommendations of the manufacturer when it comes to prepacked food."

Different parts of a refrigerator have different temperatures. But are private households even aware of this? 52 percent of respondents claimed that the bottom of the refrigerator is the coldest part. 22 percent believed the middle part and an additional fifth of respondents (21%) believed the upper part to be coldest. "The right answer is that the bottom of the refrigerator, above the fruit and veg compartment, is coldest, and suited to meat, fish, and sausage," says Martina Hoffmann. "By the way, the compartments in the refrigerator door are the least cold areas."

DOOR OPEN, DOOR CLOSED

The study participants were also requested to record how often they open their refrigerator over a 24-hour period. On average, the refrigerator door opened and closed 11.9 times. The maximum number of times the refrigerator was opened in one household was 46, while 30 households opened it just once.

The findings of the study provide useful scientific indicators for policymakers, for example with respect to determining cooling instructions for the food industry. —

More information

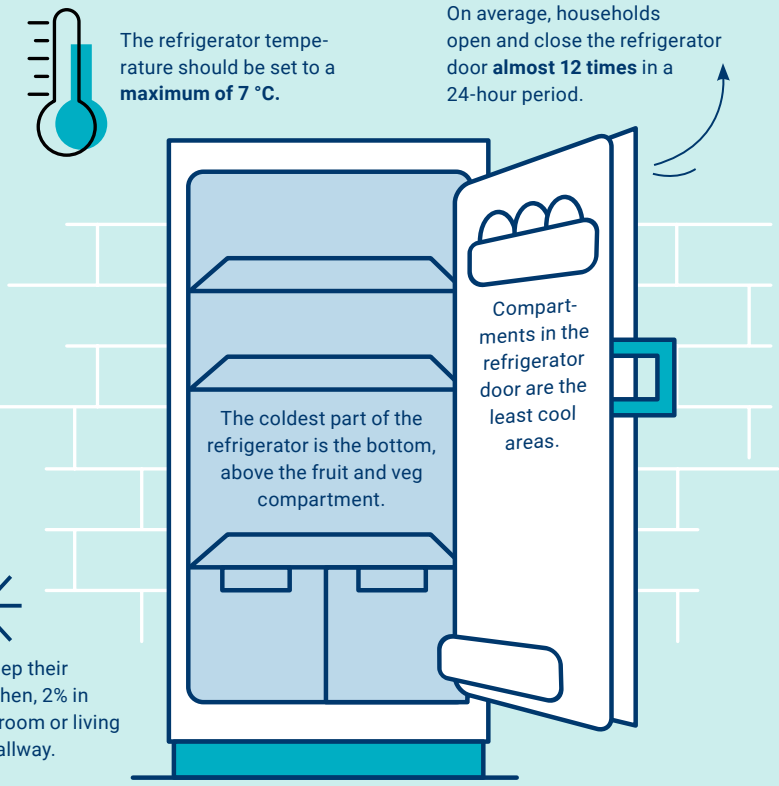
BfR-FAQ
"Refrigerating foods in private households"

TIPS

CORRECT COOLING

- Highly perishable animal and plant foodstuffs (such as meat, cheese, milk, eggs, fish, as well as chopped vegetable salad as well as chopped fruit) should be brought home and refrigerated as quickly as possible after purchasing
- Use a cool box to transport food in warm temperatures
- Avoid overfilling the refrigerator, so that the cool air can circulate
- Set the refrigerator temperature to max. +7 °C (preferably +5 °C) and check the temperature regularly
- Store raw meat, poultry, and raw fish at the bottom of the refrigerator, above the fruit and veg compartment and near the back of the refrigerator or in a 0 °C compartment
- Clean the inside of the refrigerator several times a year

COOL FRIDGE FACTS



VITAMIN B12

Like all vitamins, B12 is essential for the human body, but perhaps not as well-known as the popular vitamin C. Why do we need vitamin B12 and how much do we need? Are B12 supplements necessary?

For what purpose?

Vitamin B12 is a water-soluble vitamin. It supports the formation of red blood cells, cell division and the development and functioning of the nervous system. The body can store a relatively large amount of vitamin B12. A deficiency often only occurs after years, once the stores have been depleted.

Haematopoiesis

Cell division

Development and functioning of the nervous system

Supply in Germany

The healthy general population is well supplied with vitamin B12. However, people who follow a vegan or vegetarian diet have an increased risk of deficiency if they do not take vitamin B12 supplements. This is because significant amounts of vitamin B12 are only found in foods of animal origin. People who, for example, due to a stomach disease, can only absorb vitamin B12 to a limited extent, are also at higher risk of deficiency.

Adequate daily intake (estimated value)

4 µg

for adolescents and adults

4.5 µg

during pregnancy

5.5 µg

while breast-feeding

Source: The German Nutrition Society (DGE)

How much vitamin B12 is found

...in food? (per 100 g)

Vitamin B12 is only found in animal-based foods.

Herring (cooked)
8.5 µg

Hard cheese
2.0 µg

Pork schnitzel, plain (fried)
2.1 µg

Steak
4.4 µg

Chicken egg
(a medium-sized egg weighs approx. 60 g)
1.9 µg

Yoghurt
0.4 µg

One microgram is one-millionth of a gram (1×10^{-6}).

...in food supplements?

People following a vegan diet should ensure a proper supply of vitamin B12 by taking food supplements. For healthy people who eat a balanced diet that includes animal products, food supplements with vitamin B12 are generally unnecessary.

25 µg

The daily dose of vitamin B12 in a food supplement should not exceed this amount

More interesting facts about topics like vitamins and minerals

...can be found on www.microco.info. In addition to vitamins and minerals, this website also provides information about numerous other substances that are found in food or that are offered as food supplements. Which foods contain particularly large amounts of a certain vitamin or mineral? Why does the body need a certain substance? What are the consequences of a deficiency?

Answers to these and other questions can be found on: www.microco.info

microco.info

Too much of a good thing?

A deficiency of vitamins or minerals can cause illness. That much is true. However, it is not true that taking high-dose food supplements is always beneficial.

The elderly lady probably had no concerns when she ordered a high-dose vitamin D3 supplement on the internet. For three months, she took approximately 250 micrograms (µg) of the vitamin daily via that food supplement. In comparison: for vitamin D in such products, the BfR recommends a maximum amount of 20 µg per daily dose. One of the consequences of the self-administered supplementation of more than ten times the dosage recommended as maximum amount for food supplements was acute kidney failure. After intensive medical treatment and a two-week stay in the hospital, the patient's condition improved. This meant that she was better off than an adult man who developed irreversible kidney failure and left him dependent on dialysis for the rest of his life as a result of taking high doses of vitamin D, also on his own accord.

The two examples reported by the Drug Commission of the German Medical Association illustrate that food supplements currently available on the market are not always harmless pills and powders that can be taken safely in large amounts. Quite the contrary: excessive doses can sometimes have serious health consequences.

MORE IS NOT ALWAYS BETTER

Overconsumption of vitamins or minerals can occur when high-dosage micronutrient supplements are taken with a "more is better" approach in order to combat a supposed nutrient deficiency. Sometimes it is also application or dosage errors or – more rarely – errors in the manufacturing of products that can

TIPS

CASES IN WHICH FOOD SUPPLEMENTS ARE USEFUL, AFTER MEDICAL CONSULTATION

- **Before and during pregnancy:** 400 µg folic acid per day to reduce the risk for certain birth defects
- **During pregnancy and breastfeeding:** Iodine due to an increased need
- **In certain circumstances:** e.g. vitamin D for people who are ill and residents of care homes who are unable to spend much or any time outdoors
- **In case of certain dietary habits:** e.g. vitamin B12 and, as needed, other vitamins and minerals for vegans
- In the case of a medically diagnosed micronutrient deficiency

lead to an oversupply. For example, in the case of a woman who had experienced hair loss after taking a selenium-containing food supplement for several months, it turned out that the capsules contained about eight times the listed dose of 20 µg of selenium per day.

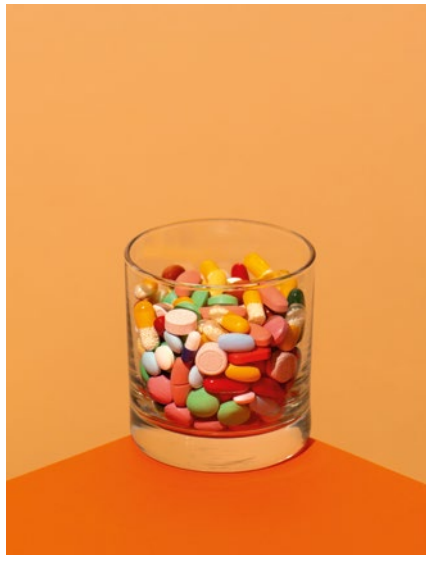
"Food supplements are legally classified as food," says BfR scientist Dr Karen Hirsch-Ernst. "They are subject to less stringent controls than medicinal products and are not subject to official authorisation before being placed on the market. The responsibility for the safety of supplements lies with the manufacturer and retailer." Moreover, there are currently no legally defined maximum amounts for the ingredients of supplements.

It is important to know that acute poisoning from the intake of food supplements containing vitamins or minerals is rare. However, a consistently high intake – far exceeding the body´s requirements – increases the risk of adverse health effects.

A FEW EXAMPLES:

— Vitamin A: A high intake from food supplements or the consumption of animal liver during pregnancy increases the risk for birth defects.

— Beta carotene (provitamin A): A high intake from food supplements can increase the risk for lung cancer in smokers.



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— Vitamin K: The intake via food supplements could counteract the effect of certain anticoagulant medications (anticoagulants of the coumarin type).

"Currently, there is no mandatory reporting requirement for adverse effects involving food supplements," says Dr Nina Glaser from the National Register of Poisonings at the BfR. "However, the BfR does accept voluntary communications from doctors and authorities. Based on the data from the Pilot Study on Poisoning Monitoring (PiMont Study), it can be estimated that the German poison control centres provide advice on approx. 600 enquiries related to food supplements every year."

SOMETIMES USEFUL

Data shows that most people get adequate amounts of micronutrients from their usual diet and, with a few exceptions, do not need food supplements. There are only a few nutrients for which there are indications of an inadequate intake in certain age groups or life situations, which increase the risk of an insufficient supply, or for which there are general recommendations (see box). Only in these cases can food supplements make a meaningful contribution to the improvement of nutrient intake and to the avoidance of deficiencies and health impairments. —

More information

BfR information
"Food supplements"

A RAW DEAL

A little sample of raw cookie or cake dough can often be tempting. However, not waiting until the oven has done its job can be dangerous.

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Cookies fresh from the oven warm the hearts of young and old alike, especially when it's cold outside. Some succumb to temptation before the treats even land on the plate. However, eating raw dough can lead to food infections.

The culprits are the bacteria known as *Escherichia (E.) coli*. They occur naturally in the intestines of humans and animals. Certain *E. coli* form toxins. *E. coli* that form Shiga toxins – known as STEC – are particularly relevant for humans. STEC that trigger severe illness in humans are termed enterohaemorrhagic *E. coli* (EHEC). STEC/EHEC bacteria can infect plant-based foodstuffs such as grain via contaminated water, natural fertiliser, or the excrement of wildlife. During the further processing of corn into flour the germs may be distributed and, under certain conditions, multiply. They can survive in the dry end product. If eggs are then used to prepare the dough in the kitchen, tasting the raw dough can also potentially lead to a *salmonella* infection.

DANGER IN DISGUISE

Food monitoring authorities in Germany have repeatedly found STEC in flour, baking mixtures, and dough samples in recent years. It is not possible to detect STEC by merely looking at or smelling the food. An infection can cause mild to severe diarrhoea. Particularly vulnerable groups such as children may also be at risk of developing hemolytic-uremic syndrome, which can have serious consequences. The disease manifests itself in acute kidney failure, blood clotting disorders, and the destruction of red blood cells, and can even prove fatal. Infected adults may not experience any symptoms. It is therefore important to resist temptation and never sample raw dough, regardless of whether it has been prepared with or without egg. —

More information

BfR-FAQ
"*Escherichia coli* in flour and dough"

TIPS TO PROTECT AGAINST A STEC/EHEC INFECTION FROM FLOUR

— After contact with flour, thoroughly wash hands with soap and water and dry them.
— Avoid contact between flour and food intended for direct consumption, and use separate boards, plates, bowls, and mixing devices.
— Thoroughly clean working area and other objects with detergent and warm water following contact with flour, and dry them.
— Never consume raw bread, cake, pizza or cookie dough.
— As a rule, people with weakened immune systems as well as small children should never consume raw dough.

Mealworm instead of mincemeat

Grasshopper: BfR

© Worm: Eric Isselée, Worm2: kolesnikovserg, Seaweed salad: ExQuisine, Black beetle: Anton @adobestock,

The BfR is examining novel protein sources as alternatives to meat, eggs, and cheese.

Whether lupins, insects, or meat derived from cell cultures – alternative protein sources are becoming more important as a way of meeting growing global demand. While there has long been research into plant proteins such as lupins and peas, little research has been done to date into new sources such as insects, algae, and cell-culture-based meat substitutes.

NEW FOOD – NEW CHALLENGES

Many of the new protein sources are from what are termed "novel foods". They are approved for use as novel foods in Europe only after a thorough risk assessment. "Before alternative proteins can land on plates, their risks must be clear," says Hermann Broll, a biologist at the German Federal Institute for Risk Assessment (BfR). Possible health risks include allergic reactions and microbiological risks such as viruses and bacteria. Some new protein sources may contain substances that are potentially harmful to health, while other risks may arise during the production process.

PREPARING FOR THE FUTURE

The BfR is already investigating alternative proteins, for example from insects or aquaculture. "We are developing detection methods for alternative protein sources and tests to identify their potential to trigger allergies," says biologist Broll. "We are not currently doing any research into other sources of protein such as meat substitutes, but we want to be informed and ready for their safe use as food and feed."

With this work, the BfR is supporting the bioeconomy strategy of the German Federal Ministry of Food and Agriculture as well as international measures such as the European Union Green Deal (EU) and the United Nations Sustainable Development Goals. One goal is the sustainable production of raw materials and products of biological or organic origin.

INTERNATIONAL EXCHANGE

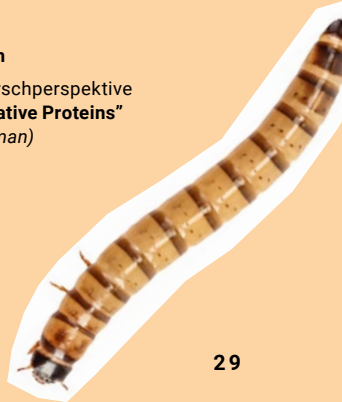
In order to promote international exchange on new protein sources between stakeholders from science, business, and government authorities, in December 2024 the BfR and national authorities for food safety from Iceland, the EU, Singapore Food Agency, and the USA jointly held an international conference in Berlin, Germany. The focus was on consumer awareness as well as safety and nutritional aspects. Alternative protein sources will play a key role in food security, both on Earth and perhaps even in space, where innovative solutions to supply space missions may be required in the future. Ideas have already been floated. —

More information

BfR information
"Proteins"

More information

BfR-Forschperspektive
"Alternative Proteins"
(in German)



“The individual is the key factor”

Our perception of risk depends on our personal experience, says psychologist Dr Peter Wiedemann. He is an adjunct professor at Monash University, Melbourne and he studies how people assess risk. He is a member of the Advisory Board in the communication project MIRKKOMM, which is coordinated by the BfR.

Mr Wiedemann, whether it’s mercury in fish, microplastics in the air, or the coronavirus: surveys on the assessment of health risks aim to probe and reflect public opinion. Do they always succeed?

It’s not easy to find out how people assess a health risk. Whether the topic under consideration is really important or rather irrelevant in the everyday lives of respondents is a decisive aspect.

How can that be discovered?

You can find out how often a person thinks about a topic, let’s say microplastics. For example: How often have you thought about microplastics in recent days – not at all, rarely, quite often, very often?

“The key factor is personal relevance: Does this risk play a role in my life?“

Psychologist Dr Peter Wiedemann

What does that mean for the survey result?

I surveyed 1,583 people about risk as part of a BfR investigation. 677, so less than half of those surveyed, were concerned to a greater or lesser degree. Under closer analysis only 98 of those 677 were “genuinely” concerned. I call those the “concerned concerned”. They tend to be fearful. And they ignore the fact that the risk posed by, for example, a chemical always depends on the dose. Instead, they stress that it is inherently dangerous. So when you look more closely, you can see that the degree of concern in the population is often lower than the survey results would initially suggest.

What determines whether a risk matters to a person?

The key indicator is its relevance to the individual: Does this risk play a role in my life? Other factors are also involved: Is this a new problem? Are we talking about something strange and unfamiliar or a potentially major threat such as cancer? Do I already have “coping strategies” or does this issue require reorientation? Are other concerns more important? In a nutshell, it’s all about the everyday relevance of the risk.

What factors underpin everyday risk perception?

What we call risk perception really refers to judgements or assessments of risk. Here too, the relevance to one’s own life is paramount: Do I have experience with this risk?

The individual is the key factor when it comes to risk assessment. Alongside personal experience, the experience of friends or acquaintances also plays a role. Media information is another source. This might take the form of scientific statistics. However, such sources are less important than personal experience.

And what happens if there is a lack of both subjective and objective information on a risk?

In this case heuristics, or intuitive reasoning, takes over. For example: Things with complicated names are risky. “Acetylsalicylic acid” sounds more dangerous than “aspirin”, although it’s the same substance. Heuristic thinking can also be derived from political views. For example, people assume that the pursuit of profit and the protection of health are incompatible. Therefore: sugar is a product of the profit-focused sugar industry, meaning it poses a risk.

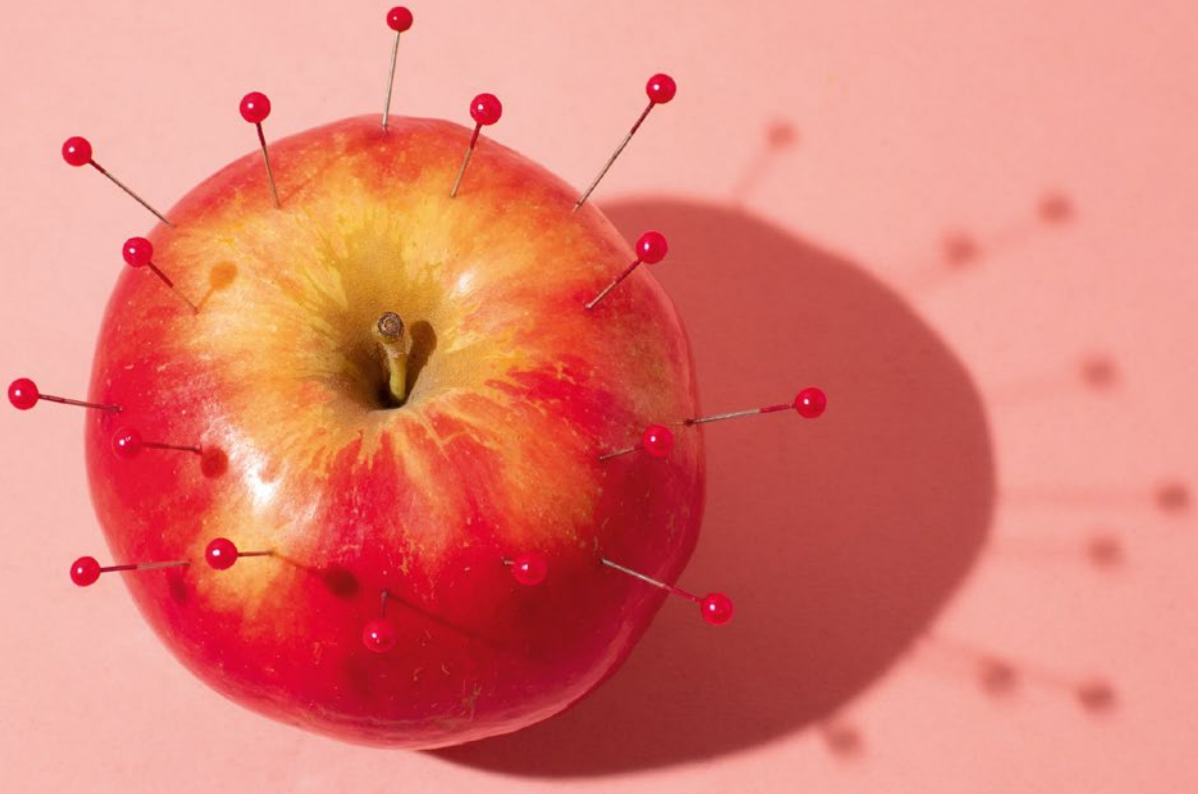
Can you influence a risk assessment using fact-based arguments?

Risk assessments based on experience are hard to influence. They are more open to influence when based on media information or heuristics. As a rule, it’s hard to change a gut feeling. —

More information

Wiedemann, P. et al. 2024. **The criticality of risk generalization beliefs. An experimental study on communication about risk of bamboo tableware.** Environmental Research 262(2). DOI: 10.1016/j.envres.2024.119919

Snow White's red apple



What are poisons and how do they work? A brief exploration of toxicology.

Envy of the beautiful Snow White eats away at the evil stepmother. And so, the offended woman resorts to a ruse and poisons a red apple. When the unsuspecting Snow White eats it, she falls into a death-like sleep. “Snow White and the Seven Dwarfs” is one of the most popular fairy tales by the Brothers Grimm, and the episode with the apple encapsulates many elements associated with the concept of poisons: deception, malice, danger. ‘Poisonous’ – the word has instilled fear since the time of the Brothers Grimm.

The science of poisons, toxicology, approaches its subject with a perspective that is more pragmatic than demonic. It defines a poison (or toxin) as a substance that can harm living organisms, even in small doses. The realm of poisons is large. Public attention is usually focused on man-made potential poisons. These include contamination by microplastics, per- and polyfluorinated alkyl substances (PFAS), and dioxins as well as residues of chemicals or active ingredients of pesticides, such as glyphosate.

NATURE AS A POISONER

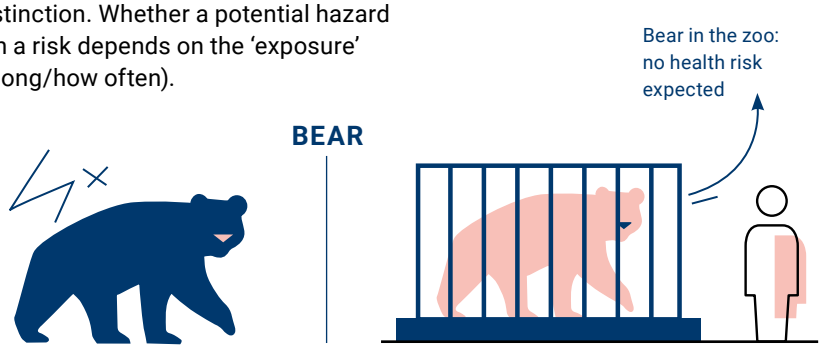
It is easy to overlook the fact that a large (if not the largest) group of poisons comes from nature itself. These chemical compounds are formed by animals, plants and microorganisms to ward off enemies or to capture prey themselves. These are substances that have been “refined” and perfected over the course of evolution to specifically harm other living things. This explains their sometimes immense toxicity. The botulinum toxin secreted by the bacterium *Clostridium botulinum* is the most potent poison known. When injected into a vein or muscle, less than one-millionth of a gram (a microgram) is fatal. It is also a little-known fact that each year, an estimated 81,000 to 138,000 people lose their lives to venomous snake bites.

IT'S ALL ABOUT THE DOSAGE

Intuitively, we tend to categorise substances as good or bad, useful or harmful, healthy or pathogenic. However, anyone who studies toxicology quickly realises that the world of poisons is not divided into good or dangerous, but into high or low doses. This scientifically fundamental insight dates back to the physician Paracelsus, who, as early as the 16th century, stated: “The dose alone makes a thing non-poisonous.” Accordingly, strictly speaking, there is no such thing as a poison per se. “Anything can be toxic, and conversely, anything can be harmless,” explains toxicologist Dr Tewes Tralau. He heads the Pesticide Safety department at the German Federal Institute for Risk Assessment (BfR). What is crucial is the amount of a substance that a person comes into contact with. The toxicological term for this is exposure.

Hazard or risk?

In our everyday language, we often use the two terms synonymously. Scientific risk assessment, however, makes a strict distinction. Whether a potential hazard is associated with a risk depends on the 'exposure' (how much/how long/how often).



HAZARD: describes the potential of something to cause harm to health (hazard potential)

RISK: describes the probability of whether and how severely health can be harmed by something

Here are a few examples: Our body consists of two-thirds water – and yet drinking excessive amounts of water can be life-threatening, as it can cause brain swelling, known as cerebral oedema. Similarly, table salt, which (like water) is essential for life – the body contains half a pound – is deadly if ingested in excess. A dose of 100 to 150 grams a day (about ten tablespoons) can be fatal. On the other hand, the aforementioned "ultra-poison" botulinum toxin is used in extremely low doses to treat nerve and movement disorders (and as a means of smoothing wrinkles).

IT IS EASY TO OVERLOOK THE FACT THAT A LARGE (IF NOT THE LARGEST) GROUP OF TOXINS COMES FROM NATURE ITSELF.

WHAT – AND HOW MUCH – LIES WITHIN

There are many methods for detecting toxins in environmental samples, food or bodily fluids. These methods are the focus of analytics, a branch of toxicology. One long-established technique is the immunoassay, where a specific antibody is coupled to the target molecule and is thus "recognised". Chromatography can be used to separate mixtures of substances in a liquid. This makes the individual components visible. The most advanced method is mass spectrometry. During a measurement, a test sample is first electrically charged (ionised). An electrical field then separates its individual components. The resulting 'mass spectrum' provides precise information about the composition of the sample.

Such modern methods can detect the smallest amounts of substances. A toxicologist at Snow White's side would have no problem detecting the stepmother's poison, no matter how tiny the amount. Conversely, however, this also means that the detection of a substance in itself means nothing when it comes to its risk potential. The decisive factor here is always the dose (exposure). Even in today's nano-era, capable of detecting billionths or trillionths of a gram, not every microgram is a macro-risk.

HOW THE BODY DEFENDS ITSELF

As a rule, the human body can defend itself well against potentially toxic substances. This is because it has developed effective “detox” methods over the course of evolution. Probably the best example of this is the enzyme family of cytochrome P450-containing monooxygenases. These proteins generally ensure that toxins are easier to excrete, for example, via the kidneys or bile in vertebrates.

The body's “detoxification centre” is the liver. As the central metabolic organ, it processes 1.5 litres of blood every minute. Almost everything potentially toxic must pass through the liver. Its approximately 200 billion liver cells have a large arsenal of “detox” enzymes. Conversely, their task also puts the organ itself at risk of damage. For example, the toxin from the death cap mushroom can destroy the liver within a few days. Similarly, chronic high-dose consumption of the ethanol in alcoholic beverages often results in irreversible organ damage.

In addition to the liver, potential toxins can put other important organs and processes at risk: the respiratory tract (e.g., asbestos fibres), kidneys (some drugs), bone marrow (e.g., benzene, a hydrocarbon), skin (e.g., nickel) and nerves (e.g., methylmercury) as well as blood formation (e.g., lead), reproductive health and foetal development (e.g., the active ingredient thalidomide, “Contergan”).

Our bodies are two-thirds water – and yet drinking too much water can be life-threatening.

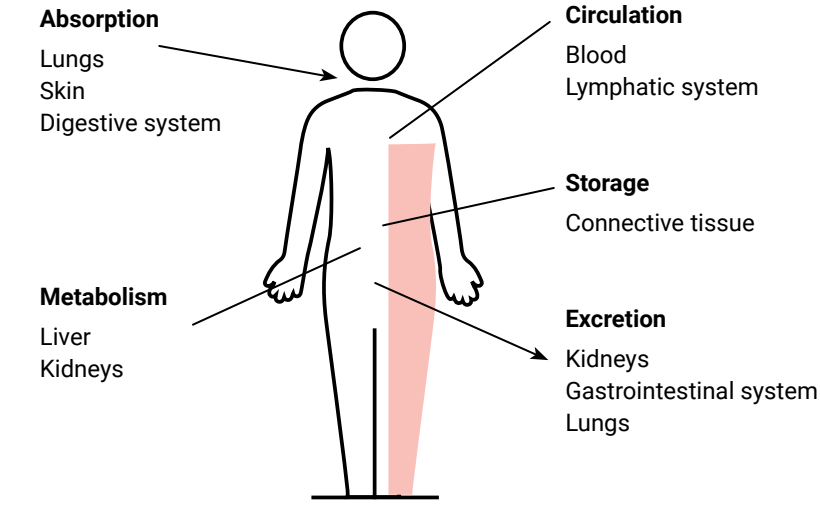
© showcake/adobestock

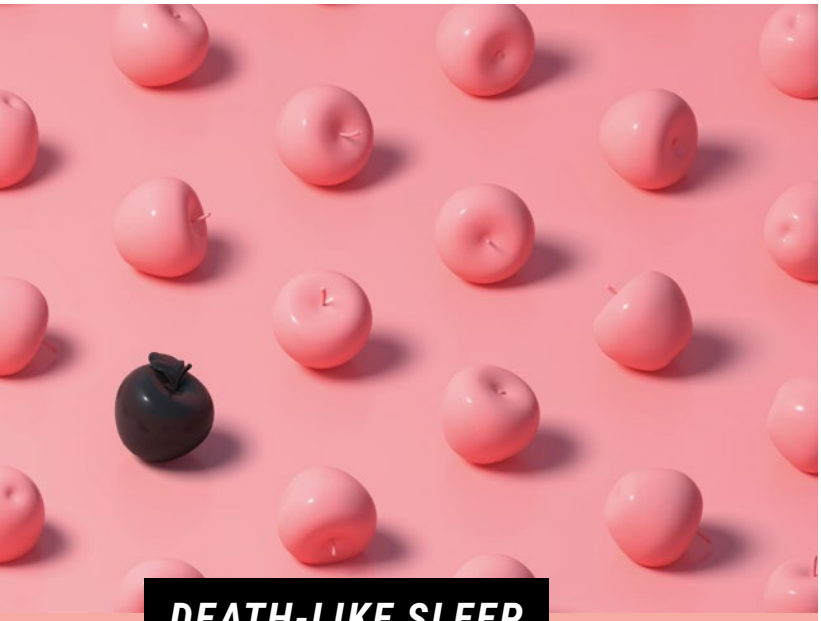
TESTED FOR LIVER AND KIDNEY DAMAGE

There are various methods for determining the possible risk of a toxin. In addition to animal testing, the model that most closely reflects biological reality, there are also animal-free methods, such as cell cultures or more complex cell systems. Epidemiological studies (population studies) are becoming increasingly important. When well-conducted, they can provide clues to the possible causes of disease.

New pharmaceutical active ingredients and chemicals are tested for toxicological health risks before they can be used, approved or authorised. The tests are required by law and manufacturers must submit them to the authorities. The same applies to active ingredients in pesticides.

Toxins in the body – **which processes are affected?**





DEATH-LIKE SLEEP

A case for toxicology

A poisoned apple causes Snow White to fall into a deep unconscious state, medically known as a coma. What substances can cause such a condition? From a toxicological point of view, there are several possibilities. Quite a few natural products and chemicals have the ability to affect the nervous system when given in the right doses. For example, for a long time, chloroform was used as an anaesthetic. Although chloroform was first artificially produced about 20 years after Grimm's fairy tales were published, seaweed and soil fungi also produce the anaesthetic chemical. The royal poisoner may have made use of these natural sources. Another possibility is tetrodotoxin (TTX), the highly dangerous poison of the puffer fish. It paralyses nerves and muscles and is about 100 times more toxic than chloroform. Just a thousandth of a gram is enough to kill a human being. Although puffer fish are rare in our latitudes, worms, frogs, lizards and many other animal species contain TTX – it is often produced by bacteria that live in symbiosis with their hosts. The guiding principle might be: "if you give me poison, you can live with me". The paralysing effect of TTX, for example as a result of poisoning from TTX-containing marine creatures, has been long known to humans and is part of the thrill of eating puffer fish (Fugu) in Japan. If Snow White had been exposed to TTX, she would have been in mortal danger – the fact that she did not swallow the poisoned apple most likely saved her life.

"These substances have been developed, for example, to harm specific fungi or insects," says BfR toxicologist Tralau. "Because of this potential, we have to examine them very carefully."

The tests determine, among other things, whether an active ingredient can cause genetic damage, trigger cancer or have acute or long-term toxic effects. They also examine whether fertility or offspring are harmed, whether hormone-like effects are possible, if the nervous system is affected, or if the skin is irritated. Toxicology has established a dense network to ensure that substances that pose a risk to humans (or the environment) are detected at an early stage. There's no doubt that evil stepmothers would have a much harder time today. —

More information

BfR information
"Plant protection products"

BfR-FAQ
"Difference between risk and hazard"

BfR2GO 1/2024
"Toxicological risk assessment for plant protection products" *(pdf)*

Saving our skin

From anti-ageing cream to toothpaste: cosmetics are found everywhere in our everyday lives. This is precisely why there are high standards intended to minimise the risks of adverse effects on health.

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Cosmetics do not have to be approved in advance. But manufacturers are obliged to conduct a safety assessment.

Warnings about supposedly harmful ingredients in cosmetic products of all kinds – be it colourants in hair dyes, parabens in deodorants or nanoparticles in toothpaste – continue to circulate on social media. “There are strict requirements for the safety of cosmetics across Europe,” explains Dr Ralph Pirow, a toxicologist at the German Federal Institute for Risk Assessment (BfR). He deals with the safety of consumer products, including cosmetics. “It is quite simple. Cosmetics that pose a health risk cannot be sold or distributed.” Whether young or old – most people use cosmetic products such as creams, shower gels, deodorants or sun creams every day and in large amounts. “This is why the standards for their safety are particularly high in comparison to other consumer products,” explains Pirow.

Only assessed colourants, preservatives and UV filters can be used in cosmetics.

CLEAR REGULATIONS IN GERMANY AND EUROPE

This is all set out in the EU Cosmetics Regulation. While new products do not have to be approved in advance, the manufacturers are obligated to conduct a safety assessment. In doing so, both the finished product and the individual ingredients are assessed. A product can only be sold and distributed if it is "safe for human health during normal and reasonably foreseeable use".

Clear requirements also apply to this safety assessment. These requirements are laid out in the Notes of Guidance of the European Commission's Scientific Committee on Consumer Safety (SCCS) which are continuously adapted to the current state of knowledge. Colourants, preservatives and UV filters can only be used if they have been assessed by SCCS and included in a "positive list". There is also a negative list for substances that are not permitted for use. In Germany, market surveillance authorities of the individual federal states monitor compliance with the requirements. If non-compliant products are found during laboratory testing or undesired effects are reported back by consumers, the market surveillance authorities can interact with the manufacturers to initiate a withdrawal of the product from the market or issue a warning in the European rapid alert system "Safety Gate" for example.

"A REAL SUCCESS STORY"

The BfR also deals with questions around the safety of cosmetics ingredients. It advises the federal government and prepares health risk assessments, which are used to inform the public or to initiate a safety assessment by the SCCS. Based on this, the legal framework can be adjusted and, if necessary, ingredients can be banned.

PLASTICISERS IN SUN PROTECTION

At the start of 2024, traces of the plasticiser DnHexP were detected in some sun creams containing a certain UV filter. DnHexP itself is banned as an ingredient in cosmetics. It became apparent that DnHexP occurs in small amounts unintentionally during the manufacture of the UV filter. In light of this the BfR conducted a risk assessment. The concentrations found in sun screens are relatively low according to this assessment. In the BfR's estimation, adverse health effects caused by using these products are therefore very unlikely.

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In addition to colourants, preservatives and UV filters, scientists at the BfR are also focusing on fragrances. While fragrances may provide a nice scent or cover up unpleasant odours, some might cause skin irritation or allergic reactions. This is why the presence of certain fragrances known to cause an allergic reaction in susceptible individuals must be declared on their packaging, so that people affected can avoid them.

"Overall consumer health protection when it comes to cosmetic products is a real success story," says Ralph Pirow. "The EU regulations for cosmetics guarantee a high level of consumer protection. And they cover thousands of different products used by millions of people every day." —

More information

BfR-FAQ
"Cosmetics"

YOUNG AND OLD ALIKE – MOST PEOPLE ENCOUNTER COSMETICS SUCH AS CREAMS, SHOWER GELS, DEODORANTS OR SUN CREAM EVERY DAY AND IN LARGE AMOUNTS.

Deciphering crisis communication

Unprecedented situations require difficult decisions: The international research project DECIPHER ("Deciphering the pandemic public sphere"), which is being conducted by the University of Ilmenau and the BfR, investigates how communication can be effective in future crises. Dr Robin Janzik, project head at the BfR, provides more details in the following interview.

Mr Janzik, the COVID-19 pandemic had the world holding its breath for around three years. How is DECIPHER approaching this?

We are investigating how the population in seven countries – in Germany, Italy, Spain, Sweden, the UK, the Netherlands and the USA – perceived government communication during the pandemic. We first collected views and opinions on government communication in interviews. To examine their prevalence in the general population, representative surveys were conducted in each country.

By analysing the interview data you discovered that science is perceived as a more trustworthy source than the government. How can this be explained?

There are many factors that influence trust and credibility. Competence, benevolence and integrity are just as important as transparency, honesty and the ability to be clear and specific. Results of earlier studies show that these characteristics are often associated with people working in science. This can also be the case for politicians, but the picture here is often more mixed.

Do the results between the countries vary greatly from each other?

First, we see that people are similar in their assessment of government communication, despite different political systems and state measures. The devil is in the details. In the UK, for example, politicians' behaviour played an essential role. And we found that there were differences in perceptions of communication on federal and state level in the USA. Particularly in

“The perceived competence and integrity of the people communicating plays a big role – expertise is very important to people.”

Dr Robin Janzik, DECIPHER Project Head at the BfR

Germany, the offers of the public broadcasting service were perceived as if they were direct information from the government.

What role did social media play for the general public?

We saw that people in all seven countries got their information from social media as well as via traditional channels and government portals. At the same time, interviewees showed a pronounced awareness of misinformation. In fact, they had purposefully used mechanisms to identify misinformation in order to either no longer deal with it or to produce counterarguments.

How were government communication and the measures perceived in general?

One negative assessment was that communication was not fast enough in some cases, for example. At the same time, people expressed an understanding for the fact that it was an exceptional situation in which mistakes could happen.

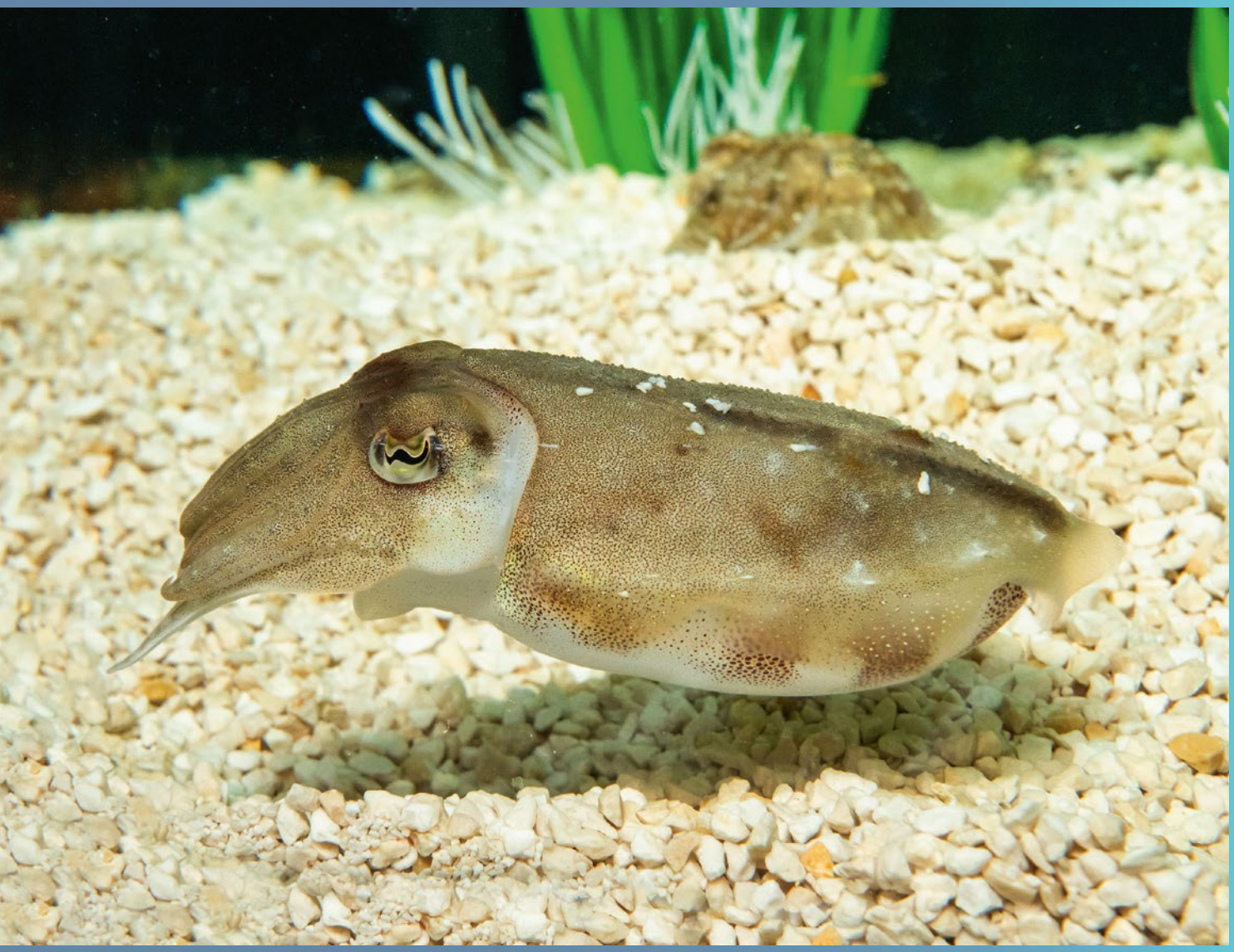
Which aspects are particularly important for government communication?

For most interviewees, a wide range of information sources, as well as clarity and concreteness, were important. They want to understand why something is being communicated, why a decision has been made, and how relevant the information is for them. In addition, the perceived competence and integrity of the people communicating plays a big role – expertise is very important to people and can contribute to a higher level of trust. —

More information

DECIPHER project website

A DIFFERENT SPECIES OF INTELLIGENCE



The cuttlefish *Sepia officinalis* can change colour in a split second. The extraordinary creature also receives extraordinary protection as a laboratory animal.

On the one hand, Sepia is very similar to us. A visual creature like us humans, the sepia appears to attentively inspect us through its W-shaped pupils. Its many-armed head gives it an almost jolly look. Is it not smiling at us as it elegantly glides through the water, fins fanning, two tentacles raised as if in greeting? *Sepia officinalis*, the roughly hand-sized "common cuttlefish", is anything but common and according to everything we know, an intelligent creature.

Yet on the other hand, the cuttlefish is very different from us. Our paths diverged more than 600 million years ago when our last common ancestor lived. Humans are more closely related to fish than to cuttlefish (which is, incidentally, not a fish). The cuttlefish's eyes (like other cephalopods) and its intellectual abilities have developed independently to those of vertebrates. With its ten suckered tentacles or "head arms", two of which act as lightning-fast "prey catchers", a shield-shaped backbone of limestone called cuttlebone which protects the soft parts, ink which is released to confuse other animals, and the powerful and deadly horned beak, Sepia is living proof of evolution's ingenuity.

TWO PATHS, ONE DESTINATION

As an invertebrate, Sepia has no spinal marrow that runs protected along the canal in the spine and directs signals to and from the brain. The brain of the sepia is concentrated in rings around the gullet forming two centres, one in front and one behind the oesophagus. In addition to other ganglia (especially in the tentacles) the sepia also has very large bean-shaped optic lobes where nerve cells process the optic signals. A visual creature, indeed. Despite its decentralised thinking organ there are some parallels to the centralised brains of vertebrates. As with the eye, this is an example of a parallel "convergent" development: different paths to the same destination.

Among invertebrates, cephalopods are the most intellectually developed. Their perception, learning capability and memory are likely comparable to that of some vertebrates. These capabilities have made the animal group an interesting object of study in terms of nervous system research for some time.

CEPHALOPODS ON SAME LEVEL AS VERTEBRATES

Against this background, in 2010 the European Union (EU) included cephalopods in its directive on the protection of animals used for scientific purposes 2010/63/EU. The directive justifies this protection in that there is scientific evidence that these creatures "can feel pain, suffering and anxiety as well as suffer permanent damage." Thus a whole group of invertebrate animals with almost 700 known species has been placed under the same protection as vertebrates for the first time. This is one of the main reasons why biologist Dr Johannes Pucher researches the husbandry and breeding of *Sepia officinalis* at the German Centre for the Protection of Laboratory Animals (Bf3R) in Berlin-Marienfelde.

GOOD HUSBANDRY FOR A DECENT LIFE

The Bf3R is obligated to adhere to the 3R principles in its work. 3R stands for "reduction" (reducing animal experiments), "replacement" (replacing animal experiments) and "refinement" (improving). Husbandry of the Sepia

THEIR PERCEPTION AND LEARNING ABILITY IS LIKELY COMPARABLE TO THAT OF SOME VERTEBRATES. THIS MAKES THE ANIMAL INTERESTING FOR NERVOUS SYSTEM RESEARCH.

is an issue of “refinement” as well as of suitable living conditions for the laboratory animals and the reduction of stress.

One of the important foundations for a good life is water quality. At the Bf3R it is possible to adapt the water conditions, such as temperature, salt content, pH value, and nitrogen concentration, very precisely to the needs of the animals. The water used at Bf3R is first desalinated (deionised) so as to create “bespoke seawater”. Johannes Pucher’s experience with research projects on aquacultures with different animal species for whom water quality is always a significant factor serve him well here.

ONE OF THE EXTRAORDINARY SKILLS OF THE ANIMAL IS ITS ABILITY TO CHANGE ITS SKIN SURFACE AT HIGH SPEED: FROM SMOOTH TO ROUGH OR PRICKLY.

THE POISONOUS SIDE OF THE SEPIA

Sepia´s nutrition, which consists primarily of shrimps and fish, is just as important for the creature’s well-being. Pucher is looking for alternatives to such live feed.

Due to the arrangement of its brain around the gullet, the Sepia cannot simply swallow large prey. “The brain would rip,” explains Pucher. Crabs or large fish are instead gripped by the tentacles, opened with the “parrot beak” and paralysed with a poison. Then the parts of the prey containing enzymes are dissolved and thus made ingestible for the Sepia.

The Sepia’s perhaps most spectacular property comes into play when they are hunting: its talent to change skin colour within a split second

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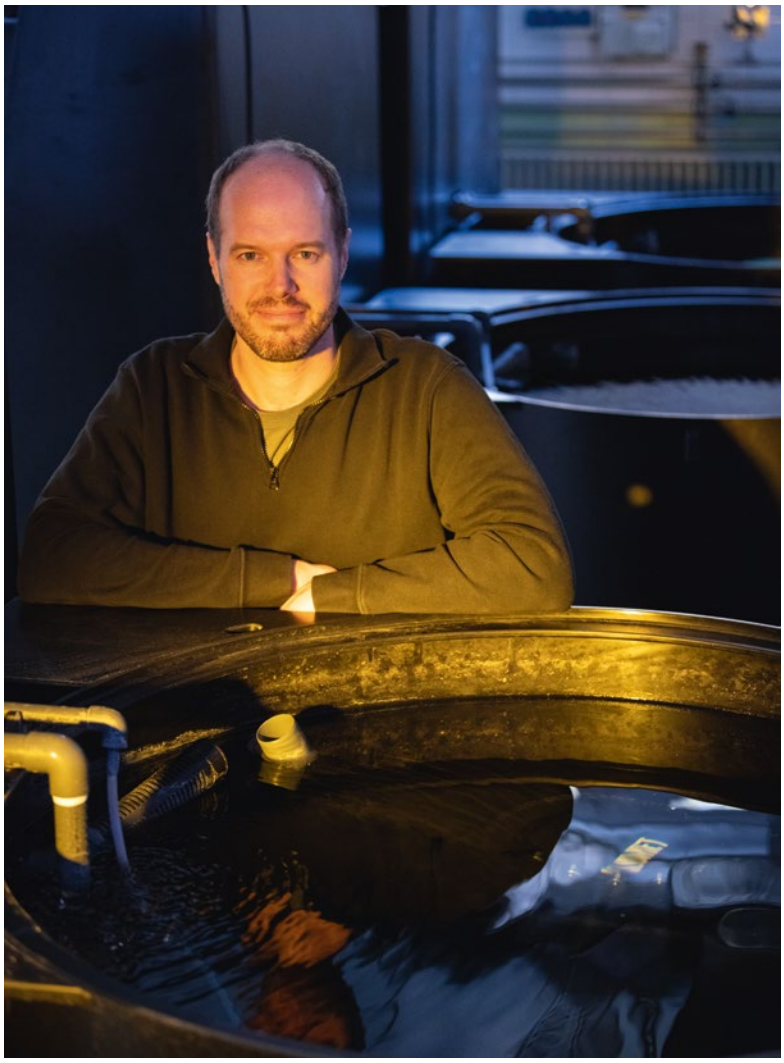
Husbandry and breeding of Sepia officinalis is researched at the German Centre for the Protection of Laboratory Animals (Bf3R) in Berlin-Marienfelde.



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One of the important foundations for a good life for cuttlefish is water quality. Biologist Johannes Pucher German Centre for the Protection of Laboratory Animals (Bf3R) draws on his experience with research projects on aquacultures with different animal species for whom water quality is always a significant factor.

– whether to camouflage itself, threaten enemy predators, defend its territory, or interact with other sepia. The "communicating skin" is nothing short of a natural wonder. And as if that was not enough, it is also able to transform the surface of its skin lightning fast: from smooth to raw or prickly, for example. "In the future we may be able to read what the animal is thinking about from its skin," says Johannes Pucher. It becomes a window into its reality and its experience and could give potential clues about its well-being.

Johannes Pucher and his team are on their way to finding out what good animal husbandry could look like for the Sepia. The creatures in the Marienfelde aquarium have spawned – a breakthrough, but breeding is difficult. "We've closed the life cycle," says Pucher. He is proud of this achievement: the strange creature has become a little more accessible. —

A HEAD FULL OF ARMS

In some regards, cephalopods such as *Sepia officinalis* are unique creatures. For example, the brain is arranged very differently to those found in vertebrates – the oesophagus runs right through it. However, Sepia have excellent learning capabilities that are otherwise only seen in vertebrates. More and more of these talents have been brought to light through behavioural experiments over the years. This is how Sepia learn to no longer grab a shrimp protected by a glass tube. If sepia are suitably trained, this experience – glass tube protects shrimp – can be even permanently imprinted in their memory.

In addition to such comparably simple learning abilities the Sepia also have very clever talents. They have an episodic memory and are thus able to remember certain events, which makes it easier for them to lay in wait for prey at a certain place at a certain time. Self-control is also no foreign concept to them. They can hold back from a less desirable prey in case a better meal comes along – at least for a couple of minutes. And that is something that even humans do not always manage ...

QUESTIONS

"WE HAVE TO UNDERSTAND WHAT MOVES PEOPLE"

BfR President Professor Andreas Hensel on the Scientific Council's* opinion and the Institute's future.

© BfR

Mr Hensel, what path does the opinion set for the future endeavours of the BfR?

The result is a very good, in some parts excellent, assessment by the Scientific Council. It almost cannot be topped; our experts have every right to be proud. It's quite an achievement, but also a great challenge! On the one hand, because the Scientific Council always makes critical comments and suggestions for improvement, which we take seriously and which we have to work on. On the other hand, we have to live up to the expectations set by such a positive assessment. Young researchers who come to us expect a correspondingly high standard. We must not rest on our laurels.

What do you view as the greatest challenges for the BfR?

For one thing, we want to strengthen and expand our position as a point of reference within the German system of consumer health protection. At the same time, we are working on new topics. It was the Scientific Council that encouraged us to strengthen our social science research. This includes questions such as: How do consumers respond to a certain piece of news? How do they classify risks? How can we build trust? How does a message best reach its target audience? We have to understand what moves people.

The BfR also has the task of informing the public about risks. How can an institution be perceived as the voice of science in a world in which public discussions are frequently dominated by loudness, exaggeration, and one-sidedness?

I can understand that not every consumer knows us, as our work only affects them indirectly. In some ways, the BfR works behind the scenes. We are something like the "risk-whisperers" for political leaders and the media. Our work is directed towards decision-makers in government bodies, ministries, and parliaments as well as multipliers, be they consumer media, health insurance companies, doctors, veterinarians, pharmacists or the media. They all need our information on complex scientific topics. Our consumer satisfaction survey showed that those who work directly with us value the work we do. In the end, anyone who adopts and makes use of our risk assessment is a customer of ours. And that brings us back to consumers.

In 2032, the BfR will turn 30. Take a guess – where do you think the Institute will be?

The already great importance of risk assessment is growing. For instance, consider food, the things we use every day, and the entire domain of preventative healthcare. Risk assessment is more necessary than ever! It is crucial for the BfR to keep focussing on its scientific expertise. Certainly, we are not infallible either. A substantial part of science involves engaging with the unknown. Every experiment opens the door to a world of unknowns and new questions. It is the principle of trial and error. After all, this approach has led us to travel comfortably by train, to fly to the moon, and to eat delicious meals that we could not have dreamed of 100 years ago. The work of the BfR is also making a small contribution to this positive development. We are making the world a safer place. —

**The Scientific Council advises the German Federal Government and the Federal States ('Laender') in matters concerning universities and research institutions. The Council conducts assessments (evaluations) and publishes corresponding statements and recommendations.*

INTERNA

On the lookout

A full renewal of the BfR-Commissions: External experts are needed for the 2026–2029 period. Within these independent commissions, they will advise the BfR in the areas of food and feed, chemicals, and product safety on a volunteer basis. Interested parties can apply via the BfR website starting from January 2025. The selection of the candidates will be performed by an independent committee.

More information

BfR information
"Commissions at the BfR"

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