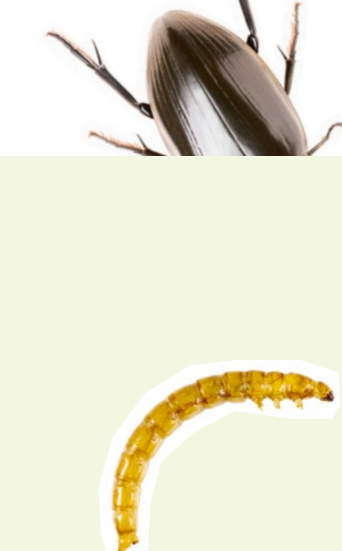



# Food on six legs



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



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



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

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

#### LOTS OF FEET, SMALL FOOTPRINT

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

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



## FOOD SECURITY

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

### More information



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



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

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

## LABELLING

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

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



## ALLERGY POTENTIAL LARGELY UNCLEAR

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

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

## ALLERGIC REACTIONS IN CELL CULTURES

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

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

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

DR MATTHIAS PEISER, BFR

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

## NEW TEST FINDS LESSER MEALWORM

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

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

### More information



BfR information  
“Insekten” (in German)

