Detecting risky substances

The European PARC project aims to uncover the unknown when it comes to chemicals and bring their risk assessment to a new level.

Are you familiar with enniatin B1? Probably not. It is a mould toxin, or mycotoxin to use its scientific name (see also the article on mould toxins on page 18). Enniatin B1 is produced by microscopic parasitic sac fungi *Fusarium*, which is found all around the world. Only experts have been familiar with the substance up to now, but this could change. Mycotoxins belonging to the enniatin group, such as enniatin B1, are being detected more and more frequently by food monitoring organisations thanks to improved analysis methods. These mycotoxins are mainly found in grains, such as wheat, oats, maize, barley, rye, rice and products made from these, and also in nuts and dried fruit.

Just like other mycotoxins, enniatins are used by *Fusarium* to defend against bacteria, other types of fungi, insects and worms. These kinds of "bioweapons" can lead to undesirable health effects in humans. Some studies on enniatins point towards effects that are carcinogenic, mutagenic, that compromise the immune system and that damage the liver, nerves and fertility.

The astonishing thing: knowledge about enniatins is still incomplete despite their widespread prevalence and sometimes high concentration in food and feed. This is insufficient for assessing the health risk.

"The mould toxin enniatin B1 is widespread, but knowledge of its toxic effects is incomplete. We are changing that."

DR JESSICA DIETRICH, BFR

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However, this may soon change because an international research team involving the German Federal Institute for Risk Assessment (BfR) is addressing the issue. "Our aim is to study the hazard potential of enniatin B1 and similar compounds, therefore improving the still incomplete data on the toxic effects," says Dr Jessica Dietrich. The food chemist is supervising the project as part of an extensive European research project called PARC ("Partnership for the Assessment of Risks from Chemicals").

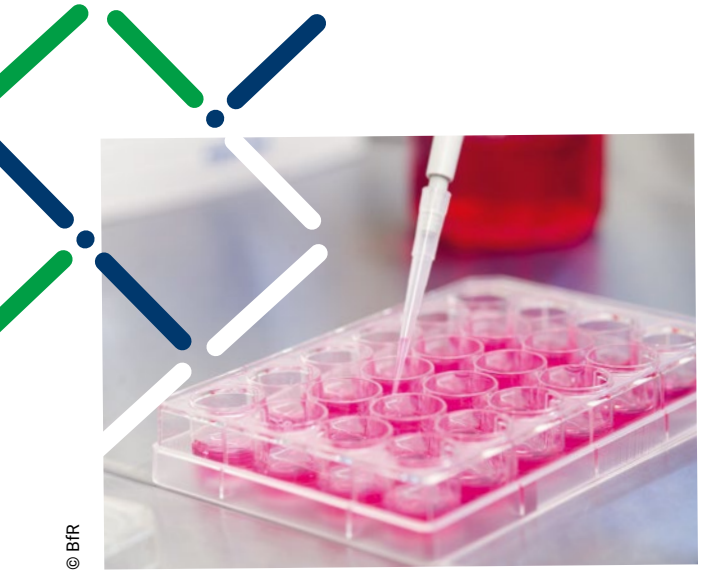
200 PARTNERS AGAINST CHEMICAL RISKS

The PARC project, which began 2022 and will run for seven years with 200 participants from 29 countries, has a budget of 400 million euros and aims to do nothing less than open up new horizons for the risk assessment of chemicals. Half of the costs are covered by Horizon Europe, the EU's framework programme for research and innovation. The other half is financed by the respective project participants.

"A major obstacle to researching mycotoxins like enniatin B1 and similar compounds is the procurement costs," says Dr Jessica Dietrich. "One thousandth of a gram of a substance can cost as much as 1,000 euros." It is now possible to overcome this obstacle thanks to the PARC budget. As part of the PARC sub-project on mould toxins, Dietrich and her team are cooperating with a working group at TU Berlin, which chemically synthesises the enniatins' complicated ring molecules, therefore replacing the time-consuming extraction from the moulds.

The initial plan is to test enniatin B1 and similarly structured compounds in bacterial and cell cultures for possible toxic effects. In addition to closing knowledge gaps, this is another of the BfR's supporting contribution to PARC: the development of new, animal-free methods. These include, for example, computer models, biochemical analyses of cell processes and experiments on cell cultures and miniature organs ("organoids"). The aim is to reduce animal experiments and to improve health protection for humans.

"New, animal-free methods are used to study mould toxins."



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ASSESSING RISKS, REGULATING SUBSTANCES

"An important guiding principle of our project is the practical benefit," says biochemist Dr Philip Marx-Stölting, who is responsible for coordinating the "hazard assessment" PARC sub-project at the BfR. "Recognising hazards, assessing risks and ultimately regulating them, for example, through policy and authorities, go hand in hand in the PARC project."

As part of the sub-project, the BfR is also dedicating itself to the task of integrating knowledge from the other segments. It is a bit like putting together pieces of a jigsaw puzzle to make a whole picture. What does a chemical substance change in a cell, an organ or an organism? Is it possible to estimate how a substance affects a person? Can predictions be made for similar chemical compounds?

COOPERATION FOR RAPID PROGRESS

From Marx-Stölting's perspective, international cooperation plays a decisive role in answering many questions. There are also very practical reasons for this. For example, the guidelines of the Organisation for Economic Co-operation and Development (OECD) stipulate that a test procedure must be recognised by every member country.

The advantage: a test conducted by a method approved by the OECD only needs to be performed in one country. On the other hand, the test procedure itself must first be approved by each OECD country. "You have to have all countries on board for a new testing guideline," explains Marx-Stölting. "This regulation saves on testing, but at the same time it makes changes long-winded, which is why it's so important that we work together at an early stage, first in the EU and then internationally."

The team working on enniatin B1 and other mycotoxins is also international. It includes scientists from Germany and Austria, Norway, Portugal, France, Spain, Slovenia, Belgium and the Netherlands. It looks as though some of the fungi in PARC will soon have to reveal their secrets. —

More information

Marx-Stoelting, P. et al. 2023. **A walk in the PARC: developing and implementing 21st century chemical risk assessment in Europe.** Arch Toxicol 97, 893-908. DOI: 10.1007/s00204-022-03435-7

The BfR is involved in many PARC projects - more information can be found on the project website: **„PARC"**