

An alternative to testing on mice

In 2025, the Dutch government wants to be the world leader in the field of animal-free innovations. For research into food safety, Wageningen scientists are developing various alternatives to laboratory animal experiments. ►

WUR

Problem: laboratory animal experiments can cause animals to suffer and, what's more, they are often not predictable enough where it concerns substance toxicity in food for humans.

T02 solution: Wageningen University & Research develops animal-free test methods with cells cultivated in the laboratory. These are used for food safety research.

Impact: after national and European acceptance of these methods, fewer laboratory animals are needed and can sometimes even be fully substituted.

For many years, laboratory animal experiments were the only permitted method to determine whether shellfish such as mussels and oysters contain toxins. Researchers injected a shellfish extract into a mouse or rat and looked at whether the animal continued to live. If it died, the mussel or oyster was toxic. Researcher Ad Peijnenburg says that was such a rigorous method, which has now fortunately been substituted by a chemical analytical method that saves animals and which has largely been developed at WUR. On an annual basis, this 'mussel test' saves around three hundred thousand European rats and mice.

Cell cultures

Peijnenburg and his peers are mainly concerned with the development of biological methods to test substances that may be detrimental if present in food. In so doing, human cells are treated with a substance or combination of substances. Then, various techniques are used to assess whether effects emerge which indicate any toxicity. Computer models are also developed to 'translate' the results of the cell cultures into the situation in the human body. Making use of various case studies, Peijnenburg wants to explore and validate the viability of these methods.

Plant toxins

At the request of the European Food Safety Authority (EFSA), Wageningen toxicologists examined whether and to what extent a group of plant substances that is known to be toxic – pyrrolizidine alkaloids (PAs) – which occur in ragwort (*Jacobaea vulgaris*), for example, and as food contamination, is detrimental to humans. Research with laboratory animals previously showed that these substances can cause DNA damage and cancer. Wageningen research with human liver cells shows that these toxic effects also occur in humans. The researchers also discovered that there are major differences in the potency of the various PAs. 'Not all PAs appear to be equally hazardous.' Thanks to the research by Peijnenburg and his peers, EFSA is able to carry out a more realistic risk assessment. This is a result achieved without the use of laboratory animal experiments.'



Mineral oils

Researchers are already working on a new case study into the effect of aromatic hydrocarbons in mineral oils on cell cultures. These oils can also come into contact with food via ink on packaging materials and pose a potential risk to humans. Here too, the concern is that hydrocarbons could possibly cause DNA damage. The aim of these studies is to demonstrate the value and viability of alternative methods and thus to promote acceptance (by regulators and risk assessors) and the application of these animal-free alternatives. ■

Who: Wageningen Food Safety Research

Duration: 2008-2021.

Budget: €200,000 per year.

Follow-up: Expand research into other animal-free alternatives and other case studies in the field of food safety.