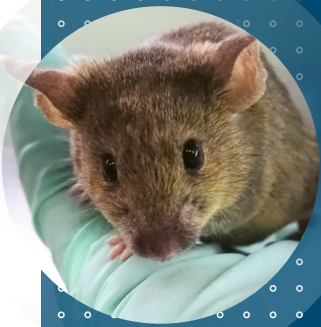
MAX PLANCK
GESELLSCHAFT



WHY DO WE NEED ANIMAL TESTING?

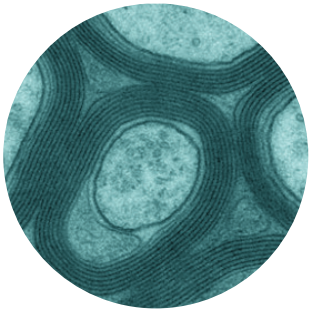
Knowledge for the benefit of humans and animals

The urge to discover new things and understand the world is as old as humanity itself. The pursuit of knowledge gives people the ability to recognise the consequences of their actions – and it is only when we know the implications of what we do that we can act responsibly.

Basic biological and medical research serves to gain knowledge, but it is also a **prerequisite for the development of new methods for the diagnosis and treatment of diseases in humans and animals**. Scientists therefore research the interaction of molecules, cells and organs in specially bred laboratory animals only where there are no alternative methods or if they cannot study the processes directly in humans for ethical reasons. This is made possible by the **great biological similarity between humans and animals**.

HELP WITH MULTIPLE SCLEROSIS

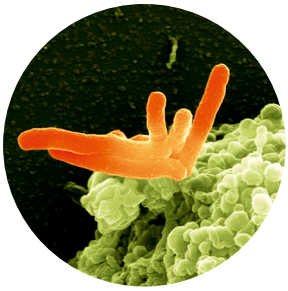
One example of how research on animals can lead to new treatments is the investigation of an immune disease in rats. In the early 1980s, Hartmut Wekerle at the Max Planck Institute of Immunobiology succeeded in transferring autoimmune encephalomyelitis from a sick rat to a healthy one. The scientist had extracted and multiplied misdirected immune cells from the animals' lymph nodes. These attack the body and destroy the insulating layer of the nerve fibres, the so-called myelin. When the researcher transferred the immune cells directed against the myelin to healthy rats, they developed what is known as experimental autoimmune encephalomyelitis.



Querschnitt durch Nervenzellfortsätze des Sehnervs einer Ratte. Die Fortsätze sind von speziellen Zellen umgeben, die sich in mehreren Lagen um die Fortsätze wickeln.

The symptoms of this disease, such as movement disorders and signs of paralysis, partly correspond to those of multiple sclerosis. The transmission technology developed by Hartmut Wekerle made the **investigation of autoimmune diseases** of the central nervous system so much easier that many of the drugs available today for multiple sclerosis would not have been possible without it.

NEW VACCINE



Animal experiments are also essential for research into new vaccines. The complex immune responses that vaccinations trigger in the body cannot yet be analysed using alternative methods. This is particularly true if the vaccination is intended to stimulate a new defence reaction in the immune system. One example of this is the **development of an improved vaccine against tuberculosis** at the Max Planck Institute for Infection Biology in Berlin.

According to estimates by the World Health Organisation (WHO), at least twenty million people worldwide suffer from tuberculosis, with ten million new cases and around 1.5 million deaths every year. The disease is caused by bacteria that mainly affect the lungs.

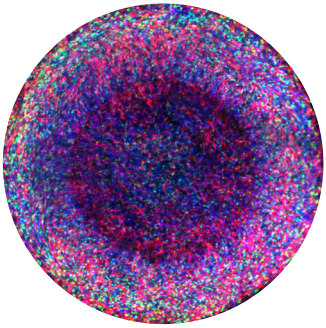
Researchers at the Max Planck Institute for Infection Biology administered the more effective vaccine to mice and then brought them into contact with tuberculosis bacteria. In this way, they found out whether and how well the vaccine protected the animals from infection. In addition, the researchers gain information on how the vaccine works.

Oben: *Eine Immunzelle (grün) attackiert Tuberkulose-Bakterien (rot) und nimmt sie in sich auf.*

Alternatives to animal testing

Research into alternative methods has made great progress in recent years. Many experiments and tests are carried out today, for example, with cells that grow in nutrient solutions.

MINI ORGANS FROM STEM CELLS



So-called **organoids** are a special form of cell culture. Researchers can grow these cell clumps, which are just a few millimetres in size, in a petri dish from stem cells capable of reproducing different tissues. The processes taking place in them are similar to those in a natural organ, so this method allows researchers to investigate processes in organs such as the liver, intestine and stomach and even individual parts of the brain.

To develop drugs against Parkinson's disease, researchers at the Max Planck Institute for Molecular Biomedicine have produced midbrain organoids. These contain many of the dopamine-producing nerve cells first damaged by Parkinson's and mimic natural brain tissue better than classic cell cultures. The researchers have also developed a process with which the organoids can be standardised and produced in large quantities, since both are required if they are to be used for drug research.

This technology earned the researchers the **Animal Welfare Research Award** from the Federal Ministry of Food and Agriculture in 2021.

Above: *Three-and-a-half week-old midbrain organoid (different cell types are coloured differently).*

Alpakas auf der Weide am Max-Planck-Institut für Multidisziplinäre Naturwissenschaften.

ALTERNATIVE TO ANTIBODIES

Every year, tens of thousands of laboratory animals are used to produce antibodies. These complex proteins are used, for example, in pregnancy tests or blood grouping.

To produce antibodies, test animals are first immunised against a specific molecule by injection – similar to a vaccination in humans. The animal's immune system then forms antibodies against the molecule. The antibodies are then collected from the animals' blood and processed. This is time-consuming and costly, as a large number of animals are required due to the enormous global demand for antibodies.

Researchers at the Max Planck Institute for Multidisciplinary Sciences have created an alternative to antibodies in the form of **nanobodies**. Nanobodies are fragments of particularly simple mini-antibodies from animals such as alpacas. As with conventional antibody production, an alpaca is first injected with a molecule that is harmless to the animal. Two months later, the researchers take around one hundred millilitres of blood from the alpaca. Both the vaccination and the blood donation only take a few minutes for the animal, and the researchers can then multiply the nanobodies in any desired quantity. With this method, the nanobodies can drastically reduce the number of animals required for the production of antibodies.

The nanobody technology earned the researchers the **Animal Welfare Research Award** from the Federal Ministry of Food and Agriculture in 2018.

Animal welfare and the law

In Germany, strict regulations ensure that the number of animal experiments is kept to an absolute minimum. They stipulate what constitutes an animal experiment and whether such an experiment may be carried out. Researchers require authorisation from the competent authority for each individual experimental project involving vertebrates and cephalopods (squid, octopuses and cuttlefish). In their application for authorisation of an experimental project, they must provide precise reasons why the research objective cannot be achieved without the use of animals, as animal experiments are only approved if they are essential for research purposes.

Only persons who have the appropriate education and training are authorised to carry out animal experiments. The law also requires that experiments place as little strain as possible on the animals, and there is close monitoring of animal husbandry and the execution of experiments.

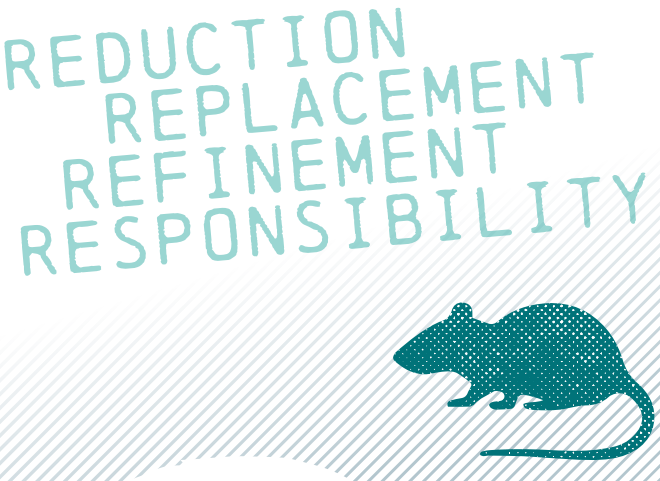
RESPONSIBLE TREATMENT OF ANIMALS

The 3Rs principle (replace, reduce, refine) underpins animal welfare in research and is a legal stipulation, which the Max Planck Society extends to include a fourth principle, namely "responsibility". In doing so, it commits to using its scientific expertise to further improve both animal welfare and the quality of science. The aim is to achieve the best possible compromise between the burden on laboratory animals and the cognitive value of experiments.

The Max Planck Society has also formulated a position paper on animal experiments in basic research and adopted a series of measures:

FURTHER DEVELOPMENT OF THE 3R MEASURES

- **Strengthening a culture of caring for animals.** This is to be achieved by improving the coordination of animal welfare within the Max Planck Society while at the same time maintaining the highest quality of science.
- **Further refinement and reduction in animal testing as far as possible:** Scientific findings are to be used to reduce the number and severity of experiments.
- **Transparent handling** of animal experiments vis-à-vis the public
- **R for responsibility**
- **Careful consideration** of the gain in knowledge and stress on the laboratory animals in each individual case
- Research into ways to improve the **implementation of the 3Rs principle**
- Research into the **living conditions of laboratory animals**, their social behaviour, perception of pain, consciousness and their right to life
- **Training** all employees working with animals in matters of animal ethics



The Max Planck Society is one of the largest science organisations in Germany. The research spectrum of the more than 80 Max Planck Institutes and research facilities ranges from astronomy, materials science and mathematics to medicine, biology and cognitive research through to the history of art and law. 31 Max Planck researchers have been honoured with the Nobel Prize to date.

FURTHER INFORMATION:

Animal experiments in the Max Planck Society
www.mpg.de/themenportal/tierversuche

Position paper of the Max Planck Society
www.mpg.de/themenportal/tierversuche/MPG_Whitepaper.pdf

Science information initiative
www.tierversuche-verstehen.de

LEGAL INFORMATION

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