UNIVERSITÉ DE FRIBOURG
UNIVERSITÄT FREIBURG

The **2023** annual report on animal research

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1. Foreword

One year ago, I was thrilled to join the University of Fribourg as the new Head of Animal Facilities for Rodents and Rabbits, as well as the Deputy Head for the Non-Human Primate facility. By filling these roles, I was given the opportunity to put my passion for Laboratory Animal Science (LAS) and my unwavering commitment to animal welfare into action. During my studies at the University of Veterinary Medicine in Vienna, Austria, I not only enrolled in various internships, including one in cancer research, but was also given the chance to complete the first-in-Europe specialisation in LAS for veterinary students. It was there that I realised the crucial part veterinarians play in ensuring responsible research practices with laboratory animals. This inspired me to become a resident in the European College of Laboratory Animal Medicine, leading up to a career dedicated to preclinical research.

At the University of Fribourg, I now aim to implement the newest and best practices in animal care and management, promote responsible experimentation, and support the scientific community in conducting valuable and ethical research. It is imperative for me to use my position to foster a culture of care, transparency, collaboration, and continuous improvement in research with animals.

As a society, we must recognise the invaluable role of laboratory animals in advancing medical knowledge and treatments. For as long as animals are still needed in research, we have a responsibility to conduct it ethically while advocating for the best possible care and welfare of our laboratory animals.

In this annual report, you will find stories of research success at the University of Fribourg in 2023. From groundbreaking neuroscientific insights to cutting-edge oncology research, our dedicated team of veterinarians and researchers has demonstrated the power of responsible experimentation. They and the university's animal caretakers work tirelessly to ensure that our laboratory animals receive the highest standards of care while contributing to groundbreaking scientific discoveries.

In the coming years, I am confident that our team will continue to embody excellence in animal care and ethical research practices. I invite you to explore this report and reflect on our commitment to responsible animal research and the scientific progress we have made at the University of Fribourg.

Dr med. vet. Nina Trimmel, Head of Animal Facilities of the University of Fribourg

- Research involving animals at the University of Fribourg: www.unifr.ch/go/animals

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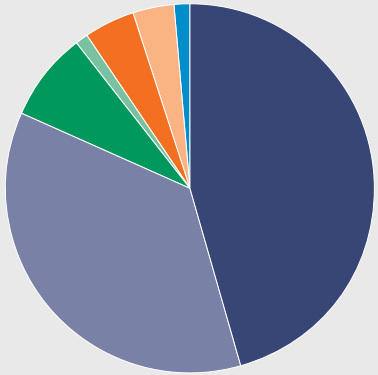
2. Figures

2.1. Numbers and species

The table below shows in detail the numbers of animals used in experiments in the calendar year 2023.

A distinction is made between genetically modified (GM) and wild-type (WT) animals.

Animals used overall, 2023



Mice WT	1799
Mice GM	1414
Rats WT	315
Rats GM	45
Zebrafish WT	173
Zebrafish GM	134
Rabbits	4
Macaques	16
Tree shrews	6
Cephalopods	28
Total	**3934**

2.2. Degrees of severity

In animal experiments in Switzerland four degrees of severity are distinguished, measuring the level of constraint from 0 to 3. Each animal experiment requires a specific authorisation issued by the Cantonal Veterinary Office and, depending on the constraints on the animals, is examined beforehand by the Cantonal Commission for Animal Experimentation.

Degree of severity 0: no constraint

If no pain, suffering, injury, or fear is inflicted on an animal during a procedure, a degree of severity 0 is assigned. This may include experiments such as behavioural observations to study the social and cognitive abilities of an animal.

Degree of severity 1: slight constraint

If an animal is subjected to slight, short-term pain or injury, or slight impairment of its general condition, a degree of severity 1 is assigned. This is the case, for example, if blood is repeatedly drawn from an animal within 24 hours in a total volume that is well tolerated.

Degree of severity 2: moderate constraint

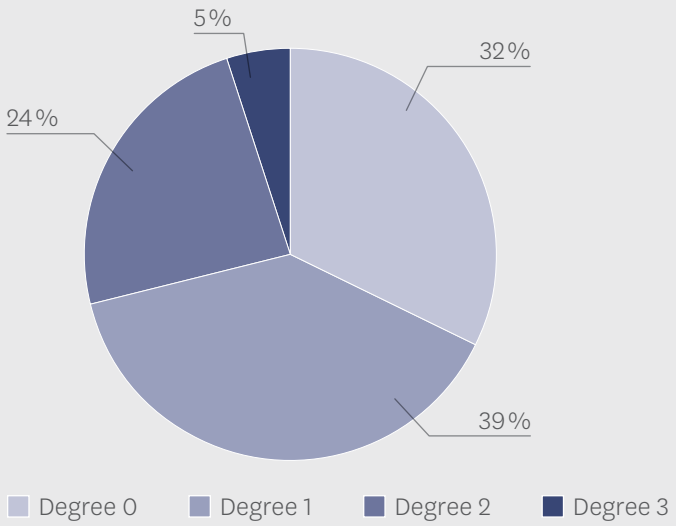
If an animal is subjected to a medium short term or a light, medium to long term constraint, a degree of severity 2 is assigned. This is the case, for example, with most surgical procedures on animals under general anaesthesia, when the postoperative pain is moderate and treated with analgesics.

Degree of severity 3: severe constraint

If an animal is subjected to severe pain, continuous suffering, significant fear, or severe impairment of its general condition, or if the constraint is moderate but persists in the medium or long term, a degree of severity 3 is assigned. Animals that unexpectedly die in the course of an experiment, even if they show no signs of illness before death, are also classified in the highest severity degree. The accumulation of different constraints of severity degree 1 or 2 each can be upgraded to the highest severity level by the cantonal authorities. Surgical procedures in the area of the chest are a typical example of degree of severity 3.

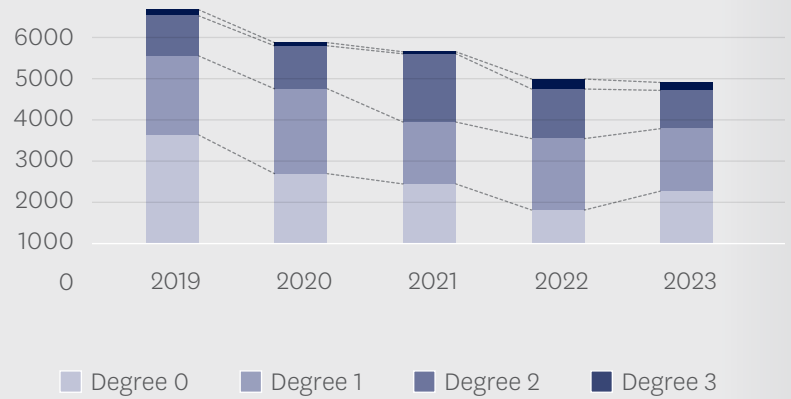
In 2023, 3909 animals were used in experiments. More than two thirds of these were used in studies with a severity level of 0 or 1.

Animals used overall according to the degree of severity, 2023

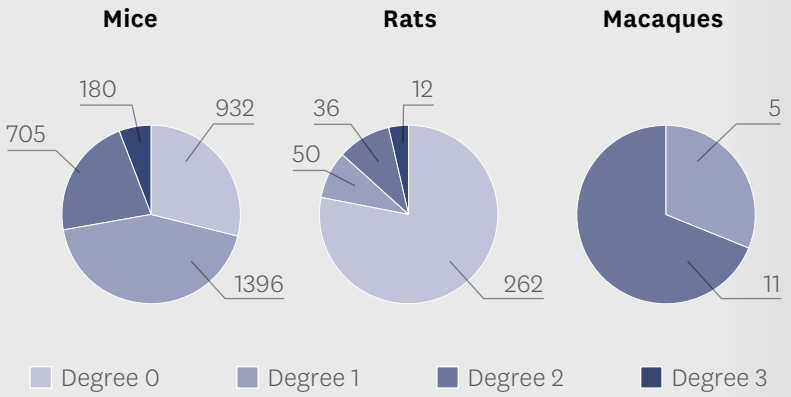


The following graphs show the evolution of animal experiments according to the degree of severity for the last five years.

Distribution according to the degree of severity, overall



Distribution according to the degree of severity, 2023



2.3. The "Three Rs" (3Rs) in animal research

Published more than 60 years ago, the concept of the 3Rs principle is today widely accepted by scientists as a moral obligation to treat animals humanely and, if possible, use alternative methods in experiments. The 3Rs stand for:

- Replacement: Methods that permit a given purpose to be achieved without conducting experiments or other scientific procedures on animals.
- Reduction: Methods for obtaining comparable levels of information from the use of fewer animals in scientific procedures, or for obtaining more information from the same number of animals.
- Refinement: Methods that alleviate or minimise potential pain, suffering and distress, and enhance animal well-being.

The University of Fribourg is committed to the ethical treatment of laboratory animals by consistently implementing the 3Rs principle. This applies to not only experimental interventions, but also the housing and handling of the animals. It also supports methods and research that can help to reduce the number of animal experiments or completely replace such experiments with alternative methods.

Through an unconditional application of the Culture of Care, all those working with animals, whether animal caretakers, veterinarians, heads of animal facilities, researchers, animal welfare officers, or management staff, contribute on a daily basis to guaranteeing the welfare of animals in the research facilities. The University provides funding for staff, infrastructure, and (continuous) education.

In Switzerland, the 3Rs principle is included in the animal protection legislation as a binding principle when conducting animal experiments. Animal experimentation in Switzerland is underpinned by three key pillars: authorisation, training, and inspection. Current legislation stipulates that every animal experiment and the keeping of laboratory animals must be authorised.

A weighing of interests is carried out for each application for an animal experiment. The expected gain in knowledge is weighed against the burden on the animals. The aim of the authorisation procedure is to keep the number of animals as low as possible, protect the animals from excessive stress, and define appropriate termination criteria. In addition, those conducting experiments are obliged to report the number of times they have used laboratory animals and officially detail completed experiments.

▷ www.fedlex.admin.ch/eli/cc/2008/416/de

▷ www.blv.admin.ch > Animals > Animal experimentation > Severity and harm-benefit analysis > Guidance (pdf)

3. Success stories

▶ Optogenetics

Successful step towards artificial vision

A group of researchers from the University of Fribourg in Switzerland, China and the USA has made a discovery which could form the basis of a new generation of visual prostheses. They have demonstrated that tree shrews can “see” even without retinal stimulation. The nerve cells of the mammals were activated by light, thereby generating visual percepts in the brain.

▷ www.unifr.ch/news/en/29752

▶ Biology

Is It Possible to Learn without a Brain?

Certain animals have no need of a brain for learning things. This is the surprising discovery that Prof. Simon Sprecher of the University of Fribourg has laid out in a study. With his team, the biologist was able to teach sea anemones to adapt their behaviour based on past experiences.

▷ www.unifr.ch/news/en/28767

▶ Oncology

A Better Model for Understanding Ovarian Cancer

Unfortunately ovarian and peritoneal cancers are often diagnosed at a stage that is already quite advanced. This greatly reduces the chances of survival for patients battling such cancers. To tackle this problem, a research team at the Adolphe Merkle Institute, in association with three other Swiss institutions, has developed a 3D model of tissue that makes it possible to better understand the processes by which the disease spreads.

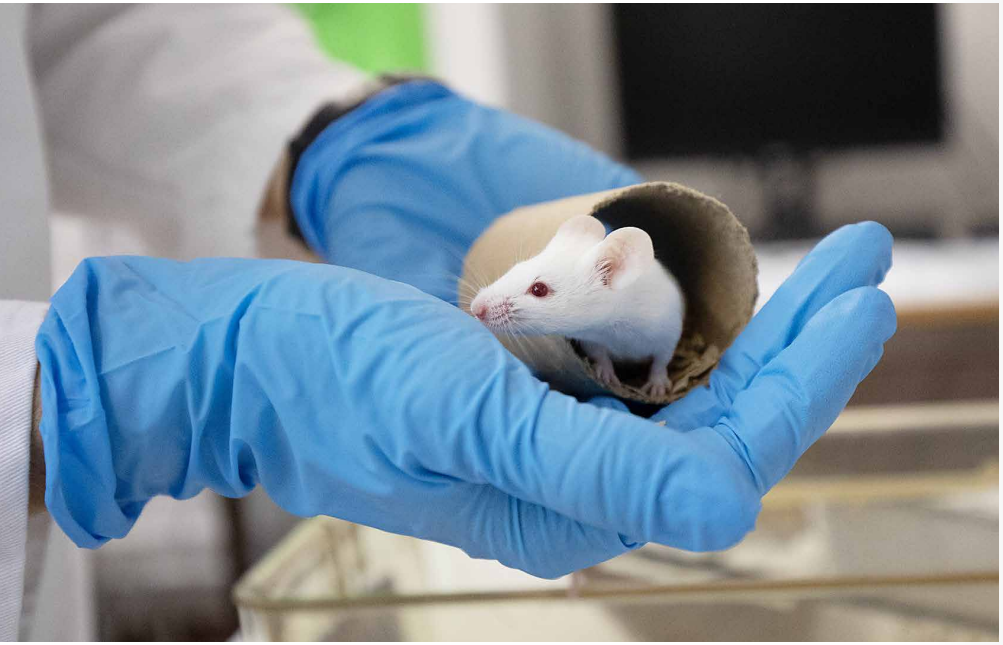
▷ www.unifr.ch/news/en/28667

4. Species

Rodents and Rabbits

The **mouse** is the most common animal model in research and is used in a very wide range of studies. At the University of Fribourg, too, it is by far the most common type of animal employed in research projects, followed by rats in the rodent category. Finally, a very small quantity of rabbits are also used, and although they do not belong to the category of rodents, they should nevertheless be mentioned here, given they are utilised in the same research areas as mice and rats.

In Fribourg, these animal species are used in a great number of ways, to study the development of various cancers, to understand circadian rhythms, the immune system, Down's Syndrome, metabolic and cardiovascular diseases, and liver regeneration, to search for treatments for neurological disorders such as multiple sclerosis, and much more.



Primates

The University of Fribourg also houses a small colony of macaques with individuals from two different species as part of the Swiss Non-Human Primates Competence Center for Research (SPCCR).

▷ www.unifr.ch/spccr/en

The **cynomolgus macaque**, also known as the long-tailed macaque and the crab-eating macaque, is indigenous to tropical South and Southeast Asia.

The **rhesus monkey**, or *Macaca mulatta*, is native throughout mainland Asia, from Afghanistan to India, Thailand and South China.

Both species live in groups in forests or forested areas, but also close to human settlements. For their housing in human care, it is therefore particularly important that they live in stable social groups and have opportunities to climb and rest in elevated areas. As in nature, they spend most of their time searching for food; they are very prone to foraging, and providing food rewards can also be used in behavioural training.

In Fribourg, they are used in the neurosciences for research into possible treatments for disorders like stroke and spinal cord injury, and in developing visual and acoustic prostheses. Some of these projects have led to human clinical trials.

Other species

Tupaia, or the **tree shrew**, is a small mammal used in neuroscience research as an alternative to primates because, like the latter, it has complex neurological functions that make it possible to study human neurological diseases. At Fribourg, tree shrews are used to study neurological and visual processes.

Zebrafish are small fresh water fish native to South Asia and commonly found in home aquariums. At Unifr, zebrafish are studied for their ability to regenerate. In fact, as adults, this species can repair and regrow injured parts of its body, such as its fins or even the heart, an ability that mammals do not possess.

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