UNIVERSITÉ DE FRIBOURG
UNIVERSITÄT FREIBURG

The **2022** annual report on animal research

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1. Introduction

The University of Fribourg is a member of the Swiss Transparency Agreement on Animal Research (STAAR) and is committed to communicating openly about the use of animals in research. As part of the STAAR initiative, this report describes the number of animals involved in scientific work at the university in 2022.

The University of Fribourg is invested in the ethical treatment of laboratory animals through a consistent application of the 3Rs (reduce - refine - replace). These guiding principles in scientific research refer not only to experimental interventions, but also to the housing and handling of the animals.

Research with and on animals adheres to the experimental objectives as stated in the Swiss Animal Protection Ordinance (art. 137) and is subject to approval by the Cantonal Veterinary Office LSVW/SAAV. Some research projects focus more on investigating basic life processes, while others are more oriented towards the potential treatment of diseases. The transitions between basic research and clinically oriented research are often fluid. Researchers do not limit themselves exclusively to animal models. The use of replacement methods like in vitro models is indispensable in research.

▶ Policy statement on animal research at the University of Fribourg: www.unifr.ch/go/animalpolicy

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2. Foreword

Achieving progress in biomedical research continues to critically depend on work using animal models. There is the continued need to test diagnostic markers of disease and to evaluate the mechanisms and efficacy of new treatments in laboratory animals. Furthermore, understanding the basic mechanisms of life and how the various parts of the body work together strongly benefits from animal experimentation. While the outcomes of such fundamental discovery research are often not immediately apparent, they do regularly lead to important findings with powerful applications in the long term.

At the University of Fribourg, we are very grateful for the public's support and trust in our research. We are likewise committed to returning this trust and informing the public about our activities involving animals and experiments conducted on them. To this end, we have joined other Swiss universities and institutions in the STAAR agreement, committing ourselves to reporting on what we are doing in various domains of biomedical research. Scientific investigations range from basic topics such as understanding the neural underpinnings of mating behaviour in fruit flies, to testing new cancer therapeutics in rodents and developing prosthetic devices to overcome neurological dysfunction in nonhuman primates; all such research adheres to the 3Rs of replacing, reducing and refining animal research.

In 2022, 4005 animals were involved in these scientific studies. This number reflects a decrease from previous years and is consistent with our aim to minimise the number of experimental animals in the future. That over 90% of the 4005 animals were rats or mice shows the importance of the rodent model for biomedical research. We have also succeeded in developing methods that can replace animal experiments in certain domains altogether. When animal models are still needed, we work with the most refined approaches and develop new methods to optimise the balance between animal welfare and gaining scientific insight.

Prof. Dr Michael Schmid, professor for Neuroscience at the Medicine Section of the University of Fribourg

3. 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 proportion 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.

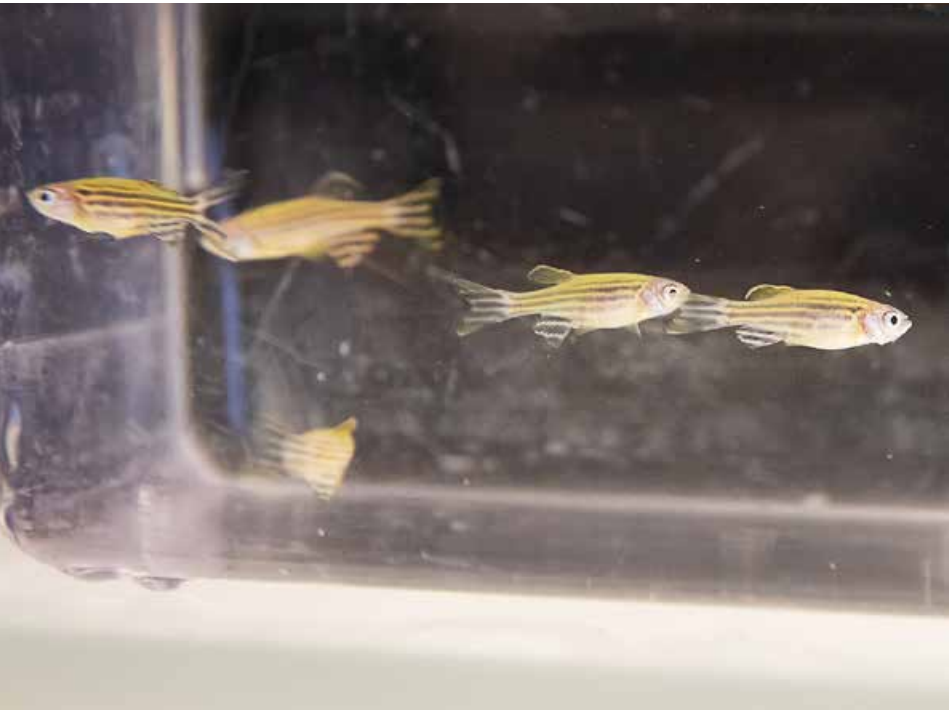
Both species live in groups in forests or forested areas, but also close to human settlements. For their housing in human care, it is therefore particularly important that they live in stable social groups and have opportunities to climb and rest in elevated areas. As in nature, they spend most of their 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 protheses. 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, this species can repair and regrow injured parts of its body, such as its fins or even the heart, as adults, an ability that mammals do not possess.



4. Figures

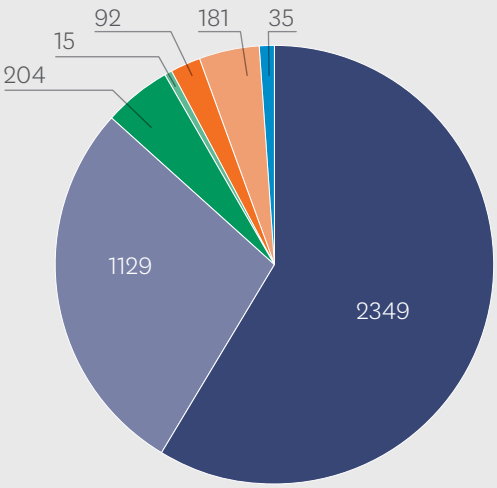
4.1. Numbers and species

The table below shows in detail the numbers of animals used in experiments in the calendar year 2022.

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

Mice WT	2349
Mice GM	1129
Rats WT	204
Rats GM	15
Zebrafish WT	92
Zebrafish GM	181
Rabbits	5
Macaques	15
Tree shrews	15
Total	**4005**

Animals used overall, 2022



- Mice WT
- Mice GM
- Rats WT
- Rats GM
- Zebrafish WT
- Zebrafish GM
- Others (Rabbits, Macaques, Tree shrews)

4.2. 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

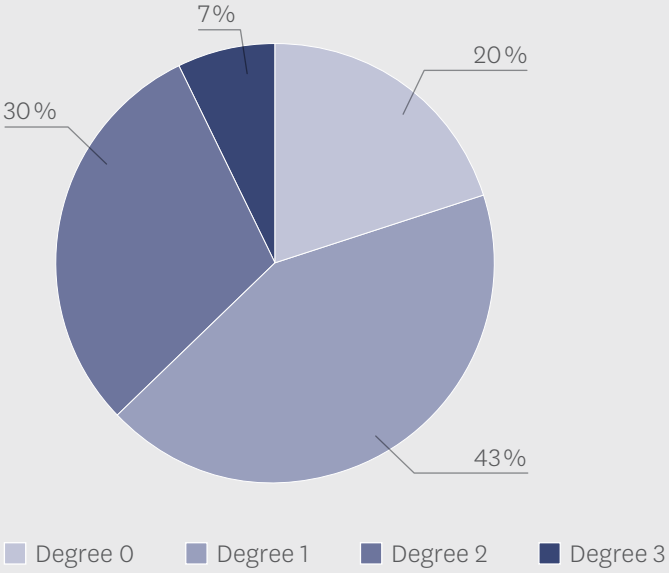
If an animal is subjected to a medium short term or a light, medium to long term constraint, a degree of severity 2 is assigned. This is the case, for example, with most surgical procedures on animals under general anaesthesia, when the postoperative pain is moderate and treated with analgesics.

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.

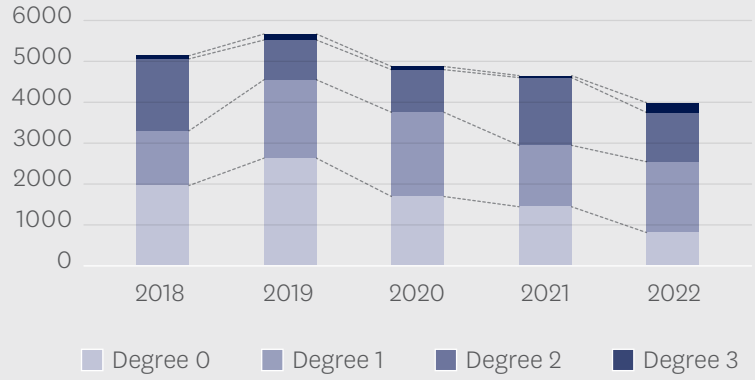
In 2022, 4005 animals were used in experiments. Almost two thirds of these were used in studies with a severity level of 0 or 1.

Animals used overall according to the degree of severity, 2022

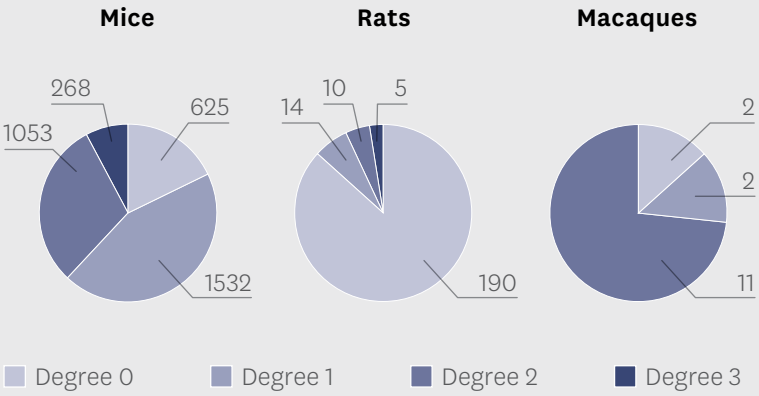


The following graphs show the evolution of animal experiments according to the degree of severity for the last five years.

Distribution according to the degree of severity, overall



Distribution according to the degree of severity, 2022



5. Success stories

▶ Breast cancer

Major discovery for treating cerebral complications

Brain metastases significantly reduce life expectancy of women suffering from breast cancer. The absence of experimental models accurately representing the situation experienced by patients is a major obstacle to research in this field. Prof. Curzio Rüegg's team, working with other groups of researchers, published a study that both fills that gap and proposes new therapeutic approaches.

By inhibiting a series of molecules involved in this mechanism, the researchers, experimenting on mice, were able not only to prevent the formation of brain metastases, but also to stop their progress when present.

▷ www.unifr.ch/news/en/27741

▶ 3D cell culture

Fewer animal experiments thanks to artificial models

How can methods and tools be developed to ensure that the number of animal experiments and animals used in research is significantly reduced? A research team from the University of Fribourg is working together with ETH Zurich to explore this question; they aim to develop 3D cell culture models that will help to reduce the need for mouse experiments. The project has received funding of around 715,666 CHF as part of the Swiss National Science Foundation's Advancing 3R – Animals, Research and Society programme.

▷ www.unifr.ch/news/en/27618

▶ SNSF projects

Innovative 3R projects underway

Two Unifr professors are each conducting research that figures among the 23 projects funded by the Swiss National Science Foundation as part of the National Research Programme NRP 79 ('Advancing 3R'). Their submitted projects are titled *Replacement of xenograft mouse models by molecularly defined 3D in vitro systems* (Prof. Jörn Dengjel, see also above) and *A regulatory step towards 3R: Refinement of in vitro – in vivo extrapolation (IVIVE) for predictive inhalation toxicology* (Prof. Barbara Rothen-Rutishauser). The two researchers have been awarded CHF 715,666 and CHF 687,222 respectively for their work over the next four years.

▷ www.snf.ch/en/C0XGTJ86CCr35NYH/news/nrp-advancing-3r-on-animal-testing-23-projects-funded

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