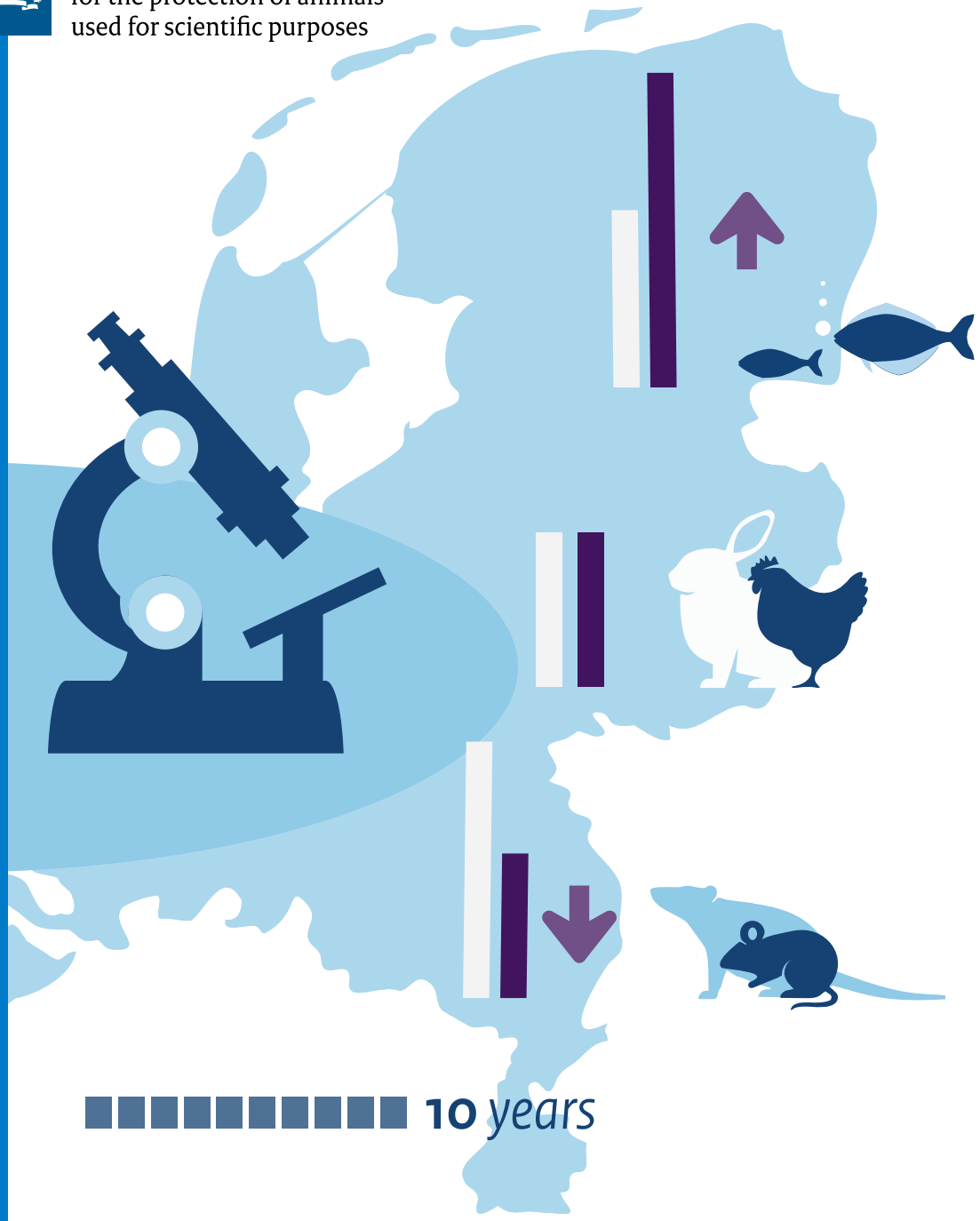
Netherlands National Committee
for the protection of animals
used for scientific purposes

Animal Procedures in the Netherlands 2015–2024

Trends, developments and their underlying factors



For today's experimental animals and tomorrow's innovations

Netherlands National Committee for the protection of animals used for scientific purposes

The NCad and its methods

The Netherlands National Committee for the protection of animals used for scientific purposes (NCad) is an independent advisory body dedicated to protecting the welfare of animals used for scientific purposes. The NCad is legally mandated to perform its advisory duties under the Dutch Experiments on Animals Act (Wod). The NCad provides solicited and unsolicited policy advice to the Minister of Agriculture, Fisheries, Food Security and Nature (LVVN), the Central Authority for Scientific Procedures on Animals (CCD) and the Animal Welfare Bodies Platform (IvD Platform). Its policy advice covers the acquisition, breeding, housing, care and use of animals in experiments. The NCad also advises on promoting alternatives to animal procedures. In this way, it advances the replacement, reduction and refinement of animal experiments, known as the 3Rs.

NCad members:
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Summary

At the request (see Appendix 1) of the Minister of Agriculture, Fisheries, Food Security and Nature (LVVN), the Netherlands National Committee for the protection of animals used for scientific purposes (NCad) has conducted an analysis of figures on animal procedures in the Netherlands for the period 2015–2024. The analysis is based on quantitative registration data, targeted interviews with research institutions and a broad survey of professionals involved in animal procedures.

Over the period 2015–2024, the total number of animal procedures in the Netherlands decreased by 20%, from 528,488 to 423,970 procedures per year. This reduction marks the continuation of a long-term trend, but it is not evenly distributed across research categories, animal species and research domains. This points to shifts in the Dutch animal procedure landscape.

Animal species and severity

Most animal procedures are conducted using mice and rats. The number of animal procedures involving mice has decreased by 49%, while the number of procedures involving rats has declined by 24%. However, the number of animal procedures with rabbits has risen by 19%, mainly driven by research for regulatory requirements. The number of animal procedures involving fish has increased by 151%. These studies are primarily focused on the preservation of species.

Around three-quarters of animal procedures fall into the mild and non-recovery severity categories. The number of procedures classified as severe has declined by 75%, from 17,209 (3% of all animal procedures) in 2015 to 4,000–6,000 (1%) from 2018 onwards. This improvement is mainly due to refinements in research methods. Non-invasive imaging techniques (MRI, PET, ultrasound) enable researchers to gather more information per animal and determine humane endpoints more accurately, allowing animal procedures to be terminated before severe suffering occurs. The use of historical data has also largely eliminated the need for challenge trials in vaccine quality control.

Shift from knowledge-driven to policy-driven research

The Dutch animal procedure landscape is undergoing a significant shift. In fundamental research, the number of animal procedures has dropped from 142,263 in 2015 to 88,536 in 2024, a decline of 38%. An even sharper decline is visible in translational and applied research, where the number of animal procedures halved from 151,538 to 75,243. Together, they accounted for 39% of the total number of animal procedures in 2024, compared with 56% in 2015. These two declining categories contain animal procedures that are primarily focused on the acquisition and implementation of knowledge.

The number of animal procedures for policy-driven research is on the rise, however. Animal procedures for research on the preservation of species have increased by 302%, from 22,255 to 89,555, mainly involving fish used in population estimates, migration studies and fisheries monitoring. The number of animal procedures for environmental protection research has risen by 2,849%, from 376 to 11,090. This is mainly due to procedures for zoonosis monitoring in birds (avian influenza, West Nile virus). A significant proportion of this growth is administrative, as some of these procedures were previously recorded under fundamental research.

The regulatory research category remained stable in size and has therefore become the largest category, with 134,158 animal procedures in 2024 (32% of the total). This research mainly comprises safety tests of industrial chemicals under the REACH regulation and quality control of batches of medicinal products.

The number of animal procedures conducted for higher education and vocational skills training has decreased by 49%, mainly due to the introduction of alternatives such as plastinates, 3D-printed models, and VR simulations.

In the category creation and maintenance of genetically altered animals, shows a more complex pattern, with a sharp decline in animal procedures from 50,843 to 1,621 animal procedures between 2015 and 2016, followed by a gradual increase from 2019 onwards, acceleration to 14,444 in 2024. While the initial decline was primarily driven by improvements in techniques and the organisation of breeding processes, the recent increase is mainly due to a reinterpretation of regulations governing the breeding of genetically altered animals.

Causes of change

- The decline in animal procedures for knowledge-driven research can be attributed to multiple factors, including refinements and technological innovation. Imaging techniques enable the collection of more information per animal. Non-invasive monitoring using sensors and AI-driven behaviour recognition also helps make research less invasive or even fall below the registration threshold for animal procedures.
- New Approach Methodologies (NAMs) that do not use laboratory animals, including in vitro models, organoids and organ-on-a-chip technology, contribute to reducing animal procedures, particularly in the early stages of research. Although the decline in the number of animal procedures in knowledge-driven research is thought to be partly linked to a relative reduction in funding, the extent of this effect cannot be quantified.
- In addition, organisational changes, such as the centralisation of breeding facilities and improved coordination of specialist techniques, have reduced the number of animal procedures. Innovations such as cryopreservation and CRISPR-Cas technology play an important role in that. Due to refinements, some animal procedures now fall below the suffering threshold and are no longer recorded.
- The growth in policy-driven research is largely attributable to external regulations and societal challenges. European and national regulations, such as the Nature Restoration Regulation, are leading to increased monitoring and research obligations. Climate change also contributes to an increase in animal research, for example, to monitor infectious diseases. These developments explain why the overall decline in the total number of animal procedures is less marked compared to the decline in animal procedures for knowledge-driven research.

Options for further reduction

Despite positive developments, several areas require attention. One such area is the validation and standardisation of alternatives, particularly for regulatory research. Regulatory authorities do not accept alternatives without extensive validation. Regulatory research methods are legally established in OECD guidelines, which limits the scope of individual institutions to reduce the number of animal procedures. Because research involving alternatives and research involving animal procedures largely operate in separate domains, NAMs are not always developed with the explicit purpose of replacing an animal procedure. According to the interviewed or surveyed researchers involved in animal procedures, NAMs are not yet able to fully replicate the complexity and physiology of humans and animals; therefore, they expect that animal procedures will continue to play a role for the foreseeable future. This applies especially to cancer treatments, neurological research and certain toxicity tests. The NCad notes that animal procedures and NAMs will always have limitations, as they remain *models* for humans.

Regulatory research requires special attention as it is currently the largest category of animal procedures and has seen only 4% decrease over the past 10 years. The vast majority (94%) of regulatory animal procedures was conducted to meet registration, evaluation and market authorisation requirements set by the European Union. In 2024, 61% of these regulatory animal procedures were conducted for industrial chemicals, compared with 34% in 2015. This increase is linked to the implementation of the European REACH regulation and subsequent amendments. Financial constraints play a lesser role here, as animal procedures for regulatory research are commercially funded and strict legal regulations limit opportunities for reduction. New approaches such as Next Generation Risk Assessment (NGRA) offer new possibilities but are not yet widely accepted. The researchers involved in animal procedures expect regulatory research to remain stable or increase slightly, as the implementation of REACH is not yet complete and new requirements for endocrine disruptors and neurotoxicity testing are likely to generate more research. However, the NCad notes that this outlook does not take into account the 'Roadmap towards phasing out animal testing for chemical safety assessments', which was adopted by the European Commission on 1 June 2026 and is committed to phasing out regulatory animal procedures.

Recommendations

The NCad recommends that the government — preferably under the leadership of the Ministry of Agriculture, Fisheries, Food Security and Nature — should be mindful of its own influence on the number of animal procedures, conduct or commission impact assessments of the effects of policy changes and ensure careful coordination of policy between various ministries and international bodies. In the interests of transparency, the NCad recommends linking the national animal procedures register to the non-technical summaries, to gain a better understanding of the implementation and effects of animal-free alternatives, and to establish mechanisms to identify opportunities to increase the impact of NAMs. For policy relating to the 3Rs, the NCad recommends setting targets for each research category, encouraging refinement, promoting the development and validation of alternatives, cross-fertilisation between research using alternatives and research using animal procedures, encouraging the centralisation of laboratory animal facilities and improving data sharing and open-data mechanisms.

Conclusion

The animal procedure landscape in the Netherlands has changed fundamentally over the past 10 years. Although the total number of animal procedures has declined by 20%, this decline is largely concentrated in knowledge-driven research, while policy-driven research is on the rise. Refinements, technological innovation and animal-free alternatives have made significant contributions to reducing animal procedures and animal suffering; however, these positive developments are offset by increasing regulation in the areas of nature conservation, environmental protection and food safety, which is causing an increase in animal procedures.

1. Introduction

Under the Dutch Experiments on Animals Act (Wod), animal procedures are prohibited in the Netherlands unless the aim of the procedure cannot be achieved by any other means (known in the Netherlands as the 'no, unless' principle). Every year, the Minister of Agriculture, Fisheries, Food Security and Nature (LVVN) informs the House of Representatives of the number of animal procedures conducted in the Netherlands that year. Up to 1 January 2026, these figures were compiled and published by the Netherlands Food and Consumer Product Safety Authority (NVWA) in the report *Zo doende*. Despite the efforts of successive governments to reduce the number of animal procedures, the annual figures show that progress has been limited.

There is also a lack of a clear, long-term overview of trends across the various research categories and domains within the Dutch animal procedure landscape. The Minister of LVVN has asked the Netherlands National Committee for the protection of animals used for scientific purposes (NCad) to analyse and interpret the Dutch animal procedure figures over a ten-year period. This will provide clearer insight into the underlying statistical trends and the possible reasons for the limited decline in animal procedures, enabling the Ministry of LVVN to provide more targeted guidance that better aligns with the House of Representatives' wish to further reduce animal procedures.

This report outlines the NCad's analysis of the animal procedure figures for the period 2015–2024, with the aim of providing insight into the developments since the amendment of the Wod on 18 December 2014. It also provides insight into the reasons behind decreases or increases in the number of animal procedures in specific research categories. These insights were obtained through targeted interviews and a survey which was distributed widely throughout the Dutch animal procedure sector. Where possible, these findings are used to forecast future trends in the number of animal procedures and to identify focus areas to further reduction. This overview of developments and drivers in research involving animal procedures can serve as a basis for policy on animal procedures and as a starting point for NCad's Transition Advice 2.0, which is expected in the autumn of this year.

2. Methods

The NCad opted for a two-part approach to address the advisory request. First, the main trends and developments in the animal procedure registration data for 2015–2024 were quantitatively mapped during an exploratory phase. This was then complemented with a qualitative interpretation based on targeted interviews with key organisations, a sectorwide survey and relevant publications. A more detailed description of the methodology is provided below.

2.1 Definition of an animal procedure

When examining the animal procedure figures in the Netherlands, it is important to have a clear definition of what constitutes an animal procedure. In European Member States, Directive 2010/63/EU sets out the guiding principles for policy on animal procedures. In the Netherlands, this directive was implemented in the Wod on 18 December 2014. Despite this harmonisation effort within the EU in animal procedure legislation, it is important to note that there are still differences between EU Member States. These stem from additional national legislation, often referred to as 'national add-ons'. The Netherlands also applies such national add-ons to Directive 2010/63/EU, including on the definition of an animal procedure. See below for the difference between the European definition of an animal procedure and the Dutch definition, as set out in the Wod.

Directive 2010/63/EU (Article 3(1)) defines an animal procedure as follows:

"'procedure': any use, invasive or non-invasive, of an animal for experimental or other scientific purposes, with known or unknown outcome, or educational purposes, which may cause the animal a level of pain, suffering, distress or lasting harm equivalent to, or higher than, that caused by the introduction of a needle in accordance with good veterinary practice. This includes any course of action intended, or liable, to result in the birth or hatching of an animal or the creation and maintenance of a genetically modified animal line in any such condition, **but excludes the killing of animals solely for the use of their organs or tissues.**"

The revised Wod (Section 1(1)(a)) words the definition differently, namely:

"'procedure': any use, invasive or non-invasive, of an animal for experimental or other scientific purposes, with known or unknown outcome, or educational purposes, which may cause the animal a level of pain, suffering, distress or lasting harm equivalent to, or higher than, that caused by the introduction of a needle in accordance with good veterinary practice. This includes any course of action intended, or liable, to result in the birth or hatching of an animal or the creation and maintenance of a genetically modified animal line in any such condition, **and also includes the killing of animals solely for the use of their organs, tissues or bodily fluids for a purpose listed under Section 1c.**"

In summary, an animal procedure is the use of an animal for scientific[1] or educational purposes, during which the animal experiences physical pain or psychological distress equivalent to, or exceeding, that caused by the insertion of a needle. Directive 2010/63/EU does not classify the killing of animals for the sole purpose of using their organs or tissues as an animal procedure, but the Wod in the Netherlands does. In this advisory report, we examine animal procedures using the definition set out in the Wod and as published in *Zo doende*.

It is important to note that one animal procedure equates to the use of a single animal, but the total number of animal procedures is not the same as the total number of laboratory animals used. Animals are not always killed after a procedure, and under certain conditions, the same animal may be used more than once in an animal procedure. The Wod covers all vertebrates, including independently feeding larval forms and foetal forms of mammals in the final third of gestation, as well as cephalopods (Wod, Section 1b (5).

[1] The Wod interprets the definition of science very broadly, also including purposes such as the assessment and detection of physiological conditions in humans, animals or plants, and the production and development of resources, feed, substances and products. These are set out in Section 1(c) of the Wod.

2.2 Exploratory phase – Quantitative analysis of animal procedure registration figures (2015–2024)

- For this analysis, the Microsoft Excel files containing the raw animal procedure registration data were collected at the level of individual annual registration forms for each establishment licence holder (institutions licensed to conduct animal procedures) for the period 2015–2024, which was the most recent data available at the time of writing. This data was made available by the NVWA exclusively for the specific purpose of this advisory report.
- A conversion table was then created to convert the registration codes and data from the Dutch system (2015–2020) into the European ALURES[2] (AnimaL Use Reporting - EU System) format. ALURES is the European Commission's central statistical database for registering the use of laboratory animals for scientific purposes. This format has been mandatory for participating Member States, including the Netherlands, since 2021 and will continue to be used for registering animal procedures. The conversion table can be downloaded from the NCad website.[3] Using the conversion table, both registration formats and various Excel file extensions were automatically incorporated into an aggregated database containing all available animal procedure registration data for the period 2015–2024. The software used to do this was created using SAS Data Integration Studio and is stored in the NCad archive. This software is available to interested parties on request.
- Automated logical data checks were performed on the aggregated file to identify incorrect, missing and duplicate values. Incorrect values were removed or corrected when the correct value could be established with certainty based on the information available in the relevant registration form. Missing values were supplemented where possible and duplicate entries were removed. The identified issues in specific registration files, their processing and the rationale for any changes were documented in a processing report and archived by the NCad. This report is available to interested parties on request.
- For the analysis, we decided to initially produce an overview of the main developments. For the following topics, we created an annual overview of

[2] ALURES website
[3] Website NCad

frequencies, proportions (both of the total and relative to 2015) and changes across the entire period (2015–2024):
  - The total number of animal procedures in the Netherlands
  - The most commonly used animal species
  - Severity
  - The main research categories of animal procedures, as classified in the animal procedures register and *Zo doende.* These are:
    - Fundamental research
    - Translational and applied research
    - Regulatory research
    - Research for protection of the environment
    - Research for the preservation of species
    - Research for higher education and training of vocational skills
    - Creation and maintenance of genetically altered animals
    - Forensic enquiries
- Developments over the past 10 years *within* the specific research categories have also been analysed. For each research category, an overview is provided of:
  - The developments regarding the number of animal procedures within the category.
  - The developments regarding the animal species used within the category.
  - The developments regarding the different research domains within the following research categories:
    - Fundamental research
    - Translational and applied research
    - Regulatory research.

The NCad opted to describe trends and developments only for species, research categories and domains in which more than 5,000 animal procedures were conducted in at least one of the past 10 years, or in which the numbers changed by more than 10% over those 10 years. This approach was chosen because smaller categories, species and research domains have virtually no impact on the total number of animal procedures and generally exhibit fluctuations that are too erratic to constitute trends. Exceptions to this are non-human primates, cats and dogs, as these species receive above-average attention in the public debate surrounding animal procedures.

2.3 In-depth phase – Qualitative interpretation of figures on animal procedures

To shed further light on key developments across the various research categories, as outlined in section 3.5, research institutions that played a prominent role in these developments were approached for in-depth interviews. In addition, the qualitative analysis in this advisory report is based on a survey of 405 professionals involved in animal procedures. Although the sample is broad and represents relevant research categories, the composition of the respondent group may introduce a bias towards the current use of animal procedures. As such, the results should be interpreted as a reflection of perceptions and experiences in the field. Among other things, the interviews covered the following topics:

- The type of animal procedures conducted
- The animal species used for those procedures
- The determining factors for the research question/need for animal procedures
- The influence of legislation and regulations
- Relevant developments in the reduction, refinement and replacement of animal procedures and their impact on the type and number of animal procedures and the severity experienced by the laboratory animals
- Opportunities regarding the 3Rs
- The main barriers regarding the 3Rs
- Expectations regarding the number of animal procedures in the near future

An overview of the organisations interviewed is available in Appendix 6.

Using the insights from these interviews and our quantitative analysis of animal procedure data, a survey was developed to gather the experiences and expertise of researchers, Animal Welfare Bodies (AWBs) and other professionals across the entire Dutch animal procedures sector. An overview of the survey questions is available in Appendix 2.

The survey was sent out via the AWBs, with a request to distribute it among AWB members, researchers, research leaders and department heads, as well as other professionals involved in designing, initiating, applying for and conducting animal procedures. To maximise reach, recipients were encouraged to further disseminate

the survey among fellow researchers involved in animal procedure. This resulted in a broad response of 405 completed surveys.

Most respondents were employed at universities or university medical centres. Two-thirds of the respondents reported having more than 10 years of experience with animal procedures. All research categories and research domains (with at least 5,000 animal procedures per year) were represented in the survey. As such, the results provide a broad insight into relevant factors and developments in the animal procedure sector from the perspective of Dutch animal procedure researchers. The data is qualitative and based on the experiences of professionals in their immediate working environments. Based on the survey, frequently cited factors have been identified that may be relevant and may influence the number of animal procedures. However, the quantitative impact of these factors cannot be extrapolated from these qualitative insights, as the precise changes in the number of animal procedures resulting from them are unknown.

See Appendix 3 for more detailed information on the survey responses.

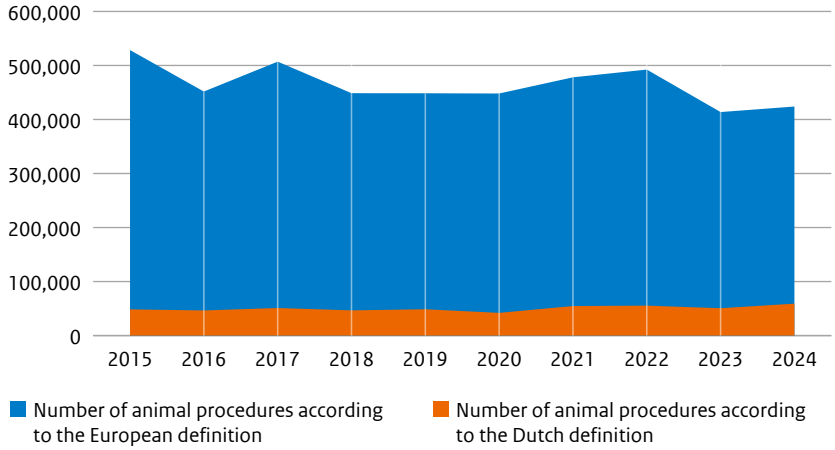
3.

General trends and developments

3.1 Total number of animal procedures in the Netherlands

The Wod came into force in 1977, and the registration of animal procedures and laboratory animals became compulsory for establishment licence holders from 1978 onwards. In 1978, 1,572,530 animal procedures were registered[4]. However, this data is not directly comparable with the current animal procedures registration. This review is limited to 2015, the first full year of data collection under the revised Wod, during which Directive 2010/63/EU was implemented in Dutch animal procedure legislation. This marked the start of the current system for applying for, assessing and authorising animal procedures. Over the following 10 years, from 2015 to 2024, the total number of animal procedures in the Netherlands decreased by 20%: from 528,488 in 2015 to 423,970 in 2024. The trend in the total number of animal procedures is shown in Figure 1.

Figure 1. *Total number of animal procedures in the Netherlands*



Stacked area graph showing the total number of animal procedures by Dutch and European definitions.

View data table 1

As described in section 2.1, more animal procedures are reported in the Dutch register than in the European ALURES database. This is due to the national add-on

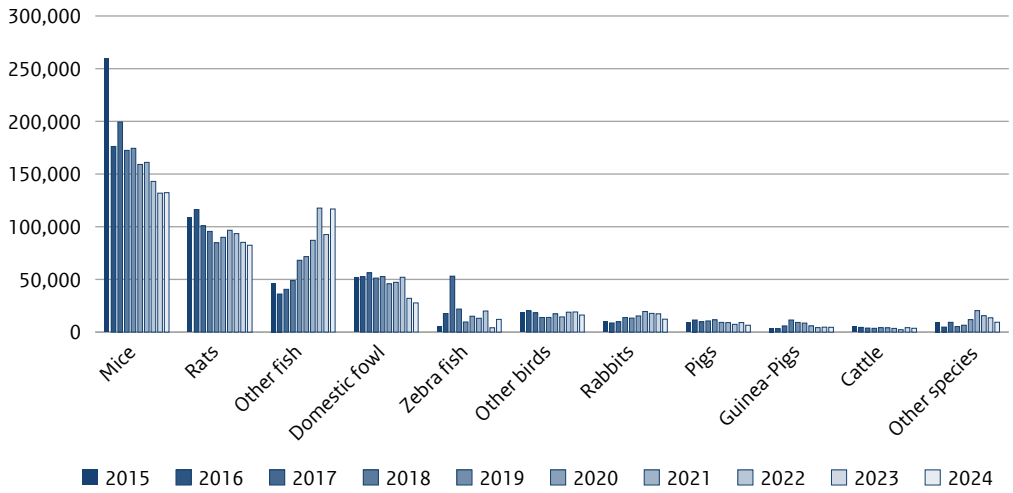
[4] *Zo doende* 1978, Netherlands Food and Consumer Product Safety Authority (NVWA)

for the definition of an animal procedure. The relative proportion of these non-ALURES animal procedures has risen by 52% over the past 10 years, from 9.2% to 13.9% of the total number of animal procedures conducted in the Netherlands.

3.2 Animal species used in animal procedures

Various animal species are used in animal procedures. Figure 2 lists those that have been used most frequently in animal procedures over the past 10 years. Species used relatively infrequently in animal procedures are not listed individually. Several animal species that are rarely used but which are the subject of considerable public interest (dogs, cats and non-human primates) are discussed separately in this chapter. Figures for all animal species used in animal procedures are listed in Appendix 4, Table 2.

Figure 2. *Animal procedures by species used*



Bar chart showing the total number of animal procedures for the years 2015–2024, broken down by animal species used. The number of animal procedures involving mice, rats, domestic fowl, pigs and cattle decreased during this period. In contrast, there has been an increase in animal procedures involving other fish, rabbits and guinea pigs. The number of procedures involving other birds has remained relatively stable, while the number of animal procedures involving zebrafish fluctuates significantly from year to year.

View data table 2

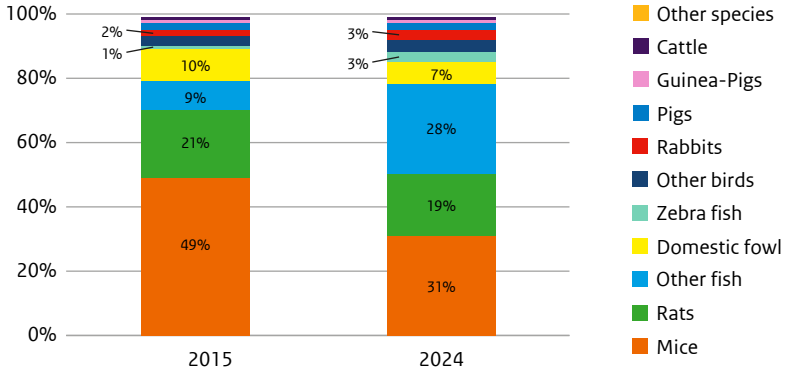
In the Netherlands, most animal procedures are conducted using rodents. The majority of procedures involve mice and rats, with guinea pigs, hamsters and gerbils used to a lesser extent. Although the use of guinea pigs has risen by 19% over the past 10 years, the sharp decline in the use of mice and rats is particularly notable. The number of animal procedures involving rats has decreased by 24% since 2015, and the number involving mice has decreased by 49%. This decline is primarily linked to a reduction in the number of animal procedures in fundamental and translational and applied research, where these species are widely used. The decline in the use of mice and rats appears to have stabilised somewhat since 2023. The number of animal procedures with domestic fowl decreased by 46%. This reduction has mainly occurred since 2023. Procedures involving other types of agricultural livestock, such as pigs and cattle, are steadily declining and have decreased by 27% and 30%, respectively, since 2015.

Given the reduction in the total number of animal procedures, it is not surprising that this trend is also evident for most animal species. This makes it all the more notable that the number of procedures involving rabbits and other fish has risen (19% and 151%, respectively). The 'other fish' category includes all fish species apart from those that have their own registration category, such as zebrafish, sea bass, salmon, trout and Arctic char. This category primarily concerns wild fish. The use of rabbits in animal procedures increased significantly between 2015 and 2021. This figure has been decreasing back toward the 2015 level since 2022.

The number of animal procedures involving zebrafish fluctuates too widely to identify a clear upward or downward trend. However, from 2024 onwards, an increase is expected in the number of zebrafish used for animal procedures in the 'breeding of genetically altered animals' category. This is due to a change in the implementation policy for collecting fin tissue for genotyping[5].

[5] Guideline 'Generating, breeding, genotyping, monitoring and maintaining genetically altered animals' | Central Authority for Scientific Procedures on Animals

Figure 3. *Proportion of procedures by animal species*



Stacked bar chart illustrating the relative distribution of species used in procedures in 2015 and 2024. The proportion of procedures involving mice and domestic fowl has decreased, while procedures involving other fish species have increased.

View data table 2

Figure 3 shows how the proportions of the most commonly used animal species in animal procedures are changing. While mice and rats were the main animal species used in 2015, there has been a sharp increase in the proportion of animal procedures involving other fish over the past 10 years. The proportion of animal procedures involving mice has decreased sharply over the same period.

Non-human primates

The number of animal procedures involving non-human primates (NHPs) has remained fairly stable at around 150–200 animals per year (see Appendix 4, Table 2). This is partly due to a cap on the number of animal procedures at the Biomedical Primate Research Centre (BPRC) in Rijswijk, the Netherlands' leading primate research centre. The majority of NHP procedures are conducted using rhesus macaques. This cap is linked to the funding provided to the BPRC by the Ministry of Education, Culture and Science in light of the political and public debate surrounding primate research in the Netherlands. In the Netherlands, animal procedures involving NHPs are mainly used in translational and applied research and, to a lesser extent, fundamental research. Animal procedures involving NHPs focus almost exclusively on infectious diseases and neurological processes and disorders. In the Netherlands, no animal procedures involving NHPs are conducted for regulatory purposes. Under the Wod, NHPs hold a special status and may only be used in animal procedures if scientific justification is provided demonstrating that the research objective cannot be achieved with any other species (non-NHP). The use of NHPs is also limited to fundamental research, research for the preservation of species or translational and applied research aimed at avoiding, preventing, diagnosing or treating serious or potentially lifethreatening clinical conditions in humans (Wod, Section 10.e).

Cats and dogs

Animal procedures involving cats and dogs are also conducted in the Netherlands. The number of animal procedures involving dogs fluctuates between 550-1,050 per year. The number of animal procedures involving cats typically ranges from 60-200 per year, with a spike to over 600 in 2020 and 2021. These fluctuations can amount to several hundred experiments from one year to the next, so that the trend can be described as broadly stable but subject to marked year-on-year fluctuation.

Animal procedures involving cats and dogs are most commonly used for translational and applied research, as well as regulatory research. They are also used for animal procedures in fundamental research and in higher education and vocational skills training (i.e., veterinary training). Animal procedures involving cats and dogs focus primarily on animal diseases, toxicology and the legally required repeated-dose and pharmacokinetic research for veterinary medicines. The interviews indicate ongoing discussions about whether including data from a nonrodent species in pharmaceutical repeateddose research actually provides added value to the assessment of veterinary medicines. Eliminating the requirement to include a non-rodent species could significantly reduce the use of dogs in animal procedures.

3.3 Suffering

In the Netherlands and in the EU as a whole, the suffering caused by procedures conducted on laboratory animals is classified into the following severity categories:

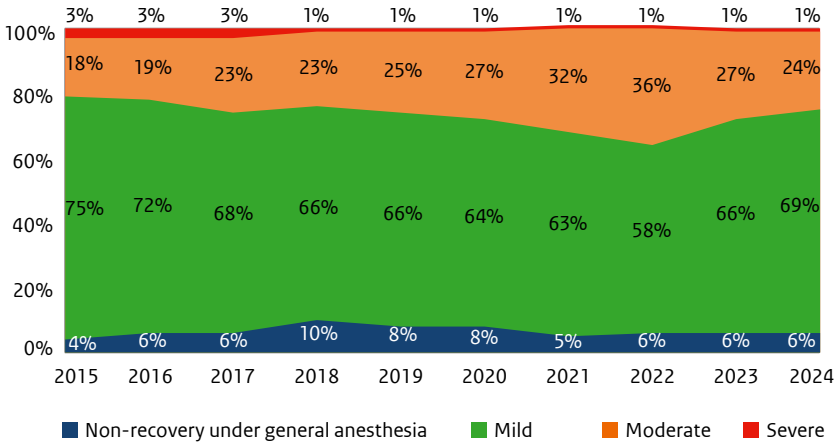
- Mild: Procedures on animals as a result of which the animals are likely to experience short-term mild pain, suffering or distress, as well as procedures with no significant impairment of the well-being or general condition of the animals.
- Moderate: Procedures on animals as a result of which the animals are likely to experience short-term moderate pain, suffering or distress, or long-lasting mild pain, suffering or distress as well as procedures that are likely to cause moderate impairment of the well-being or general condition of the animals.
- Severe: Procedures on animals as a result of which the animals are likely to experience severe pain, suffering or distress, or long-lasting moderate pain, suffering or distress as well as procedures that are likely to cause severe impairment of the well-being or general condition of the animals.
- There is also a fourth category, 'non-recovery', in which procedures are performed entirely under general anaesthesia from which the animal will not recover consciousness.

The animal procedures register documents the cumulative suffering caused by the entire animal procedure. Suffering is not limited to physical suffering, but also includes the stress and anxiety an animal experiences as a result of activities related to the procedure. Suffering also includes what is referred to as the 'violation of an animal's integrity'. An animal's integrity may be compromised when its ability to express natural behaviour is prevented by housing conditions, limitations on freedom and genetic modifications. The overall severity of an animal procedure is an accumulation of multiple induced procedures, environmental factors and/or violations of the animal's integrity. This is not a simple summation, as severity is also influenced by several additional aspects, including the nature, frequency and duration of experimental procedures. It is also affected by the training and acclimatisation of the animals, their care and housing conditions, pain management, staff experience and competence and all possible interactions between these factors. The relevant legislation contains virtually no explicit instructions for the assessment of animal suffering, and the classification of animal procedures into severity categories is based on human interpretation of behaviours indicating pain, stress, and/or anxiety. This means that the classification of the severity of an animal procedure is a case-by-case assessment which must be determined at the level of individual experiments and involves a degree of subjectivity.

3.4 Severity of animal procedures in the Netherlands

Around three-quarters of animal procedures fall into the 'non-recovery' and 'mild' categories. The majority of these — around two-thirds of the total number of animal procedures — fall into the 'mild' category. Of the remaining animal procedures, the majority fall into the 'moderate' category. Since 2018, around 1% of all animal procedures have fallen into the 'severe' category.

Figure 4. *Classification of severity*



Percentage stacked area graph showing the level of suffering experienced by animals in animal procedures from 2015 to 2024, broken down into the four severity categories. Most animal procedures fall into the mild or moderate categories.

View data table 3

The number of animal procedures classified as severe has decreased from 3% (17,209) in 2015 to around 1% in 2018. Since then, the number of animal procedures in the Netherlands classified as severe has remained stable at around 1%, with

between 4,000 and 6,000 such procedures conducted every year. The number of animal procedures classified as moderate has grown from 92,940 in 2015 to 102,273 in 2024. The qualitative research indicates that some procedures involving severe suffering have shifted to moderate suffering. According to researchers, this is a result of refinements and technological innovations, such as continuous, non-invasive monitoring of animal welfare and disease progression using imaging techniques (MRI, PET, ultrasound), and the refinement of humane endpoints in studies involving a risk of severe suffering.

3.5 Animal procedure research categories

In the Dutch and European registration systems, animal procedures are classified into nine research categories based on the research objective of the procedure. The research categories are:

1. Fundamental research
2. Translational and applied research
3. Research for regulatory use and routine production (hereinafter: regulatory research)
4. Research for the protection of the natural environment in the interest of the health or welfare of human beings or animals (hereinafter: research for protection of the environment)
5. Research for the preservation of species
6. Higher education
7. Training for the acquisition, maintenance or improvement of vocational skills
8. Forensic enquiries
9. Laboratory animals used in animal procedures for the creation and maintenance of genetically altered animals

While the latter six research categories serve fairly specific research purposes, the fundamental research and translational and applied research categories encompass a range of animal procedures across various research domains. The regulatory research category includes a range of quality control, safety and efficacy tests as well as animal procedures for routine production. Traditionally, these three categories also account for the largest share in the animal procedures register.

The higher education and training of vocational skills categories have been registered separately since 2021. Previously, both categories were registered together as a single category, namely: research for higher education and training of vocational skills. In this report, we have combined the two categories to illustrate their development since 2015.

Article 10.1 of Implementing Decision EU/2020/569 sets out the definitions of the various research categories.

The definition of 'Maintenance of colonies of established genetically altered animals, not used in other procedures' was subsequently amended. At the request of the Ministry of Agriculture, Fisheries, Food Security and Nature (LVVN), the Netherlands' implementing policy in this area was harmonised in 2023 with the European Union's 'Framework for the Genetically Altered Animals under Directive 2010/63/EU on the protection of animals used for scientific purposes'. For the current definition of this research category, please refer to the revised CCD guidance document 'The Generation, Breeding, Genotyping, Monitoring and Keeping of Genetically Modified Animals'[6].

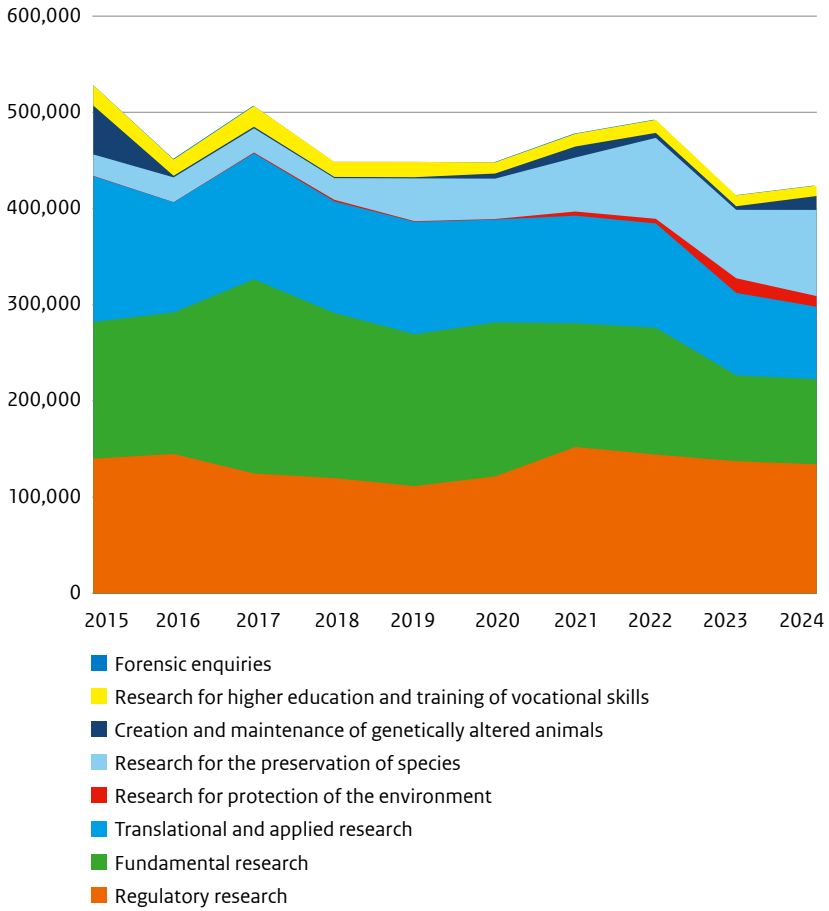
Trends within research categories

A variety of trends have been observed within the individual research categories over the past 10 years. These trends are displayed in Figure 5. The number of animal procedures has declined in the categories research for higher education and training of vocational skills, fundamental research and translational and applied research. There is an upward trend in the number of animal procedures in the categories research for the preservation of species and research for protection of the environment. In the category creation and maintenance of genetically altered animals, the number of animal procedures is also set to rise again from 2023, following an initial sharp decline in 2016. In the categories of regulatory research and forensic enquiries, the number of animal procedures has remained stable over the past 10 years. When these trends are considered together, there has been a 20% reduction in the total number of animal procedures over the past

[6] Guideline 'Generating, breeding, genotyping, monitoring and maintaining genetically altered animals' | Central Authority for Scientific Procedures on Animals

10 years. However, it is by no means certain that this decline will continue if the number of animal procedures in the research categories relating to the preservation of species and the protection of the environment continues to rise at the current rate.

Figure 5. *Research categories: absolute numbers*

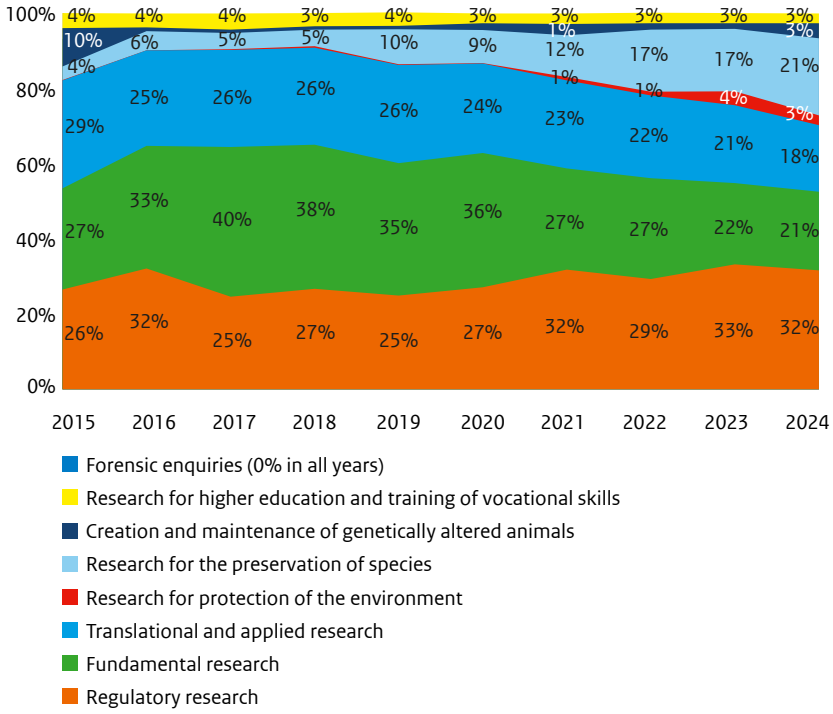


Stacked area graph showing the absolute numbers of animal procedures from 2015 to 2024, broken down by research category. The number of animal procedures conducted for fundamental research, translational and applied research, research for higher education and training of vocational skills and the creation and maintenance of genetically altered animals has declined. However, the number of procedures conducted for research for the preservation of species and protection of the environment increased over the same period. The number of procedures conducted for regulatory research and forensic enquiries has remained relatively stable.

View data table 4

The focus of animal procedures in the Netherlands is shifting (see Appendix 4, Table 4). Traditional categories fundamental research and translational and applied research — now account for a smaller share of animal procedures, while procedures related to preservation of species and environmental protection are on the rise. Research for the preservation of species has grown from 4% in 2015 to become the second-largest category in 2024, accounting for 21% of the total. As a result, this category's share of total animal procedures in 2024 has grown to match those of fundamental research (21%) and translational and applied research (18%). The share of regulatory research has also risen, even though the number of animal procedures in this category has remained relatively stable over the past decade. As the total number of animal procedures in the Netherlands has declined, this category accounted for the largest share (32%) of procedures conducted in the Netherlands in 2024. Therefore, the relative proportions of the various research categories have shifted over the 2015–2024 period. These changes are even more apparent when examining each research category's relative share of the total number of animal procedures (see Figure 6).

Figure 6. *Relative breakdown of research categories since 2015*



Percentage stacked area graph showing the relative breakdown of animal procedures across research categories from 2015 to 2024. The share of fundamental research and translational and applied research has declined during this period. There has been an increase in the proportion of animal procedures conducted for the preservation of species and protection of the environment, as well as for regulatory research.

View data table 4

4.

Further details on individual research categories

This chapter discusses the trends and developments within each of the research categories covered by the animal procedures register. For each research category, the report describes the types of animal procedures conducted within it, as well as the trends observable across the various animal species and research domains within that category. Where possible, explanations for the observed trends are provided, and projections of the number of animal procedures in the near future are outlined.

4.1 Fundamental research

Animal procedures in this research category are primarily aimed at acquiring fundamental knowledge about the behaviour and functioning of organisms and the environment, based on scientific motives. A lot of fundamental research is conducted in research domains such as cancer research, infectious diseases, neuroscience and cardiovascular diseases. A key feature of this type of research is its focus on understanding underlying biological mechanisms, such as the roles of genes, proteins, cells, and environmental factors in health and disease. Developing or testing specific therapies is not the main focus here, but that is often an underlying motivation and an intended next step. As such, research projects focusing on a specific clinical condition often include not only fundamental animal procedures but also translational and applied animal procedures. Examples of common animal procedures in fundamental research domains include:

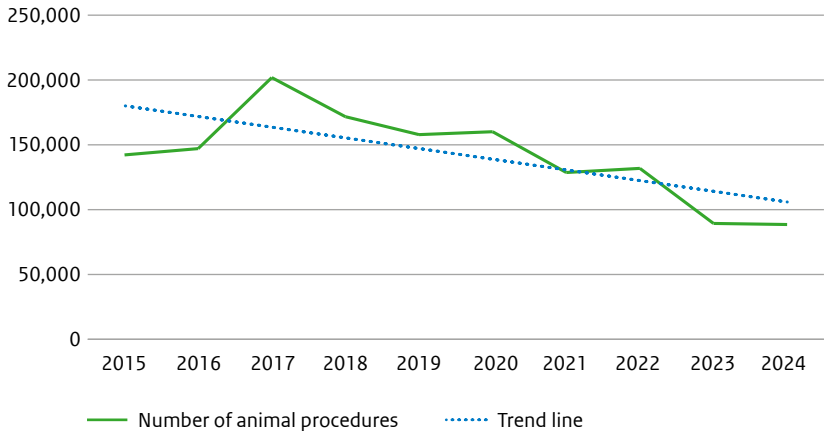
- **Cancer research (oncology)**
  Animal procedures aimed at studying processes such as tumour growth, metastasis and interactions between tumour cells and the immune system. This could involve researching, for example, which genetic changes cause cancer or how cellular signalling pathways function or malfunction. This type of research is primarily conducted on mice and rats to study tumours or specific genetic mutations.
- **Nervous system (neurology)**
  Animal procedures to research neurological disorders such as Parkinson's disease and Alzheimer's disease, as well as to study brain functions such as learning, memory and behaviour. This type of research is conducted on mice and rats; in some cases, non-human primates are used to study more complex brain processes that can only be studied in primates.

- **Ethology, animal behaviour and animal biology**
  Animal procedures in this research domain aim to gain a fundamental understanding of animal behaviour, welfare, and adaptive capacity. Examples include research into migratory behaviour, habitat use, social interactions and stress responses in birds, fish and mammals. This category also includes research on agricultural livestock, such as the causes of post-weaning diarrhoea in piglets or mastitis in dairy cows, with a focus on the underlying biological and behavioural mechanisms.
- **Cardiovascular, haematological and lymphatic systems**
  Research into the underlying mechanisms of heart failure, cardiac arrhythmias and cardiovascular diseases, including the role of genetic factors, inflammatory processes and cell communication. This research is mainly conducted on mice, rats and, in some cases, zebrafish to understand these processes at the molecular and physiological levels.
- **Immune system (immunology)**
  Research into the functioning of the immune system, including how immune cells communicate, how inflammatory responses arise and how autoimmune diseases develop. The focus is on understanding infection mechanisms and immune responses, such as which cells and molecules are involved in combatting viruses. Mice, rats and sometimes ferrets are used for this purpose.
- **Endocrinology and metabolism**
  In this research domain, animal procedures are conducted to study endocrine function. This type of research focuses on the functioning of hormone-secreting glands, the properties of hormones and how hormones influence processes related to metabolism, growth, reproduction and stress responses.

Numbers

In 2015, fundamental research was one of the largest research categories in the Netherlands. With 142,263 animal procedures, this category accounted for 27% of the total number of animal procedures. From 2017 onwards, there has been a steady decline to 88,536 animal procedures in 2024. This means that the number of animal procedures in fundamental research has fallen by 38% compared with 2015. Despite this downward trend, fundamental research remains one of the largest research categories in the Netherlands in 2024 (accounting for 21% of the total) in terms of the annual number of animal procedures.

Figure 7. *Number of animal procedures in fundamental research*



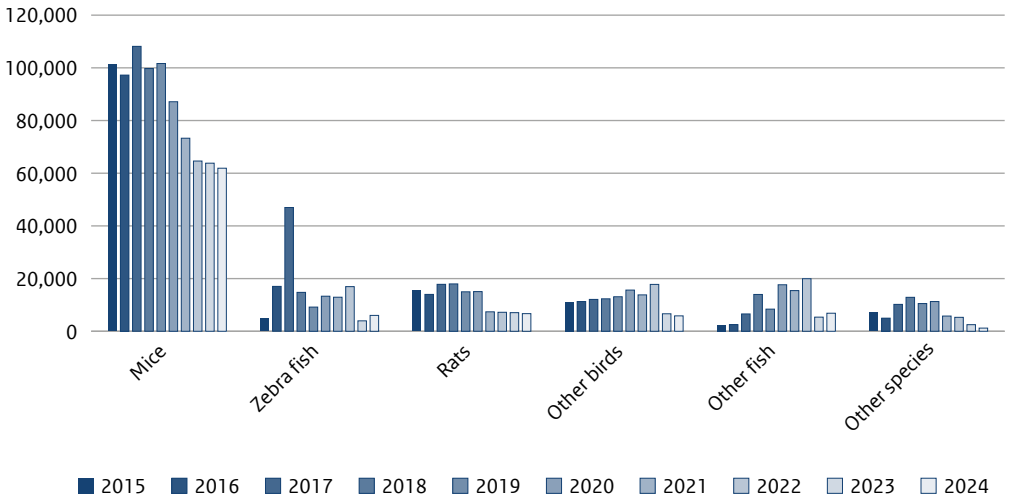
Line graph of animal procedures in the fundamental research category shows a downward trend from 2015 to 2024.

View data table 5

Animal species

The majority of animal procedures in fundamental research are conducted using mice. Zebrafish, rats, other birds and other fish are also frequently used. A complete overview of the animal species used in animal procedures within fundamental research is included in Appendix 4, Table 7. There has been a sharp decline in the number of animal procedures involving mice. In 2015, there were 101,307 animal procedures involving mice; in 2024, this figure stood at 61,900 (-39%). The number of animal procedures involving rats declined by 57%, from 15,483 to 6,697.
The decreased use of these commonly used animal species is linked to the general downward trend in the number of animal procedures conducted for fundamental research and is driven by a variety of factors.

Figure 8. *Animal species used in fundamental research*



Bar chart showing the most commonly used animal species in animal procedures in the fundamental research category between 2015 and 2024. The number of animal procedures involving mice, rats and other birds declined during this period. Number of animal procedures involving other fish increased. Number of animal procedures involving zebrafish also increased between 2016 and 2022, then returned to the 2015 level.

View data table 7

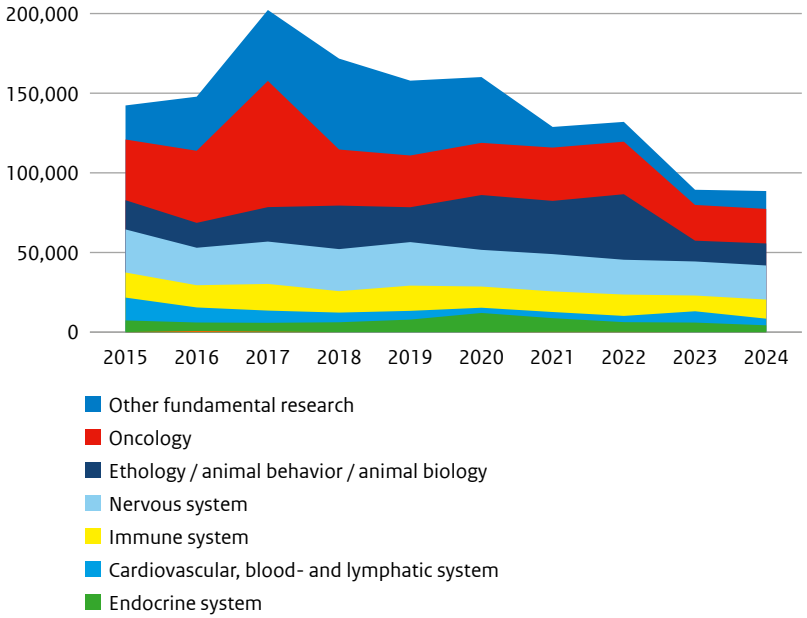
Following an initial rise in the number of animal procedures involving zebrafish and other fish, the use of these animal species declined sharply in 2023. The reason for this change is not entirely clear, but the survey suggests it may be due to improved analytical techniques that allow genotyping at the larval stage, before the animals come under the scope of the Wod. There was also a sharp decline in the number of animal procedures involving other birds in 2023. The interviews indicate that this is the result of an administrative reclassification of these animal procedures (research into pathogens in migratory birds) as research for protection of the environment.

Research domains and explanations for changes in numbers of animal procedures

Animal procedures in fundamental research fall into multiple research domains. The main research domains, in terms of the number of animal procedures, are oncology, the nervous system, animal research (ethology/animal behaviour/animal biology) and the immune system. The proportions between research domains have remained largely stable over 2015–2024, and all major research domains show a downward trend.

The reasons most frequently cited in the survey for the decline in the number of animal procedures in fundamental research in general (not specific to individual research domains) are: rising costs of animal procedures, reduced funding for research involving animal procedures and the use of non-animal methods (NAMs, computer models and measurements in humans). In addition, refinements using innovative techniques (such as developments in imaging technologies) lead to a reduction, as more information can be obtained from an animal. Other key reasons cited include the discontinuation of research lines or the relocation of animal procedures abroad. According to researchers, the latter is partly due to the application process for a CCD (Central Authority for Scientific Procedures on Animals) licence to conduct animal procedures, which is perceived as slow and bureaucratic compared with the procedures in neighbouring countries.

Figure 9. *Main research domains in fundamental research*



Stacked area graph showing the main research domains within the fundamental research category for the period 2015–2024. The number of animal procedures has fallen across all research domains compared with 2015. The proportions across research domains remained largely stable.

View data table 8

Oncological and cardiological research show a faster decline in the number of animal procedures than the other research domains. Technological developments play an important role here, including innovations in non-animal methods and the refinement of research methods that allow more information to be obtained from fewer animals. Specific examples include:

- The use of iPSC-derived cardiac muscle cells, which eliminates the need to culture primary cardiac muscle cells from mice or rats.
- Advances in imaging techniques (MRI, PET and ultrasound), which have made it possible to gather more information per animal, thereby reducing the number of animals required.

Advances in refinement techniques, which have led to a reduction in the number of animal procedures and to a sharp decline in the number of procedures classified as severe.

Example of refinement
Imaging technology plays a crucial role in advancing and refining oncology research. Whereas researchers previously had to kill multiple mice on different days to measure tumour growth, that growth can now be monitored in a single mouse using MRI or ultrasound equipment. This leads directly to a significant reduction in the use of animals. This refinement also leads to fewer procedures being classified as severe, as the same imaging techniques can be used to determine humane endpoints before animals exhibit physical signs of severe suffering. One research institute reported that it had reduced the number of oncological animal procedures classified as severe by approximately 75%.

The domain of other fundamental research recorded a significant increase in the number of animal procedures between 2016 and 2020, after which the number declined sharply in 2021 to half the 2015 level. This is likely because the NVWA has started conducting stricter checks to ensure that the research categories are recorded correctly. Many animal procedures that had been recorded under other fundamental research were found to fit a specific registration category after all.

As a result, most animal procedures conducted under other fundamental research appear to have shifted into the field of ethology, animal behaviour and animal biology. This domain shows an increase in the number of animal procedures in the period up to 2022. After 2022, the number declines sharply, from 41,132 in 2022 to 13,819 in 2024. This decline also appears to be linked to technological innovations, such as specialised transmitters that enable non-invasive, continuous monitoring. Researchers say that this enables more information to be gathered from fewer animals through automated recording, behavioural monitoring and AI-based analysis. As a result, the level of suffering caused by welfare and behavioural research, for example, has now fallen to such a low level that many of these animal procedures are no longer subject to licensing and registration requirements.

Another key reason for the decline in the number of animal procedures is that the registration of research involving other birds (zoonosis monitoring in migratory birds) has been reclassified as research for protection of the environment.

Researchers involved in animal procedures note that NAMs cannot yet fully replicate the complexity and physiology of humans and animals, so animal procedures will continue to play a role in understanding disease processes and developing therapies for the time being. They also observe that NAMs and animal procedures are not interconnected. The development of new alternatives does not automatically lead to a reduction in the number of animal procedures. Researchers also point out that the lack of validation and standardisation remain common barriers to the adoption of NAMs. Validation and standardisation are costly and timeconsuming processes, and the necessary attention and resources are often lacking.

The NCad also notes that the predictive value and translatability of animal procedures have limitations and argues that a stronger ethical assessment is needed in research. Individual NAMs also have limitations. As such, there is a growing focus on integrated approaches that combine NAMs, human data and clinical research to develop more human-relevant and innovative research methods. The NCad notes that promoting the development, standardisation and validation of alternatives—which are currently often lacking—can contribute to a further reduction in animal procedures and may also positively impact the quality of research involving laboratory animals.

Example of the relationship between animal procedures and alternatives
Many organ-on-a-chip models are reportedly still not sufficiently translatable for certain research questions, often due to the absence of essential functions crucial to a living organism, such as a functioning immune system, blood pressure, lymph and lymphatic drainage, and neural innervation. NAMs are well-suited to replacing specific animal procedures in which a living organism is not required. For example, potential cancer therapies are no longer selected using animal models, but using in vitro methods in which human tumour tissue is cultured and treated with candidate compounds. This enables the selection of the most promising substances before resorting to animal models. Only substances that effectively inhibit tumour growth are selected for further investigation in animal models to assess their actual effectiveness in a living organism and any side effects resulting from interactions with organs and endogenous cells. This allows many more potential treatments to be screened and increases the chance that animal procedures will lead to the development of an effective treatment for clinical use. NAMs therefore offer considerable added value to animal procedures and lead to greater efficiency (i.e., fewer non-productive animal procedures) and more translatable results, but in this example, do not necessarily lead to a reduction in the total number of animal procedures.

Future outlook
The survey of professionals involved in animal procedures shows that most researchers expect the number of animal procedures conducted for fundamental research to remain roughly the same, as there will be a continued need for animal procedures to answer fundamental questions. A smaller share of researchers expect the number of animal procedures to decrease as a result of further developments in alternatives, technology and refinement. Few researchers expect the number of animal procedures to increase. The researchers say these developments will depend heavily on the costs of and funding available for fundamental research in the future. Any increases in animal procedures will mainly stem from the start of new research or the expansion of existing research as more funding becomes available.

The survey shows that laws and regulations can also lead to an increase in animal procedures, such as the use of improved tumour growth models involving patient-derived xenografts (PDX models). National regulations lead to unnecessary duplication of animal procedures, as patient-derived material cannot be exchanged freely between countries. Each country must develop its own PDX models in parallel. This results in a large number of animal procedures. Developing a single stable, reliable and reproducible tumour model requires multiple attempts, several generations of mice and rigorous selection.

Example of the influence of financial factors
Despite the general downward trend in the number of oncological animal procedures, the number of such procedures involving mice doubled in 2017. The interviews revealed that this sharp increase was caused by a single researcher who had received an NWO grant for research into combination therapies requiring extensive dosing and pharmacokinetic studies. This research was a precursor to a clinical trial.

This example demonstrates that financial factors have a significant influence on the number of animal procedures and can cause considerable fluctuations within a specific research category and domain.

4.2 Translational and applied research

Translational and applied research focuses on developing, testing and optimising practical applications of existing knowledge. Research in this category focuses on:

- The prevention, diagnosis or treatment of diseases, health disorders or other abnormalities.
- The assessment, detection, regulation or modification of physiological conditions in humans, animals or plants.
- Animal welfare and the improvement of production conditions for animals reared for agricultural purposes.
- Any of the objectives listed above, during the development, manufacture or testing of the quality, efficacy and safety of medicinal products, foodstuffs and animal feed and other substances or products. This category does not include regulatory research.

Translational and applied animal procedures are conducted with practical applications in mind. These studies form an essential link in translating insights from fundamental research into practical applications. As such, it is unsurprising that there are many similarities between fundamental research and translational and applied research across the main research domains. Most animal procedures in this category are conducted within the research domains of oncology, immunology, neurology and cardiovascular diseases. In addition, a significant portion of animal procedures in this category focus on animal welfare, health and nutrition. Examples of common animal procedures in translational and applied research include:

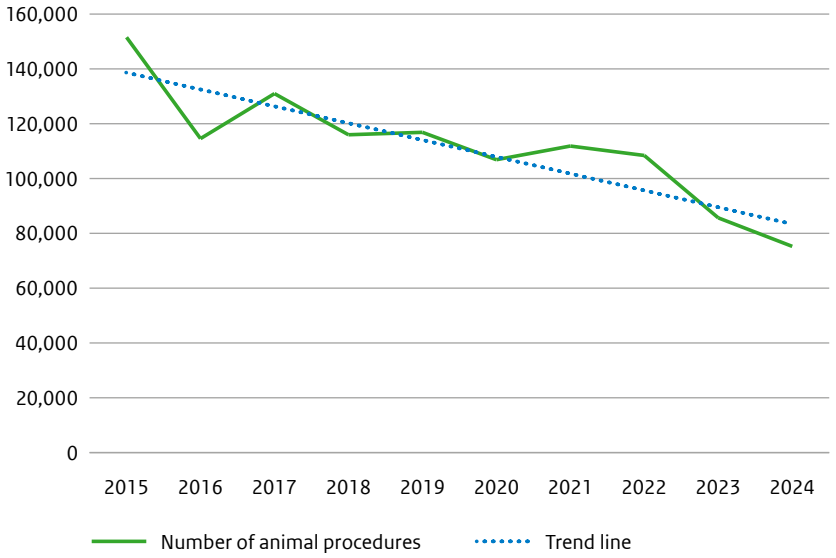
- **Oncology (cancer in humans)**
  In oncology research, animal procedures primarily involving mice (and sometimes rats) are used to study tumour growth and metastasis mechanisms. To that end, cancer cells are often implanted to assess the effectiveness and side effects of new therapies.
- **Immunology (in humans and animals)**
  When researching infectious diseases, scientists examine topics such as vaccine efficacy by exposing vaccinated animals to a virus. A significant body of research also focuses on the immune system (e.g., autoimmune diseases), lung diseases (e.g., COPD) and metabolic disorders (e.g., diabetes), often using rodents to research and manipulate inflammatory responses and their effects.

- **Cardiovascular disorders (in humans)**
  In animal procedures on cardiovascular diseases, conditions such as myocardial infarctions are induced in small animals, often in combination with potential treatments. Larger animals such as pigs and sheep are used to test implants, including stents, heart valves and artificial organs.
- **Neurology (neurological and psychological disorders in humans)**
  An example of animal procedures in neurological research is research into neurodegenerative disorders, such as dementia and Alzheimer's disease. This category also includes the treatment of psychological conditions such as depression and post-traumatic stress disorder (PTSD). Human conditions are often replicated in laboratory animals through genetic, chemical or surgical manipulations, after which interventions and treatments are administered. Animal procedures for neurological research primarily use mice and rats.
- **Animal- for- animal studies**
  In addition to diseaseoriented research, a substantial share of research focuses on animal welfare, health and nutrition. Animal procedures involving agricultural livestock, such as pigs, cattle and chickens, are used to test interventions to reduce health problems. Examples include methods to prevent post-weaning diarrhoea in piglets, the treatment and prevention of mastitis in dairy cows and vaccine development for poultry. In such research, the emphasis lies on evaluating practical measures and their effectiveness. In animal welfare and nutrition research, animal procedures may be used to examine whether specific feed formulations or additives contribute to the resilience and overall well-being of livestock. This typically involves measuring blood parameters, hormone levels, behaviour and growth indicators.

Numbers

The number of animal procedures conducted for translational and applied research halved between 2015 and 2024, declining from 151,538 in 2015 to 75,243 in 2024. This is the fastest declining research category in terms of the number of animal procedures. In 2015, translational and applied research was still the largest research category, accounting for 29% of all animal procedures. In 2024, it made up 18% of the total, making it the fourth-largest category.

Figure 10. *Number of animal procedures in translational and applied research*



Line graph showing the number of animal procedures in translational and applied research reveals a downward trend from 2015 to 2024.

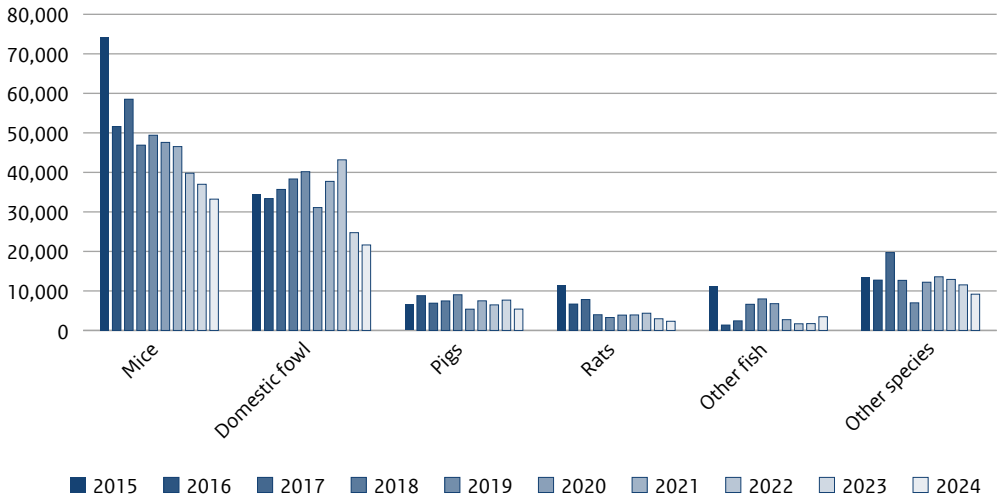
View data table 9

Animal species

Most animal procedures in the translational and applied research category are conducted using mice and domestic fowl. The number of animal procedures involving mice has more than halved, from 74,160 in 2015 to 33,230 in 2024. The number of animal procedures involving domestic fowl has also shown a sharp 37% decline. The sharpest decline has been in animal procedures involving rats, from 11,574 in 2015 to 2,325 in 2024, a decrease of 80%. Pigs, rats and other fish are used in only a relatively small proportion of animal procedures. After mice and domestic fowl, pigs are the most commonly used species in animal procedures within translational and applied research. The number of animal procedures varies but generally remains stable. Other fish rank fifth among the most commonly used animal species in animal procedures within translational and applied research.

While the number of animal procedures involving other fish has declined compared with 2015, there is too much fluctuation to indicate a clear downward trend.

Figure 11. *Animal species used in translational and applied research*



Bar chart showing the most commonly used animal species in procedures within the translational and applied research category for the years 2015–2024. The number of animal procedures involving mice, domestic fowl and rats declined during this period. The use of pigs and other fish remained relatively stable.

View data table 11

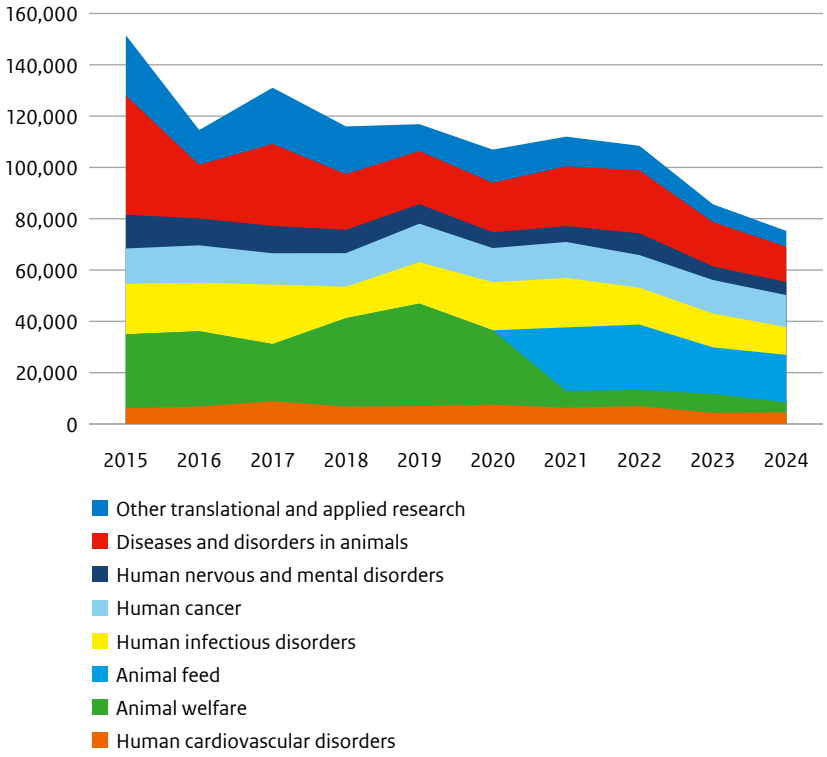
Research domains and explanations for changes in numbers of animal procedures

The vast majority of animal procedures conducted in the translational and applied research category in 2015 focused on diseases and disorders in animals (46,485 procedures). Since then, the number of animal procedures in this category has fallen by 70%, a greater-than-average decline compared with other research categories. A significant body of research is also conducted into animal welfare and nutrition. From 2021 onwards, there appears to have been a sharp decline in the number of animal procedures relating to animal welfare, but a significant increase in the number of animal procedures relating to animal nutrition. Interviews indicate that this is due to the transition from the Dutch registration to the European ALURES registration system in 2021. ALURES introduced a separate category for research on animal nutrition, which did not exist in the Dutch registration system. Hence, a significant share of animal procedures previously recorded under animal welfare has been re-categorised under animal nutrition since 2021. Another reason for the decline in the number of animal procedures related to animal welfare is that refinements such as non-invasive monitoring equipment have reduced the suffering caused by some experiments to such a low level that these studies are no longer subject to licence and registration requirements. These studies do not meet the Wod criteria for an animal procedure and are therefore not included in the animal procedure registration figures.

Example of sub-threshold research through refinement

The survey and interviews show that the development of smart camera systems and non-invasive sensors such as heart rate monitors, telemetry and temperature measurement has made it possible to monitor animals continuously. Innovations such as AI are also being used for behaviour recognition, allowing the continuous collection of research data without disturbing the animals. These non-invasive measurements are increasingly being used in research into nutrition and animal welfare. In the past, invasive measurements, such as blood samples, were often taken. The suffering caused by these non-invasive measurements is minimal and does not constitute an animal procedure under the Wod criteria. Consequently, these procedures are not included in the registration figures.

Figure 12. *Main research domains in translational and applied research*



Stacked area graph showing the main research domains within the translational and applied research category for the years 2015–2024. In 2021, there was a sharp decline in the number of animal procedures conducted for animal welfare and an increase in the number of animal procedures conducted for animal nutrition. This is due to the transition to the ALURES registration system, in which animal procedures for animal nutrition are registered in a separate category.

View data table 12

The interviews also revealed that the use of non-invasive measurement methods in certain areas, such as nutrition or disease resilience research, is often less accurate or informative than invasive measurements. Without animal procedures involving invasive measurements (e.g., blood samples), certain parameters can no longer be measured, or more animals are required to measure the same effect indirectly. Nevertheless, researchers are increasingly opting for non-invasive measurement methods. This is not only due to animal welfare considerations; financial considerations and the duration of the application process for a project licence also play an important role. Finally, our interviews revealed that the discontinuation of research lines—e.g. when the research question has been answered—can sometimes significantly affect the number of animal procedures.

Example of fluctuations caused by the discontinuation of research lines
In one interview, the departure of a researcher and the completion of a research project on chicken welfare were cited as reasons for the decline in the number of animal procedures. In the latter case, the research need had been fulfilled. This led to a sudden and sharp decline in the number of animal procedures on chickens at the institution, which had totalled thousands of animals per year.

The number of animal procedures conducted to research infectious diseases in humans has declined by 45% compared with 2015. The survey found that the most frequently cited reasons for this decline were the use of in vitro cell culture models (2D, 3D, organoids), improved sharing of research information and the reuse of existing data. Compared with other research domains, the number of animal procedures related to cancer in humans has declined only slightly, by 9% over the past 10 years. The interviews revealed that a functioning organism with an immune system is key when researching new cancer treatments, such as immunotherapy or chemotherapy. As such, animal-free methods are therefore only limitedly applicable in this research domain.

The number of animal procedures related to neurological diseases and psychological disorders in humans declined by 62% between 2015 and 2024 (from 13,150 in 2015 to 5,061 in 2024). The survey indicates a perceived decline in available funding

for research involving animal procedures and refinement efforts. In neurological research, non-invasive imaging techniques such as ultrasound, MRI and PET play a key role in reducing the number of animal procedures by allowing more information to be gathered from the same animal. Along with other technological innovations in the field of wearables, these techniques also mean that an increasing number of research questions are being investigated directly in humans.

Future outlook
The general impression that emerges from the survey and interviews is that the number of animal procedures used in translational and applied research is expected to continue to decline. The same reasons are cited for this category as for fundamental research: the introduction of alternatives and the refinement of methods. However, future developments will also depend heavily on cost trends and available funding.

4.3 Regulatory research

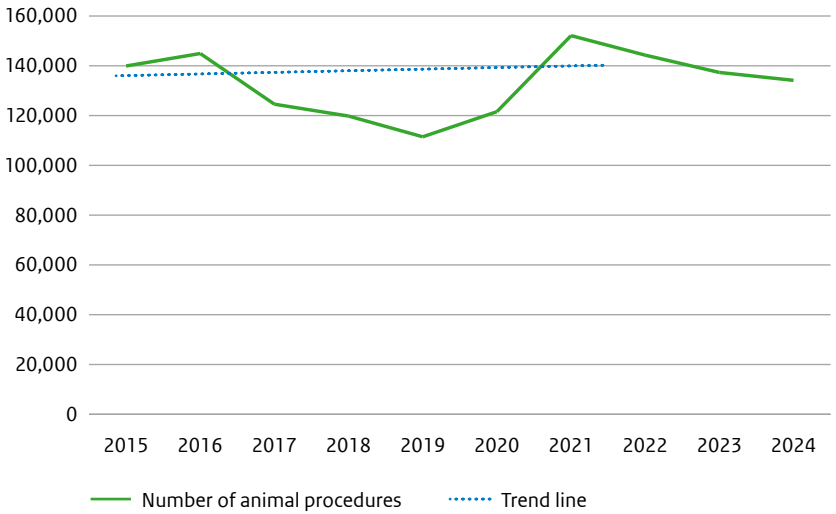
Regulatory research consists of animal procedures conducted to meet legal requirements for the production, authorisation and marketing of products and substances. This involves safety and risk assessments of, among other things, medicinal products, vaccines, foodstuffs, animal feed, and chemical substances. This category also includes animal procedures performed in routine production processes, such as the manufacturing of diagnostic agents and biological products, although these are not conducted to comply with specific legislation or regulations. Animal procedures for efficacy studies on new medicinal products do not fall within this category; these are registered under translational and applied research. Examples of common regulatory animal procedures include:

- **Quality control and efficacy testing**
  This includes quality control and efficacy tests on vaccines and antiviral drugs. These animal procedures use mice, chickens, cattle, pigs and rabbits. The animals may be vaccinated, after which their immune responses are measured to assess vaccine efficacy and safety. Vaccines are also tested against specific animal diseases, such as avian influenza, bluetongue and foot-and-mouth disease.
- **Toxicological safety testing**
  This type of research aims to assess the safety of medicinal products, chemicals, biocides, food ingredients, etc. Animals such as rats, mice and rabbits are used in animal procedures to determine whether substances are harmful and, if so, to what extent. In the Netherlands, this category mainly comprises research into reproductive and developmental toxicity, which examines the effects on fertility, and the development of offspring, respectively. These are large studies in which animals are bred and effects are studied across multiple generations.
- **Routine production of biological material**
  This category covers the production of diagnostic agents and biological products, such as antibodies and sera. In these animal procedures, animals such as rabbits, sheep and ferrets are used to produce antibodies or for diagnostic tests. Blood samples are also collected for use in medical analysers and laboratory tests.
- **Ecotoxicology**
  These animal procedures focus on the effects of substances on wildlife and the environment. For example, fish are used in animal procedures to monitor water quality. This type of research is often conducted to meet environmental requirements.

Numbers
The number of animal procedures conducted within the regulatory research category has remained relatively stable in recent years. In 2015, 139,919 animal procedures were conducted, compared with 134,158 in 2024. While the number of animal procedures declined by 20% between 2015 and 2019, there was a sharp increase between 2020 and 2021. The interviews suggest that this increase may be linked to a revision of the REACH regulation regarding the information required for the risk classification of chemicals. The United Kingdom's departure from the European Union and the COVID-19 pandemic may also have played a role. After 2021, the number of animal procedures declined to a level comparable to that of 2015.

Because the total number of animal procedures in the Netherlands declined by 20% between 2015 and 2024, it is now the largest category in relative terms, accounting for 32% of the total number of animal procedures.

Figure 13. *Number of animal procedures in regulatory research*



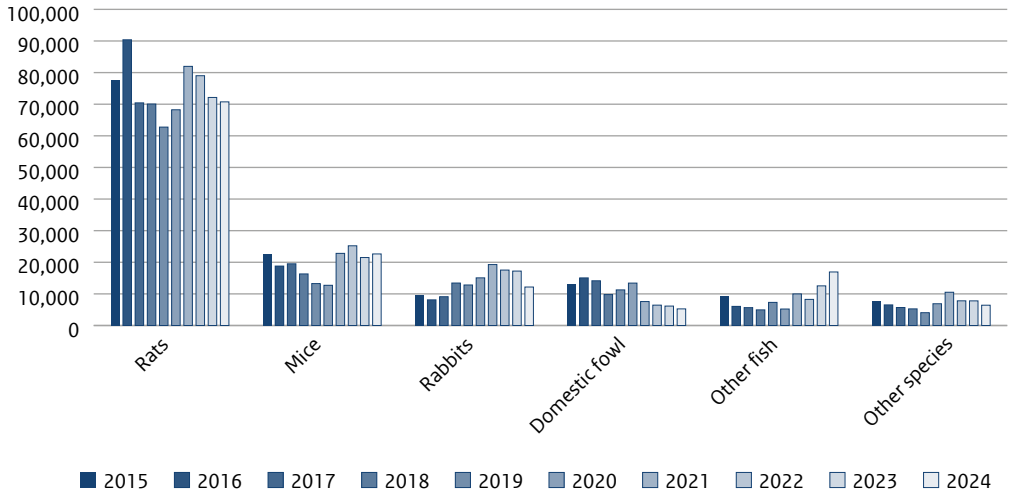
Line graph showing the number of animal procedures in the regulatory research category. It shows that the number of animal procedures remained relatively stable between 2015 and 2024.

View data table 13

Animal species

The vast majority of animal procedures in regulatory research are conducted using rats. Mice, rabbits, domestic fowl and various fish species are also used, but considerably less frequently than rats (see Figure 14). The number of animal procedures involving rats and mice fluctuates. The number of animal procedures involving rats fell slightly between 2015 and 2024, but the pattern is too erratic to suggest a clear downward trend. Following an initial decline, the number of animal procedures involving mice appears to be stabilising again at the 2015 level. However, clear trends can be observed for other animal species. During the period 2015–2024, the number of animal procedures involving domestic fowl declined steadily, while the number of animal procedures involving rabbits and other fish increased.

Figure 14. *Animal species used in regulatory research*



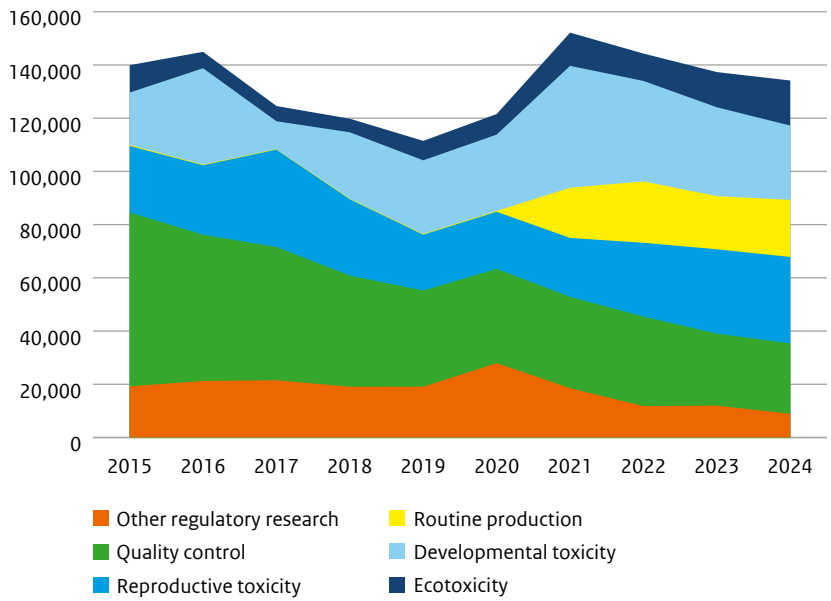
Bar chart showing the most commonly used animal species in animal procedures in the regulatory research category for the years 2015–2024. The number of animal procedures involving rats and mice fluctuated but has remained relatively stable at around the 2015 level. The number of animal procedures involving rabbits and other fish increased during this period, while the number of procedures involving domestic fowl declined.

View data table 15

Research domains

Between 2015 and 2024, significant shifts are evident in the number of animal procedures across research domains within the regulatory research category. The number of animal procedures for quality control has declined by 60% over the past 10 years. These procedures are primarily used for efficacy and safety testing of vaccine batches. The interviews revealed that this decline is partly due to the acceptance of serological tests for demonstrating vaccine efficacy, meaning that challenge trials are no longer necessary.

Figure 15. *Main research domains in regulatory research*



Stacked area graph showing the main research domains within the regulatory research category for the period 2015–2024. The number of animal procedures conducted for quality control has more than halved. However, this decline is largely offset by an increase in the number of animal procedures for toxicity testing and routine production of biological material in 2021.

View data table 16

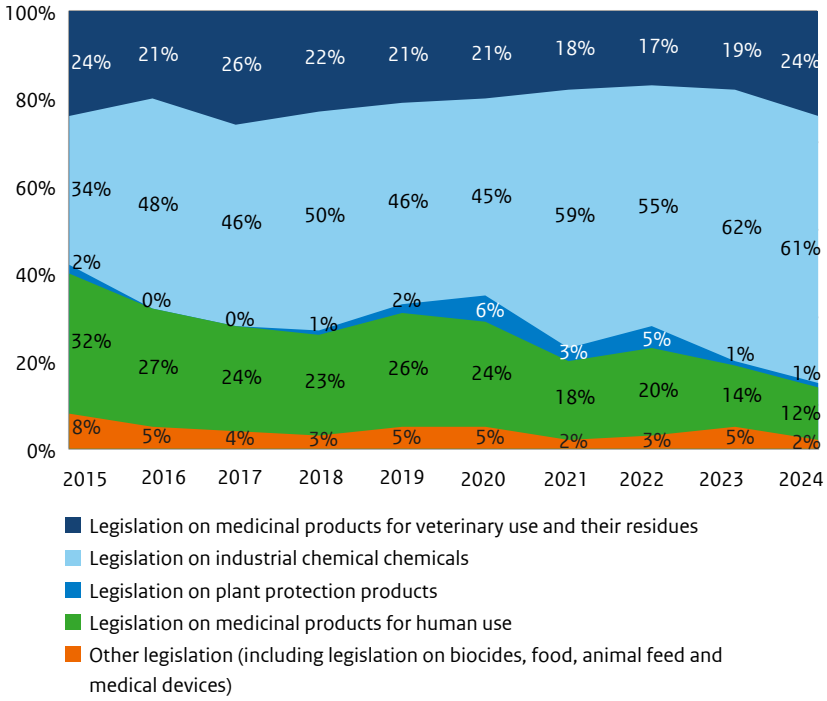
Example of acceptance of a refined method
One of the organisations interviewed stated that the efficacy of new vaccine batches can be assessed using the predictive value of blood samples and provided scientific evidence to support this. After vaccine administration, blood sampling results are compared with historical data from previous efficacy trials for these vaccines. Efficacy was previously measured using challenge trials, in which animals were infected with pathogens to test whether a vaccine provided sufficient protection. These are often severe procedures that cause substantial suffering. With this refinement, the institution has significantly reduced the number of animal procedures and the level of suffering.

The number of animal procedures for reproductive toxicity has increased steadily over the period 2015–2024. In 2024, 30% more animal procedures were conducted for this purpose than in 2015. There has also been a 42% increase in the number of animal procedures for developmental toxicity. The interviews indicated that this increase is due to additional registration requirements arising from updates and amendments to the European REACH legislation.

The number of animal procedures for routine production was minimal during the period 2015–2020, but increased sharply to between 18,862 and 23,070 procedures in 2021. Enquiries with the NVWA reveal that this concerns an organisation that started conducting animal procedures for the routine production of antibodies. In 2024, 16,933 animal procedures were registered for ecotoxicity research, compared with 10,301 procedures in 2015. No clear explanation has been found for this 64% increase.

Origin and type of laws and regulations
Between 2015 and 2024, 94% of regulatory animal procedures was conducted to comply with laws and regulations. The remaining 6% consisted of animal procedures for routine production and is technically not driven by statutory requirements. The majority (96%) of the animal procedures that do arise from statutory and regulatory frameworks are dictated by the requirements of European authorities. The Netherlands does not impose any additional national requirements. Approximately 4% of legally required animal testing is carried out to comply with national legislation or those of non-EU countries.

Figure 16. *Type of regulatory research*

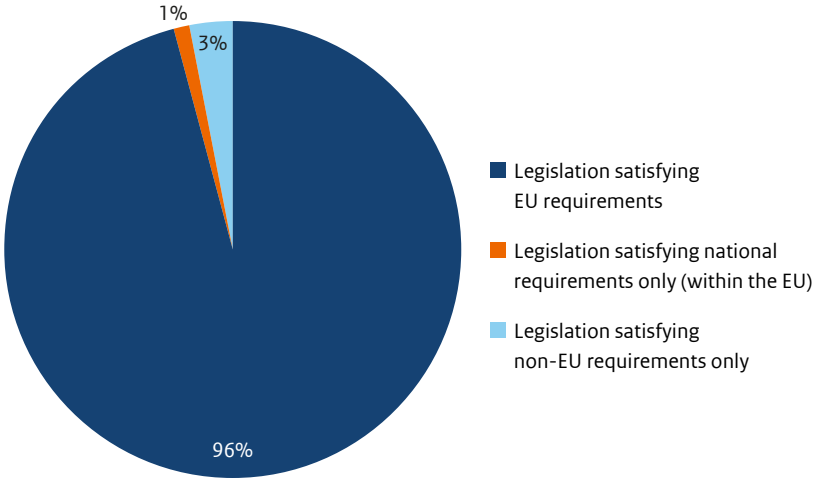


Percentage stacked area graph showing the relative distribution of the types of legislation which animal procedures were conducted in the regulatory research category for the years 2015–2024. The share of animal procedures for legislation on industrial chemicals is increasing, while the share of animal procedures for legislation on medicinal products for human use is decreasing. The share of animal procedures for legislation on veterinary medicinal products and plant protection products remained relatively stable. Animal procedures for routine production have not been included in these statistics.

View data table 17

The main European authorities in this field are ECHA for chemicals (including biocides), EFSA for food safety and agrochemicals and EMA for medicinal products for human and veterinary use and medical devices. In 2024, 61% of animal procedures stemming from statutory requirements were conducted to comply with legislation on industrial chemicals, compared with just 34% in 2015. The share of animal procedures conducted to comply with legislation on medicinal products for human use declined from 32% in 2015 to 12% in 2024. The share of animal procedures for legislation on veterinary medicinal products has remained stable over the past decade, at between 20% and 25% of the total number of animal procedures conducted to comply with statutory requirements.

Figure 17. *Origin of legislation*



Pie chart showing the origin of the legislation for which animal procedures were conducted in the regulatory research category during the period 2015–2024. Animal procedures for routine production have not been included in these statistics.

View data table 18

Causes
Most legally required animal procedures in the Netherlands are conducted for chemicals, usually by specialised contract research organisations (CROs), and, to a lesser extent, for medicinal products for human or veterinary use. The OECD has established detailed test protocols for legally required animal procedures. ECHA and EFSA impose strict requirements for compliance with these protocols; deviations from these guidelines are permitted only in exceptional cases and on the basis of proper scientific justification. The REACH regulation plays a key role in the chemical research domain. The resulting requirements for animal procedures depend on both safety considerations and production volumes (tonnage). Above certain tonnage thresholds, safety testing on both rats and rabbits is mandatory. This explains the increase in animal procedures involving rabbits. The implementation of REACH is not yet complete, and ongoing amendments are increasing the need for additional animal procedures.

A decline in the number of animal procedures is hampered by the mandatory re-registration of agrochemicals, which occurs approximately every 10 years. Re-registration commonly requires compliance with stricter or amended requirements, which often leads to additional animal procedures, such as extensive one-generation studies that were not previously required. One example is the debate surrounding glyphosate, where possible links are being drawn with Parkinson's disease. This has led to a reassessment, which required a large number of additional animal procedures.

The current assessment system is primarily based on hazard assessment. This approach relies on high-dose exposure to identify potential risks as comprehensively as possible, without accounting for real-world exposure scenarios. For industrial substances in particular, there is often insufficient knowledge about how and to what extent humans are exposed. There is also still a substantial backlog in toxicity studies, particularly for existing chemicals. The introduction of new or enhanced safety requirements may lead to a further increase in the number of animal procedures required.

The animal procedures that are required for regulatory compliance are primarily set out in European legislation and the associated OECD guidelines. As a result, individual CROs or institutions, and individual countries, have limited options for implementing alternatives or refinements. The validation of new procedures and their approval by the regulatory agencies are essential to reduce the number of animal procedures in this category. However, the validation of alternatives is a labour-intensive and costly process for which there are often insufficient resources.

Example of the difficult acceptance of alternatives
One clear example is a test for thyroid toxicity (TPO assay) that has been developed and validated. This test was assessed positively by the OECD. However, the next step—multicentre studies (ring trials) in which multiple laboratories conduct the same test to demonstrate reliability—has failed to materialise. Without these ring trials, the OECD guideline cannot be revised, and without a revision of the OECD guideline, regulators will not accept the test.

The survey and interviews show that, although alternatives to animal procedures for regulatory research are being developed extensively—particularly within academia—the validation phase is largely absent. The European Commission is investing heavily in research that does not involve laboratory animals, but the findings of such research are rarely incorporated into legislation or implementation policies. The core problem is that validation steps require funding and central coordination, but there is no specific body responsible for this role. Interviewees mentioned that alternatives are often developed on a bottom-up basis (e.g., a test conducted by a university), while regulators (ECHA) sometimes require different endpoints for market authorisation. A top-down approach could make the validation process more effective.

Future outlook
Researchers indicate that it is difficult to predict the number of animal procedures required for regulatory research in the future. Research is conducted in an international context, and financial developments and changes to statutory requirements at the European level can significantly impact the demand for supplementary regulatory research. For example, the European Commission has been working on a REACH update concerning potential endocrine disruptors for years. This update has been postponed for several years, and the implications for

the need for additional safety testing are not yet clear. If policy remains unchanged, demand for animal procedures for regulatory research is expected to remain substantial and is more likely to increase than to decrease.

The interviews indicate that new developments, such as Next Generation Risk Assessment (NGRA), have the potential to reduce the number of animal procedures. The NGRA approach utilises an integrated evaluation of realistic exposure scenarios, mechanistic information, kinetic modelling, and data generated through NAMs for the safety assessment of substances. This approach is suitable for domains in which exposure can be reliably estimated (e.g., medicinal products and specific biocides), but is not widely accepted by the competent authorities for the regulatory assessment of chemicals.

The researchers involved stated that risk assessment for chemicals at the whole-organism level is so complex that a battery of validated in vitro tests is required to replace an animal procedure. Fifteen tests are currently being developed for developmental neurotoxicity testing (DNT), but there is currently no validated method for interpreting the results and tests.

There is also debate over whether using a second animal species provides added value in repeated-dose animal studies. Data is being collected to that end. Eliminating the requirement for animal procedures with a second species would significantly reduce the number of animal procedures. The rapidly developing capabilities of AI could be used to identify patterns in large datasets and to classify substances into groups. Sharing large datasets across the industry could lead to a reduction in the number of animal procedures.

At the same time, it should be noted that policies are being developed at the European level to reduce and ultimately phase out animal procedures in regulatory research, which may drive developments in the opposite direction in the longer term.

4.4 Research for the preservation of species

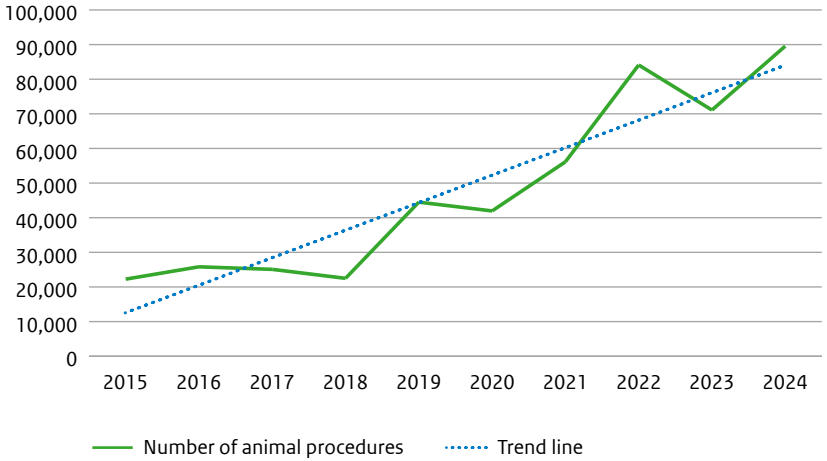
Research for the preservation of species comprises animal procedures aimed at protecting animal species. This could include the identification of populations, foraging areas, migration routes and habitat. These are often field studies involving animals living in the wild. In the Netherlands, the capture of wild animals is not considered an animal procedure. However, any subsequent procedure conducted on these animals for scientific purposes must be registered as such if the estimated pain, suffering or distress is equivalent to or greater than that caused by the introduction of a needle.

Common animal procedures include marking, ringing, transmitter tagging, blood sampling, euthanisation for tissue analysis, or combinations thereof. The following research domains can be identified within this research category based on practical experience:

- **Research into populations and habitat**
  Research in which populations are surveyed and habitats are characterised, such as fish population monitoring projects in rivers and seas. Frequently studied species include commercially important fish and glass eel (European eel).
- **Migration research and transmitter surveys**
  Research aimed at tracking animal migration patterns and movements, often using transmitters or tags. This often involves animal procedures in which fish are tagged with transmitters to map migration routes and gain an understanding of the migration potential of waterways and the effectiveness of fish passages. Research into migration is mainly conducted on fish, migratory birds and, occasionally, mammals.
- **Assessment of fisheries and catch management**
  Research for data used in determining catch quotas and ensuring sustainable fisheries management, both within the European Union and beyond. By gaining an understanding of population size, reproduction and mortality, policy measures can be substantiated. A considerable amount of research is conducted on commercial fish species, the results of which are used to prevent overfishing and maintain population levels.

- **Research into water management and infrastructure**
  Research focused on how human interventions, such as dams, locks and water management, affect animal habitats. The key theme is fish migration, with research assessing the migratability of waterways and the effectiveness of fish passages.

Figure 18. *Number of animal procedures in research for the preservation of species*



Line graph showing the number of animal procedures in the research for the preservation of species category reveals an upward trend from 2015 to 2024.

View data table 19

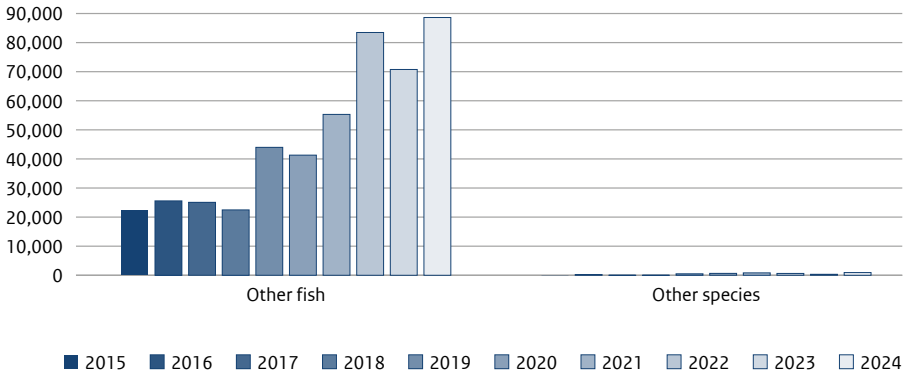
Numbers

This research category, which has very specific objectives, has seen a sharp increase in the number of animal procedures over the past decade. Since 2015, the number of procedures conducted for the preservation of species has risen by 302%, reaching 89,555 in 2024. As such, this category accounted for 21% of all animal procedures conducted in the Netherlands in that year. The only research category in which more animal procedures were conducted in 2024 is regulatory research.

Animal species

Research for the preservation of species category almost exclusively concerns animal procedures with other fish. The number of procedures involving other fish is rising sharply, as reflected in the total number of animal procedures in this category. Less than 1% of animal procedures in this category involve other animal species.

Figure 19. *Animal species used in research for the preservation of species*



Bar chart showing the number of animal species used in animal procedures within the research for the preservation of species category between 2015 and 2024. There is a visible upward trend for other fish.

View data table 21

Causes

The interviews indicate that animal procedures in this category predominantly use other fish. The increase in the number of animal procedures is mainly due to requirements arising from statutory research obligations imposed by national and European legislation, such as those required for setting fishing quotas through stock assessments (see for example the Common Fisheries Policy and the Marine Strategy Framework Directive). Another example is the monitoring of protected areas and species, such as the biometric monitoring of glass eel and research into their migration. In these animal procedures, large groups of animals are anaesthetised for length or weight measurements, or injected with a coloured elastomer (an elastic

silicone rubber that does not restrict the animals' freedom of movement) to help accurately track their migration routes. As these are invasive procedures conducted for scientific research, they fall within the scope of the Wod. This research can involve high numbers of animal procedures—up to 10,000–30,000 per year.

The interviews reveal that another key reason for the high number of reported animal procedures involving fish is the use of population estimates for commercial and non-commercial fish species in national waters. This research involves catching and killing fish for age determination (which requires the extraction of otoliths) and tissue sample collection, and comprises around 20,000 animal procedures per year.

In addition, to determine bycatch in fisheries (the discard programme), fishermen kill the bycatch, collect it in bags, and send it to a laboratory for identification. As these animals are killed for scientific research, these animal procedures are formally governed by the Wod in the Netherlands. This is in contrast to most other EU countries, where animals killed for scientific purposes without any prior procedures are not usually classified as animal procedures or reported as such.

Animal procedures are also necessary for, which sometimes requires extensive monitoring of animal populations (not only of fish, but also of other species in protected areas) and offshore wind farm impact assessments.
Animal procedures are also necessary for nature conservation, which sometimes requires extensive monitoring of animal populations (including both fish and other animal species in protected areas), or impact assessments regarding the effects of offshore wind farms. New government-imposed monitoring requirements are expected to lead to a further increase in the number of animal procedures.

Future outlook
The interviews indicate that camera systems are being developed to better monitor animals. However, these systems are not yet sufficiently advanced to completely replace animal procedures. New sonar and hydroacoustic techniques, combined with AI, may help improve population estimates in the future, potentially reducing the need for capture. According to the researchers involved, it is not yet possible to determine a population's age structure or accurately distinguish species within groups using these techniques. Promising techniques are being developed to determine age structure, such as the fin clipping method, which involves collecting a DNA sample for age determination without requiring the animals to be killed. However, this method is not yet operational on a large scale, and fish caught and released at sea often have a very low chance of survival. Environmental DNA (eDNA) can be used for species identification in general, but is not yet suitable for reliably estimating population sizes.

Smart cameras make it possible to monitor animals in protected areas, for example by tracking their population and behaviour. This may partially reduce but cannot yet replace the need for animal tagging, which constitutes[7] an animal procedure in certain cases.

Despite these developments, the qualitative interviews reveal that the researchers involved expect an increase in the number of animal procedures in the research for the preservation of species category. A major research programme is currently underway in which samples are taken from discards. This programme produces large numbers of dead fish (100,000-165,000 per year), but only a small proportion (around 20,000) are currently registered as animal procedures, as they are actively killed on board fishing vessels for tissue sampling and age determination. The remaining fish are killed by bagging and freezing them for subsequent identification in a research laboratory. A legal issue is currently under consideration as to whether all discards used for research fall within the scope of the Wod and must be registered as animal procedures. If that is the case, the number of registered animal procedures involving other fish species will rise sharply.

The European Nature Restoration Regulation[8] (in force since August 2024) requires Member States to take measures to restore degraded ecosystems on land and at sea. This is likely to result in the government imposing further research and monitoring requirements involving animal procedures. However, it is currently unclear exactly what numbers this will entail. There are also growing concerns about the impact of human activities on animals, seas and rivers, including the construction of weirs, locks, pumping stations, wind farms and floating solar farms.

7 Guideline 'Experiments involving wild animals in their biotope' | Central Authority for Scientific Procedures on Animals
8 Policy on nature and biodiversity | Government.nl

4.5 Research for protection of the environment

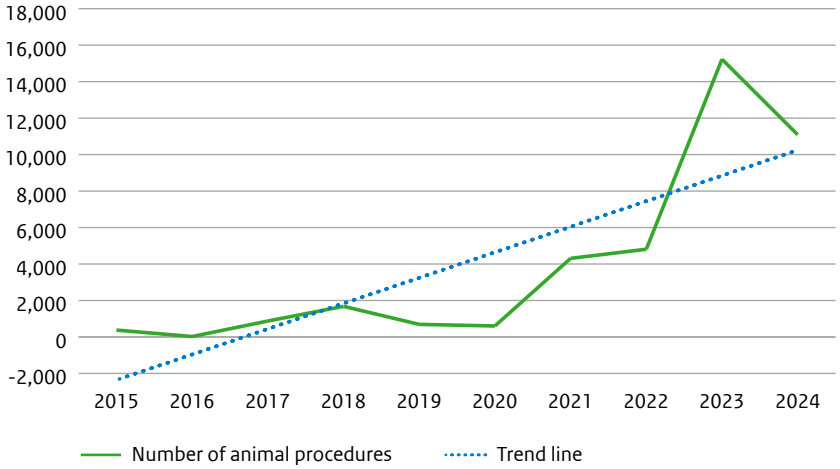
The research for protection of the environment category includes research involving animal procedures aimed at understanding phenomena such as environmental pollution, loss of biodiversity and epidemiological research on wild animals. Animal procedures conducted for ecotoxicological research to meet legal requirements do not fall under this research category; they are classified as regulatory research. Examples of animal procedures for protection of the environment include:

- **Ecotoxicology**
  Animal procedures focused on the effects of environmental pollution and other stress factors on organisms and ecosystems. This includes research into the impacts of chemicals, microplastics, electromagnetic fields, and their disruption, and the potential remediation of contaminated sediment. Examples include toxicity tests on fish, research into embryonic development in rays and sharks, bioaccumulation studies and research into immune responses in mammals.
- **Bird research and population dynamics**
  Animal procedures designed to measure the behaviour and population dynamics of birds, often in relation to changing environments. Examples include tracking migration patterns, analysing habitat use and monitoring populations. Techniques such as transmitter tagging and ring research are used for this purpose.
- **Fish research and aquatic ecology**
  Research into fish populations, migration, habitat use and food chains in aquatic ecosystems. Examples include telemetry research, tag-recovery research, and research on the safety of fish passages at pumping and hydroelectric power stations. This also includes research into nutrition and growth in cultivation systems.
- **Infectious disease and surveillance**
  This research domain focuses on monitoring and understanding infectious diseases in wild and captive animals, including zoonoses. These are usually birds, small mammals (e.g., rodents) and, in some cases, fish and poultry. Examples of animal procedures in this domain include serological research (blood sampling), vaccination research, transmission research and the detection of pathogens in animal populations.

Numbers

In 2024, research for protection of the environment accounted for around 3% of the total number of animal procedures in the Netherlands. This makes it a relatively small research category. Nevertheless, there has been a sharp rise in the number of animal procedures in this research category over the past 10 years. While 376 animal procedures were conducted for research for protection of the environment in 2015, this category has grown by 2,849%, reaching 11,090 animal procedures in 2024. This is the fastest-growing research category in terms of the number of animal procedures conducted in the Netherlands.

Figure 20. *Number of animal procedures in research for protection of the environment*



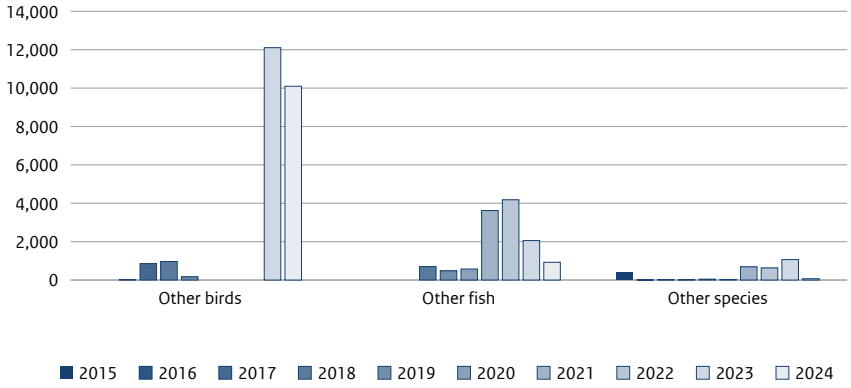
Line graph showing the number of animal procedures in the research for protection of the environment category. There is an upward trend between 2015 and 2024.

View data table 22

Animal species

In the research for protection of the environment category, animal procedures are mainly conducted on other birds and other fish. The number of animal procedures involving other animal species in this category is substantially more limited, typically ranging from a few dozen to 700 animals per year.

Figure 21. *Animal species used in research for protection of the environment*



Bar chart showing the animal species used in procedures within the research for protection of the environment category between 2015 and 2024. Procedures in this category are mainly conducted using other fish and other birds. Between 2021 and 2023, there was a peak in the number of procedures involving other fish; in 2023, there was an abrupt increase in the number of procedures involving other birds.

View data table 24

Causes

The interviews indicated that the majority of animal procedures involving other birds in the research for protection of the environment category are conducted in the interests of human or animal health or welfare as part of national surveillance programmes for infectious diseases. This includes animal procedures for monitoring avian influenza, West Nile virus, Japanese encephalitis virus and other infectious diseases that may pose a risk to humans or animals and are increasingly being detected in the Netherlands as a result of climate change.

Each year, 10,000–12,000 birds are caught for demographic research, from which blood samples, cloacal swabs and feathers are also collected. Blood sampling from these animals for scientific research is subject to the Wod and is conducted to monitor zoonoses. The notable increase in the number of registered animal procedures is largely due to an administrative shift. These animal procedures were previously recorded under fundamental research or translational and applied research, but now fall under research for protection of the environment following reclassification by the relevant agency. The number of animal procedures involving birds has remained relatively stable since 2020. The primary commissioning bodies for this study are the Ministry of LVVN (avian influenza surveillance), the National Institute for Public Health and the Environment (RIVM, arbovirus surveillance) and the EFSA (early warning for new avian influenza variants).

Example of zoonosis monitoring

In 2020, this form of monitoring led to the detection of the first case of a bird infected with West Nile virus in the Netherlands. Further research revealed multiple infections and led to the first diagnoses of patients hospitalized with a West Nile virus infection. By monitoring larger groups of birds, the spread of diseases can be identified early, allowing timely measures to prevent transmission to humans or animals.

Animal procedures involving other species include examinations of mammals for zoonotic infections, such as avian influenza viruses. Fish are primarily used to monitor contaminants in the water.

Future outlook

Blood sample analysis is essential for monitoring the occurrence and spread of zoonotic and other infections. The interviews show that these animal procedures cannot yet be replaced by alternative methods. Analysis of feathers could serve as a non-invasive method for virus detection in the future, but it is not yet sufficiently sensitive, according to researchers. In the future, hair or scales could be used to analyse for contaminants or pathogens. However, blood samples can reveal which infections an animal has previously contracted, even if the virus itself is no longer

detectable. As such, blood samples will remain important for detecting pathogens for the time being.

Samples can be taken from wild animals found dead, but this may lead to a distorted picture and is not suitable for reliable prevalence estimates. The host (the animal carrying the virus) does not always fall ill itself, and animal carcasses are often quickly eaten by scavengers.

The interviews also show that improved international cooperation and more effective sampling strategies—e.g., based on migration routes and high-risk species—could lead to a reduction in the number of animals that needs to be studied.

It is impossible to prevent the introduction and spread of pathogens via animals in the Netherlands, and surveillance is therefore considered essential. It is expected that animal procedures will still be necessary for this purpose in the near future and cannot be replaced by alternatives. Researchers indicate that, generally speaking, animal procedures will not need to exceed the current level of 10,000–20,000 per year. As a result, the number of animal procedures for research for protection of the environment is expected to remain roughly the same.

4.6 Research for higher education and training of vocational skills

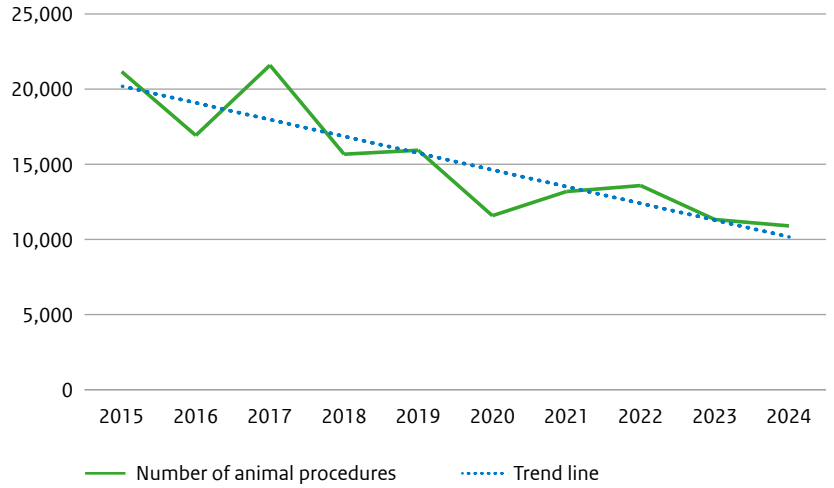
The research for higher education and training of vocational skills category includes animal procedures conducted to transfer knowledge and to teach and maintain practical skills within higher education. These are training programmes in which future professionals, such as veterinarians, doctors and biotechnology staff, learn to work with animals in a controlled environment and master specific techniques.

The emphasis in higher education is on imparting theoretical knowledge, but animal procedures are sometimes used to illustrate or explore the subject matter in greater depth. Training of vocational skills focuses specifically on the practical application of skills, such as surgical techniques, animal handling and other clinical or technical procedures. These training programmes are designed to enable participants to perform procedures safely and competently in a professional setting. Since 2021, these two components have been registered as separate categories of animal procedures. In previous years, they were recorded as a single combined category. This review uses the combined category of research for higher education and training of vocational skills.

Numbers

The combined category of research for higher education and training of vocational skills accounts for roughly 3% of animal procedures in the Netherlands every year. The number of animal procedures in this category has nearly halved, from 21,252 in 2015 to 10,899 in 2024, a decline of 49%. This decline appears to have slowed somewhat since 2020. Nonetheless, the proportion of this category in the total number of animal procedures has decreased from 4% to 2.6%.

Figure 22. *Number of animal procedures in research for higher education and training of vocational skills*



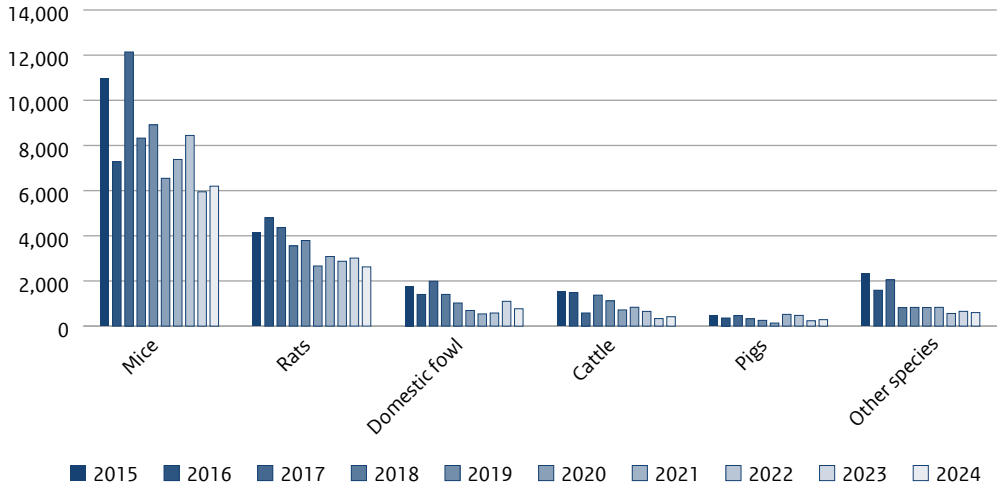
Line graph showing the number of animal procedures within the research for higher education and training of vocational skills category for the years 2015–2024. This category of animal procedures shows a downward trend.

View data table 25

Animal species

Animal procedures in the research for higher education and training of vocational skills category mainly involve mice. Rats are also used relatively frequently. Also domestic fowl, cattle and pigs are used fairly regularly in animal procedures within this category. There has been a downward trend in the number of animal procedures across all animal species over the past 10 years.

Figure 23. *Animal species used in research for higher education and training of vocational skills*



Bar chart showing the most commonly used animal species in animal procedures in the research for higher education and training of vocational skills category for the years 2015–2024. The number of animal procedures has declined across all animal species during this period.

View data table 27

The number of animal procedures involving mice varies from year to year, but shows an overall downward trend. The number of procedures with mice decreased with 44%, from 10,977 in 2015 to 6,197 in 2024. The number of animal procedures involving rats declined from 4,156 in 2015 to 2,623 in 2024, a 37% reduction. As with rodents, the number of animal procedures involving pigs declined by around 40%, to 286 in 2024. The reduction was most pronounced for animal procedures involving domestic fowl and cattle, with a decline of 57% and 73% respectively. In 2024, 768 domestic fowl, 416 cattle and 286 pigs were used for animal procedures in the research for higher education and training of vocational skills category. A total of 599 animal procedures were conducted using all other animal species (e.g., zebrafish, rabbits and guinea pigs) in this category in 2024, a 74% decrease compared to 2015.

Causes

In the survey, researchers indicated various reasons for the decline in the number of animal procedures within the research for higher education and training of vocational skills category. For example, available material is utilised more efficiently by making use of residual tissues or abattoir waste. An increasing number of non-animal methods are also being used, such as replacing the use of animals in teaching with 3D-printed models, plastinates (plasticised dead animals), in silico (VR) anatomical models, film footage, or students practising procedures on phantoms (non-living models, such as an artificial rat, cow or body part). Animal procedures are also being replaced by the use of human and animal donor cadavers, and veterinary training procedures are increasingly being practised on real animal patients. Refinements also play a role in reducing the number of animal procedures, such as the habituation and training of animals so that they cooperate voluntarily during procedures. This can reduce the level of pain, suffering, and distress caused by certain procedures to such an extent that these animal procedures are no longer subject to licence and registration requirements.

Example of non-recovery procedures

Compared with other categories, the research for higher education and training of vocational skills category has a relatively high number of non-recovery animal procedures under full anaesthesia. While other categories sometimes have virtually no animal procedures in this severity category for several years, the figure in this research category has ranged between 11% and 30% in recent years. The survey shows that this is linked to the training of surgical skills by veterinarians and medical professionals. For example, heart surgery is practised on pigs, after which the animals do not recover from anaesthesia.

Researchers also note that various refinements are being implemented to reduce suffering, such as improved administration of anaesthesia and analgesia (including the use of new agents) and the involvement of an anaesthetist and an anaesthesia assistant for each individual laboratory animal during dissection sessions involving pigs. Less stressful handling techniques are also used in research involving mice and rats, and the animals are provided with better housing conditions (e.g., additional enrichment) to reduce stress.

Future outlook

There is a strong focus on refining, reducing and replacing animal procedures in this category, as is evident from the vision for animal-free innovation in higher education published in 2022 by Universities of the Netherlands (UNL) and UMCNL (formerly NFU), the umbrella organisation of the Dutch university medical centres[9]. The bachelor programme in veterinary medicine has now become entirely free of animal procedures by implementing alternative methods. It would be logical to expect the number of animal procedures to decline further, yet most survey respondents expect the number to remain roughly the same, as certain educational and training purposes require intact, functioning organisms. This is the case, for example, when training biotechnologists and researchers in specific laboratory animal procedures, as well as veterinarians and surgeons. These specialist skills must not only be acquired, but also periodically refreshed.

4.7 Creation and maintenance of genetically altered animals

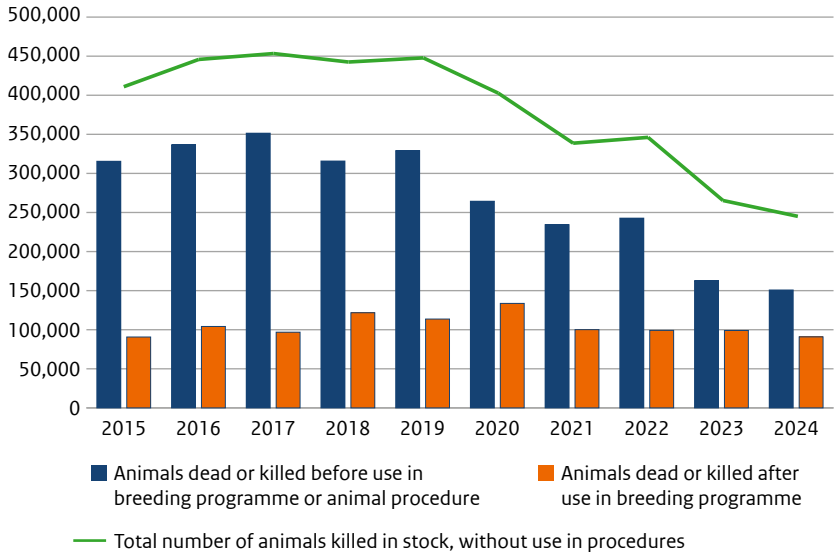
Surplus animals

In the Netherlands, animals are bred for research purposes, but not all animals bred are actually used in animal procedures. Some of them are used as dams and breeder males in breeding programmes. It is also common for some of the bred animals to be unsuitable for the intended procedure. Factors that may play a role include sex, weight, age and genotype (hereditary characteristics). These surplus-bred animals that are not used in procedures are classified as ‘surplus animals’ and are typically ‘killed in stock’.

Laboratory animals not used in animal procedures are also covered by the Wod (Section 1.b.3), and establishment licence holders (organisations that have been granted a licence by the NVWA to care for, house and breed laboratory animals and conduct animal procedures) are obliged to register animals that have died or been killed without having been used in an animal procedure. Since 2014, a distinction has been made between animals dead or killed after use in breeding programmes and animals dead or killed *before* use in breeding programmes or animal procedures (e.g., due to unsuitability for animal procedures). Although these are not animal procedures from a legal perspective, they involve a significant number of animals in relation to the number of animal procedures conducted each year. The total number of surplus animals killed has declined by 40% since 2015, from 406,175 to 241,683. However, this decline only became apparent from 2019 onwards, when 442,767 surplus animals were killed. The decline is almost entirely due to fewer animals being killed before use in breeding programmes or animal procedures. A total of 315,487 surplus animals were killed in 2015; that figure was 150,809 in 2024, a 52% decrease. The number of animals used for breeding but not in animal procedures (killed after breeding) in 2024 was virtually the same as in 2015: 90,874 compared with 90,688, respectively.

9 Ambition statement on innovation in higher education using fewer laboratory animals | Netherlands National Committee for the protection of animals used for scientific purposes

Figure 24. *Number of surplus animals*



Bar chart showing the number of surplus animals. The number of animals dead or killed after use in breeding programmes and not used in animal procedures has remained roughly the same between 2015 and 2024. The number of animals dead or killed before use in breeding programmes or animal procedures shows a downward trend since 2019.

View data table 28

Creation and maintenance of genetically altered animals, not used in other procedures

The breeding of laboratory animals is generally not registered as an animal procedure. However, in certain cases, the breeding of genetically altered animals is registered as an animal procedure. Implementing Decision (EU) 2020/569 defines the term 'genetically altered animals' as:

- genetically modified (such as transgenic, knock-out, knock-in and other forms of genetic alteration) and induced mutant animals (irrespective of the type of mutation);
- animals with spontaneous deleterious mutations maintained for research for that specific genotype.

The genetically altered animals category in the animal procedures registration includes both genetically altered animals and animals originating from lines with spontaneous or induced harmful mutations. Maintaining a genetically altered line is only registered as an animal procedure if the animals experience equal or greater levels of pain, suffering, distress or long lasting harm than the threshold described in the Wod. These lines are considered to have a 'pathological phenotype'.
Creating a *new* genetically altered line with a potential pathological phenotype also constitutes an animal procedure. When creating such a genetically altered line, the level of suffering must be monitored for at least two generations (or until the genetic alteration is stably inherited) to assess welfare. The Dutch implementation policy on the generation, breeding, genotyping, monitoring and housing of genetically altered animals was revised on 1 January 2023 (revised guidance document 'Generating, breeding, genotyping, monitoring and maintaining genetically altered animals').
The most significant change was that this monitoring phase of a new genetic line has become subject to authorization and registration requirements. Before 2023, this was only required once a pathological phenotype was identified during welfare monitoring. In addition, fin clipping (the removal of a small piece of fin tissue under anaesthesia) for genotyping zebrafish is now covered by the definition of an animal procedure.

All animal procedures used to create a genetically modified line that have induced above-threshold levels of pain, suffering, distress or long lasting harm, in the animals are also registered under the creation and maintenance of genetically altered animals. This includes procedures for the creation of vasectomised males, superovulated oocyte/embryo donors, foster/surrogate mothers and, where applicable, founders (first-generation animals of a new genetic line). For a new genetic line in which the possibility of pain, suffering, distress or long lasting harm cannot be ruled out, all offspring must be registered as an animal procedure for at least the first two generations or until the genetic alteration is stably inherited.

The creation and maintenance of genetically altered animals category also includes the re-derivation of lines. This is a technique for eliminating viral, bacterial or parasitic contamination from a line of laboratory animals. The process involves the transfer of embryos from an infected or potentially infected dam to a clean surrogate mother. Re-derivation is only registered as creation and maintenance of genetically altered animals when performed solely for scientific purposes (i.e., not for the health

or welfare of the colony) to maintain a stable line and for animals used for embryo transfer or vasectomy.

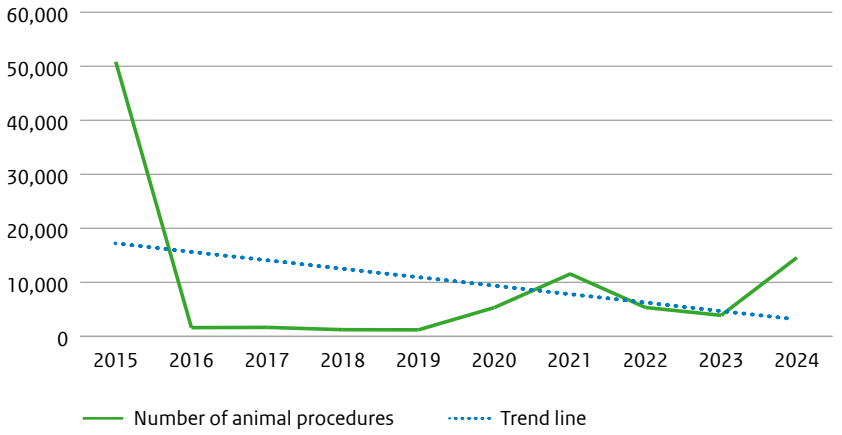
When breeding laboratory animals, it is standard practice to determine or verify the offspring's genotype. This is often done by analysing tissue obtained by marking the animals for identification purposes, such as tissue taken during a toe clip or ear notch. This is usually not considered an animal procedure because procedures with animal identification as the primary purpose do not fall under the Wod (Art. 1B(7)(e) Wod). However, invasive procedures performed solely for genotyping, rather than for identification, are considered animal procedures under the Wod. These procedures must be registered as creation and maintenance of genetically altered animals.

In all of the above cases, animals are only registered in the creation and maintenance of genetically altered animals category if they are not used in any other procedures. Animals that are also used in other scientific procedures are registered in the research category applicable to those procedures.

Numbers

This research category shows a sharp 97% decline in the number of animal procedures between 2015 and 2016, from 50,843 to 1,621. The numbers remain relatively stable from 2016 to 2019, ranging between 1,211-1,667 procedures per year. An increase is visible again from 2019 onwards, which appears to accelerate in 2024, increasing to 14,444 procedures. According to the researchers queried, the increase in 2024 is largely attributable to the aforementioned redefinition of this category in the CCD's implementation policy, which was harmonised with Directive 2010/63/EU in 2022. After a transition year in 2023, a larger share of animals used for the creation and maintenance of genetically altered animals has fallen under the definition of an animal procedure since 2024. This accounts for part of the registered increase.

Figure 25. *Number of animal procedures in creation and maintenance of genetically altered animals*



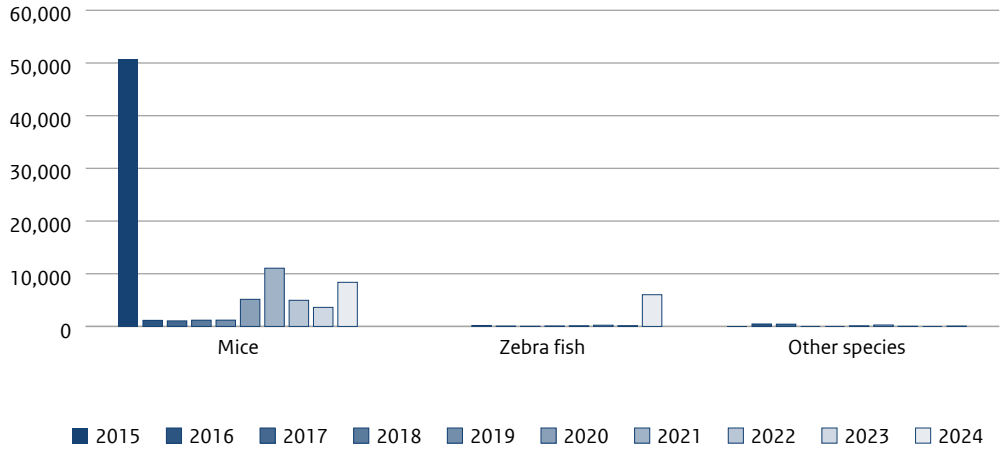
Line graph showing the number of animal procedures in the creation and maintenance of genetically altered animals research category between 2015 and 2024. Following a decline in 2016, the number of animal procedures remained relatively constant before showing an upward trend from 2019 onwards.

View data table 29

Animal species

Animal procedures in the creation and maintenance of genetically altered animals category mainly involve mice and, since 2024, zebrafish. There was a sharp decline in the number of animal procedures involving mice after 2015. Between 2016 and 2019, the number of animal procedures involving mice was approximately 2% of the 2015 figure. This was followed by an increase to 8,371 mice in 2024. Between 2015 and 2023, the number of animal procedures involving zebrafish ranged between 0-235 per year. In 2024, this number abruptly increased to 6,021. Researchers say this is due to the introduction of a new policy on fin clipping.

Figure 26. *Animal species used in creation and maintenance of genetically altered animals*



Bar chart showing the most commonly used animal species in procedures in the creation and maintenance of genetically altered animals research category between 2015 and 2024. In 2016, the number of animal procedures involving mice decreased sharply in 2016 but increased again from 2020 onward. There are virtually no animal procedures involving other species, with the exception of procedures on zebrafish, which began to increase in 2024.

View data table 31

Causes

The number of animals registered in the creation and maintenance of genetically altered animals category has shown a remarkable trend: a sharp decline followed by a recent increase. The interviews reveal that the reduction in the number of animals used for breeding programmes is linked to the centralisation of breeding management. Breeding activities have been transferred from individual researchers to specialised breeding coordinators. Improved specialisation and coordination, combined with techniques such as cryopreservation and CRISPRCas technology, have led to a substantial decrease in the number of animal procedures in the creation and maintenance of genetically altered animals category and in the number of surplus animals killed in breeding facilities.

Example of the effects of centralisation and specialisation

Concentrating all breeding lines within a specialised breeding department led by a breeding coordinator ensures a more efficient breeding process. Closer coordination with researchers and a concentration of breeding expertise means fewer animals are bred unnecessarily. Additionally, the cryopreservation of lines that are not active in research significantly reduces the number of animals needed to maintain genetically modified lines. The implementation of CRISPR-Cas technology also has a major impact on the number of breeding animals required. Where researchers previously had to crossbreed complex breeding lines over several generations to produce animals with multiple genetic modifications, CRISPR-Cas now enables the introduction of numerous mutations into a single animal, drastically reducing the number of breeding animals required.

Future outlook

Given the recent changes to the implementation policy, the number of animals involved in the creation and maintenance of genetically altered animals is expected to continue to rise slightly in the near future. In the medium term, the further expansion of cryopreservation (possibly within a national mouse bank) and the development of alternative genotyping methods (e.g., skin swabs or eDNA in zebrafish) may help mitigate this increase.

5.

Conclusions and recommendations

Overall, the data shows that the number of animal procedures has decreased by 20% over the past 10 years. This decline is heavily concentrated in certain research categories, while others are growing. The NCad notes that the developments and expectations outlined in this report are based on 'hard' registration data and on the perceptions of professionals form all animal procedure registration categories, as gathered through interviews and surveys. These insights are valuable and are therefore briefly presented here by the NCad within the broader context of social, scientific and policy developments. 'Briefly', as a more detailed examination of these developments and the ongoing strategic and systematic efforts to transition from animal procedures to alternatives—and thus to further reduce the use of animal procedures—will be included in the NCad's Transition Advice 2.0, to be published in autumn 2026.

Severity

Around three-quarters of animal procedures in the Netherlands are classified as mild or non-recovery. Around a quarter of animal procedures are classified as moderate. The number of procedures classified as severe has decreased by 75% over the past decade, accounting for around 1% of the total since 2018. This reduction in severe suffering is mainly due to refinements in research methods. Continuous non-invasive measurements enable more accurate monitoring of animal welfare, meaning that fewer animals are required per study and that animal procedures can increasingly be terminated before severe suffering occurs. The use of historical data has also largely eliminated the need for challenge trials for vaccine quality control, in which animals can become seriously ill. Another outcome of refinement may be that procedures involving mild suffering are reduced to such a low level of suffering that they fall outside the scope of the Wod and registration requirements.

Animal species

The vast majority of animals used in animal procedures are mice, rats, other fish and domestic fowl. The number of animal procedures involving mice has roughly halved over the past 10 years. The number of animal procedures with rats and domestic fowl has also decreased by 24% and 46%, respectively. This is mainly due to a decline in the number of animal procedures in fundamental research and translational and applied research. The number of procedures with rabbits has risen by 19%, partly due to increased demand for reproductive toxicology research for legislative and regulatory purposes. The number of animal procedures involving other fish has risen

by 151% over the past ten years. This is mainly due to research for the preservation of species driven by policy questions raised by the government. If this trend continues, it is not unlikely that other fish species will become the most commonly used animal species in animal procedures in the Netherlands.

Research categories

There are various trends in the number of animal procedures across the different research categories. The traditionally large categories of fundamental research and translational and applied research have seen the number of animal procedures almost halve over the past decade, reducing their combined share of the total number of animal procedures from 56% in 2015 to 39% in 2024. There are various reasons for this. The survey and interviews show that refinement plays an important role, as it allows more information to be obtained from each animal, thereby reducing the number of animals (i.e., animal procedures) required. Refinements have also reduced the level of suffering in certain animal procedures to such an extent that those procedures are no longer subject to licence and registration requirements. One of the most frequently cited factors is the rising cost of animal procedures. Although funding for biomedical research has increased, the survey suggests that less funding is being allocated to animal procedures (depending on the funding body). This implies that funding for alternative (non-animal) methods has increased substantially. However, it is not possible to quantify the direct impact of funding on changes in the number of animal procedures and alternative research methods.

According to researchers, new methods (such as NAMs) are increasingly being used and have a positive effect on the quality and translational value of animal procedures. However, they are not interdependent systems; each has its own specific qualities and limitations. The survey indicates that many researchers regard NAMs as a valuable addition to animal procedures, but that NAMs are not yet able to fully replicate all aspects of the complexity and physiology of humans and animals; consequently, they believe that animal procedures will continue to play a role in understanding disease processes and developing therapies for the time being. Because there is no record of which animal procedures have been replaced by NAMs, their contribution to the observed decline cannot be quantified with certainty. However, NAMs are helping to refine animal procedures, as research questions requiring animal procedures are becoming more specific. Researchers also point out that alternatives for certain purposes have not yet been sufficiently validated and standardised. This is considered a major barrier to replacing animal procedures with alternative methods, particularly in regulatory research. Furthermore, the NCad notes that the predictive value and translatability of animal procedures have limitations and argues that a stronger ethical assessment is needed within animal research. Individual NAMs also have limitations. As such, there is a growing focus on integrated approaches that combine NAMs, human data and clinical research to develop more human-relevant and innovative research methods.

There has been a sharp increase in the number of animal procedures in the research for the preservation of species and research for protection of the environment research categories. The total number of procedures across both categories rose from 22,631 to 100,645 over a ten-year period. This is an increase of 344%. Ten years ago, the combined share of these two categories was relatively small, at 4%. In 2024, this rose to nearly 24% of all animal procedures in the Netherlands. Research for the preservation of species has become a particularly prominent category, now accounting for nearly a fifth of all animal procedures in the Netherlands. The demand for this type of research stems mainly from research questions raised by the government in the areas of nature restoration, biodiversity, the Water Framework Directive, population estimates and the threat of zoonoses. Key factors include national and European legislation and regulations, as well as their implementation by the relevant authorities. As this research largely involves capturing and tracking wild animals (mainly fish and birds), the possibilities for replacing animal procedures are currently limited. For this research category, this calls for a reflection on the overall intended phaseout of animal procedures, for which we refer to the forthcoming Transition Advice 2.0. Based on the interviews, we expect national and international regulations regarding nature restoration, environmental protection and framework directives to increase, leading to a further rise in the number of animal procedures in this category in the near future.

At present, regulatory research is the largest research category involving animal procedures in the Netherlands. The number of animal procedures in this category has decreased by only 4% over the past 10 years, and accounted for approximately one-third of the total number of animal procedures in 2024. Financial constraints are less of an issue than in scientific research, as animal procedures within regulatory research are commercially funded. According to the researchers involved, opportunities to reduce the number of regulatory procedures through replacement

and refinement are limited under current (European) laws and regulations. This is because regulatory requirements are statutory, and strict regulations govern the research methods to be used. Non-animal alternatives are often not accepted by the relevant authorities as substitutes for animal procedures due to a lack of validation, standardisation and availability of information on the validity and reliability of results. Policy developments, such as the recently adopted EU 'Roadmap towards phasing out animal testing for chemical safety assessments' and Next Generation Risk Assessment, may play an important role in the validation and acceptance of alternatives, an area which requires greater attention.

The creation and maintenance of genetically altered animals, research for higher education and training of vocational skills and forensic enquiries are relatively small research categories, together accounting for around 5% of the total number of animal procedures. The creation and maintenance of genetically altered animals declined sharply in 2016 due to new technological developments in cryopreservation and genetic modification (CRISPR-Cas). Centralisation has also significantly improved the quality, efficiency, and coordination of the breeding programme (i.e., by aligning breeding efforts with research needs). Since 2020, the number of animal procedures for the creation and maintenance of genetically altered animals has started to increase again with a noticeable acceleration in 2024. The interviews indicate that this increase is primarily due to the harmonisation of the Wod with Directive 2010/63/EU, resulting in a larger proportion of breeding activities now falling under the definition of an animal procedure. The number of animal procedures for educational and training purposes has roughly halved over the past 10 years, mainly due to the introduction of alternatives.

Future outlook

Predicting future trends in the number of animal procedures in the near future is extremely complex. As the Dutch animal research sector is relatively small, individual research projects can lead to large fluctuations, particularly in smaller research categories or domains. In addition, hard-to-predict factors (e.g., financial developments, unforeseen social needs, pandemics, political and administrative changes and revisions to laws and regulations) can have a significant impact. Developments in the 3Rs, non-animal methods, and technological progress generally have a dampening effect on the number of animal procedures; that effect is expected to increase, though not to the same extent across research categories.

Most researchers in fundamental research and translational and applied research indicated in the survey that they do not expect the number of animal procedures to decline sharply in the coming years, as the main reduction mechanisms have now been widely implemented. They expect any further decline in the coming years to be gradual. This potential trend calls for a strategic commitment to the transition to a society in which scientific research is conducted without the use of animal procedures.

The number of animals used in research for the preservation of species and research for protection of the environment has increased sharply over the past 10 years. Interviewees indicated that the European Nature Restoration Regulation is expected to result in additional monitoring obligations. In addition, there is a legal question regarding research on discards (specifically, whether by-catch sent in by fishermen for research falls within the scope of the Wod). If all by-catch used for research were formally classified as animal procedures, the number of procedures for protection of species could increase by 100,000 or more per year. Based on the interviews, the number of animal procedures in these categories is expected to continue to rise in the near future.

The size of the regulatory research category has remained virtually unchanged over the past 10 years. The requirements for animal procedures are primarily set at the European level (ECHA, EFSA, EMA) and REACH has not yet been fully implemented. The interviews indicated that the number of animal procedures is not expected to decrease significantly in the short term. Contributing factors include a continued backlog within REACH (particularly in reproductive, developmental and chronic ecotoxicity), adjustments to testing requirements for endocrine-disrupting substances, and a growing demand for neurotoxicity testing (DNT), including as part of biocide regulatory requirements. In addition, the periodic re-registration of agrochemicals and increasingly stringent requirements lead to a sustained demand for animal procedures.

Initiatives such as the EU 'Roadmap towards phasing out animal testing for chemical safety assessments', adopted on 1 June 2026 and Next Generation Risk Assessment could play a significant role in phasing out animal procedures for regulatory research.

The number of animal procedures involving the creation and maintenance of genetically altered animals has fallen by 72% compared to 2015. However, the review of the Dutch implementation policy on genetically altered animals (2023) and the introduction of a registration requirement for fin clipping in zebrafish have led to a recent increase in the number of procedures. This increase is likely to continue in the coming years. However, this is an administrative artefact; in practice, no more animals are being bred, but a larger proportion of breeding activities is now classified as creation and maintenance of genetically altered animals.

Europe's ambitions regarding strategic autonomy may further increase the demand for independent scientific research within Europe. This underscores the importance of accelerating the development, validation and implementation of alternatives to animal procedures (NAMs), including the use of AI (digital twins, synthetic data, etc.), not only as an ethical objective, but also as a prerequisite for accommodating future research needs in an alternative manner.

Areas of focus

Based on the trends and developments outlined above, the overall outlook is that, if current policy and practice continue, the structural decline in knowledge-driven animal procedures is likely to persist but stabilise somewhat. At the same time, the need for regulatory animal procedures is expected to remain stable or continue to increase. The number of policy-driven animal procedures has risen sharply in recent years and is expected to continue to increase. Extrapolating these trends suggests that the total number of animal procedures will likely stabilise in the short term and may begin to rise in the medium term. Preventing and reversing this stabilisation or potential increase requires active transition policies from the European and Dutch governments. The study identifies the following areas of attention where opportunities and barriers exist to further reduce animal procedures and limit the risk of future increases.

Government and policy

Analysis of registration data, the survey and the interviews shows that government-driven research questions account for a large and growing share of animal procedures conducted in the Netherlands. Multiple ministries have policy interests in the animal procedures dossier, and these interests often also play a role in an international context (science, safety, public health, environment). Although animal procedure policy aims to reduce the number of procedures, the data shows that a growing share of Dutch animal procedures are conducted to comply with laws and regulations and to advance policy issues, such as the protection of species, area and water management and regulations concerning chemicals and medicinal products. In 2024, more than half of all animal procedures in the Netherlands fell into these three categories, compared with 30% in 2015. In the Netherlands, this primarily concerns safety testing for industrial chemicals, regulations on fisheries, environmental protection and nature conservation, and compliance with regulations at the European level. This makes the government a major driver of animal procedures, both directly and indirectly.

The NCad has no information regarding the government's awareness of the impact of its policy choices on the number of animal procedures and recommends that the interests of laboratory animals should carry greater weight in policy development. This could involve impact assessments of how policy changes affect animal procedures, as well as careful policy alignment among ministries, within ministries, and with local authorities.

Interpretation, transparency and provision of information

Transparency and clear interpretation of registration data are essential for both policymaking and public accountability regarding the use of laboratory animals. The varying trends in the data, objectives and nature of the underlying scientific questions and studies provide policymaking and executive bodies with deeper insight and opportunities to develop effective policies. This type of project-specific information is made publicly available during the licensing process as a non-technical summary (NTS). One way to improve transparency could be to link the current animal procedure register to the NTS database.

This qualitative analysis by the NCad shows that new non-animal methods are being used in various categories of research. These have a positive effect on the quality of animal research, reduce the number of animal procedures, and decrease animal suffering. However, the impact of NAMs on the number of animal procedures cannot be quantified due to a lack of registration data. The NCad notes that it may be valuable to establish mechanisms to provide a clearer picture of the implementation and effects of alternatives to animal procedures and to identify opportunities for increasing the impact of NAMs. One of the programmes launched by LVVN to this end is the 'Beyond Animal Testing Index' (BATI), which aims to highlight progress in the transition towards animal-free innovation.

Given the insights and analyses made possible by the dataset used, it would be desirable to enable more frequent and automated analyses of animal procedure data. This would help detect developments more quickly and allow for more targeted policy management. The combination of quantitative data and qualitative insights (interviews and survey) also offers opportunities to identify best practices and to monitor and evaluate animal procedures in the Netherlands more systematically.

Policy on the 3Rs and alternatives

The analysis of registration data, the survey and the interviews shows that the number of animal procedures for fundamental research and translational and applied research has declined steadily in recent years. The qualitative research indicates attention to animal welfare and the 3Rs, as well as a general willingness to adopt innovations and alternatives. However, the NCad notes that the research categories differ substantially in their objectives, research questions, drivers, funding structures and the options and limitations associated with the 3Rs and alternative methods. Therefore, vision statements drafted by the various categories and domains themselves are an important instrument for identifying and implementing developments that will contribute to a further reduction in the number of animal procedures within the respective category.

The qualitative research also highlights the following general points for further stimulating the refinement, reduction and replacement of animal procedures:

- The NCad notes that refinements not only contribute to the welfare of laboratory animals and the quality of research and its results, but they also lead to a tangible reduction in the number of animal procedures and associated suffering.
- Researchers indicate that, at present, research using alternative methods (NAMs) and research using animal procedures are largely separate spheres. Alternatives that could potentially replace animal procedures are often not developed with that specific purpose in mind. Researchers who conduct animal procedures are generally willing to reduce the use of animal procedures. At the same time, some researchers have limited expertise in alternative methods, which means they are not always up to date with the latest developments. The NCad therefore concludes that encouraging cross-fertilisation between research using alternatives and research using animal procedures can make a significant contribution to the further improvement of scientific research and the replacement, reduction and refinement of animal procedures.
- The centralisation of animal procedure facilities and specialist techniques at regional and national levels could lead to a reduction in animal procedures. By pooling expertise and resources and utilising specialised technologies, complex research can be conducted more efficiently and reliably than if these resources and expertise were spread across different locations. The NCad therefore concludes that consolidating activities related to breeding, specialised techniques and/or research categories can help further reduce and refine animal procedures, while also improving the quality of research involving animals.
- The interviews indicate that privacy legislation can sometimes impede the exchange of human samples and data. Data sharing and open-data mechanisms (anonymised databases, database standardisation and mandatory data deposition after patent approval) are also mentioned as ways to prevent duplicate research and improve research design. The NCad notes that improving access to human samples and data, as well as enhancing the sharing of existing research data, can play an important role in advancing the replacement, reduction and refinement of animal procedures.

Final considerations by the NCad

This report shows that the Dutch animal procedure landscape has changed drastically over the past 10 years, but also that a further decline in animal procedures is not self-evident. Technological progress, refinement and non-animal methods demonstrably contribute to a reduction in animal procedures, whereas policy and regulations generate new research questions that lead to additional animal procedures.

The findings in this report are based on insights from the field and provide a view of current practice, perceptions and expectations. At the same time, the NCad notes that this practice is developing within a broader context of national and European social and political ambitions aimed at reducing and ultimately replacing animal procedures.

The transition to animal-free research is not a linear process but is shaped by a complex interplay of socio-cultural and scientific developments, institutional choices, and national and international regulations. A further reduction in the number of animal procedures will not automatically follow from technological progress or initiatives from within the sector alone.

The NCad therefore considers it necessary for policy decisions to be directed more explicitly and consistently towards accelerating the development of non-animal alternatives. This will support the transition to a society in which scientific research is conducted without the use of animal procedures. The NCad calls for attention to structural barriers within the system, such as the validation and acceptance of alternative methods and the way in which national and European legislation influences the use of animal procedures, both positively and negatively.

Given the significant share of EU-level legislation, particularly in regulatory research, this also presents an important avenue for policy influence. The NCad considers it important for the Netherlands to continue to play an active role in European forums to pave the way for the acceptance and implementation of non-animal methods.

The insights from this report will form a key basis for Transition Advice 2.0, which the NCad will publish in the autumn of this year. In Transition Advice 2.0, the NCad will provide more specific advice on the necessary policy choices, governance tools and international engagement required to accelerate the transition.

A further and structural reduction in the number of animal procedures can only be achieved through a targeted, consistent, and internationally coordinated approach.

Impact and follow-up

The conclusions and recommendations set out in this advisory report are intended to serve as building blocks for further policy development and for the continued development of non-animal methods. This supports the transition to a society in which scientific research is conducted without the use of animal procedures. The NCad expressly regards this report as an interim step. The findings will be incorporated into Transition Advice 2.0, which is scheduled for publication in autumn 2026. This advice—taking into account the trends and bottlenecks identified in this report—will more concretely address how these findings can be translated into practical courses of action for government, research institutions, and other relevant public and private parties, including the necessary national and international (primarily European) policy efforts.

Furthermore, the NCad considers it important that developments in animal procedures and non-animal alternatives, as well as the effects of relevant policy, are monitored structurally and systematically. To this end, the data and analytical methods used in this report provide a valuable foundation. Further enhancement of monitoring and evaluation can support more continuous, targeted and evidence-based steering of developments—including through improved data accessibility, collection, connection and use, as well as further development of data analysis with real-time or near-real-time interpretation where possible. This will enable the government, the research community and practitioners to act in a more coordinated manner and to be transparent and accountable to the relevant stakeholders and society at large.

Appendix 1: Advisory request

On 27 August 2024, Minister Wiersma of Agriculture, Fisheries, Food Security and Nature requested the NCad to issue an advisory and provide further clarification on the NVWA's annual publication of animal procedure figures. In this letter (reference number DGA 86441100), she asks the NCad for advice on how this might be achieved.

"*I hereby request the Netherlands National Committee for the protection of animals used for scientific purposes (NCad) to issue an advisory opinion. The advisory request concerns an interpretation of the animal procedure figures in a broader perspective and context than the one presented annually in 'Zo doende' by the Netherlands Food and Consumer Product Safety Authority (NVWA). The expectation is that this will provide better insight into the underlying dynamics and into the options and limitations for meeting the wishes of society and Parliament to further phase out the use of animal procedures.*

Background and societal context
Despite various technological developments and innovations, animal procedures remain necessary to safeguard the health and safety of humans, animals and the environment.
The NVWA oversees the use of laboratory animals in the Netherlands; it registers the number of animal procedures conducted and publishes an annual overview. After several years of decline, followed by a stable period, the past two years have shown a slight increase in the use of animal procedures in the Netherlands, despite growing attention for the development of non-animal methods such as organ-on-a-chip, research using human tissue and other approaches including systematic reviews and computer simulations.

The number of animal procedures published by the NVWA is an absolute figure; it is not presented in relation to the total volume of research. It is therefore not possible to determine whether the share of animal-based research relative to the total research volume has decreased, remained stable or increased. Animal-based research is also continually evolving: new, rapidly advancing techniques may increase the use of laboratory animals. Animal-based research is broad and diverse. It may be necessary to focus on specific research domains to obtain relevant insights.

Advisory request

1. *Broader insight into annual animal procedure figures*
    a. *Analysis of the annual figures over a longer period (>5 years).*
    b. *What trends or changes can be observed per primary objective?*
    c. *What trends or changes can be observed within specific research domains?*

2. *A look ahead*
    a. *What trends or changes can be expected in the coming years?*
    b. *What effects might these developments have on the annual figures?*

Plan of action

I ask that you draw up a clear plan before developing the advisory report, setting out the question, method, analysis and timeline. I also ask that you explain which choices have been made (e.g., selection of research domains) and why. I request that the NCad inform me about this within one month of the date of this letter. I would like the advisory report to include information on how figures and experts have been involved and how this information has been weighed in developing the advice.

I would appreciate continuing discussions with you at the administrative level regarding this request, the progress and your findings. I wish the NCad all the best in preparing this advisory report."

On 7 November 2024, the NCad sent the following response to the Minister for Food Security, Fisheries and Horticulture Rummenie:

"Following the letter dated 27 August 2024 from the Minister of Agriculture, Fisheries, Food Security and Nature, registered under reference number DGA 86441100, the NCad has decided to address the advisory request concerning the interpretation of animal procedure figures within the limits of its current capacity. The NCad considers it feasible to develop an overview of trends and developments in animal procedure figures in the Netherlands. It can also acquire further insight into the underlying dynamics and the potential options and limitations for further reducing the number of animal procedures in the Netherlands. Given its current capacity, however, the NCad does not consider it feasible to assess the animal procedure figures in the context of biomedical research as a whole.

To arrive at a well-considered advisory report, the study will consist of two phases.

Exploratory phase: quantitative analysis of the animal procedures register

In the exploratory phase, the NCad will conduct a detailed analysis of the annual registration figures published by the NVWA and map the historical development of trends and changes in animal procedure figures by primary objective and relevant sub-domains. The NCad will look back up to 10 years, to 2014, when the revised Experiments on Animals Act entered into force. Through this quantitative analysis, the NCad expects to identify areas of interest for further analysis in the second, in-depth phase. The NCad expects to complete the first phase in the first quarter of 2025.

Indepth phase: qualitative interviews

In the in-depth phase, the driving factors and dynamics within specific domains will be further examined, as well as the potential options and limitations for phasing out or replacing animal procedures in those domains. The NCad expects to deliver the second phase of its study and the accompanying advisory report in the fourth quarter of 2025.

Looking ahead

In her letter, the Minister also asks for our expectations regarding trends and developments in the coming years and the possible effects on annual figures. The NCad will extrapolate its findings to the future, but considers the practical value of such predictions to be limited, particularly over the longer term. This is due to the multitude of influencing factors, some of which are unknown or cannot be anticipated in advance, such as the possibility of a crisis or pandemic.

I hope this provides sufficient clarity on how we intend to address this advisory request.

Appendix 2: Survey

This Appendix describes the survey sent out by the NCad.

Background questions

1. What is your name?

   .....

2. What type of organisation do you work for? One answer only.
   - ☐ University
   - ☐ University Medical Centre
   - ☐ University of Applied Sciences
   - ☐ Research institution involved in animal procedures
   - ☐ Research agency involved in animal procedures
   - ☐ Contract research organisation for animal procedures
   - ☐ Company with an in-house research department involved in animal procedures
   - ☐ Other, namely: .....

3. What is the name of your organisation?
   - ☐ .....
   - ☐ I would like my response to remain anonymous

4. What is your position within this organisation?
   - ☐ .....
   - ☐ I prefer not to share this information

5. Are you involved in animal-based research?
   - ☐ Yes, I am involved in animal-based research
   - ☐ No, I am not involved in animal-based research in any way → Skip to end of questionnaire (question 35)

6. How are you involved in animal-based research? Select all that apply.
   - ☐ I conduct my own research
   - ☐ I manage a research group
   - ☐ I manage a research department
   - ☐ I manage my organisation's animal research facility
   - ☐ I work in an animal research facility (animal caretaker/biotechnician)
   - ☐ I supervise animal procedures within my organisation
   - ☐ Other: .....

7. How long have you been involved in animal procedures? Please provide an estimate in years.

   .....

8. The animal procedure register distinguishes between different research categories. In which category or categories do you conduct research? Only select the categories in which you are personally involved or have insight into. Note: If you do not conduct research yourself, you can complete this question on behalf of your research group, department or organisation.
   - ☐ Fundamental research
   - ☐ Translational and applied research
   - ☐ Research for regulatory use and routine production
   - ☐ Research for higher education and training of vocational skills
   - ☐ Research for the preservation of species
   - ☐ Research for protection of the environment
   - ☐ Breeding
   - ☐ Forensic enquiries
   - ☐ Other: .....

9. <If question 8 = Fundamental research>
   The fundamental research category comprises multiple research domains. In which research domains do you primarily conduct research? Note: If you do not conduct research yourself, you can complete this question on behalf of your research group, department or organisation.
   - ☐ Oncology
   - ☐ Immunology
   - ☐ Neurology
   - ☐ Endocrinology/metabolism
   - ☐ Cardiovascular, haematological and lymphatic systems
   - ☐ Ethology/animal behaviour/animal biology
   - ☐ Other: .....

10. <If question 8 = Translational and applied research>
    The translational and applied research category comprises multiple research domains. In which research domains do you primarily conduct research? Note: If you do not conduct research yourself, you can complete this question on behalf of your research group, department or organisation.
    - ☐ Cancer in humans
    - ☐ Infectious diseases in humans
    - ☐ Neurological and mental disorders in humans
    - ☐ Endocrine and metabolic disorders in humans
    - ☐ Cardiovascular disorders in humans
    - ☐ Diseases and disorders in animals
    - ☐ Animal nutrition
    - ☐ Animal welfare
    - ☐ Other: .....

11. <If question 8 = Research for regulatory use and routine production>
    The research for regulatory use and routine production category comprises multiple research domains. In which research domains do you conduct research?
    Note: If you do not conduct research yourself, you can complete this question on behalf of your research group, department or organisation.
    - ☐ Reproductive toxicity
    - ☐ Developmental toxicity
    - ☐ Batch efficacy testing
    - ☐ Production of blood-derived products
    - ☐ Chronic toxicity (ecotoxicity)
    - ☐ Other: .....

12. Which animal species do you/your research group/your department/your organisation use in animal procedures? Select all that apply.
    - ☐ Mice
    - ☐ Rats
    - ☐ Rabbits
    - ☐ Guinea pigs
    - ☐ Zebrafish
    - ☐ Other fish
    - ☐ Cattle
    - ☐ Pigs
    - ☐ Non-human primates
    - ☐ Domestic fowl
    - ☐ Other birds
    - ☐ Other animal species

13. <If question 12 = Other fish; Other birds; Other animal species>
    What other fish, birds or other animal species do you use in animal procedures?

    .....

14. How is your research funded? What are the main funding streams? Select all that apply.
    - ☐ 1st funding stream, directly from your own organisation
    - ☐ 2nd funding stream, EU, government, NWO, ZONMW
    - ☐ 3rd funding stream, NGOs, foundations and patient organisations
    - ☐ 4th funding stream, commercial/industry
    - ☐ Other: .....

Numbers/replacement and reduction

15. Has the number of animal procedures conducted by your research group or organisation increased or decreased over the past 10 years (or since you started working there)? The number of animal procedures has:
    - ☐ Strongly decreased (> 25%)
    - ☐ Decreased (10%–25%)
    - ☐ Remained more or less the same
    - ☐ Increased (10%–25%)
    - ☐ Strongly increased (> 25%)
    - ☐ I don't know → Continue to question 24 (questions 16–23 will not be displayed)

16. Can you explain your basis for this assessment?

    .....

17. <If question 15 = Strongly decreased (> 25%); decreased (10%–25%) >
What do you believe are the main reasons for this decline? Select all that apply.
   - ☐ Discontinuation of research lines because the research questions have been answered
   - ☐ Discontinuation of research lines due to a researcher's departure
   - ☐ Research moved abroad
   - ☐ Less funding available for animal procedures
   - ☐ Animal-based research has become more expensive
   - ☐ Consequence of laws and regulations
   - ☐ Less attention to this topic
   - ☐ Some research questions can be answered using non-animal methods
   - ☐ Some measurements can now be taken from humans
   - ☐ More information can be collected from fewer animals
   - ☐ Refinements have reduced suffering in some procedures to below-threshold levels
   - ☐ I don't know
   - ☐ Other: .....

18. <If question 17 = Some research questions can be answered using non-animal methods; Some measurements can now be taken from humans; More information can be collected from fewer animals; Refinements have reduced suffering in some procedures to below-threshold levels>
You indicated that the decline in the number of animal procedures in your organisation or research group is linked to one or more of the following 3R-related developments:
   - Introduction of non-animal methods
   - A shift from animal-based research to measurements in humans
   - Developments that allow the collection of more information from fewer animals
   - Refinements which have reduced the level of suffering in some animal procedures to below the suffering threshold

   Can you provide one or more examples of developments relating to the 3Rs that are relevant to your research?

   .....

19. <If question 17 = Consequence of laws and regulations>
You indicated that the decline in the number of animal procedures in your organisation or research group is partly due to laws and regulations. Can you explain which laws and regulations this concerns and how they have affected the number of animal procedures?

    .....

20. <If question 15 = Remained more or less the same>
What do you believe are the main factors that have kept the number of animal procedures stable?

    .....

21. <If question 15 = Increased (10%–25%) or Strongly increased (> 25%)>
What do you believe are the main reasons for this increase? Select all that apply.
   - ☐ Startup of new research lines
   - ☐ Expansion of existing research lines
   - ☐ Increased attention to this topic
   - ☐ Increased funding
   - ☐ Increased research demand from policymakers and governments
   - ☐ Consequence of laws and regulations
   - ☐ Acute threat to public health (e.g., pandemic)
   - ☐ New or growing public health issue
   - ☐ New or growing animal health issue
   - ☐ New or growing environmental issue
   - ☐ I don't know
   - ☐ Other: .....

22. <If question 21 = Increased research demand from policymakers and governments; Acute threat to public health (e.g., pandemic); New or growing public health issue; New or growing animal health issue; New or growing environmental issue>
    You indicated that the increase in the number of animal procedures in your organisation or research group is linked to one or more of the following factors:
    - Increased research demand from policymakers and governments
    - An acute threat to public health (e.g., pandemic)
    - A new or growing public health issue
    - A new or growing animal health issue
    - A new or growing environmental issue

    Can you describe the public-sector research demand, acute threat, or environmental or health issue in question?

    .....

23. <If question 21 = Consequence of laws and regulations>
    You indicated that the increase in the number of animal procedures in your organisation or research group is partly due to laws and regulations. Can you explain which laws and regulations this concerns and how they have affected the number of animal procedures?

    .....

24. How do you expect the number of animal procedures within your research group, department or organisation to develop over the next 3–5 years, assuming no unforeseen events occur? The number of animal procedures will likely:
    - ☐ Strongly increase (> 25%)
    - ☐ Increase (10%–25%)
    - ☐ Remain more or less the same
    - ☐ Decrease (10%–25%)
    - ☐ Strongly decrease (> 25%)
    - ☐ I don't know → Continue to question 26 (question 25 will not be displayed)

25. Can you explain why you expect the number of animal procedures to increase, decrease or remain the same?

    .....

26. Suppose you wanted to reduce the number of animal procedures in your research domain(s); what do you believe are the main barriers to overcome?

    .....

27. Where do you see the main opportunities for reducing the number of animal procedures in your research domain(s)?

    .....

Refinement

28. Over the past 10 years, have any refinements in your research resulted in animal procedures causing less suffering or yielding more information per animal or procedure? This could relate to greater reliability, validity and/or translatability of the measurements.
    - ☐ Yes, refinements have reduced the level of suffering in procedures
    - ☐ Yes, refinements have increased the quality of the information obtained from procedures
    - ☐ Yes, both of the above
    - ☐ No → Continue to question 33 (questions 29–32 will not be displayed)
    - ☐ I don't know → Continue to question 33 (questions 16–32 will not be displayed)

29. <If question 28 = Yes, refinements have reduced the level of suffering in procedures; Yes, both of the above>
    Can you provide one or more examples of a refinement that has reduced the suffering associated with a procedure?

    .....

30. <If question 28 = Yes, refinements have reduced the level of suffering in procedures; Yes, both of the above>
    Have any procedures been reclassified into a lower severity category as a result of these refinements (e.g., from 'severe' to 'moderate' or from 'mild' to below threshold)?
    - ☐ Yes, from severe to moderate
    - ☐ Yes, from moderate to mild
    - ☐ Yes, from mild to non-recovery
    - ☐ Yes, from non-recovery to below threshold
    - ☐ No, the level of suffering is lower but remains in the same category

31. <If question 28 = Yes, refinements have reduced the level of suffering in procedures; Yes, both of the above>
    For which procedures is this the case?

    .....

32. <If question 28 = Yes, refinements have increased the quality of the information obtained from procedures; Yes, both of the above>
    Can you provide one or more examples of a refinement that has led to animal procedures yielding higher-quality information?

    .....

Conclusion/consent

33. If you have any further comments on this survey or any suggestions for the NCad, please feel free to share them with us here.

    .....

34. May we contact you if we have any additional questions? If so, please enter your email address in the comments field after 'Yes'.
    - ☐ Yes .....
    - ☐ No

Thank you for participating/not in target group

35. <If question 5 = No, I am not involved in animal-based research in any way>
    This survey is intended for people who are actively involved in animal procedures. Thank you for your interest, but you are not eligible to continue the questionnaire. If you have any suggestions or information you would like to share with the NCad, please feel free to do so here.

    .....

Appendix 3: Survey methodology

The NCad contacted all Dutch institutions authorised to conduct animal procedures via the Animal Welfare Bodies. Recipients were asked to further distribute the survey within their institution, such as to other research groups. As a result, a single institution may have multiple respondents from different parts of the organisation. The survey was used as a qualitative tool to gain insight into the current state of affairs at the institutions.

This request resulted in 405 completed surveys. The majority of respondents work at a university medical centre (211), a university (91) or a research institution involved in animal procedures (46). The remaining 57 respondents worked at a research institute or agency involved in animal procedures, a contract research organisation involved in animal procedures, or a company with its own research department involved in animal procedures. In the survey, respondents were asked about the nature of their involvement in animal procedures. Multiple options could be selected. Most respondents were involved through their own research (215) and/or leading a research group (145). In addition, 58 respondents oversee animal procedures within their own organisation and 48 respondents work in the animal research facility, e.g., as animal carers or biotechnicians. In addition, some respondents lead research departments or animal research facilities (27 and 19, respectively). Based on this, it can be concluded that all respondents are involved in animal procedures.

22% of respondents (91) reported having been involved in animal procedures for up to 5 years. More than 260 people reported being involved in animal procedures for between 6-30 years. 10% of the respondents have been active in the field for 31-40 years. Among the respondents, 11 people have worked in animal research for more than 40 years.

All research categories from the animal procedures registration are represented in the survey results. By far the largest share of respondents conduct research in the fundamental research (347) and translational and applied research (226) categories. A relatively large number of respondents also indicated involvement in breeding (71) and in research for higher education and training of vocational skills (64). A smaller group reported being active in regulatory research (23), research for protection of the environment (17), research for the preservation of species (28), or forensic enquiries (2).

In fundamental research, respondents were involved in research across all major Dutch research domains, as described in Chapter 4.1, namely immunology (147), neurology (127), cardiovascular, haematological and lymphatic systems (106), endocrinology and metabolism (98), oncology (91) and ethology, animal behaviour and animal biology (59). The same applies to translational and applied research, where respondents were drawn from all the major research domains listed in section 4.2, such as infectious diseases in humans (73), neurological and mental disorders in humans (69), cardiovascular diseases in humans (66), cancer in humans (64), animal welfare (34), diseases and disorders in animals (30) and animal nutrition (24). In regulatory research, the respondents were involved in batch efficacy testing (8), developmental toxicity (3), reproductive toxicity (3), chronic ecotoxicity (3) and the production of blood-derived products (2). These are also the main regulatory domains in the animal procedures registration, as described in Chapter 4.3.
In addition, 14 respondents indicated that they are active in other regulatory research domains, such as food safety or acute toxicity assessments of substances. By far the largest number of respondents reported conducting research with mice (313) and rats (144), followed by other species (52), pigs (54) and zebrafish (45).

Appendix 4: Data tables

4.1 General

Table 1. *Total number of animal procedures in the Netherlands*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Number of animal procedures according to the European definition	480,011	405,203	456,089	402,035	399,826	406,082	423,347	437,009	363,148	364,873	-115,138	4,137,623
Proportion compared to 2015	100%	84%	95%	84%	83%	85%	88%	91%	76%	76%	-24%	
Proportion of total	91%	90%	90%	90%	89%	91%	89%	89%	88%	86%	-5%	89%
Additional animal procedures under Dutch legislation	48,477	46,504	50,984	46,663	48,706	42,010	54,679	55,393	50,598	59,097	10,620	503,111
Proportion compared to 2015	100%	96%	105%	96%	100%	87%	113%	114%	104%	122%	22%	
Proportion of total	9%	10%	10%	10%	11%	9%	11%	11%	12%	14%	5%	11%
Total number of animal procedures	528,488	451,707	507,073	448,698	448,532	448,092	478,026	492,402	413,746	423,970	-104,518	4,640,734
Proportion compared to 2015	100%	85%	96%	85%	85%	85%	90%	93%	78%	80%	-20%	

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Table 2. *Animal procedures by species used*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Mice	259,698	176,187	199,387	172,460	174,421	159,137	161,066	143,043	131,872	132,334	-127,364	1,709,605
Proportion compared to 2015	100%	68%	77%	66%	67%	61%	62%	55%	51%	51%	-49%	
Proportion of total	49%	39%	39%	38%	39%	36%	34%	29%	32%	31%	-18%	37%
Rats	108,854	116,344	100,872	95,578	84,812	89,956	96,644	93,460	85,180	82,441	-26,413	954,141
Proportion compared to 2015	100%	107%	93%	88%	78%	83%	89%	86%	78%	76%	-24%	
Proportion of total	21%	26%	20%	21%	19%	20%	20%	19%	21%	19%	-1%	21%
Other fish	46,535	36,139	40,602	48,869	68,167	71,619	87,114	117,694	92,548	116,842	70,307	726,129
Proportion compared to 2015	100%	78%	87%	105%	146%	154%	187%	253%	199%	251%	151%	
Proportion of total	9%	8%	8%	11%	15%	16%	18%	24%	22%	28%	19%	16%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Domestic fowl	51,638	52,615	56,253	51,284	52,706	45,836	47,266	52,041	32,049	27,703	-23,935	469,391
Proportion compared to 2015	100%	102%	109%	99%	102%	89%	92%	101%	62%	54%	-46%	
Proportion of total	10%	12%	11%	11%	12%	10%	10%	11%	8%	7%	-3%	10%
Zebra fish	5,575	17,658	53,082	21,882	9,602	15,083	13,151	20,027	4,112	12,071	6,496	172,243
Proportion compared to 2015	100%	317%	952%	393%	172%	271%	236%	359%	74%	217%	117%	
Proportion of total	1%	4%	10%	5%	2%	3%	3%	4%	1%	3%	2%	4%
Other birds	18,248	20,143	18,270	13,884	13,957	17,365	14,439	18,906	19,126	16,196	-2,052	170,534
Proportion compared to 2015	100%	110%	100%	76%	76%	95%	79%	104%	105%	89%	-11%	
Proportion of total	3%	4%	4%	3%	3%	4%	3%	4%	5%	4%	0%	4%
Rabbits	10,309	8,681	9,802	13,791	13,298	15,373	19,531	17,787	17,311	12,282	1,973	138,165
Proportion compared to 2015	100%	84%	95%	134%	129%	149%	189%	173%	168%	119%	19%	
Proportion of total	2%	2%	2%	3%	3%	3%	4%	4%	4%	3%	1%	3%
Pigs	8,921	11,476	9,783	10,607	11,629	9,243	8,982	7,373	9,055	6,509	-2,412	93,578
Proportion compared to 2015	100%	129%	110%	119%	130%	104%	101%	83%	102%	73%	-27%	
Proportion of total	2%	3%	2%	2%	3%	2%	2%	1%	2%	2%	0%	2%
Guinea-Pigs	3,850	3,206	5,895	11,483	9,192	8,559	5,903	4,258	4,711	4,578	728	61,635
Proportion compared to 2015	100%	83%	153%	298%	239%	222%	153%	111%	122%	119%	19%	
Proportion of total	1%	1%	1%	3%	2%	2%	1%	1%	1%	1%	0%	1%
Cattle	5,240	4,502	3,833	3,607	4,214	4,090	3,527	2,256	4,216	3,645	-1,595	39,130
Proportion compared to 2015	100%	86%	73%	69%	80%	78%	67%	43%	80%	70%	-30%	
Proportion of total	1%	1%	1%	1%	1%	1%	1%	0%	1%	1%	0%	1%
Hamsters (Syrian)	1,518	1,443	1,035	911	684	2,856	4,331	2,741	1,655	1,360	-158	18,534
Proportion compared to 2015	100%	95%	68%	60%	45%	188%	285%	181%	109%	90%	-10%	
Proportion of total	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%
Sheep	2,126	438	565	643	1,373	2,278	2,195	1,662	1,736	2,171	45	15,187
Proportion compared to 2015	100%	21%	27%	30%	65%	107%	103%	78%	82%	102%	2%	
Proportion of total	0%	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Salmon, trout, chars and graylings	0	0	0	0	0	0	3,975	2,799	3,463	2,656	2,656	12,893
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	0%
Xenopus	1,183	431	438	401	284	2,641	2,957	2,837	867	174	-1,009	12,213
Proportion compared to 2015	100%	36%	37%	34%	24%	223%	250%	240%	73%	15%	-85%	
Proportion of total	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%	0%	0%
Dogs	750	659	909	1,016	550	803	1,011	1,008	947	633	-117	8,286
Proportion compared to 2015	100%	88%	121%	135%	73%	107%	135%	134%	126%	84%	-16%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other rodents	1,035	475	736	668	1,066	495	1,513	746	1,103	130	-905	7,967
Proportion compared to 2015	100%	46%	71%	65%	103%	48%	146%	72%	107%	13%	-87%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other mammals	14	1	3,315	225	294	244	263	591	913	254	240	6,114
Proportion compared to 2015	100%	7%	23,679%	1,607%	2,100%	1,743%	1,879%	4,221%	6,521%	1,814%	1,714%	
Proportion of total	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Ferrets	396	294	700	477	643	570	510	452	337	354	-42	4,733
Proportion compared to 2015	100%	74%	177%	120%	162%	144%	129%	114%	85%	89%	-11%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Guppy, swordtail, molly, platy	0	0	0	0	0	0	1,688	1,422	267	54	54	3,431
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Horses, donkeys and cross-breeds	215	148	175	148	137	312	275	474	354	285	70	2,523
Proportion compared to 2015	100%	69%	81%	69%	64%	145%	128%	220%	165%	133%	33%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Goats	265	152	259	125	321	248	190	224	206	207	-58	2,197
Proportion compared to 2015	100%	57%	98%	47%	121%	94%	72%	85%	78%	78%	-22%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Reptiles	851	207	294	125	1	360	101	0	0	134	-717	2,073
Proportion compared to 2015	100%	24%	35%	15%	0%	42%	12%	0%	0%	16%	-84%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0,0%	0%	0%	0%
Cats	61	89	200	120	171	604	287	141	138	170	109	1,981
Proportion compared to 2015	100%	146%	328%	197%	280%	990%	470%	231%	226%	279%	179%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other amphibians	562	63	60	0	720	74	12	0	0	328	-234	1,819
Proportion compared to 2015	100%	11%	11%	0%	128%	13%	2%	0%	0%	58%	-42%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0,0%	0%	0%	0%
Rhesus monkeys	96	70	234	160	117	159	200	145	117	108	12	1,406
Proportion compared to 2015	100%	73%	244%	167%	122%	166%	208%	151%	122%	113%	13%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sea bass	0	0	0	0	0	0	242	0	1,029	17	17	1,288
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other carnivores	410	216	270	84	81	25	38	24	19	43	-367	1,210
Proportion compared to 2015	100%	53%	66%	20%	20%	6%	9%	6%	5%	10%	-90%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cephalopods	0	0	0	0	0	0	343	98	77	58	58	576
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mongolian gerbils	0	0	0	105	54	109	164	60	72	6	6	570
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turkeys	0	0	0	0	0	0	93	96	239	71	71	499
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Cynomolgus monkeys	47	34	42	0	38	28	13	32	22	2	-45	258
Proportion compared to 2015	100%	72%	89%	0%	81%	60%	28%	68%	47%	4%	-96%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Marmosets and tamarins	91	16	41	45	0	25	2	5	5	25	-66	255
Proportion compared to 2015	100%	18%	45%	49%	0%	27%	2%	5%	5%	27%	-73%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rana	0	20	9	0	0	0	0	0	0	129	129	158
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Hamsters (Chinese)	0	0	12	0	0	0	0	0	0	0	0	12
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	528,488	451,707	507,073	448,698	448,532	448,092	478,026	492,402	413,746	423,970	-104,518	4,640,734

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Table 3. *Classification of severity*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Non-recovery under general anaesthesia	23,538	25,392	31,638	43,764	35,814	34,833	23,785	27,985	24,389	26,121	2,583	297,259
Proportion compared to 2015	100%	108%	134%	186%	152%	148%	101%	119%	104%	111%	11%	
Proportion of total	4%	6%	6%	10%	8%	8%	5%	6%	6%	6%	2%	6%
Mild	394,801	325,136	346,739	295,741	293,804	286,334	298,853	283,653	273,128	291,267	-103,534	3,089,456
Proportion compared to 2015	100%	82%	88%	75%	74%	73%	76%	72%	69%	74%	-26%	
Proportion of total	75%	72%	68%	66%	66%	64%	63%	58%	66%	69%	-6%	67%
Moderate	92,940	87,824	115,146	103,334	113,921	123,145	151,226	176,247	111,671	102,273	9,333	1,177,727
Proportion compared to 2015	100%	95%	124%	111%	123%	133%	163%	190%	120%	110%	10%	
Proportion of total	18%	19%	23%	23%	25%	27%	32%	36%	27%	24%	7%	25%
Severe	17,209	13,355	13,550	5,859	4,993	3,780	4,162	4,517	4,558	4,309	-12,900	76,292
Proportion compared to 2015	100%	78%	79%	34%	29%	22%	24%	26%	26%	25%	-75%	
Proportion of total	3%	3%	3%	1%	1%	1%	1%	1%	1%	1%	-2%	2%
Total number of animal procedures	528,488	451,707	507,073	448,698	448,532	448,092	478,026	492,402	413,746	423,970	-104,518	4,640,734

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Table 4. *Research categories*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Fundamental research	142,263	147,076	201,865	171,697	157,866	160,106	128,653	131,837	89,364	88,536	-53,727	1,419,263
Proportion compared to 2015	100%	103%	142%	121%	111%	113%	90%	93%	63%	62%	-38%	
Proportion of total	27%	33%	40%	38%	35%	36%	27%	27%	22%	21%	-6%	31%
Regulatory research	139,919	144,934	124,567	119,805	111,476	121,556	152,145	144,281	137,326	134,158	-5,761	1,330,167
Proportion compared to 2015	100%	104%	89%	86%	80%	87%	109%	103%	98%	96%	-4%	
Proportion of total	26%	32%	25%	27%	25%	27%	32%	29%	33%	32%	5%	29%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Translational and applied research	151,538	114,569	131,067	115,971	116,857	106,944	111,990	108,408	85,643	75,243	-76,295	1,118,230
Proportion compared to 2015	100%	76%	86%	77%	77%	71%	74%	72%	57%	50%	-50%	
Proportion of total	29%	25%	26%	26%	26%	24%	23%	22%	21%	18%	-11%	24%
Research for the preservation of species	22,255	25,819	25,083	22,489	44,494	41,956	56,140	84,107	71,091	89,555	67,300	482,989
Proportion compared to 2015	100%	116%	113%	101%	200%	189%	252%	378%	319%	402%	302%	
Proportion of total	4%	6%	5%	5%	10%	9%	12%	17%	17%	21%	17%	10%
Research for higher education and training of vocational skills	21,252	16,919	21,590	15,802	15,934	11,579	13,187	13,583	11,324	10,899	-10,353	152,069
Proportion compared to 2015	100%	80%	102%	74%	75%	55%	62%	64%	54%	51%	-49%	
Proportion of total	4%	4%	4%	3%	4%	3%	3%	3%	3%	3%	-1%	3%
Creation and maintenance of genetically altered animals	50,843	1,621	1,667	1,240	1,211	5,323	11,446	5,214	3,756	14,444	-36,399	96,765
Proportion compared to 2015	100%	3%	3%	2%	2%	10%	23%	10%	7%	28%	-72%	
Proportion of total	10%	0%	0%	0%	0%	1%	2%	1%	1%	3%	-6%	2%
Research for protection of the environment	376	24	873	1,678	690	602	4,309	4,810	15,228	11,090	10,714	39,680
Proportion compared to 2015	100%	6%	232%	446%	184%	160%	1,146%	1,279%	4,050%	2,949%	2,849%	
Proportion of total	0%	0%	0%	0%	0%	0%	1%	1%	4%	3%	3%	1%
Forensic enquiries	42	745	361	16	4	26	156	162	14	45	3	1,571
Proportion compared to 2015	100%	1,774%	860%	38%	10%	62%	371%	386%	33%	107%	7%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	528,488	451,707	507,073	448,698	448,532	448,092	478,026	492,402	413,746	423,970	-104,518	4,640,734

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4.2 Fundamental research

Table 5. *Number of animal procedures in fundamental research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Number of animal procedures	142,263	147,076	201,865	171,697	157,866	160,106	128,653	131,837	89,364	88,536	-53,727	1,419,263
Proportion compared to 2015	100%	103%	142%	121%	111%	113%	90%	93%	63%	62%	-38%	
Proportion of total	27%	33%	40%	38%	35%	36%	27%	27%	22%	21%	-6%	31%

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Table 6. *Classification of severity in fundamental research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Non-recovery under general anaesthesia	3,991	21,073	25,474	36,865	30,106	29,220	3,402	3,078	2,284	2,794	-1,197	158,287
Proportion compared to 2015	100%	528%	638%	924%	754%	732%	85%	77%	57%	70%	-30%	
Proportion of total	3%	14%	13%	21%	19%	18%	3%	2%	3%	3%	0%	11%
Mild	97,858	90,004	127,011	89,267	85,524	83,719	68,495	61,870	51,381	51,101	-46,757	806,230
Proportion compared to 2015	100%	92%	130%	91%	87%	86%	70%	63%	53%	52%	-48%	
Proportion of total	69%	61%	63%	52%	54%	52%	53%	47%	57%	58%	-11%	57%
Moderate	38,116	34,068	47,522	44,435	40,852	46,108	55,507	65,817	34,347	33,566	-4,550	440,338
Proportion compared to 2015	100%	89%	125%	117%	107%	121%	146%	173%	90%	88%	-12%	
Proportion of total	27%	23%	24%	26%	26%	29%	43%	50%	38%	38%	11%	31%
Severe	2,298	1,931	1,858	1,130	1,384	1,059	1,249	1,072	1,352	1,075	-1,223	14,408
Proportion compared to 2015	100%	84%	81%	49%	60%	46%	54%	47%	59%	47%	-53%	
Proportion of total	2%	1%	1%	1%	1%	1%	1%	1%	2%	1%	0%	1%
Total number of animal procedures	142,263	147,076	201,865	171,697	157,866	160,106	128,653	131,837	89,364	88,536	-53,727	1,419,263

Table 7. *Animal species used in fundamental research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Mice	101,307	97,245	108,154	99,739	101,645	87,138	73,287	64,626	63,810	61,900	-39,407	858,851
Proportion compared to 2015	100%	96%	107%	98%	100%	86%	72%	64%	63%	61%	-39%	
Proportion of total	71%	66%	54%	58%	64%	54%	57%	49%	71%	70%	-1%	61%
Zebra fish	4,785	17,041	46,988	14,771	9,184	13,317	12,933	16,946	3,965	6,027	1,242	145,957
Proportion compared to 2015	100%	356%	982%	309%	192%	278%	270%	354%	83%	126%	26%	
Proportion of total	3%	12%	23%	9%	6%	8%	10%	13%	4%	7%	3%	10%
Rats	15,483	14,000	17,824	17,984	14,991	15,056	7,392	7,213	7,068	6,697	-8,786	123,708
Proportion compared to 2015	100%	90%	115%	116%	97%	97%	48%	47%	46%	43%	-57%	
Proportion of total	11%	10%	9%	10%	9%	9%	6%	5%	8%	8%	-3%	9%
Other birds	11,158	11,296	12,097	12,334	13,117	15,642	13,820	17,796	6,646	5,854	-5,304	119,760
Proportion compared to 2015	100%	101%	108%	111%	118%	140%	124%	159%	60%	52%	-48%	
Proportion of total	8%	8%	6%	7%	8%	10%	11%	13%	7%	7%	-1%	8%
Other fish	2,443	2,514	6,588	13,978	8,408	17,665	15,438	19,959	5,369	6,854	4,411	99,216
Proportion compared to 2015	100%	103%	270%	572%	344%	723%	632%	817%	220%	281%	181%	
Proportion of total	2%	2%	3%	8%	5%	11%	12%	15%	6%	8%	6%	7%
Guinea-Pigs	403	459	3,022	9,232	7,761	7,437	238	0	98	15	-388	28,665
Proportion compared to 2015	100%	114%	750%	2,291%	1,926%	1,845%	59%	0%	24%	4%	-96%	
Proportion of total	0%	0%	1%	5%	5%	5%	0%	0%	0%	0%	0%	2%
Domestic fowl	2,263	2,165	4,115	1,768	236	630	1,368	1,780	60	0	-2,263	14,385
Proportion compared to 2015	100%	96%	182%	78%	10%	28%	60%	79%	3%	0%	-100%	
Proportion of total	2%	1%	2%	1%	0%	0%	1%	1%	0%	0%	-2%	1%
Pigs	197	441	845	494	321	1,681	40	85	376	87	-110	4,567
Proportion compared to 2015	100%	224%	429%	251%	163%	853%	20%	43%	191%	44%	-56%	
Proportion of total	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Other rodents	794	389	583	350	526	358	814	277	306	71	-723	4,468
Proportion compared to 2015	100%	49%	73%	44%	66%	45%	103%	35%	39%	9%	-91%	
Proportion of total	1%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%
Xenopus	463	431	438	386	284	396	476	814	176	164	-299	4,028
Proportion compared to 2015	100%	93%	95%	83%	61%	86%	103%	176%	38%	35%	-65%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%
Guppy, swordtail, molly, platy	0	0	0	0	0	0	1,688	1,422	267	44	44	3,421
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	1%	1%	0%	0%	0%	0%
Other mammals	4	1	151	214	291	226	239	254	523	249	245	2,152
Proportion compared to 2015	100%	25%	3,775%	5,350%	7,275%	5,650%	5,975%	6,350%	13,075%	6,225%	6,125%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%
Reptiles	851	207	294	125	1	0	101	0	0	0	-851	1,579
Proportion compared to 2015	100%	24%	35%	15%	0%	0%	12%	0%	0%	0%	-100%	
Proportion of total	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-1%	0%
Cattle	962	173	102	52	64	8	56	39	35	23	-939	1,514
Proportion compared to 2015	100%	18%	11%	5%	7%	1%	6%	4%	4%	2%	-98%	
Proportion of total	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-1%	0%
Other amphibians	562	63	60	0	679	74	0	0	0	0	-562	1,438
Proportion compared to 2015	100%	11%	11%	0%	121%	13%	0%	0%	0%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Hamsters (Syrian)	0	360	302	0	0	0	0	57	36	0	0	755
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rabbits	181	45	67	50	120	70	47	68	45	5	-176	698
Proportion compared to 2015	100%	25%	37%	28%	66%	39%	26%	38%	25%	3%	-97%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Cephalopods	0	0	0	0	0	0	343	98	77	58	58	576
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mongolian gerbils	0	0	0	105	54	109	153	60	72	6	6	559
Proportion compared to 2015	0%	0%	0%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Horses, donkeys and cross-breeds	23	7	0	50	57	30	20	32	180	105	82	504
Proportion compared to 2015	100%	30%	0%	217%	248%	130%	87%	139%	783%	457%	357%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Salmon, trout, chars and graylings	0	0	0	0	0	0	95	38	113	256	256	502
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dogs	19	28	46	39	36	36	16	191	0	3	-16	414
Proportion compared to 2015	100%	147%	242%	205%	189%	189%	84%	1,005%	0%	16%	-84%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other carnivores	89	77	6	0	13	25	38	24	19	43	-46	334
Proportion compared to 2015	100%	87%	7%	0%	15%	28%	43%	27%	21%	48%	-52%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Goats	22	33	14	0	64	183	0	2	10	4	-18	332
Proportion compared to 2015	100%	150%	64%	0%	291%	832%	0%	9%	45%	18%	-82%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Ferrets	19	9	16	25	5	12	9	32	69	70	51	266
Proportion compared to 2015	100%	47%	84%	132%	26%	63%	47%	168%	363%	368%	268%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sheep	157	13	35	1	8	9	22	0	0	0	-157	245
Proportion compared to 2015	100%	8%	22%	1%	5%	6%	14%	0%	0%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Rhesus monkeys	21	15	62	0	1	4	5	2	0	1	-20	111
Proportion compared to 2015	100%	71%	295%	0%	5%	19%	24%	10%	0%	5%	-95%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cats	5	30	0	0	0	0	15	22	8	0	-5	80
Proportion compared to 2015	100%	600%	0%	0%	0%	0%	300%	440%	160%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Marmosets and tamarins	48	0	30	0	0	0	0	0	0	0	-48	78
Proportion compared to 2015	100%	0%	63%	0%	0%	0%	0%	0%	0%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cynomolgus monkeys	4	14	26	0	0	0	0	0	0	0	-4	44
Proportion compared to 2015	100%	350%	650%	0%	0%	0%	0%	0%	0%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sea bass	0	0	0	0	0	0	0	0	36	0	0	36
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rana	0	20	0	0	0	0	0	0	0	0	0	20
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	142,263	147,076	201,865	171,697	157,866	160,106	128,653	131,837	89,364	88,536	-53,727	1,419,263

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Table 8. *Main research domains in fundamental research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Oncology	38,107	45,260	79,222	35,185	32,478	32,752	33,461	32,981	22,428	21,680	-16,427	373,554
Proportion compared to 2015	100%	119%	208%	92%	85%	86%	88%	87%	59%	57%	-43%	
Proportion of total	27%	31%	39%	20%	21%	20%	26%	25%	25%	24%	-2%	26%
Nervous system	27,035	23,523	26,588	26,397	27,312	23,022	23,404	21,840	21,387	21,391	-5,644	241,899
Proportion compared to 2015	100%	87%	98%	98%	101%	85%	87%	81%	79%	79%	-21%	
Proportion of total	19%	16%	13%	15%	17%	14%	18%	17%	24%	24%	5%	17%
Ethology / animal behaviour / animal biology	18,343	15,623	21,621	27,334	21,884	34,417	33,407	41,132	13,054	13,819	-4,524	240,634
Proportion compared to 2015	100%	85%	118%	149%	119%	188%	182%	224%	71%	75%	-25%	
Proportion of total	13%	11%	11%	16%	14%	21%	26%	31%	15%	16%	3%	17%
Other fundamental research	6,111	21,280	32,309	46,797	36,217	34,539	40	52	36	0	-6,111	177,381
Proportion compared to 2015	100%	348%	529%	766%	593%	565%	1%	1%	1%	0%	-100%	
Proportion of total	4%	14%	16%	27%	23%	22%	0%	0%	0%	0%	-4%	12%
Immune system	15,758	13,950	16,735	13,445	15,849	13,303	12,945	13,420	9,875	11,996	-3,762	137,276
Proportion compared to 2015	100%	89%	106%	85%	101%	84%	82%	85%	63%	76%	-24%	
Proportion of total	11%	9%	8%	8%	10%	8%	10%	10%	11%	14%	2%	10%
Endocrine system / metabolism	7,331	5,303	5,496	6,180	7,872	12,014	8,608	6,108	5,986	4,247	-3,084	69,145
Proportion compared to 2015	100%	72%	75%	84%	107%	164%	117%	83%	82%	58%	-42%	
Proportion of total	5%	4%	3%	4%	5%	8%	7%	5%	7%	5%	0%	5%
Cardiovascular, blood and lymphatic system	14,316	9,453	7,674	6,079	5,489	3,288	3,875	3,920	7,107	4,169	-10,147	65,370
Proportion compared to 2015	100%	66%	54%	42%	38%	23%	27%	27%	50%	29%	-71%	
Proportion of total	10%	6%	4%	4%	3%	2%	3%	3%	8%	5%	-5%	5%
Gastrointestinal system including liver	4,060	3,940	3,739	3,404	4,010	2,488	3,197	1,991	1,279	1,680	-2,380	29,788
Proportion compared to 2015	100%	97%	92%	84%	99%	61%	79%	49%	32%	41%	-59%	
Proportion of total	3%	3%	2%	2%	3%	2%	2%	2%	1%	2%	-1%	2%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Multisystemic	4,048	3,997	4,332	1,367	1,456	1,126	1,986	1,985	1,479	818	-3,230	22,594
Proportion compared to 2015	100%	99%	107%	34%	36%	28%	49%	49%	37%	20%	-80%	
Proportion of total	3%	3%	2%	1%	1%	1%	2%	2%	2%	1%	-2%	2%
Urogenital / reproductive system	3,079	1,739	1,288	1,775	2,206	697	959	1,336	973	1,537	-1,542	15,589
Proportion compared to 2015	100%	56%	42%	58%	72%	23%	31%	43%	32%	50%	-50%	
Proportion of total	2%	1%	1%	1%	1%	0%	1%	1%	1%	2%	0%	1%
Musculoskeletal system	1,965	901	812	775	1,430	938	1,104	925	1,727	1,580	-385	12,157
Proportion compared to 2015	100%	46%	41%	39%	73%	48%	56%	47%	88%	80%	-20%	
Proportion of total	1%	1%	0%	0%	1%	1%	1%	1%	2%	2%	0%	1%
Developmental biology	0	0	0	0	0	0	2,745	4,144	1,799	2,905	2,905	11,593
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	2%	3%	2%	3%	3%	1%
Respiratory system	1,777	1,531	760	1,481	810	718	898	502	1,707	1,045	-732	11,229
Proportion compared to 2015	100%	86%	43%	83%	46%	40%	51%	28%	96%	59%	-41%	
Proportion of total	1%	1%	0%	1%	1%	0%	1%	0%	2%	1%	0%	1%
Sensory organs (skin, eyes and ears)	333	576	1,289	1,478	853	804	2,024	1,501	527	1,669	1,336	11,054
Proportion compared to 2015	100%	173%	387%	444%	256%	241%	608%	451%	158%	501%	401%	
Proportion of total	0%	0%	1%	1%	1%	1%	2%	1%	1%	2%	2%	1%
Total number of animal procedures	142,263	147,076	201,865	171,697	157,866	160,106	128,653	131,837	89,364	88,536	-53,727	1,419,263
Proportion compared to 2015	100%	103%	142%	121%	111%	113%	90%	93%	63%	62%	-38%	

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4.3 Translational and applied research

Table 9. *Number of animal procedures in translational and applied research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Number of animal procedures	151,538	114,569	131,067	115,971	116,857	106,944	111,990	108,408	85,643	75,243	-76,295	1,118,230
Proportion compared to 2015	100%	76%	86%	77%	77%	71%	74%	72%	57%	50%	-50%	
Proportion of total	29%	25%	26%	26%	26%	24%	23%	22%	21%	18%	-11%	24%

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Table 10. *Classification of severity in translational and applied research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Non-recovery under general anaesthesia	16,921	1,840	1,488	2,901	1,918	2,697	1,935	2,437	2,174	2,756	-14,165	37,067
Proportion compared to 2015	100%	11%	9%	17%	11%	16%	11%	14%	13%	16%	-84%	
Proportion of total	11%	2%	1%	3%	2%	3%	2%	2%	3%	4%	-8%	3%
Mild	89,535	73,403	90,177	78,930	78,840	69,752	68,160	73,403	55,904	48,004	-41,531	726,108
Proportion compared to 2015	100%	82%	101%	88%	88%	78%	76%	82%	62%	54%	-46%	
Proportion of total	59%	64%	69%	68%	67%	65%	61%	68%	65%	64%	5%	65%
Moderate	36,097	32,557	34,511	31,231	33,777	32,534	39,638	29,764	26,091	22,703	-13,394	318,903
Proportion compared to 2015	100%	90%	96%	87%	94%	90%	110%	82%	72%	63%	-37%	
Proportion of total	24%	28%	26%	27%	29%	30%	35%	27%	30%	30%	6%	29%
Severe	8,985	6,769	4,891	2,909	2,322	1,961	2,257	2,804	1,474	1,780	-7,205	36,152
Proportion compared to 2015	100%	75%	54%	32%	26%	22%	25%	31%	16%	20%	-80%	
Proportion of total	6%	6%	4%	3%	2%	2%	2%	3%	2%	2%	-4%	3%
Total number of animal procedures	151,538	114,569	131,067	115,971	116,857	106,944	111,990	108,408	85,643	75,243	-76,295	1,118,230
Proportion compared to 2015	100%	76%	86%	77%	77%	71%	74%	72%	57%	50%	-50%	

Table 11. *Animal species used in translational and applied research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Mice	74,160	51,608	58,514	46,893	49,406	47,589	46,530	39,795	36,990	33,230	-40,930	484,715
Proportion compared to 2015	100%	70%	79%	63%	67%	64%	63%	54%	50%	45%	-55%	
Proportion of total	49%	45%	45%	40%	42%	44%	42%	37%	43%	44%	-5%	43%
Domestic fowl	34,457	33,380	35,687	38,329	40,178	31,099	37,724	43,179	24,747	21,635	-12,822	340,415
Proportion compared to 2015	100%	97%	104%	111%	117%	90%	109%	125%	72%	63%	-37%	
Proportion of total	23%	29%	27%	33%	34%	29%	34%	40%	29%	29%	6%	30%
Pigs	6,560	8,804	6,901	7,470	9,035	5,386	7,497	6,471	7,678	5,404	-1,156	71,206
Proportion compared to 2015	100%	134%	105%	114%	138%	82%	114%	99%	117%	82%	-18%	
Proportion of total	4%	8%	5%	6%	8%	5%	7%	6%	9%	7%	3%	6%
Rats	11,574	6,676	7,823	3,981	3,270	3,884	3,924	4,359	2,962	2,325	-9,249	50,778
Proportion compared to 2015	100%	58%	68%	34%	28%	34%	34%	38%	26%	20%	-80%	
Proportion of total	8%	6%	6%	3%	3%	4%	4%	4%	3%	3%	-5%	5%
Other fish	11,262	1,365	2,430	6,620	7,977	6,781	2,733	1,691	1,731	3,471	-7,791	46,061
Proportion compared to 2015	100%	12%	22%	59%	71%	60%	24%	15%	15%	31%	-69%	
Proportion of total	7%	1%	2%	6%	7%	6%	2%	2%	2%	5%	-3%	4%
Cattle	2,289	2,694	3,035	2,108	2,934	3,055	2,414	1,375	3,552	2,884	595	26,340
Proportion compared to 2015	100%	118%	133%	92%	128%	133%	105%	60%	155%	126%	26%	
Proportion of total	2%	2%	2%	2%	3%	3%	2%	1%	4%	4%	2%	2%
Other birds	6,448	7,865	4,993	438	325	1,279	55	941	137	25	-6,423	22,506
Proportion compared to 2015	100%	122%	77%	7%	5%	20%	1%	15%	2%	0%	-100%	
Proportion of total	4%	7%	4%	0%	0%	1%	0%	1%	0%	0%	-4%	2%
Zebra fish	628	440	5,713	6,749	255	1,400	16	2,848	0	0	-628	18,049
Proportion compared to 2015	100%	70%	910%	1,075%	41%	223%	3%	454%	0%	0%	-100%	
Proportion of total	0%	0%	4%	6%	0%	1%	0%	3%	0%	0%	0%	2%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Sheep	1,874	207	423	523	1,183	2,120	2,065	1,309	1,618	2,087	213	13,409
Proportion compared to 2015	100%	11%	23%	28%	63%	113%	110%	70%	86%	111%	11%	
Proportion of total	1%	0%	0%	0%	1%	2%	2%	1%	2%	3%	2%	1%
Hamsters (Syrian)	378	81	96	335	235	2,183	3,305	2,036	747	694	316	10,090
Proportion compared to 2015	100%	21%	25%	89%	62%	578%	874%	539%	198%	184%	84%	
Proportion of total	0%	0%	0%	0%	0%	2%	3%	2%	1%	1%	1%	1%
Salmon, trout, chars and graylings	0	0	0	0	0	0	3,036	1,688	3,102	2,132	2,132	9,958
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	3,572%	1,986%	3,649%	2,508%	2,508%	1%
Ferrets	313	231	630	424	614	534	477	390	232	278	-35	4,123
Proportion compared to 2015	100%	74%	201%	135%	196%	171%	152%	125%	74%	89%	-11%	
Proportion of total	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Guinea-Pigs	609	441	548	842	469	181	235	246	230	142	-467	3,943
Proportion compared to 2015	100%	72%	90%	138%	77%	30%	39%	40%	38%	23%	-77%	
Proportion of total	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%
Other mammals	10	0	3,164	11	3	12	15	288	31	2	-8	3,536
Proportion compared to 2015	100%	0%	31,640%	110%	30%	120%	150%	2,880%	310%	20%	-80%	
Proportion of total	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dogs	194	112	147	331	138	311	449	433	286	336	142	2,737
Proportion compared to 2015	100%	58%	76%	171%	71%	160%	231%	223%	147%	173%	73%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rabbits	278	365	460	252	302	167	151	165	35	57	-221	2,232
Proportion compared to 2015	100%	131%	165%	91%	109%	60%	54%	59%	13%	21%	-79%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other rodents	131	86	30	239	244	0	661	469	125	57	-74	2,042
Proportion compared to 2015	100%	66%	23%	182%	186%	0%	505%	358%	95%	44%	-56%	
Proportion of total	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Horses, donkeys and cross-breeds	120	92	72	71	55	221	188	384	124	119	-1	1,446
Proportion compared to 2015	100%	77%	60%	59%	46%	184%	157%	320%	103%	99%	-1%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rhesus monkeys	75	55	172	160	116	155	195	143	117	107	32	1,295
Proportion compared to 2015	100%	73%	229%	213%	155%	207%	260%	191%	156%	143%	43%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cats	17	13	101	48	16	470	174	62	69	152	135	1,122
Proportion compared to 2015	100%	76%	594%	282%	94%	2,765%	1,024%	365%	406%	894%	794%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sea bass	0	0	0	0	0	0	0	0	960	0	0	960
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%
Goats	75	18	101	102	58	64	38	3	8	8	-67	475
Proportion compared to 2015	100%	24%	135%	136%	77%	85%	51%	4%	11%	11%	-89%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turkeys	0	0	0	0	0	0	93	96	135	71	71	395
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cynomolgus monkeys	43	20	16	0	38	28	13	32	22	2	-41	214
Proportion compared to 2015	100%	47%	37%	0%	88%	65%	30%	74%	51%	5%	-95%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Marmosets and tamarins	43	16	11	45	0	25	2	5	5	25	-18	177
Proportion compared to 2015	100%	37%	26%	105%	0%	58%	5%	12%	12%	58%	-42%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other carnivores	0	0	0	0	6	0	0	0	0	0	0	6
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Reptiles	0	0	0	0	0	0	0	0	0	0	0	0
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	151,538	114,569	131,067	115,971	116,857	106,944	111,990	108,408	85,643	75,243	-76,295	1,118,230
Proportion compared to 2015	100%	76%	86%	77%	77%	71%	74%	72%	57%	50%	-50%	

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Table 12. *Main research domains in translational and applied research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Animal diseases and disorders	46,485	20,909	31,959	21,703	20,701	19,254	23,303	24,534	17,261	13,763	-32,722	239,872
Proportion compared to 2015	100%	45%	69%	47%	45%	41%	50%	53%	37%	30%	-70%	
Proportion of total	31%	18%	24%	19%	18%	18%	21%	23%	20%	18%	-12%	21%
Animal welfare	28,794	29,373	22,272	34,468	39,948	28,958	6,478	6,322	7,383	3,901	-24,893	207,897
Proportion compared to 2015	100%	102%	77%	120%	139%	101%	22%	22%	26%	14%	-86%	
Proportion of total	19%	26%	17%	30%	34%	27%	6%	6%	9%	5%	-14%	19%
Human infectious disorders	19,660	18,857	23,214	12,248	16,185	18,740	19,285	14,379	13,202	10,809	-8,851	166,579
Proportion compared to 2015	100%	96%	118%	62%	82%	95%	98%	73%	67%	55%	-45%	
Proportion of total	13%	16%	18%	11%	14%	18%	17%	13%	15%	14%	1%	15%
Human cancer	13,799	14,614	12,194	13,108	14,973	13,320	14,006	12,704	13,062	12,496	-1,303	134,276
Proportion compared to 2015	100%	106%	88%	95%	109%	97%	102%	92%	95%	91%	-9%	
Proportion of total	9%	13%	9%	11%	13%	12%	13%	12%	15%	17%	8%	12%
Animal nutrition	0	0	0	0	0	0	24,790	25,438	18,132	18,516	18,516	86,876
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	22%	23%	21%	25%	25%	8%
Human nervous and mental disorders	13,150	10,488	10,654	9,084	7,609	6,172	6,173	8,507	5,320	5,061	-8,089	82,218
Proportion compared to 2015	100%	80%	81%	69%	58%	47%	47%	65%	40%	38%	-62%	
Proportion of total	9%	9%	8%	8%	7%	6%	6%	8%	6%	7%	-2%	7%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Human cardiovascular disorders	6,156	6,782	8,864	6,766	6,962	7,548	6,385	6,976	4,335	4,520	-1,636	65,294
Proportion compared to 2015	100%	110%	144%	110%	113%	123%	104%	113%	70%	73%	-27%	
Proportion of total	4%	6%	7%	6%	6%	7%	6%	6%	5%	6%	2%	6%
Human immune disorders	2,338	2,117	4,015	3,638	2,448	3,161	3,355	2,176	1,401	836	-1,502	25,485
Proportion compared to 2015	100%	91%	172%	156%	105%	135%	143%	93%	60%	36%	-64%	
Proportion of total	2%	2%	3%	3%	2%	3%	3%	2%	2%	1%	0%	2%
Non-regulatory toxicology and ecotoxicology	923	626	5,499	7,847	2,194	2,914	1,852	1,601	1,152	495	-428	25,103
Proportion compared to 2015	100%	68%	596%	850%	238%	316%	201%	173%	125%	54%	-46%	
Proportion of total	1%	1%	4%	7%	2%	3%	2%	1%	1%	1%	0%	2%
Human endocrine / metabolism disorders	4,749	2,460	2,425	1,064	448	833	1,449	1,091	1,549	1,623	-3,126	17,691
Proportion compared to 2015	100%	52%	51%	22%	9%	18%	31%	23%	33%	34%	-66%	
Proportion of total	3%	2%	2%	1%	0%	1%	1%	1%	2%	2%	-1%	2%
Human gastrointestinal disorders including liver	2,611	2,430	2,667	1,228	921	1,341	708	986	1,270	1,702	-909	15,864
Proportion compared to 2015	100%	93%	102%	47%	35%	51%	27%	38%	49%	65%	-35%	
Proportion of total	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	1%	1%
Human respiratory disorders	4,177	2,787	2,579	959	555	664	408	600	128	44	-4,133	12,901
Proportion compared to 2015	100%	67%	62%	23%	13%	16%	10%	14%	3%	1%	-99%	
Proportion of total	3%	2%	2%	1%	0%	1%	0%	1%	0%	0%	-3%	1%
Diagnosis of diseases	1,877	1,390	1,305	1,419	1,319	1,091	1,079	1,181	382	690	-1,187	11,733
Proportion compared to 2015	100%	74%	70%	76%	70%	58%	57%	63%	20%	37%	-63%	
Proportion of total	1%	1%	1%	1%	1%	1%	1%	1%	0%	1%	0%	1%
Human musculoskeletal disorders	627	922	1,701	538	687	943	772	898	564	518	-109	8,170
Proportion compared to 2015	100%	147%	271%	86%	110%	150%	123%	143%	90%	83%	-17%	
Proportion of total	0%	1%	1%	0%	1%	1%	1%	1%	1%	1%	0%	1%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Human sensory organ disorders (skin, eyes and ears)	281	447	575	761	880	1,257	1,335	678	315	143	-138	6,672
Proportion compared to 2015	100%	159%	205%	271%	313%	447%	475%	241%	112%	51%	-49%	
Proportion of total	0%	0%	0%	1%	1%	1%	1%	1%	0%	0%	0%	1%
Other human disorders	4,848	42	308	459	275	226	263	92	0	0	-4,848	6,513
Proportion compared to 2015	100%	1%	6%	9%	6%	5%	5%	2%	0%	0%	-100%	
Proportion of total	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-3%	1%
Human urogenital / reproductive disorders	627	282	828	678	748	522	349	245	187	126	-501	4,592
Proportion compared to 2015	100%	45%	132%	108%	119%	83%	56%	39%	30%	20%	-80%	
Proportion of total	0%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%
Plant diseases	436	43	8	3	4	0	0	0	0	0	-436	494
Proportion compared to 2015	100%	10%	2%	1%	1%	0%	0%	0%	0%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	151,538	114,569	131,067	115,971	116,857	106,944	111,990	108,408	85,643	75,243	-76,295	1,118,230
Proportion compared to 2015	100%	76%	86%	77%	77%	71%	74%	72%	57%	50%	-50%	

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4.4 Regulatory research

Table 13. *Number of animal procedures in regulatory research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Number of animal procedures	139,919	144,934	124,567	119,805	111,476	121,556	152,145	144,281	137,326	134,158	-5,761	1,330,167
Proportion compared to 2015	100%	104%	89%	86%	80%	87%	109%	103%	98%	96%	-4%	
Proportion of total	26%	32%	25%	27%	25%	27%	32%	29%	33%	32%	5%	29%

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Table 14. *Classification of severity in regulatory research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Non-recovery under general anaesthesia	254	33	46	27	30	57	16,370	18,501	17,676	19,057	18,803	72,051
Proportion compared to 2015	100%	13%	18%	11%	12%	22%	6,445%	7,284%	6,959%	7,503%	7,403%	
Proportion of total	0%	0%	0%	0%	0%	0%	11%	13%	13%	14%	14%	5%
Mild	120,768	123,099	92,203	94,182	92,019	99,409	112,466	101,629	97,643	94,619	-26,149	1,028,037
Proportion compared to 2015	100%	102%	76%	78%	76%	82%	93%	84%	81%	78%	-22%	
Proportion of total	86%	85%	74%	79%	83%	82%	74%	70%	71%	71%	-16%	77%
Moderate	13,289	17,266	25,575	23,795	18,195	21,607	22,719	23,637	20,734	19,519	6,230	206,336
Proportion compared to 2015	100%	130%	192%	179%	137%	163%	171%	178%	156%	147%	47%	
Proportion of total	9%	12%	21%	20%	16%	18%	15%	16%	15%	15%	5%	16%
Severe	5,608	4,536	6,743	1,801	1,232	483	590	514	1,273	963	-4,645	23,743
Proportion compared to 2015	100%	81%	120%	32%	22%	9%	11%	9%	23%	17%	-83%	
Proportion of total	4%	3%	5%	2%	1%	0%	0%	0%	1%	1%	-3%	2%
Total number of animal procedures	139,919	144,934	124,567	119,805	111,476	121,556	152,145	144,281	137,326	134,158	-5,761	1,330,167
Proportion compared to 2015	100%	104%	89%	86%	80%	87%	109%	103%	98%	96%	-4%	

Table 15. *Animal species used in regulatory research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Rats	77,524	90,387	70,430	70,059	62,760	68,245	81,973	79,016	72,137	70,744	-6,780	743,275
Proportion compared to 2015	100%	117%	91%	90%	81%	88%	106%	102%	93%	91%	-9%	
Proportion of total	55%	62%	57%	58%	56%	56%	54%	55%	53%	53%	-3%	56%
Mice	22,528	18,797	19,522	16,316	13,262	12,719	22,816	25,217	21,501	22,636	108	195,314
Proportion compared to 2015	100%	83%	87%	72%	59%	56%	101%	112%	95%	100%	0%	
Proportion of total	16%	13%	16%	14%	12%	10%	15%	17%	16%	17%	1%	15%
Rabbits	9,698	8,117	9,116	13,434	12,817	15,076	19,277	17,536	17,214	12,171	2,473	134,456
Proportion compared to 2015	100%	84%	94%	139%	132%	155%	199%	181%	178%	126%	26%	
Proportion of total	7%	6%	7%	11%	11%	12%	13%	12%	13%	9%	2%	10%
Domestic fowl	13,143	15,064	14,150	9,783	11,268	13,415	7,574	6,442	6,144	5,255	-7,888	102,238
Proportion compared to 2015	100%	115%	108%	74%	86%	102%	58%	49%	47%	40%	-60%	
Proportion of total	9%	10%	11%	8%	10%	11%	5%	4%	4%	4%	-5%	8%
Other fish	9,427	6,047	5,658	4,949	7,311	5,215	9,986	8,262	12,539	16,933	7,506	86,327
Proportion compared to 2015	100%	64%	60%	52%	78%	55%	106%	88%	133%	180%	80%	
Proportion of total	7%	4%	5%	4%	7%	4%	7%	6%	9%	13%	6%	6%
Guinea-Pigs	2,693	2,270	2,266	1,374	935	909	5,395	3,929	4,383	4,385	1,692	28,539
Proportion compared to 2015	100%	84%	84%	51%	35%	34%	200%	146%	163%	163%	63%	
Proportion of total	2%	2%	2%	1%	1%	1%	4%	3%	3%	3%	1%	2%
Pigs	1,675	1,870	1,549	2,316	2,016	2,040	839	256	764	732	-943	14,057
Proportion compared to 2015	100%	112%	92%	138%	120%	122%	50%	15%	46%	44%	-56%	
Proportion of total	1%	1%	1%	2%	2%	2%	1%	0%	1%	1%	-1%	1%
Xenopus	720	0	0	0	0	2,085	2,481	2,023	691	0	-720	8,000
Proportion compared to 2015	100%	0%	0%	0%	0%	290%	345%	281%	96%	0%	-100%	
Proportion of total	1%	0%	0%	0%	0%	2%	2%	1%	1%	0%	-1%	1%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Hamsters (Syrian)	1,140	1,002	585	555	449	630	975	630	870	659	-481	7,495
Proportion compared to 2015	100%	88%	51%	49%	39%	55%	86%	55%	76%	58%	-42%	
Proportion of total	1%	1%	0%	0%	0%	1%	1%	0%	1%	0%	0%	1%
Dogs	338	461	624	602	328	412	502	383	558	250	-88	4,458
Proportion compared to 2015	100%	136%	185%	178%	97%	122%	149%	113%	165%	74%	-26%	
Proportion of total	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%
Cattle	72	119	89	59	93	284	212	154	282	272	200	1,636
Proportion compared to 2015	100%	165%	124%	82%	129%	394%	294%	214%	392%	378%	278%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other birds	312	388	53	0	0	78	0	0	0	0	-312	831
Proportion compared to 2015	100%	124%	17%	0%	0%	25%	0%	0%	0%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other carnivores	321	135	257	74	42	0	0	0	0	0	-321	829
Proportion compared to 2015	100%	42%	80%	23%	13%	0%	0%	0%	0%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Zebra fish	154	123	78	159	0	240	0	0	0	0	-154	754
Proportion compared to 2015	100%	80%	51%	103%	0%	156%	0%	0%	0%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cats	39	46	68	61	144	121	87	57	50	18	-21	691
Proportion compared to 2015	100%	118%	174%	156%	369%	310%	223%	146%	128%	46%	-54%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sheep	6	106	6	2	51	48	2	311	69	67	61	668
Proportion compared to 2015	100%	1,767%	100%	33%	850%	800%	33%	50,183%	1,150%	1,117%	1,017%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other rodents	105	0	104	60	0	0	0	0	0	0	-105	269
Proportion compared to 2015	100%	0%	99%	57%	0%	0%	0%	0%	0%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Horses, donkeys and cross-breeds	24	2	0	0	0	39	20	35	28	34	10	182
Proportion compared to 2015	100%	8%	0%	0%	0%	163%	83%	146%	117%	142%	42%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turkeys	0	0	0	0	0	0	0	0	64	0	0	64
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Ferrets	0	0	0	0	0	0	0	30	30	0	0	60
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Hamsters (Chinese)	0	0	12	0	0	0	0	0	0	0	0	12
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other mammals	0	0	0	0	0	0	2	0	2	2	2	6
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sea bass	0	0	0	0	0	0	4	0	0	0	0	4
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Goats	0	0	0	2	0	0	0	0	0	0	0	2
Proportion compared to 2015	n.a.	n.a.	n.a.	100%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	139,919	144,934	124,567	119,805	111,476	121,556	152,145	144,281	137,326	134,158	-5,761	1,330,167
Proportion compared to 2015	100%	104%	89%	86%	80%	87%	109%	103%	98%	96%	-4%	

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Table 16. *Purpose of animal procedures in regulatory research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Quality control	65,370	54,947	50,082	41,765	36,154	35,431	34,327	33,625	27,069	26,445	-38,925	405,215
Proportion compared to 2015	100%	84%	77%	64%	55%	54%	53%	51%	41%	40%	-60%	
Proportion of total	47%	38%	40%	35%	32%	29%	23%	23%	20%	20%	-27%	30%
Developmental toxicity	19,624	36,197	10,505	24,923	27,636	28,690	45,815	37,745	33,386	27,929	8,305	292,450
Proportion compared to 2015	100%	184%	54%	127%	141%	146%	233%	192%	170%	142%	42%	
Proportion of total	14%	25%	8%	21%	25%	24%	30%	26%	24%	21%	7%	22%
Reproductive toxicity	24,970	26,098	36,568	28,678	21,005	21,451	22,133	27,757	31,698	32,485	7,515	272,843
Proportion compared to 2015	100%	105%	146%	115%	84%	86%	89%	111%	127%	130%	30%	
Proportion of total	18%	18%	29%	24%	19%	18%	15%	19%	23%	24%	6%	21%
Ecotoxicity	10,301	6,170	5,721	5,108	7,311	7,728	12,471	10,285	13,230	16,933	6,632	95,258
Proportion compared to 2015	100%	60%	56%	50%	71%	75%	121%	100%	128%	164%	64%	
Proportion of total	7%	4%	5%	4%	7%	6%	8%	7%	10%	13%	5%	7%
Routine production	423	264	177	252	288	322	18,862	23,070	19,971	21,446	21,023	85,075
Proportion compared to 2015	100%	62%	42%	60%	68%	76%	4,459%	5,454%	4,721%	5,070%	4,970%	
Proportion of total	0%	0%	0%	0%	0%	0%	12%	16%	15%	16%	16%	6%
Repeated dose toxicity	6,928	6,392	8,739	8,304	7,877	11,848	9,343	3,888	3,350	3,668	-3,260	70,337
Proportion compared to 2015	100%	92%	126%	120%	114%	171%	135%	56%	48%	53%	-47%	
Proportion of total	5%	4%	7%	7%	7%	10%	6%	3%	2%	3%	-2%	5%
Skin sensitisation	3,777	4,086	2,378	2,752	2,345	3,239	2,244	1,906	1,256	827	-2,950	24,810
Proportion compared to 2015	100%	108%	63%	73%	62%	86%	59%	50%	33%	22%	-78%	
Proportion of total	3%	3%	2%	2%	2%	3%	1%	1%	1%	1%	-2%	2%
Other efficacy and tolerance testing	1,023	5,121	3,359	2,853	3,292	3,720	237	692	0	318	-705	20,615
Proportion compared to 2015	100%	501%	328%	279%	322%	364%	23%	68%	0%	31%	-69%	
Proportion of total	1%	4%	3%	2%	3%	3%	0%	0%	0%	0%	0%	2%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Target animal safety	1,839	7	1,174	1,019	761	2,740	949	856	2,075	1,597	-242	13,017
Proportion compared to 2015	100%	0%	64%	55%	41%	149%	52%	47%	113%	87%	-13%	
Proportion of total	1%	0%	1%	1%	1%	2%	1%	1%	2%	1%	0%	1%
Safety testing in food and feed area	960	1,792	2,104	1,120	2,828	1,834	1,110	714	182	135	-825	12,779
Proportion compared to 2015	100%	187%	219%	117%	295%	191%	116%	74%	19%	14%	-86%	
Proportion of total	1%	1%	2%	1%	3%	2%	1%	0%	0%	0%	-1%	1%
Acute and subacute toxicity	1,020	1,903	1,886	1,452	932	974	865	1,963	950	480	-540	12,425
Proportion compared to 2015	100%	187%	185%	142%	91%	95%	85%	192%	93%	47%	-53%	
Proportion of total	1%	1%	2%	1%	1%	1%	1%	1%	1%	0%	0%	1%
Kinetics (pharmacokinetics, toxicokinetics, residue depletion)	1,012	1,066	1,650	870	549	531	1,651	818	1,024	233	-779	9,404
Proportion compared to 2015	100%	105%	163%	86%	54%	52%	163%	81%	101%	23%	-77%	
Proportion of total	1%	1%	1%	1%	0%	0%	1%	1%	1%	0%	-1%	1%
Genotoxicity	733	660	106	32	0	1,038	1,550	0	1,546	992	259	6,657
Proportion compared to 2015	100%	90%	14%	4%	0%	142%	211%	0%	211%	135%	35%	
Proportion of total	1%	0%	0%	0%	0%	1%	1%	0%	1%	1%	0%	1%
Carcinogenicity	1,538	0	0	508	0	0	0	320	1,110	0	-1,538	3,476
Proportion compared to 2015	100%	0%	0%	33%	0%	0%	0%	21%	72%	0%	-100%	
Proportion of total	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%	-1%	0%
Neurotoxicity	0	0	0	0	415	1,773	0	0	0	349	349	2,537
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%
Phototoxicity	0	0	4	108	0	0	525	600	467	312	312	2,016
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Eye irritation / corrosion	401	231	106	59	71	143	56	42	12	9	-392	1,130
Proportion compared to 2015	100%	58%	26%	15%	18%	36%	14%	10%	3%	2%	-98%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other toxicity or safety testing	0	0	0	0	3	94	0	0	0	0	0	97
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pharmaco-dynamics (including safety pharmacology)	0	0	8	2	9	0	7	0	0	0	0	26
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	139,919	144,934	124,567	119,805	111,476	121,556	152,145	144,281	137,326	134,158	-5,761	1,330,167
Proportion compared to 2015	100%	104%	89%	86%	80%	87%	109%	103%	98%	96%	-4%	

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Table 17. *Type of regulatory research*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Legislation on industrial chemicals	47,337	68,834	57,600	60,024	51,483	54,187	78,331	67,209	72,363	69,011	21,674	626,379
Proportion compared to 2015	100%	145%	122%	127%	109%	114%	165%	142%	153%	146%	46%	
Proportion of total	34%	48%	46%	50%	46%	45%	59%	55%	62%	61%	27%	50%
Legislation on medicinal products for human use	44,052	38,543	30,227	27,637	29,070	29,665	24,083	24,019	16,073	13,617	-30,435	276,986
Proportion compared to 2015	100%	87%	69%	63%	66%	67%	55%	55%	36%	31%	-69%	
Proportion of total	32%	27%	24%	23%	26%	24%	18%	20%	14%	12%	-19%	22%
Legislation on medicinal products for veterinary use and their residues	34,069	30,297	32,039	26,604	23,441	25,048	23,747	21,072	22,457	27,241	-6,828	266,015
Proportion compared to 2015	100%	89%	94%	78%	69%	74%	70%	62%	66%	80%	-20%	
Proportion of total	24%	21%	26%	22%	21%	21%	18%	17%	19%	24%	0%	21%
Legislation on plant protection products	2,790	310	312	1,684	1,999	7,089	4,186	5,468	733	1,101	-1,689	25,672
Proportion compared to 2015	100%	11%	11%	60%	72%	254%	150%	196%	26%	39%	-61%	
Proportion of total	2%	0%	0%	1%	2%	6%	3%	5%	1%	1%	-1%	2%
Legislation on food including food contact materials	1,749	1,697	2,067	2,593	2,381	1,473	1,789	2,235	4,483	1,558	-191	22,025
Proportion compared to 2015	100%	97%	118%	148%	136%	84%	102%	128%	256%	89%	-11%	
Proportion of total	1%	1%	2%	2%	2%	1%	1%	2%	4%	1%	0%	2%
Legislation on animal feed, including safety requirements for target animals, workers and the environment	1,045	2,138	2,164	1,120	2,896	1,843	1,038	714	412	135	-910	13,505
Proportion compared to 2015	100%	205%	207%	107%	277%	176%	99%	68%	39%	13%	-87%	
Proportion of total	1%	1%	2%	1%	3%	2%	1%	1%	0%	0%	-1%	1%
Other legislation	8,771	2,756	66	0	0	17	0	10	140	0	-8,771	11,760
Proportion compared to 2015	100%	31%	1%	0%	0%	0%	0%	0%	2%	0%	-100%	
Proportion of total	6%	2%	0%	0%	0%	0%	0%	0%	0%	0%	-6%	1%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Legislation on biocides	0	151	92	126	166	2,231	80	484	694	46	46	4,070
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%	0%	0%
Legislation on medical devices	2	62	0	17	40	3	29	0	0	3	1	156
Proportion compared to 2015	100%	3,100%	0%	850%	2,000%	150%	1,450%	0%	0%	150%	50%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures to comply with legislation and regulations[10]	139,815	144,788	124,567	119,805	111,476	121,556	133,283	121,211	117,355	112,712	-27,103	1,246,568
Proportion compared to 2015	100%	104%	89%	86%	80%	87%	95%	87%	84%	81%	-19%	

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[10] Animal procedures for routine production are not performed to comply with specific laws or regulations and are not included in this table.

Table 18. *Origin of legislation*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Legislation satisfying EU requirements	129,205	140,936	120,235	116,264	108,183	118,690	127,524	115,338	110,873	106,534	-22,671	1,193,782
Proportion compared to 2015	100%	109%	93%	90%	84%	92%	99%	89%	86%	82%	-18%	
Proportion of total	92%	97%	97%	97%	97%	98%	96%	95%	94%	95%	2%	96%
Legislation satisfying non-EU requirements only	9,184	2,643	2,704	2,113	1,563	1,479	3,840	4,191	3,134	4,724	-4,460	35,575
Proportion compared to 2015	100%	29%	29%	23%	17%	16%	42%	46%	34%	51%	-49%	
Proportion of total	7%	2%	2%	2%	1%	1%	3%	3%	3%	4%	-2%	3%
Legislation satisfying national requirements only (within the EU)	1,530	1,253	1,628	1,428	1,730	1,387	1,919	1,682	3,348	1,454	-76	17,359
Proportion compared to 2015	100%	82%	106%	93%	113%	91%	125%	110%	219%	95%	-5%	
Proportion of total	1%	1%	1%	1%	2%	1%	1%	1%	3%	1%	0%	1%
Total number of animal procedures to comply with legislations and regulations[11]	139,919	144,832	124,567	119,805	111,476	121,556	133,283	121,211	117,355	112,712	-27,207	1,246,716
Proportion compared to 2015	100%	104%	89%	86%	80%	87%	95%	87%	84%	81%	-19%	

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[11] Animal procedures for routine production are not performed to comply with specific laws or regulations and are not included in this table.

4.5 Research for the preservation of species

Table 19. *Number of animal procedures in research for the preservation of species*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Number of animal procedures	22,255	25,819	25,083	22,489	44,494	41,956	56,140	84,107	71,091	89,555	67,300	482,989
Proportion compared to 2015	100%	116%	113%	101%	200%	189%	252%	378%	319%	402%	302%	
Proportion of total	4%	6%	5%	5%	10%	9%	12%	17%	17%	21%	17%	10%

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Table 20. *Classification of severity in research for the preservation of species*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Non-recovery under general anaesthesia	0	0	0	0	777	630	0	0	0	0	0	1,407
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	2%	2%	0%	0%	0%	0%	0%	0%
Mild	20,620	23,790	21,470	21,272	25,696	20,900	26,745	30,881	54,282	68,988	48,368	314,644
Proportion compared to 2015	100%	115%	104%	103%	125%	101%	130%	150%	263%	335%	235%	
Proportion of total	93%	92%	86%	95%	58%	50%	48%	37%	76%	77%	-16%	65%
Moderate	1,635	2,029	3,613	1,217	18,021	20,426	29,395	53,226	16,809	20,567	18,932	166,938
Proportion compared to 2015	100%	124%	221%	74%	1,102%	1,249%	1,798%	3,255%	1,028%	1,258%	1,158%	
Proportion of total	7%	8%	14%	5%	41%	49%	52%	63%	24%	23%	16%	35%
Severe	0	0	0	0	0	0	0	0	0	0	0	0
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	22,255	25,819	25,083	22,489	44,494	41,956	56,140	84,107	71,091	89,555	67,300	482,989
Proportion compared to 2015	100%	116%	113%	101%	200%	189%	252%	378%	319%	402%	302%	

Table 21. *Animal species used in research for the preservation of species*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Other fish	22,255	25,578	25,076	22,479	43,984	41,306	55,311	83,476	70,759	88,625	66,370	478,849
Proportion compared to 2015	100%	115%	113%	101%	198%	186%	249%	375%	318%	398%	298%	
Proportion of total	100%	99%	100%	100%	99%	98%	99%	99%	100%	99%	-1%	99%
Other birds	0	237	0	0	211	224	390	153	90	70	70	1,375
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	1%	0%	0%	0%	1%	1%	0%	0%	0%	0%	0%
Salmon, trout, chars and graylings	0	0	0	0	0	0	184	458	242	268	268	1,152
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%
Reptiles	0	0	0	0	0	360	0	0	0	134	134	494
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%
Other amphibians	0	0	0	0	41	0	12	0	0	328	328	381
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other rodents	0	0	0	0	238	66	0	0	0	0	0	304
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Sea bass	0	0	0	0	0	0	238	0	0	0	0	238
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rana	0	0	0	0	0	0	0	0	0	129	129	129
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Other carnivores	0	4	7	10	20	0	0	0	0	0	0	41
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other mammals	0	0	0	0	0	0	5	20	0	1	1	26
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Research for the preservation of species	0	0	0	0	0	0	0	0	0	0	0	0
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Domestic fowl	0	0	0	0	0	0	0	0	0	0	0	0
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mice	0	0	0	0	0	0	0	0	0	0	0	0
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	22,255	25,819	25,083	22,489	44,494	41,956	56,140	84,107	71,091	89,555	67,300	482,989
Proportion compared to 2015	100%	116%	113%	101%	200%	189%	252%	378%	319%	402%	302%	

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4.6 Research for protection of the environment

Table 22. *Number of animal procedures in research for protection of the environment*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Number of animal procedures	376	24	873	1,678	690	602	4,309	4,810	15,228	11,090	10,714	39,680
Proportion compared to 2015	100%	6%	232%	446%	184%	160%	1,146%	1,279%	4,050%	2,949%	2,849%	
Proportion of total	0%	0%	0%	0%	0%	0%	1%	1%	4%	3%	3%	1%

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Table 23. *Classification of severity in research for protection of the environment*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Non-recovery under general anaesthesia	12	0	0	0	0	0	0	0	0	1	-11	13
Proportion compared to 2015	100%	0%	0%	0%	0%	0%	0%	0%	0%	8%	-92%	
Proportion of total	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-3%	0%
Mild	364	4	873	1,508	205	320	2,581	2,739	3,803	9,271	8,907	21,668
Proportion compared to 2015	100%	1%	240%	414%	56%	88%	709%	752%	1,045%	2,547%	2,447%	
Proportion of total	97%	17%	100%	90%	30%	53%	60%	57%	25%	84%	-13%	55%
Moderate	0	20	0	170	485	282	1,728	2,071	11,425	1,818	1,818	17,999
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	83%	0%	10%	70%	47%	40%	43%	75%	16%	16%	45%
Severe	0	0	0	0	0	0	0	0	0	0	0	0
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	376	24	873	1,678	690	602	4,309	4,810	15,228	11,090	10,714	39,680
Proportion compared to 2015	100%	6%	232%	446%	184%	160%	1,146%	1,279%	4,050%	2,949%	2,849%	

Table 24. *Animal species used in research for protection of the environment*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Other birds	0	20	854	964	165	0	0	0	12,107	10,096	10,096	24,206
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	83%	98%	57%	24%	0%	0%	0%	80%	91%	91%	61%
Other fish	0	0	0	695	479	575	3,621	4,181	2,056	925	925	12,532
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	41%	69%	96%	84%	87%	14%	8%	8%	32%
Salmon, trout, chars and graylings	0	0	0	0	0	0	656	600	0	0	0	1,256
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	15%	12%	0%	0%	0%	3%
Other rodents	0	0	19	19	46	21	30	0	672	2	2	809
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	2%	1%	7%	3%	1%	0%	4%	0%	0%	2%
Cattle	364	4	0	0	0	0	0	0	0	50	-314	418
Proportion compared to 2015	100%	1%	0%	0%	0%	0%	0%	0%	0%	14%	-86%	
Proportion of total	97%	17%	0%	0%	0%	0%	0%	0%	0%	0%	-96%	1%
Other mammals	0	0	0	0	0	6	2	29	357	0	0	394
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	1%	0%	1%	2%	0%	0%	1%
Sea bass	0	0	0	0	0	0	0	0	33	17	17	50
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pigs	12	0	0	0	0	0	0	0	0	0	-12	12
Proportion compared to 2015	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-100%	
Proportion of total	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-3%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Mice	0	0	0	0	0	0	0	0	3	0	0	3
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	376	24	873	1,678	690	602	4,309	4,810	15,228	11,090	10,714	39,680
Proportion compared to 2015	100%	6%	232%	446%	184%	160%	1,146%	1,279%	4,050%	2,949%	2,849%	

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4.7 Research for higher education and training of vocational skills

Table 25. *Number of animal procedures in research for higher education and training of vocational skills*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Number of animal procedures	21,252	16,919	21,590	15,802	15,934	11,579	13,187	13,583	11,324	10,899	-10,353	152,069
Proportion compared to 2015	100%	80%	102%	74%	75%	55%	62%	64%	54%	51%	-49%	
Proportion of total	4%	4%	4%	3%	4%	3%	3%	3%	3%	3%	-1%	3%

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Table 26. *Classification of severity in research for higher education and training of vocational skills*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Non-recovery under general anaesthesia	2,343	2,442	4,630	3,971	2,983	2,229	2,078	3,969	2,255	1,514	-829	28,414
Proportion compared to 2015	100%	104%	198%	169%	127%	95%	89%	169%	96%	65%	-35%	
Proportion of total	11%	14%	21%	25%	19%	19%	16%	29%	20%	14%	3%	19%
Mild	16,052	13,112	13,538	9,578	11,014	7,855	9,707	8,610	7,726	7,528	-8,524	104,720
Proportion compared to 2015	100%	82%	84%	60%	69%	49%	60%	54%	48%	47%	-53%	
Proportion of total	76%	77%	63%	61%	69%	68%	74%	63%	68%	69%	-6%	69%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Moderate	2,764	1,262	3,381	2,246	1,928	1,483	1,384	979	1,327	1,817	-947	18,571
Proportion compared to 2015	100%	46%	122%	81%	70%	54%	50%	35%	48%	66%	-34%	
Proportion of total	13%	7%	16%	14%	12%	13%	10%	7%	12%	17%	4%	12%
Severe	93	103	41	7	9	12	18	25	16	40	-53	364
Proportion compared to 2015	100%	111%	44%	8%	10%	13%	19%	27%	17%	43%	-57%	
Proportion of total	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	21,252	16,919	21,590	15,802	15,934	11,579	13,187	13,583	11,324	10,899	-10,353	152,069
Proportion compared to 2015	100%	80%	102%	74%	75%	54%	62%	64%	53%	51%	-49%	

Table 27. *Animal species used in research for higher education and training of vocational skills*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Mice	10,977	7,283	12,140	8,326	8,914	6,546	7,380	8,444	5,949	6,197	-4,780	82,156
Proportion compared to 2015	100%	66%	111%	76%	81%	60%	67%	77%	54%	56%	-44%	
Proportion of total	52%	43%	56%	53%	56%	57%	56%	62%	53%	57%	5%	54%
Rats	4,156	4,800	4,366	3,554	3,791	2,663	3,081	2,872	3,013	2,623	-1,533	34,919
Proportion compared to 2015	100%	115%	105%	86%	91%	64%	74%	69%	72%	63%	-37%	
Proportion of total	20%	28%	20%	22%	24%	23%	23%	21%	27%	24%	5%	23%
Domestic fowl	1,775	1,402	1,986	1,404	1,024	692	540	580	1,098	768	-1,007	11,269
Proportion compared to 2015	100%	79%	112%	79%	58%	39%	30%	33%	62%	43%	-57%	
Proportion of total	8%	8%	9%	9%	6%	6%	4%	4%	10%	7%	-1%	7%
Cattle	1,547	1,487	581	1,372	1,121	717	835	652	333	416	-1,131	9,061
Proportion compared to 2015	100%	96%	38%	89%	72%	46%	54%	42%	22%	27%	-73%	
Proportion of total	7%	9%	3%	9%	7%	6%	6%	5%	3%	4%	-3%	6%
Pigs	477	359	468	327	255	136	520	475	237	286	-191	3,540
Proportion compared to 2015	100%	75%	98%	69%	53%	29%	109%	100%	50%	60%	-40%	
Proportion of total	2%	2%	2%	2%	2%	1%	4%	3%	2%	3%	0%	2%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Other fish	1,148	635	850	148	8	77	25	125	94	34	-1,114	3,144
Proportion compared to 2015	100%	55%	74%	13%	1%	7%	2%	11%	8%	3%	-97%	
Proportion of total	5%	4%	4%	1%	0%	1%	0%	1%	1%	0%	-5%	2%
Other birds	330	337	273	148	139	142	174	16	146	151	-179	1,856
Proportion compared to 2015	100%	102%	83%	45%	42%	43%	53%	5%	44%	46%	-54%	
Proportion of total	2%	2%	1%	1%	1%	1%	1%	0%	1%	1%	0%	1%
Goats	168	101	144	21	199	1	152	219	188	195	27	1,388
Proportion compared to 2015	100%	60%	86%	13%	118%	1%	90%	130%	112%	116%	16%	
Proportion of total	1%	1%	1%	0%	1%	0%	1%	2%	2%	2%	1%	1%
Sheep	89	112	101	117	131	101	106	42	49	17	-72	865
Proportion compared to 2015	100%	126%	113%	131%	147%	113%	119%	47%	55%	19%	-81%	
Proportion of total	0%	1%	0%	1%	1%	1%	1%	0%	0%	0%	0%	1%
Rabbits	152	154	159	55	59	60	56	18	17	49	-103	779
Proportion compared to 2015	100%	101%	105%	36%	39%	39%	37%	12%	11%	32%	-68%	
Proportion of total	1%	1%	1%	0%	0%	1%	0%	0%	0%	0%	0%	1%
Dogs	199	58	92	44	48	44	44	1	103	44	-155	677
Proportion compared to 2015	100%	29%	46%	22%	24%	22%	22%	1%	52%	22%	-78%	
Proportion of total	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%	-1%	0%
Zebra fish	8	54	122	149	146	56	83	0	10	23	15	651
Proportion compared to 2015	100%	675%	1,525%	1,863%	1,825%	700%	1,038%	0%	125%	288%	188%	
Proportion of total	0%	0%	1%	1%	1%	0%	1%	0%	0%	0%	0%	0%
Guinea-Pigs	109	36	59	35	27	32	35	83	0	36	-73	452
Proportion compared to 2015	100%	33%	54%	32%	25%	29%	32%	76%	0%	33%	-67%	
Proportion of total	1%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%
Horses, donkeys and cross-breeds	48	47	103	27	25	22	47	23	22	27	-21	391
Proportion compared to 2015	100%	98%	215%	56%	52%	46%	98%	48%	46%	56%	-44%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Ferrets	64	54	54	28	24	24	24	0	6	6	-58	284
Proportion compared to 2015	100%	84%	84%	44%	38%	38%	38%	0%	9%	9%	-91%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Hamsters (Syrian)	0	0	52	21	0	43	51	18	2	7	7	194
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Xenopus	0	0	0	15	0	160	0	0	0	10	10	185
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%
Cats	0	0	31	11	11	13	11	0	11	0	0	88
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other rodents	5	0	0	0	12	50	8	0	0	0	-5	75
Proportion compared to 2015	100%	0%	0%	0%	240%	1,000%	160%	0%	0%	0%	-100%	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turkeys	0	0	0	0	0	0	0	0	40	0	0	40
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Salmon, trout, chars and graylings	0	0	0	0	0	0	4	15	6	0	0	25
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mongolian gerbils	0	0	0	0	0	0	11	0	0	0	0	11
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Guppy, swordtail, molly, platy	0	0	0	0	0	0	0	0	0	10	10	10
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Rana	0	0	9	0	0	0	0	0	0	0	0	9
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other carnivores	0	0	0	0	0	0	0	0	0	0	0	0
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Reptiles	0	0	0	0	0	0	0	0	0	0	0	0
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	21,252	16,919	21,590	15,802	15,934	11,579	13,187	13,583	11,324	10,899	-10,353	152,069
Proportion compared to 2015	100%	80%	102%	74%	75%	54%	62%	64%	53%	51%	-49%	

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4.8 Creation and maintenance of genetically altered animals

Table 28. *Number of surplus animals**

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Animals dead or killed before use in breeding programmes or animal procedures	315,487	336,600	351,414	315,775	329,105	264,353	234,397	242,728	162,777	150,809	-164,678	2,703,445
Proportion compared to 2015	100%	107%	111%	100%	104%	84%	74%	77%	52%	48%	-52%	
Proportion of total	78%	76%	78%	72%	74%	66%	70%	71%	62%	62%	-15%	72%
Animals dead or killed after use in breeding programmes	90,688	104,166	96,838	121,731	113,662	133,683	100,107	99,159	99,021	90,874	186	1,049,929
Proportion compared to 2015	100%	115%	107%	134%	125%	147%	110%	109%	109%	100%	0%	
Proportion of total	22%	24%	22%	28%	26%	34%	30%	29%	38%	38%	15%	28%
Total number of animal procedures	406,175	440,766	448,252	437,506	442,767	398,036	334,504	341,887	261,798	241,683	-164,492	3,753,374
Proportion compared to 2015	100%	109%	110%	108%	109%	98%	82%	84%	64%	60%	-40%	

* These data are not derived directly from the registration dataset compiled by the NCad, but have been taken from 'Zo doende' the annual reports on animal procedures by the NVWA.

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Table 29. *Number of animal procedures in creation and maintenance of genetically altered animals*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Number of animal procedures	50,843	1,621	1,667	1,240	1,211	5,323	11,446	5,214	3,756	14,444	-36,399	96,765
Proportion compared to 2015	100%	3%	3%	2%	2%	10%	23%	10%	7%	28%	-72%	
Proportion of total	10%	0%	0%	0%	0%	1%	2%	1%	1%	3%	-6%	2%

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Table 30. *Classification of severity in creation and maintenance of genetically altered animals*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Non-recovery under general anaesthesia	0	3	0	0	0	0	0	0	0	0	0	3
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mild	49,598	993	1,106	988	502	4,353	10,543	4,359	2,375	11,711	-37,887	86,528
Proportion compared to 2015	100%	2%	2%	2%	1%	9%	21%	9%	5%	24%	-76%	
Proportion of total	98%	61%	66%	80%	41%	82%	92%	84%	63%	81%	-16%	89%
Moderate	1,020	609	544	240	663	705	855	753	938	2,283	1,263	8,610
Proportion compared to 2015	100%	60%	53%	24%	65%	69%	84%	74%	92%	224%	124%	
Proportion of total	2%	38%	33%	19%	55%	13%	7%	14%	25%	16%	14%	9%
Severe	225	16	17	12	46	265	48	102	443	450	225	1,624
Proportion compared to 2015	100%	7%	8%	5%	20%	118%	21%	45%	197%	200%	100%	
Proportion of total	0%	1%	1%	1%	4%	5%	0%	2%	12%	3%	3%	2%
Total number of animal procedures	50,843	1,621	1,667	1,240	1,211	5,323	11,446	5,214	3,756	14,444	-36,399	96,765
Proportion compared to 2015	100%	3%	3%	2%	2%	10%	23%	10%	7%	28%	-72%	

Table 31. *Animal species used in creation and maintenance of genetically altered animals*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Mice	50,726	1,154	1,057	1,186	1,194	5,145	11,053	4,961	3,619	8,371	-42,355	88,466
Proportion compared to 2015	100%	2%	2%	2%	2%	10%	22%	10%	7%	17%	-83%	
Proportion of total	100%	71%	63%	96%	99%	97%	97%	95%	96%	58%	-42%	91%
Zebra fish	0	0	181	54	17	70	119	233	137	6,021	6,021	6,832
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	11%	4%	1%	1%	1%	4%	4%	42%	42%	7%
Rats	117	467	429	0	0	108	274	0	0	52	-65	1,447
Proportion compared to 2015	100%	399%	367%	0%	0%	92%	234%	0%	0%	44%	-56%	
Proportion of total	0%	29%	26%	0%	0%	2%	2%	0%	0%	0%	0%	1%
Cattle	0	0	0	0	0	0	0	20	0	0	0	20
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	50,843	1,621	1,667	1,240	1,211	5,323	11,446	5,214	3,756	14,444	-36,399	96,765
Proportion compared to 2015	100%	3%	3%	2%	2%	10%	23%	10%	7%	28%	-72%	

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4.9 Forensic enquiries

Animal procedures in the forensic enquiries category involve procedures conducted to develop forensic methodologies or insights. This includes killing animals to monitor the decomposition process under the influence of different environmental factors.

Numbers

In the Netherlands, this is a very small research category, with between 4 and 745 animal procedures per year. Although there are occasional fluctuations in the numbers, these are too small to suggest a specific trend or development.

Table 32. *Number of animal procedures in forensic enquiries*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Number of animal procedures	42	745	361	16	4	26	156	162	14	45	-3	1,571
Proportion compared to 2015	100%	1,774%	860%	38%	10%	62%	371%	386%	33%	107%	-7%	
Proportion of total	0.01%	0.16%	0.07%	0.00%	0.00%	0.01%	0.03%	0.03%	0.00%	0.01%	0.00%	0.03%

Table 33. *Classification of severity in forensic enquiries*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Non-recovery under general anaesthesia	17	1	0	0	0	0	0	0	0	0	-17	18
Proportion compared to 2015	100%	6%	0%	0%	0%	0%	0%	0%	0%	0%	-100%	
Proportion of total	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-40%	1%
Mild	6	731	361	16	4	26	156	162	14	45	39	1,521
Proportion compared to 2015	100%	12,183%	6,017%	267%	67%	433%	2,600%	2,700%	233%	750%	650%	
Proportion of total	14%	98%	100%	100%	100%	100%	100%	100%	100%	100%	86%	97%
Moderate	19	13	0	0	0	0	0	0	0	0	-19	32
Proportion compared to 2015	100%	68%	0%	0%	0%	0%	0%	0%	0%	0%	-100%	
Proportion of total	45%	2%	0%	0%	0%	0%	0%	0%	0%	0%	-45%	2%
Severe	0	0	0	0	0	0	0	0	0	0	0	0
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total number of animal procedures	42	745	361	16	4	26	156	162	14	45	3	1,571
Proportion compared to 2015	100%	1,774%	860%	38%	10%	62%	371%	386%	33%	107%	7%	

Table 34. *Animal species used in forensic enquiries*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Domestic fowl	0	604	315	0	0	0	60	60	0	45	45	1,084
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	81%	87%	0%	0%	0%	38%	37%	0%	100%	100%	69%
Pigs	0	2	20	0	2	0	86	86	0	0	0	196
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	0%	6%	0%	50%	0%	55%	53%	0%	0%	0%	12%
Cattle	6	25	26	16	2	26	10	16	14	0	-6	141
Proportion compared to 2015	100%	417%	433%	267%	33%	433%	167%	267%	233%	0%	-100%	
Proportion of total	14%	3%	7%	100%	50%	100%	6%	10%	100%	0%	-14%	9%
Mice	0	100	0	0	0	0	0	0	0	0	0	100
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	13%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%
Guinea-Pigs	36	0	0	0	0	0	0	0	0	0	-36	36
Proportion compared to 2015	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-100%	
Proportion of total	86%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-86%	2%
Rats	0	14	0	0	0	0	0	0	0	0	0	14
Proportion compared to 2015	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
Proportion of total	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Total number of animal procedures	42	745	361	16	4	26	156	162	14	45	3	1,571
Proportion compared to 2015	100%	1,774%	860%	38%	10%	62%	371%	386%	33%	107%	7%	

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Table 35. *Genetic status of animals used in procedures*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Not genetically altered	392,047	364,790	378,487	362,587	362,395	361,246	386,259	412,153	348,420	347,867	-44,180	3,716,251
Proportion compared to 2015	100%	93%	97%	92%	92%	92%	99%	105%	89%	89%	-11%	
Proportion of total	74%	81%	75%	81%	81%	81%	81%	84%	84%	82%	8%	80%
Genetically altered	136,441	86,917	128,586	86,111	86,137	86,846	91,767	80,249	65,326	76,103	-60,338	924,483
Proportion compared to 2015	100%	64%	94%	63%	63%	64%	67%	59%	48%	56%	-44%	
Proportion of total	26%	19%	25%	19%	19%	19%	19%	16%	16%	18%	-8%	20%
Total number of animal procedures	528,488	451,707	507,073	448,698	448,532	448,092	478,026	492,402	413,746	423,970	-104,518	4,640,734

Table 36. *Animal procedures in which animals were reused*

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Difference 2015-2024	Total 2015-2024
Reuse	10,220	11,960	13,510	11,236	7,638	5,203	4,506	5,620	4,311	4,192	-6,028	78,396
Proportion compared to 2015	100%	117%	132%	110%	75%	51%	44%	55%	42%	41%	-59%	
Proportion of total	2%	3%	3%	3%	2%	1%	1%	1%	1%	1%	-1%	2%
Total number of animal procedures	528,488	451,707	507,073	448,698	448,532	448,092	478,026	492,402	413,746	423,970	-104,518	4,640,734

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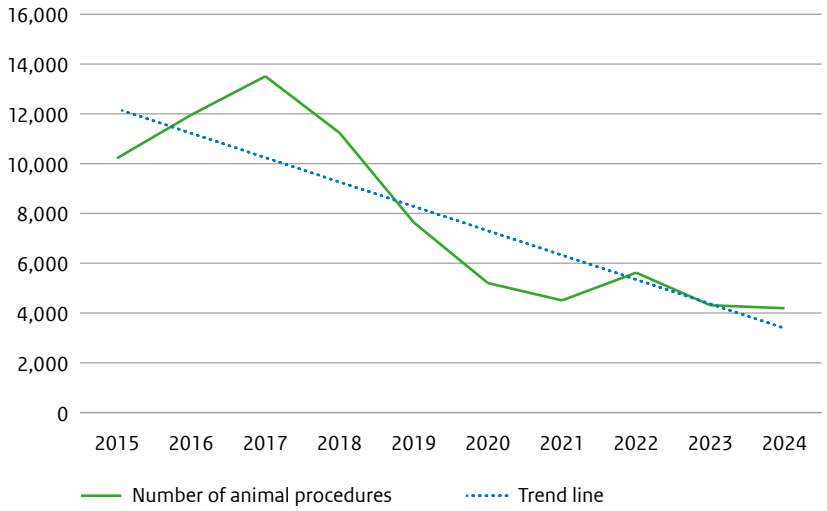
Appendix 5: Reuse

The number of registered animal procedures does not equate to the number of animals used annually in procedures. Animals are not always killed at the end of a procedure, and under specific conditions, an animal may be reused in a subsequent procedure. As a result, the number of registered animal procedures is slightly higher than the number of laboratory animals used.

The registration data shows a decline in the number of procedures involving reuse. In 2017, 13,510 procedures involved reuse, but this number had fallen to 4,192 procedures in 2024. This decline is not only absolute but also relative (from 2.7% of all animal procedures in 2017 to 1% in 2024).

Figure 27. *Animal procedures in which animals were reused*



Line graph showing the number of animal procedures in which animals were reused, for the years 2015–2024. There is a downward trend.

View data table 36

Appendix 6: Acknowledgements

Contributing experts

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This advisory report was prepared with contributions from the following experts:

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- Netherlands Cancer Institute (NKI)
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- Wageningen Marine Research (WMR)
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