HPRA
An tÚdarás Rialála Táirgí Sláinte
Health Products Regulatory Authority

Annual statistical report for animals used in Ireland under scientific animal protection legislation - 2022

15 DECEMBER 2023

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1 INTRODUCTION

The Health Products Regulatory Authority (HPRA) is the State agency with responsibility for the protection of animals used for scientific purposes, the regulation of human and veterinary clinical trials, and the regulation of human and veterinary medicines, medical devices and other health products, amongst other regulatory functions. The European legislation regulating the use of animals for scientific purposes is Directive 2010/63/EU (hereafter referred to as the Directive), and the HPRA is the competent authority responsible for the Directive's implementation in Ireland.

The Directive is among the world's most advanced pieces of animal welfare legislation. The restrictions and standards set by the Directive aim to enhance animal welfare and ensure that animals are used in studies only when absolutely necessary and following independent assessment. The Directive firmly anchors in EU Legislation the 3R principles, i.e., Replacement, Reduction, and Refinement:

- **Replacement** involves the acceleration of the development and use of models and tools, based on the latest science and technologies, to address important scientific questions without the use of animals. Examples of alternative methods would include *in vitro* tests such as the use of cell lines, computer and mathematical simulation and modelling, video material, or the use of invertebrates such as fruit flies or worms.

- **Reduction** refers to methods that minimise the number of animals used per project or study consistent with the scientific aims. It is essential that studies using animals are appropriately designed and analysed to ensure robust and reproducible findings. Reduction also includes methods that allow the information gathered per animal in a study to be maximised in order to reduce the use of additional animals. Examples of this include the use of some imaging modalities which allow repeated measurements in the same animal to be taken over time (rather than, for example, imaging different animals at each time point) or microsampling of blood, where limiting the amount of blood taken each time to small volumes enables repeat sampling in the same animal.

- **Refinement** refers to methods that minimise the pain, suffering, distress or lasting harm that may be experienced by the animals, and which improve their welfare. Refinement means that animals are provided with the best possible care, and this applies to all aspects of animal use from the animals' housing and husbandry to the scientific procedures performed on them. Examples of refinement include ensuring that animals are provided with housing that allows the expression of species-specific behaviours, using appropriate anaesthesia and analgesia to minimise pain, and training animals to cooperate with procedures to minimise any stress.

Although complete replacement of animal studies is the ultimate goal of the Directive, for the moment the use of live animals continues to be necessary to protect human and animal health and the environment. Where biological processes are not sufficiently understood or are very complex, non-animal research or test methods are often not available. After generating as much information as possible using non-animal alternatives, animal studies can sometimes be necessary to fill knowledge gaps. However, the Directive plays a vital role in protecting and improving the welfare of those animals that are required to be used for scientific purposes. The HPRA regulates the sector by means of authorisation at three levels:

1. **Breeder/supplier/user establishments:** Breeders and suppliers of animals, as well as establishments where procedures are performed, must be authorised and are subject to HPRA inspections. During 2022, there were 23 inspections completed to monitor animal welfare standards and compliance with legislation, with 48% of these performed as unannounced inspections.

2. **Projects:** Scientific procedures involving animals can only take place following a detailed submission of the planned study/studies and subsequent approval by the HPRA on the basis of a favourable harm/benefit analysis.

3. **Individuals:** Any person wishing to carry out scientific procedures involving animals, as well as project managers and those conducting euthanasia in an authorised establishment, must be adequately trained to do so and hold a HPRA individual authorisation.

The HPRA aims to improve the welfare of animals used for scientific purposes and to promote the principles of the 3Rs. Every application received for a project involving animals is subject to a detailed evaluation process rooted in the 3R principles and requires robust scientific justification for the research techniques being applied. The HPRA considers whether alternative (non-animal) methods are available or appropriate, as alternatives to the use of live animals must be used where possible. Where non-animal methods to address the specific research question are not available/appropriate, the likely impact on the animals must be minimised in so far as possible by applying the principles of Reduction and Refinement, and any harms experienced by the animals must be outweighed by the expected benefits of the work. In fulfilment of the HPRA's mandate to promote the 3Rs, in 2022 the HPRA continued its ongoing efforts to enhance awareness and utilisation of non-animal alternatives. The HPRA continued to promote the application of the principles of Replacement, Reduction, and Refinement in the conduct of scientific studies in animals through its work, including the regular dissemination of pertinent information to the regulated sector.

The objective of this report is to present statistical data on the number of uses of animals for scientific purposes in Ireland during 2022 in accordance with Article 54(2) of the Directive. This is the tenth report to be prepared by the HPRA since it became the competent authority for the protection of animals used for scientific purposes.

As in previous years, the data provided are based on self-declarations by the establishments concerned. The data are presented in this report in accordance with the Commission Implementing Decision 2020/569/EU, which sets out a common format for the submission of information to the European Commission. In line with the EU summary reports under Directive 2010/63/EU on the uses of animals for scientific purposes within the EU and Norway, data has been categorised in this report as follows:

- number of animals used in research, testing, routine production, and education and training purposes[1]
- details of all uses (first and any subsequent reuse) of animals for research and testing
- numbers and uses of animals for the creation and maintenance of genetically altered animal lines

[1] Hereafter referred to as 'research and testing'

Please refer to the Appendix for definitions relating to some of the terminology used in this report.

2 SUMMARY

In 2022, there were a total of 93,825 uses of animals in procedures for research and testing purposes, with reuse representing <1% of this number (886 uses). Some 92,939 animals were reported as being used for the first time for research and testing purposes in 2022. Mice were the most commonly used species at 72% of total animal use. In addition, 528 mice were reported as having been used to create and maintain colonies of genetically altered animals. These 528 mice are not considered by the European Commission to have been directly used in research and testing.

Of the total number of uses of animals in procedures for research and testing purposes, 63% were used for regulatory purposes, which refers to legal requirements to test the safety, quality, and potency of medicines (e.g., biological medicines such as vaccines). Of the total number of uses of animals in procedures for research and testing purposes, 6,527 involved genetically altered animals, which represents 7% of all animal use.

The most frequently reported actual severity experienced by animals during their uses in procedures for research and testing purposes was mild at 56%, followed by moderate at 28%. Of the animals reported as being used for the creation of new genetically altered lines, 69% were reported as having experienced an actual severity of moderate. Of the animals reported as being used for the maintenance of genetically altered lines, 93% were reported as having experienced an actual severity of mild.

3 DATA ON THE USES OF ANIMALS FOR RESEARCH AND TESTING PURPOSES

3.1 Species and numbers of uses of animals for research and testing purposes

Table 1 shows the number of animals used (by species) for the first time in procedures performed for research and testing purposes. Each use of an animal extends from the time when the first intervention is applied to the animal until the completion of data collection under a project, or when the animal is removed from the project.

Mice (72% of total first uses of animals) were the most commonly used species. The second most commonly used species was rats, followed by sheep. The species reported as being used under the category 'other rodents' (<0.03%) were red squirrels being studied as part of a conservation project aiming to protect their population numbers and habitats. The species reported under the category 'other fish' (0.05%) were wild fish species such as bluefin tuna and blue sharks being studied for conservation projects to improve the survival of these species.

It should be noted that the following species have been excluded from this table as they were not reported as being used for the first time for research and testing purposes in 2022; hamsters (Chinese), Mongolian gerbils, other carnivores, other mammals, other birds, reptiles, *Rana*, other amphibians, zebrafish, sea bass, guppy, swordtail, molly, platy, cephalopods and non-human primates.

Table 1: Numbers animals used for the first time by species

Animal species	Number of uses	Percentage
Mice	67,320	72.43%
Rats	13,082	14.08%
Guinea pigs	741	0.80%
Hamsters (Syrian)	42	0.05%
Other rodents	23	0.02%
Rabbits	1,012	1.09%
Cats	32	0.03%
Dogs	113	0.12%
Ferrets	219	0.24%
Horses, donkeys and cross-breeds	259	0.28%
Pigs	2,460	2.65%
Goats	19	0.02%
Sheep	3,544	3.81%
Cattle	2,427	2.61%
Domestic fowl	102	0.11%
Turkey	4	<0.01%
Xenopus	131	0.14%
Salmon, trout, chars and graylings	1,364	1.47%
Other fish	45	0.05%
Total uses	**92,939**	**100.00%**

3.2 Reuse of animals

Table 2 shows the proportion of reuse (see Appendix for definition), which represents <1% of total animal use. Under the legislation, animals are only permitted to be reused on second or subsequent projects if the severity they have experienced to date is mild or moderate (see Appendix for definition of severity categories) and they have been assessed as having returned to full general health between projects.

It should be noted that the true number of animals that are reused cannot be deduced from this data due to the fact that some animals may be reused more than once (i.e., the figure 886 represents the total *reuses of animals,* not actual numbers of animals reused). Cattle, sheep, horses, dogs, and cats were the species reused during 2022. Cattle are the species most commonly reused in Ireland. The reuse of cattle was in agricultural research studies investigating, for example, ways to protect the environment through the reduction of methane emissions. Sheep were reused mainly as a result of a project researching human cardiovascular disease. The horses that were reused were used for the purposes of training veterinary students, and the severity of the procedures did not exceed mild. In Ireland, cats and dogs are used exclusively for research into animal diseases and disorders, and the development and testing of veterinary medicines for companion animals.

Table 2 shows the total numbers of all uses of animals (first time and reuse) in procedures performed for research and testing purposes, broken down by species.

Table 2: Numbers animals used (first time and reuse) by species

Animal species	First uses	Reuses	Percentage of reuses	Total uses (first use + reuse)
Mice	67,320	0	0.00%	67,320
Rats	13,082	0	0.00%	13,082
Guinea pigs	741	0	0.00%	741
Hamsters (Syrian)	42	0	0.00%	42
Other rodents	23	0	0.00%	23
Rabbits	1,012	0	0.00%	1,012
Cats	32	18	2.03%	50
Dogs	113	151	17.04%	264
Ferrets	219	0	0.00%	219
Horses, donkeys and cross-breeds	259	10	1.13%	269
Pigs	2,460	0	0.00%	2,460
Goats	19	0	0.00%	19
Sheep	3,544	147	16.60%	3,691
Cattle	2,427	560	63.21%	2,987
Domestic fowl	102	0	0.00%	102
Turkey	4	0	0.00%	4
Xenopus	131	0	0.00%	131
Salmon, trout, chars and graylings	1,364	0	0.00%	1,364
Other fish	45	0	0.00%	45
Total uses	**92,939**	**886**	**0.94%**	**93,825**

3.3 Origin of animals at the first use

Table 3 shows the number of animals according to their place of birth, but only includes animals used for the first time as the place of birth is not recorded for animals on their second (or subsequent) use(s). The majority (89%) of animals were born in the EU at a registered breeder, which means that they were born at breeding establishments authorised under the Directive. Animals born in the EU but not at a registered breeder (6%) includes wild animals and farm animals. Animals born in the rest of Europe (5%) represents rats and mice sourced from establishments authorised in the UK (since the UK is no longer an EU Member State). Animals born in the rest of the world (<1%) represents animals that have been obtained from breeding establishments outside of Europe (e.g., specific strains of mice not available in Europe).

Table 3: Origin of animals at the first use

Place of Birth	Number of uses	Percentage
Animals born in the EU at a registered breeder	82,417	88.68%
Animals born in the EU not at a registered breeder	5,583	6.01%
Animals born in rest of Europe	4,888	5.26%
Animals born in rest of world	51	0.05%
Total uses	**92,939**	**100.00%**

3.4 Project purposes

Table 4 shows the primary purposes for which animals were used in research and testing. The most common primary purpose at 63% was 'Regulatory use and routine production'. This is defined as the 'use of animals in procedures with a view to satisfying legal requirements for producing, placing and maintaining products/substances on the market, including safety and risk assessment for food and feed'.

The primary purposes are further sub-divided in **Tables 5-11**. It should be noted that the primary purposes 'Higher education' and 'Forensic enquiries' are excluded from this table as no uses were reported under these purposes for 2022.

Table 4: Primary purpose for which animals are used

Primary purpose	Number of uses	Percentage
Basic research	11,042	11.77%
Translational and applied research	19,646	20.94%
Regulatory use and routine production	59,245	63.14%
Protection of the natural environment in the interests of the health or welfare of human beings or animals	2,886	3.08%
Preservation of the species	773	0.82%
Training for the acquisition, maintenance or improvement of vocational skills	233	0.25%
Total uses	**93,825**	**100.00%**

Table 5 shows the number of uses of animals in more specific categories of 'Basic research'. 'Basic research' refers to studies of a fundamental nature, which are designed to add knowledge about the structure, functioning, or behaviour of organisms. It should be noted that the sub-fields of 'respiratory system', 'musculoskeletal system', 'urogenital/reproductive system', 'endocrine system/metabolism', and 'other basic research' were excluded from this table as no uses under these sub-fields were reported for 2022.

The most common sub-field of 'Basic research' at 43% was 'immune system', which relates to research investigating the functioning and activities of the immune system in health and disease. The next most common sub-field at 28% was 'nervous system'. Nervous system research involves studies that investigate how the brain, spinal cord, and nerves function in both health and in disease (e.g., Alzheimer's disease or Parkinson's disease). These types of studies most commonly use mice and rats.

The third most common sub-field was 'ethology/animal behaviour/animal biology', representing 11% of all basic research performed. In Ireland, this is mainly accounted for by agricultural research into farm animal biology, or research into the behaviour of wild animals (e.g., fish tracking studies).

Table 5: Uses of animals for basic research

Basic Research	Number of uses	Percentage
Oncology	442	4.00%
Cardiovascular, blood and lymphatic system	50	0.45%
Nervous system	3,124	28.29%
Gastrointestinal system including liver	99	0.90%
Immune system	4,707	42.63%
Sensory organs (skin, eyes and ears)	299	2.71%
Developmental biology	27	0.24%
Multisystemic	1,098	9.94%
Ethology / animal behaviour /animal biology	1,196	10.83%
Total uses	**11,042**	**100.00%**

Table 6 shows the number of uses of animals in more specific categories of 'Translational and applied research', which refers to studies which aim to prevent, diagnose, detect or treat disease in animals or humans, as well as studies which aim to improve animal nutrition and welfare. It should be noted that the sub-fields of 'other human disorders', 'plant diseases' and 'non-regulatory toxicology and ecotoxicology' were excluded from this table as no uses under these sub-fields were reported for 2022.

The most common sub-field of 'Translational and applied research' at 32% was research into 'human nervous and mental disorders'. This includes research into diagnostics and treatments for diseases such as epilepsy, autism, and depression, using mice and rats. The next most common sub-field at 19% was 'animal diseases and disorders'. Studies conducted under this project purpose sub-field in 2022 included research into non-antibiotic alternative treatments for preventing infection in piglets, and the investigation of new treatments for parasitic infections in dogs. The third most common sub-field at 10% was research into 'animal nutrition'. Studies performed under this sub-field included investigations into optimal nutritional strategies for health and productivity in piglets and cattle.

Table 6: Uses of animals for translational and applied research

Translational and applied research	Number of uses	Percentage
Human cancer	774	3.94%
Human infectious disorders	963	4.90%
Human cardiovascular disorders	544	2.77%
Human nervous and mental disorders	6,317	32.15%
Human respiratory disorders	586	2.98%
Human gastrointestinal disorders including liver	602	3.06%
Human musculoskeletal disorders	679	3.46%
Human immune disorders	1,576	8.02%
Human urogenital/reproductive disorders	651	3.31%

Translational and applied research	Number of uses	Percentage
Human sensory organ disorders (skin, eyes and ears)	496	2.52%
Human endocrine/metabolism disorders	439	2.23%
Animal diseases and disorders	3,702	18.84%
Animal nutrition	1,934	9.84%
Animal welfare	382	1.94%
Diagnosis of diseases	1	0.01%
Total uses	**19,646**	**100.00%**

Table 7 shows the breakdown of animal uses for 'Routine production'. Routine production refers to the use of animals for the production of biological material, for example blood required in the development of diagnostic assays for the identification and treatment of diseases. The sub-fields 'monoclonal antibody by mouse ascites method only', 'monoclonal and polyclonal antibodies (excluding ascites method), and 'other products' were excluded from this table as no uses under these sub-fields were reported in 2022.

Table 7: Uses of animals for routine production

Routine production uses	Number of uses	Percentage
Blood based products	2	100.00%
Total uses	**2**	**100.00%**

Table 8 shows the breakdown of animal uses for 'Regulatory testing'. The majority of reported uses (>99%) can be attributed to quality control testing. The animals used for 'Other efficacy and tolerance testing' were cattle used to test an intramammary veterinary medicinal product and the animals used for 'Toxicity and other safety testing' were pigs used to test the safety of a medical device.

Table 8: Uses of animals for regulatory testing

Regulatory use	Number of uses	Percentage
Quality control (including batch safety and potency testing)	59,224	99.97%
Other efficacy and tolerance testing	11	0.02%
Toxicity and other safety testing including pharmacology	8	0.01%
Total uses	**59,243**	**100.00%**

Table 9 shows a further breakdown of animal use for 'Quality control' tests. Quality control refers to animals used in the testing of purity, stability, efficacy, and potency parameters of a final medicinal product, in order to satisfy regulatory requirements. The majority of quality control tests were for batch potency (98%), and of these tests, 83% were performed on mice. It should be noted that the sub-field of 'other quality controls' was excluded from this table as no uses under this sub-field were reported for 2022.

Batch potency testing is required for biological products, which are products made in a living system such as a microorganism, or plant or animal cells, as opposed to being manufactured through chemical synthesis. The nature of biological products is that they can be inherently variable, and therefore it is necessary to perform batch potency testing to ensure that each

manufactured batch of product is of a consistent strength, and therefore both safe and effective for patients. It is also required as a safety/efficacy test for certain types of vaccine. In relation to pyrogenicity testing (<2%), non-animal alternatives have been developed to replace this type of testing for certain medicines. However, there are still some limited circumstances in which it is not possible to use a non-animal alternative to test for pyrogenicity (e.g., for some blood and protein-based human medicines), and therefore currently it is necessary to continue to employ animal-based tests in some instances.

Table 9: Uses of animals for regulatory testing - quality control

Quality control	Number of uses	Percentage
Batch safety testing	145	0.24%
Pyrogenicity testing	966	1.63%
Batch potency testing	58,113	98.12%
Total uses	**59,224**	**100.00%**

Table 10 relates to the use of animals for regulatory testing under the sub-field 'Toxicity and other safety testing including pharmacology'. Animals reported under this sub-field in 2022 were used to test the safety of medical devices. Since there were no animals reported under any other sub-fields of 'Toxicity and other safety testing including pharmacology' in 2022 these have been excluded from this table.

Table 10: Uses of animals for regulatory testing - toxicity and other safety testing including pharmacology

Toxicity and other safety testing including pharmacology	Number of uses	Percentage
Other toxicity/safety testing	8	100.00%
Total uses	**8**	**100.00%**

3.5 Use of animals to meet legislative requirements

Table 11 shows which type of legislation is being satisfied in the performance of the regulatory tests for which animals were used. Only categories of legislation under which animal use was reported are included in this table. The vast majority (>99%) were performed on medicinal products manufactured for use in humans. <1% of uses were to satisfy legislation on medicinal products for veterinary use and their residues or medical devices legislation.

Table 11: Regulatory testing by type of legislation

Testing by Legislation	Number of uses	Percentage
Legislation on medicinal products for human use	59,224	99.97%
Legislation on medicinal products for veterinary use and their residues	11	0.02%
Medical devices legislation	8	0.01%
Total uses	**59,243**	**100.00%**

Table 12 shows the geographical origin of the legal requirement. All tests were performed to satisfy EU legislative requirements.

Table 12: Origin of legislative requirement

Legislative Requirement	Number of uses	Percentage
Legislation satisfying EU requirements	59,243	100.00%
Legislation satisfying national requirements only [within EU]	0	0.00%
Legislation satisfying non-EU requirements only	0	0.00%
Total uses	**59,243**	**100.00%**

3.6 Use by genetic status for research and testing purposes

Table 13 shows the number of uses of animals for research and testing purposes that had a genetic alteration, broken down by whether the animal exhibited a harmful phenotype at the time of the study or not. The majority of animals (93%) were not genetically altered, with 3% of all uses involving animals with harmful phenotypes (see Appendix for definitions).

Table 13: Genetic status

Genetic Status	Number of uses	Percentage
Not genetically altered	87,298	93.04%
Genetically altered without a harmful phenotype	3,781	4.03%
Genetically altered with a harmful phenotype	2,746	2.93%
Total uses	**93,825**	**100.00%**

3.7 Actual severity of uses of animals for research and testing purposes

Table 14 shows the reported actual severity experienced by the animals during their uses for research and testing purposes. Overall, <2% of uses were classified as non-recovery, 56% were classified as mild, 28% were moderate and 14% were severe (see Appendix for definitions). Of the animals that were reported as experiencing severe severity in 2022, >99% were mice. It should be noted that there were no reports received of the severe classification being exceeded, nor did the HPRA grant any exemptions for the severe classification to be exceeded.

Table 14: Classification of actual severity

Severity	Number of uses	Percentage
Non-recovery	1,494	1.59%
Mild [up to and including]	52,398	55.85%
Moderate	26,721	28.48%
Severe	13,212	14.08%
Total uses	**93,825**	**100.00%**

4 DATA ON THE USES OF ANIMALS FOR THE CREATION AND MAINTENANCE OF GENETICALLY ALTERED ANIMAL LINES

Table 15 shows the number of animals (by species) used for the creation of new genetically altered animal lines for the first time. There was no reuse of animals reported for the creation of new genetically altered animal lines in 2022.

Table 15: Number of animals (by species) used for the creation of new genetically altered animal lines for the first time

Animal species	Number of uses	Percentage
Mice	42	1.34%
Zebrafish	3,085	98.66%
Total uses	**3,127**	**100.00%**

Table 16 shows the uses of animals for the creation of new genetically altered lines by severity.

Table 16: Uses of animals for the creation of new genetically altered animal lines by severity

Severity	Number of uses	Percentage
Non-recovery	0	0.00%
Mild [up to and including]	965	30.86%
Moderate	2,162	69.14%
Severe	0	0.00%
Total uses	**3,127**	**100.00%**

Table 17 shows the number of animals used for the creation of new genetically altered lines by genetic status of the animals. <1% of animals used in 2022 for the creation of a new genetically altered line were reported as not genetically altered. 83% were reported as genetically altered without a harmful phenotype, with 16% were reported as genetically altered with a harmful phenotype.

Table 17: Uses of animals for the creation of new genetically altered animal lines by genetic status

Genetic status	Number of uses	Percentage
Not genetically altered	24	0.77%
Genetically altered without a harmful phenotype	2,589	82.80%
Genetically altered with a harmful phenotype	514	16.44%
Total uses	**3,127**	**100.00%**

Table 18 shows the uses of animals for the creation of new genetically altered lines by type of 'Basic research' purposes. 91% of animals used for the creation of a new genetically altered line were reported under the 'Basic research' sub-field 'oncology', with 9% reported under the sub-field 'multisystemic', which relates to research looking at multiple organ systems. Since the remaining 'Basic research' purposes had no animals reported, they are excluded from this table.

Table 18: Uses of animals for the creation of new genetically altered animal lines by type of basic research purposes

Basic research	Number of uses	Percentage
Oncology	409	90.69%
Multisystemic	42	9.31%
Total uses	**451**	**100.00%**

Table 19 shows the uses of animals for the creation of new genetically altered lines by type of 'Translational and applied research' purposes. The only 'Translational and applied research' sub-field under which animals were reported as being used for the creation of a new genetically altered line was 'human sensory organ disorders (skin, eyes and ears)'. Since the remaining 'Translational and applied research' sub-fields had no animals reported, they are excluded from this table.

Table 19: Uses of animals for the creation of new genetically altered animal lines by type of translational and applied research purposes

Translational and applied research	Number of uses	Percentage
Human sensory organ disorders (skin, eyes and ears)	2,676	100.00%
Total uses	**2,676**	**100.00%**

Table 20 shows the number of animals used (by species) for the maintenance of established genetically altered lines for the first time. Mice and zebrafish were the only species of animal reported as being used for the maintenance of established genetically altered lines during 2022. There was no reuse of animals reported for the maintenance of established genetically altered lines in 2022.

Table 20: Number of animals used for the maintenance of established genetically altered animal lines by species

Animal species	Number of uses	Percentage
Mice	486	88.85%
Zebrafish	61	11.15%
Total uses	**547**	**100.00%**

Table 21 shows the uses of animals for the maintenance of established genetically altered lines by severity. 93% of animals used for the maintenance of established genetically altered lines in 2022 were reported as having experienced mild severity.

Table 21: Uses of animals for the maintenance of established genetically altered animal lines by severity

Severity	Number of uses	Percentage
Non-recovery	0	0.00%
Mild [up to and including]	511	93.42%
Moderate	26	4.75%
Severe	10	1.83%
Total uses	**547**	**100.00%**

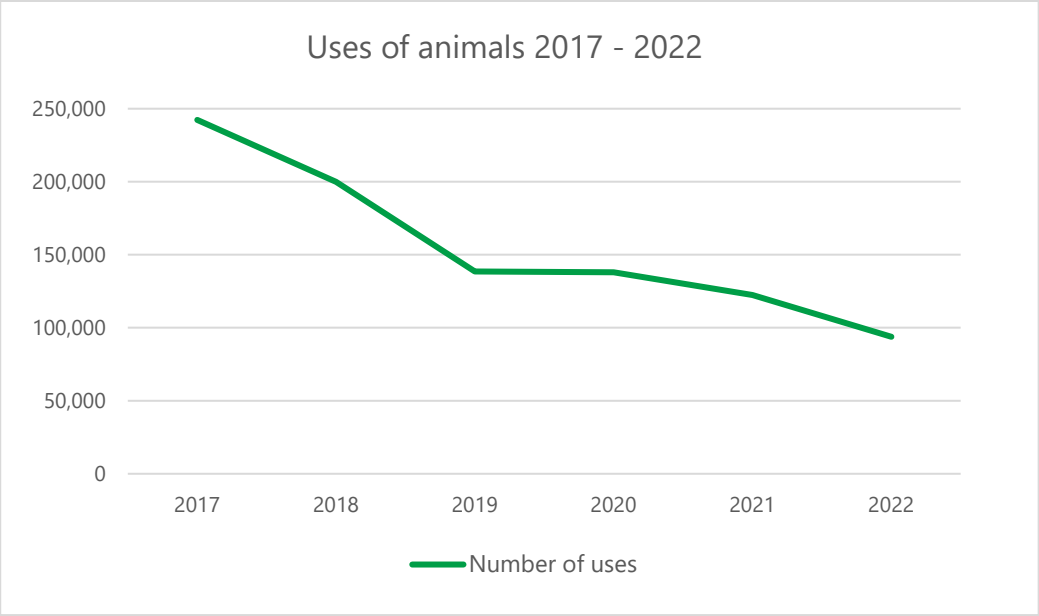
Table 22 shows the uses of animals for the maintenance of established genetically altered lines by genetic status of the animals. 36% of animals used for the maintenance of established genetically altered lines in 2022 were reported as not genetically altered, with 43% reported as genetically altered with a harmful phenotype.

Table 22: Uses of animals for the maintenance of established genetically altered animal lines by genetic status

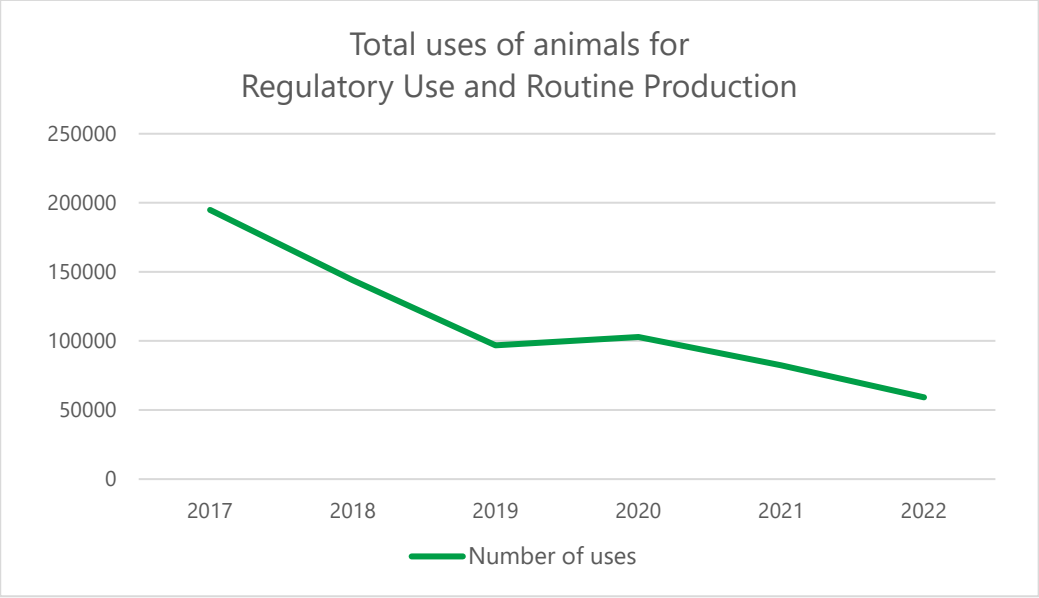
Genetic status	Number of uses	Percentage
Not genetically altered	198	36.20%
Genetically altered without a harmful phenotype	115	21.02%
Genetically altered with a harmful phenotype	234	42.78%
Total uses	**547**	**100.00%**

5 TRENDS

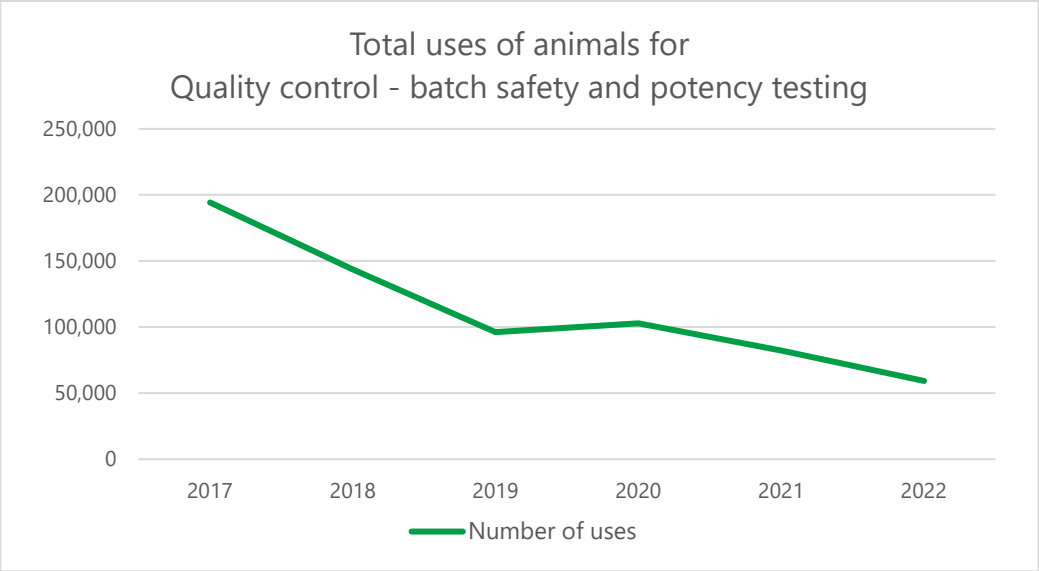
a) In 2022, there were 93,825 uses of animals for research, testing, routine production, and education and training purposes. This represents an 23% decrease from the number of uses reported for 2021 (122,383 uses in 2021). This decrease was mirrored by an 24% reduction in the numbers of animals used for first time in 2022 versus 2021 (92,939 in 2022 versus 121,558 animals in 2021). The total number of uses of animals in Ireland has decreased significantly since 2017, as illustrated by the graph below.



b) There was a 28% decrease in the number of animals used for 'Regulatory Use and Routine production' in 2022 (59,245 animals) versus 2021 (82,325 animals). There has been a significant reduction of 70% in the number of animals used for the purpose of 'Regulatory Use and Routine production' since 2017, as illustrated by the graph below.



c) This reduction in the overall number of animals used for regulatory testing purposes results from a significant decrease in the number of animals used for the secondary purpose 'Quality Control (including batch safety and potency testing)'. 23,003 fewer animals were used for this purpose in 2022 (59,224 animals) than in 2021 (82,227 animals), representing a 28% decrease. By way of more long-term comparison, there has been a 70% decrease in the number of animals used for batch safety and potency testing in 2022 (59,224 animals) versus 2017 (194,247 animals), as illustrated by the graph below.



d) There was a 47% increase in the number of rabbits used for pyrogenicity testing (966 in 2022 versus 657 in 2021). This increase is as a result of sponsor companies requiring increased volumes of rabbit pyrogen testing as part of the process of investigating and validating non-animal alternative tests to detect pyrogenic contaminants, in preparation for the removal of the rabbit pyrogen test as a regulatory requirement over the coming years.

e) Mice remain the most commonly used species at 72% of all uses. There was a 26% decrease in the number of mice used, with 67,320 mice used in 2022 versus 91,497 in 2021. This was driven by a 29% reduction in the number of mice used for Regulatory testing (including batch safety and potency testing) in 2022 compared to 2021.

f) There was a 39% decrease in reported uses of ferrets in 2022 versus 2021, with 219 ferrets used in 2022 compared to 358 in 2021. This was as a result of reduced volumes of regulatory testing of influenza vaccines in 2022 compared to 2021.

g) The number of uses of pigs reported in 2022 increased by greater than threefold from 2021 as several large-scale studies on porcine nutrition and anti-microbial resistance were undertaken during 2022.

h) There was an almost fourfold increase in the number of animals used for the purpose 'Preservation of species' (773 animals in 2022 versus 217 animals in 2021). This increase was as a result of a large-scale conservation study using fish.

i) There was an almost eightfold increase in the number of zebrafish reported as used for the creation of new genetically altered animal lines. This increase was due to a project undertaken during 2022 to create new genetic lines of zebrafish for the purposes of generating zebrafish larvae as a model for inherited forms of blindness.

j) The distribution of animal numbers across the four severity categories in 2022 mirrors that of 2021, with no significant changes noted.

To Note: In addition to routine year-on-year variation in the number and nature of projects authorised, annual trend data can be impacted by a range of other factors which can lead to variation in the overall number of animals used. Decreases, for example, may arise as a result of the ongoing application of the 3Rs principles while certain extraneous developments may result in increases in the levels of animal use. Among the factors that should be considered when assessing annual trend data include:

- The relocation of existing regulatory testing either to or from Ireland.
- The regulatory requirement for the use of animal tests to determine the safety and effectiveness of new human medicines and vaccines developed in response to emerging and significant public health developments.
- The adoption, following regulatory approval, of alternative testing methods including *in vitro* tests.

6 CONCLUSION

In the year 2022, there were 93,825 reported uses of animals for research, testing, routine production, and education and training purposes in Ireland. In addition, 3,127 animals were reported as being used for the creation of new genetically altered animal lines, with 547 animals were reported as being used for the maintenance of genetically altered animal lines.

The distribution of animal numbers across the four severity categories in 2022 mirrors that of 2021, and as with previous years, the most commonly reported actual severity remains at mild.

The HPRA's focus will continue to be on promoting the replacement of tests using animals with suitable non-animal alternative tests, ensuring that the principle of Reduction is applied appropriately when it is necessary to use animals, and refining the husbandry, care and use of animals in procedures. In addition, the HPRA will ensure that animals are used only when there is no equivalent alternative (non-animal) technique available, and the harm-benefit analysis of the proposed use is favourable.

7 APPENDIX: DEFINITIONS

Procedures

The Directive defines a procedure as: "any use of an animal for scientific 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 the creation and maintenance of any genetically altered animal lines that may result in pain or distress as per the above definition. Each procedure may consist of several stages or techniques for a single scientific purpose, which is then counted as *one* procedure and reported in the year it was completed.

Reuse

Reuse means that following a full recovery from a completed procedure and having been certified by a veterinarian as being returned to full health, that animal can then be enrolled on another project.

Genetically altered animals

Genetically altered animals are those that have been genetically modified, for example, by the introduction (into an animal) of genetic material from another animal, or by 'knocking out' or disrupting an existing gene. Statistics are only collected on genetically altered animals that have an impairment to their well-being from the genetic alteration (a harmful phenotype), or when a new genetic line of animals is being created and the effect on the animals is not yet known.

Actual severity

At the end of the use of an animal on a procedure, the impact of the procedure must be determined and reported as 'actual severity'. This means that the *highest severity* that an

animal may have experienced throughout the course of their time on procedure (rather than the severity at the end or the average severity throughout) must be recorded. Therefore, it is based on the real impact of the procedure, rather than any predicted impact. The legislation defines four categories of actual severity, in order of least to most harmful, as: non-recovery, mild, moderate, and severe.

Non-recovery: This means the entire procedure is carried out under general anaesthesia and, at the end, the animal is humanely euthanised rather than being allowed to wake up.

Mild: Any pain or suffering experienced by the animal is only slight, minor, or temporary and so the animal recovers in a short period of time. This would include an injection, a short period of social isolation, or non-invasive imaging under sedation or anaesthesia (e.g. MRI scanning).

Moderate: Any suffering experienced by the animal is short-term moderate pain, suffering, or distress; long-lasting mild pain, suffering, or distress; or involves a moderate impairment to their well-being. This would include surgery performed under general anaesthesia, repeated injections or blood tests, or the induction of tumours that cause moderate impairment to well-being.

Severe: Severe procedures indicate a major departure from the animal's usual state of health or well-being, and cause long-lasting moderate pain, suffering or distress, or short-term severe pain. This might include toxicity testing under legislation where fatalities may occur, surgical procedures that cause severe post-operative pain, or the breeding of animals with serious genetic disorders.

It should also be noted that procedures that involve severe pain, suffering, or distress that are *long-lasting* are prohibited under the legislation.