



Home Office

Annual Statistics of Scientific Procedures on Living Animals Great Britain 2016

Speaking of Research



Annual Statistics of Scientific Procedures on Living Animals Great Britain 2016

Presented to Parliament pursuant to section 21(7) and 21A(1)
of the Animals (Scientific Procedures) Act 1986

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Introductory notes

Animals (Scientific Procedures) Act 1986 and key definitions

In the United Kingdom (UK) the use of animals in scientific procedures is regulated by the Animals (Scientific Procedures) Act 1986¹ (ASPA), an animal protection measure that requires licensing and oversight of all places, projects and personnel involved in such work. The general system of control under the 1986 Act is explained in detail in Appendix B.

The purpose of this publication is to meet the requirements of the 1986 Act to collect and publish statistical information on the use of protected animals in regulated procedures during the previous calendar year and to lay that information before Parliament². This release covers Great Britain while, for Northern Ireland, the Department of Health separately collects and publishes information on regulated procedures under devolved arrangements.

Protected animals are defined in the 1986 Act³ as any living vertebrate other than man and any living cephalopod. Regulated procedures are defined in the 1986 Act as “any procedure applied to a protected animal for an experimental or other scientific purpose, or for an educational purpose⁴, that may have the effect of causing an animal 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”. As the 1986 Act indicates, the breeding of an animal⁵ is a regulated procedure if the animal is bred from, or is the descendant of, an animal whose genes have mutated or been modified. For simplicity, these procedures will be referred to from this point on as the creation/breeding of genetically altered animals.

The number of regulated procedures, simply referred to as ‘procedures’ from this point on, usually corresponds with the number of animals used⁶. However, animals are sometimes ‘re-used’ when they have fully recovered from a previous procedure and in these instances they are counted as separate, additional, procedures. Overall, the number of procedures is always slightly higher than the number of animals used. The figures in this release focus on the number of procedures, not the number of animals, unless otherwise stated.

Changes to data collection from 2014 onwards

The European Directive 2010/63/EU⁷ sets out a common format for member states of the European Union (EU), which includes the UK – and therefore Great Britain – to submit information on the use of animals for scientific purposes. Following the transposition of the directive into UK law in January 2013, through amendment regulations to 1986 Act, some changes were made that affect data from 2014 onwards. The key changes are listed in the accompanying user guide.

¹ The Animals (Scientific Procedures) Act 1986 can be accessed at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/308593/ConsolidatedASPA1Jan2013.pdf.

² Sections 21(7), 21A(1) and 21A(2) of the 1986 Act.

³ Section 1(1) of the 1986 Act. The remainder of section 1 provides additional information on what protected animals cover.

⁴ Sections 2(1) and 2(1A) of the 1986 Act. The remainder of section 2 provides additional information on what regulated procedures cover.

⁵ Section 2(3B) of the 1986 Act.

⁶ Specifically, the number of animals used for the first time in procedures. Information on the number of animals re-used is not collected.

⁷ See <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010L0063>.

Data quality

Information on data collection and quality assurance processes can be found in the accompanying [user guide](#).

Details on the severity of procedures were recorded for the first time in 2014. As a result, it is likely that there were initially some misclassifications in the reporting by data suppliers of severity data. However, statisticians believe these misclassifications have reduced as data suppliers have become more familiar with the new reporting requirements. The Home Office provided additional support to all stakeholders on severity assessment and scoring throughout the 2015 and 2016 data collection periods. Given that information on severity has only been available since 2014, clear trends for this data will take a few years to emerge.

Presentation

In some instances, there may appear to be small discrepancies between totals and the sums of related breakdowns for figures in this report. These discrepancies are attributable to rounding.

Rounding was employed to simplify the presentation of figures. However, all numeric changes across years, percentages, and percentage changes across years are based on unrounded data, which are available in the [data tables](#). The rounding conventions, which also ensure that a sufficient level of detail is still presented, are as follows:

- all figures in millions are presented as millions and rounded to two decimal places, e.g. 2,121,582 would be presented as 2.12 million
- all figures less than a million but greater than 10,000 are presented as whole numbers and rounded to the nearest thousand, e.g. 343,465 would be presented as 343,000
- all figures less than 10,000 but greater than 1,000 are presented as whole numbers to the nearest 100, e.g. 8,465 would be presented as 8,500
- all figures less than a thousand but greater than 10 are presented as whole numbers and rounded to the nearest 10, e.g. 49 would be presented as 50
- all figures less than 10 are presented as unrounded whole numbers
- all percentages greater than 1% are presented to the nearest per cent, e.g. 1.43% would be presented as 1%
- all percentages less than 1% are rounded to the nearest significant figure, e.g. 0.43% would be presented as 0.4% and 0.043% would be presented as 0.04%

The United Kingdom Statistics Authority has designated these statistics as National Statistics, in accordance with the Statistics and Registration Service Act 2007, signifying compliance with the Code of Practice for Official Statistics.

Designation can be broadly interpreted to mean that the statistics:

- meet identified user needs
- are well explained and readily accessible
- are produced according to sound methods
- are managed impartially and objectively in the public interest

Once statistics are designated as National Statistics, it is a statutory requirement that the Code of Practice shall continue to be observed.

This National Statistics output has been produced to the highest professional standards and free from political interference. It has been produced by statisticians working in the Home Office Analysis and Insight Directorate in accordance with the Home Office's 'Statement of compliance with the Code of Practice for Official Statistics' which covers our policy on revisions and other matters. The Chief Statistician, as Head of Profession, reports to the National Statistician with respect to all professional statistical matters and oversees all Home Office National Statistics products with respect to the Code, being responsible for their timing, content and methodology.

Summary

Introduction

Following the transposition of European Directive 2010/63/EU into UK law through amendment regulations to the Animals (Scientific Procedures) Act 1986, some key changes were applied to the 2014 collection (see section on changes to data collection from 2014 in the [user guide](#)). In particular, information is now being collected on procedures completed, not procedures started, as for publications prior to 2014. As a result, we are now able to collect information on the actual severity of procedures. The 2016 figures in this release are the third year for which these changes apply.

Total procedures

(See data table 1)

In 2016, 3.94 million procedures were completed. Of those, 51% (2.02 million) were experimental procedures⁸ and 49% (1.91 million) related to the creation/breeding of genetically altered animals⁹ not used in further experimental procedures.

Between 2007 and 2016, the total number of procedures increased by 23% (735,000). The creation/breeding of genetically altered animals primarily accounted for this rise (745,000), while the number of experimental procedures decreased by 9,400.

When comparing 2016 with 2015:

- there were 3.94 million procedures in 2016 representing a decrease of 5% (206,000), within which:
 - there were 2.02 million experimental procedures in 2016 representing a decrease of 3% (57,000)
 - there were 1.91 million genetically altered animals created/bred but not used in further procedures in 2016, representing a decrease of 7% (149,000)

⁸ Experimental procedures includes all animals used in basic research, regulatory use, translational/applied research, protection of the natural environment, higher education and training, preservation of species and forensic enquiries. It excludes the use of animals for the creation of new lines of genetically altered animals and the breeding of established lines of genetically altered animals that were not used in further regulated procedures.

⁹ The creation/breeding of genetically altered animals includes the use of animals for the creation of new lines of genetically altered animals and the breeding of established lines of genetically altered animals that were not used in further regulated procedures. This category also includes some animals that were bred with the intention of producing genetically altered animals, but resulted in non-genetically altered animals being born (5% of procedures involving the creation/breeding of genetically altered animals in 2016).

Figure 1: Total number of procedures by experimental procedures and creation/breeding of genetically altered animals, 2007 to 2016

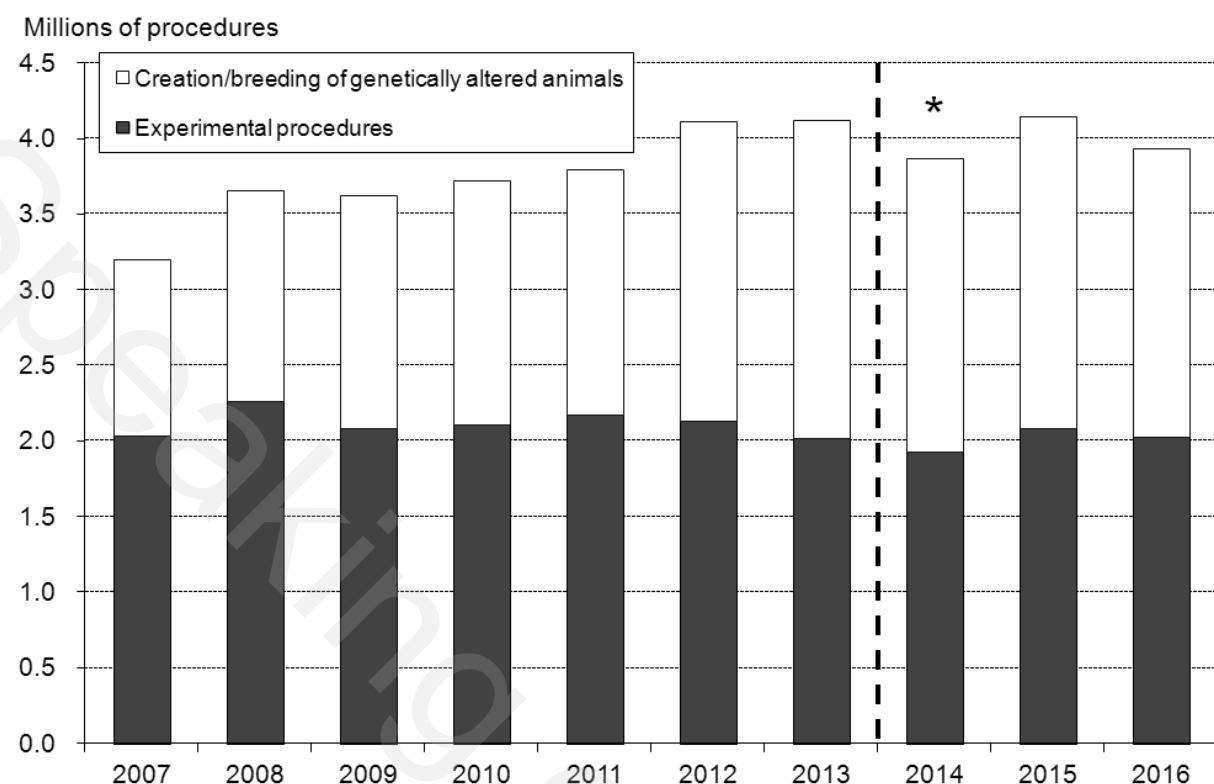


Chart notes:

* The data collection methodology changed in 2014, which resulted in some under-reporting for that year (see section on changes to data collection from 2014 in the [user guide](#)).

Experimental procedures

(See data tables 1, 3.1 and 3.2)

Of the 2.02 million experimental procedures completed in 2016, the majority involved mice, 60% (1.22 million procedures); fish, 14% (287,000 procedures); rats, 12% (239,000 procedures) and birds, 7% (150,000 procedures). Experimental procedures involving specially protected species (i.e. horses¹⁰, dogs, cats, and non-human primates) accounted for 0.9% (18,000) of procedures in 2016.

¹⁰ Includes donkeys and cross-bred horses.

Figure 2: Experimental procedures by species, 2016

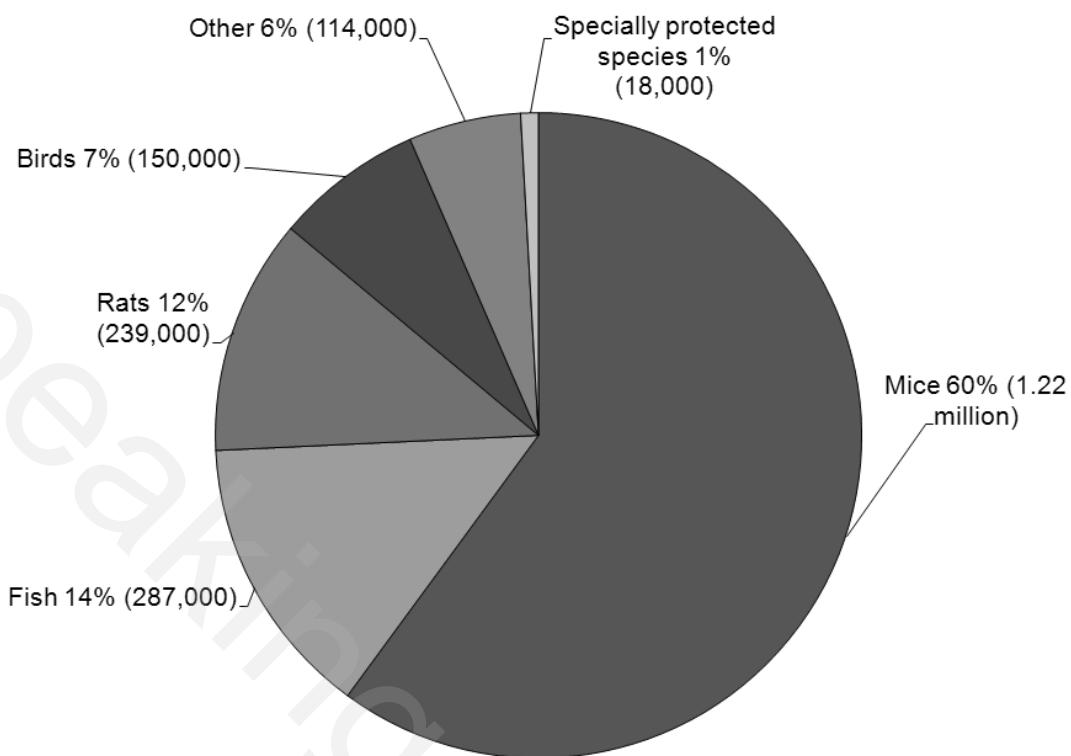


Chart notes:

Specially protected species are horses (8,900 procedures), dogs (4,900 procedures), non-human primates (3,600 procedures) and cats (190 procedures).

Comparing 2016 with 2015 by species, there were notable changes to the number of experimental procedures involving:

- guinea pigs, up 20% (4,400) to 26,000, similar to the number in 2014
- domestic fowl, up 9% (12,000) to 138,000, while procedures involving 'other birds' fell by 18% (2,500) to 12,000
- rabbits, up 9% (1,300) to 15,000
- sheep, up 3% (1,300) to 48,000
- rats, down 7% (19,000) to 239,000, similar to the number in 2014
- mice, down 4% (49,000) to 1.22 million
- fish, down 2% (7,000) to 287,000 overall, within which:
 - the number of zebrafish procedures increased 28% (42,000) while procedures involving 'other fish' fell by 34% (49,000)

Of the severity assessments undertaken for the 2.02 million experimental procedures completed in 2016:

- 12% (235,000) were assessed as sub-threshold, compared with 13% (268,000) in 2015

- 8% (154,000) were assessed as non-recovery¹¹, compared with 6% (123,000) in 2015
- 46% (938,000) were assessed as mild, compared with 51% (1.06 million) in 2015
- 29% (581,000) were assessed as moderate, compared with 24% (502,000) in 2015
- 6% (114,000) were assessed as severe, compared with 6% (123,000) in 2015

Creation/breeding of genetically altered animals

(See data tables 1 and 8)

Of the 1.91 million procedures in 2016 relating to the creation/breeding of genetically altered animals that were not used in further procedures, nearly all involved mice, 86% (1.65 million); zebrafish, 13% (248,000); and rats, 0.6% (11,000).

Of the severity assessments undertaken for these 1.91 million procedures:

- 67% (1.28 million) were assessed as sub-threshold, compared with 55% (1.13 million) in 2015
- 0.1% (1,500) were assessed as non-recovery, compared with 0.2% (3,300) in 2015
- 29% (546,000) were assessed as mild, compared with 39% (806,000) in 2015
- 3% (50,000) were assessed as moderate, compared with 3% (65,000) in 2015
- 2% (40,000) were assessed as severe, compared with 3% (62,000) in 2015

¹¹ Non-recovery procedures are procedures performed entirely under general anaesthesia from which the animal does not recover consciousness.

Commentary

Introduction

Following the transposition of European Directive 2010/63/EU into UK law through amendment regulations to the Animals (Scientific Procedures) Act 1986, some key changes were made to the 2014 collection (see section on changes to data collection from 2014 in the [user guide](#)). In particular, information is now being collected on procedures completed, not procedures started, as for publications prior to 2014. As a result, we are now able to collect information on the actual severity of procedures. The 2016 figures in this release are the third year for which these changes apply.

Total procedures

Introduction

(See data tables 1 and 1a)

In 2016, 3.94 million procedures were completed, a decrease of 5% (206,000) compared with 2015.

There were 3.87 million animals used for the first time in procedures completed in 2016, a decrease of 5% (202,000 animals) compared with 2015.

Of the 3.94 million scientific procedures completed in 2016, 69,000 involved the re-use of animals. It is no longer possible to ascertain the number of animals re-used given the changes to the collection in 2014 (see section on changes to data collection from 2014 in the [user guide](#)).

Figure 3 shows that the number of experiments increased considerably from 1945 (when figures were first collected) to 1971, rising from 1.18 million to 5.61 million overall. Subsequently, the number generally declined, falling to 3.11 million in 1986. The implementation of the Animals (Scientific Procedures) Act 1986 changed the methodology of the collection from experiments to procedures¹² and in 1987 data were collected based on both measures, the combined figure being 3.63 million experiments/procedures.

From 1988 onwards, only data for procedures were collected and in the following years, the number generally decreased, falling to 2.62 million in 2001. This was mainly due to a reduction in the use of rodents, rabbits and birds (although there was an increase in the number of procedures involving fish). Since then, the number of procedures has risen (reaching 4.12 million in 2013), primarily due to an increase in the creation/breeding of genetically altered animals, with mice mainly accounting for the rise.

The overall level of scientific procedures is determined by a number of factors, including the economic climate and global trends in scientific endeavour. In recent years, while many types of research have declined or even ended, the advent of modern scientific techniques has opened up new research areas, with genetically altered animals, mainly mice, often being required to support these areas.

¹² The Cruelty to Animals Act 1876 covered all animals that were used in experiments, i.e. a procedure of unknown outcome. The Animals (Scientific Procedures) Act 1986 has a broader definition as it includes all scientific procedures that may cause pain, suffering, distress or lasting harm. Therefore, the methodological change accounted for the increase in figures from 1987 onwards.

Figure 3: Total experiments/procedures, 1945 to 2016

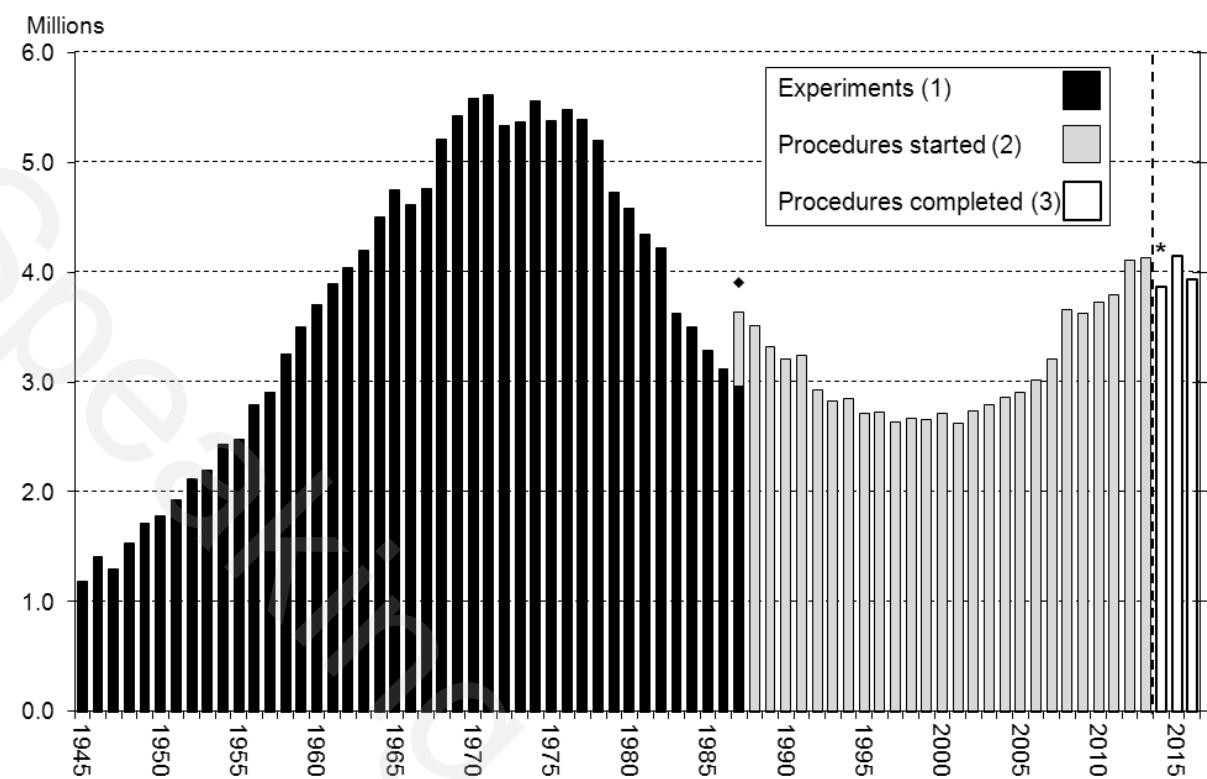


Chart notes:

- (1) Experiments **started** under the Cruelty to Animals Act 1876.
- (2) Scientific Procedures **started** under the Animals (Scientific Procedures) Act 1986.
- (3) Following the transposition of European Directive 2010/63/EU into UK law, scientific procedures **completed** under the revised Animals (Scientific Procedures) Act 1986.
- ◆ The 1987 total includes experiments started under the 1876 Act as well as procedures started under the 1986 Act.
- * The data collection methodology changed in 2014 which resulted in some under-reporting for that year (see section on changes to data collection from 2014 in the [user guide](#)).

Purpose

(See data table 1)

In 2016, 3.94 million procedures were completed. Of those, as Figure 4 shows:

- 51% of procedures (2.02 million) were undertaken for experimental purposes, of which:
 - 1.12 million procedures were undertaken for basic research¹³ (28% of all procedures)
 - 532,000 procedures were undertaken for regulatory use¹⁴ (14% of all procedures)

¹³ Studies that are designed to add knowledge about the normal and abnormal structure, functioning and behaviour of living organisms and the environment. These include fundamental studies in toxicology.

¹⁴ All procedures carried out to satisfy legal requirements including the production of substances to legal specification, such as material for diagnostic tests (e.g. blood products), studies to evaluate the safety or effectiveness of pharmaceuticals and studies to evaluate the safety of other chemicals.

- 341,000 procedures were undertaken for translational/applied research¹⁵ (9% of all procedures)
- 29,000 procedures were undertaken for other purposes¹⁶ (0.7% of all procedures)
- the remaining 49% (1.91 million) were undertaken to create/breed genetically altered animals not used in further procedures (genetically altered animals created/bred and subsequently used in further procedures are reported under experimental procedures)

Figure 4: Total procedures by purpose, 2016

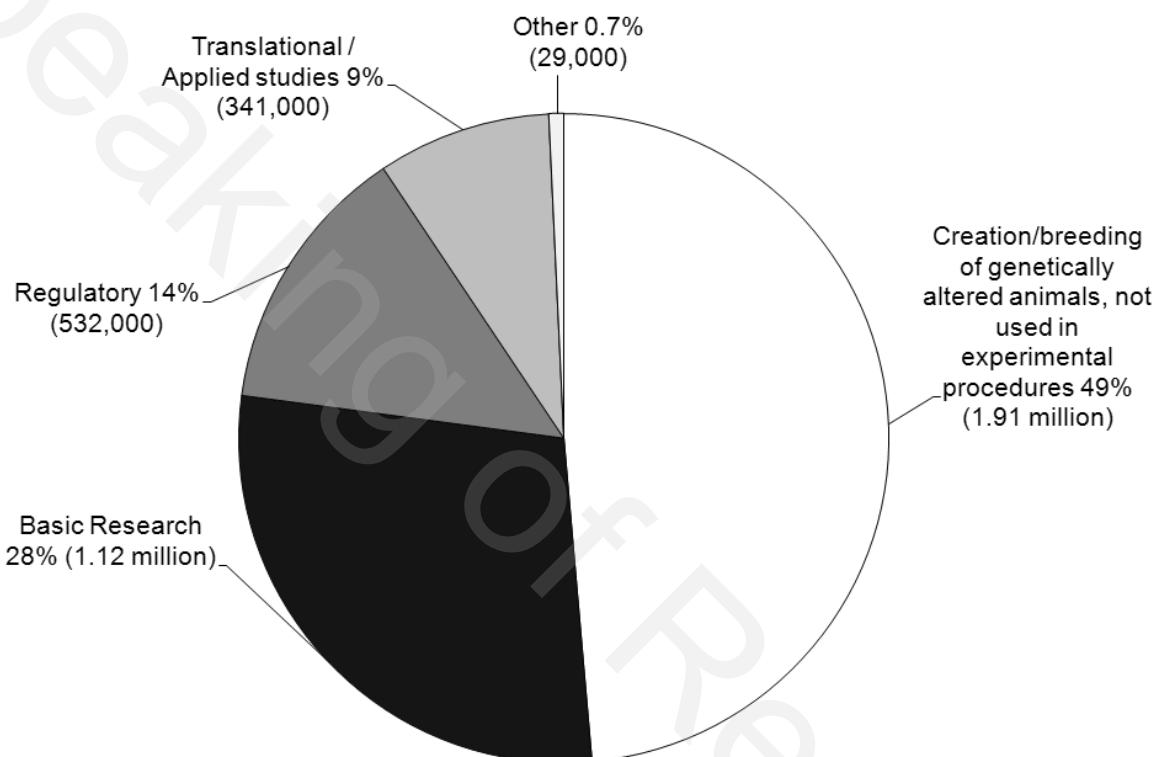


Figure 5 shows that, between 2007 and 2016, the total number of procedures increased by 23% (735,000). The creation/breeding of genetically altered animals primarily accounted for this rise (745,000), while the number of experimental procedures decreased by 9,400.

Over the past decade, the proportion of procedures accounted for by the breeding of genetically altered animals rose from 37% in 2007 to 49% in 2016. For experimental procedures, the proportion involving the use of genetically altered animals over the same period increased from 26% in 2007 to 36% in 2016.

¹⁵ Studies that are designed to address human or animal disease including development of drugs and treatments but excluding studies carried out for regulatory purposes.

¹⁶ Other procedures cover protection of the environment (26,000 or 0.7% of all procedures), higher education or training (1,400 or 0.04% of all procedures), and preservation of species (1,800 or 0.05% of all procedures).

When comparing 2016 with 2015:

- there were 3.94 million procedures in 2016 representing a decrease of 5% (206,000), within which:
 - there were 2.02 million experimental procedures in 2016 representing a decrease of 3% (57,000)
 - there were 1.91 million genetically altered animals created/bred but not used in further procedures in 2016 representing a decrease of 7% (149,000)

Figure 5: Total number of procedures by experimental procedures and creation/breeding of genetically altered animals, 2007 to 2016

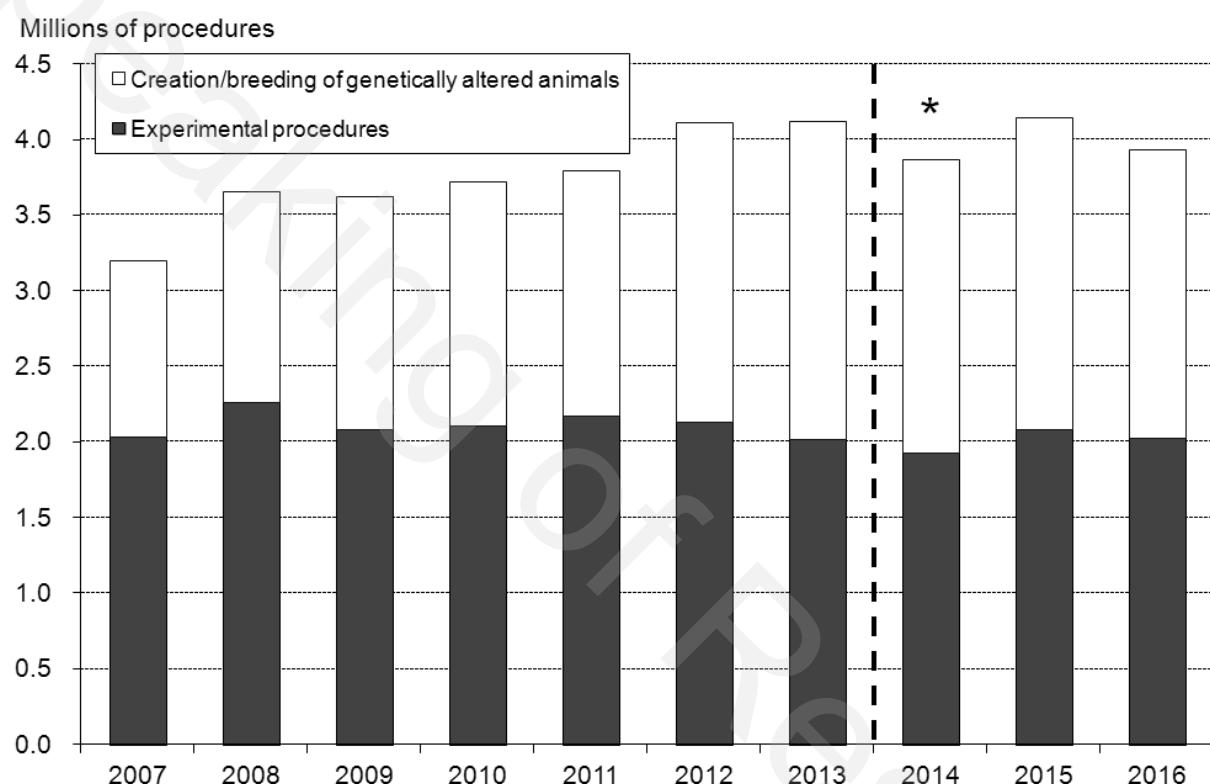


Chart notes:

* The data collection methodology changed in 2014 which resulted in some under-reporting for that year (see section on changes to data collection from 2014 in the [user guide](#)).

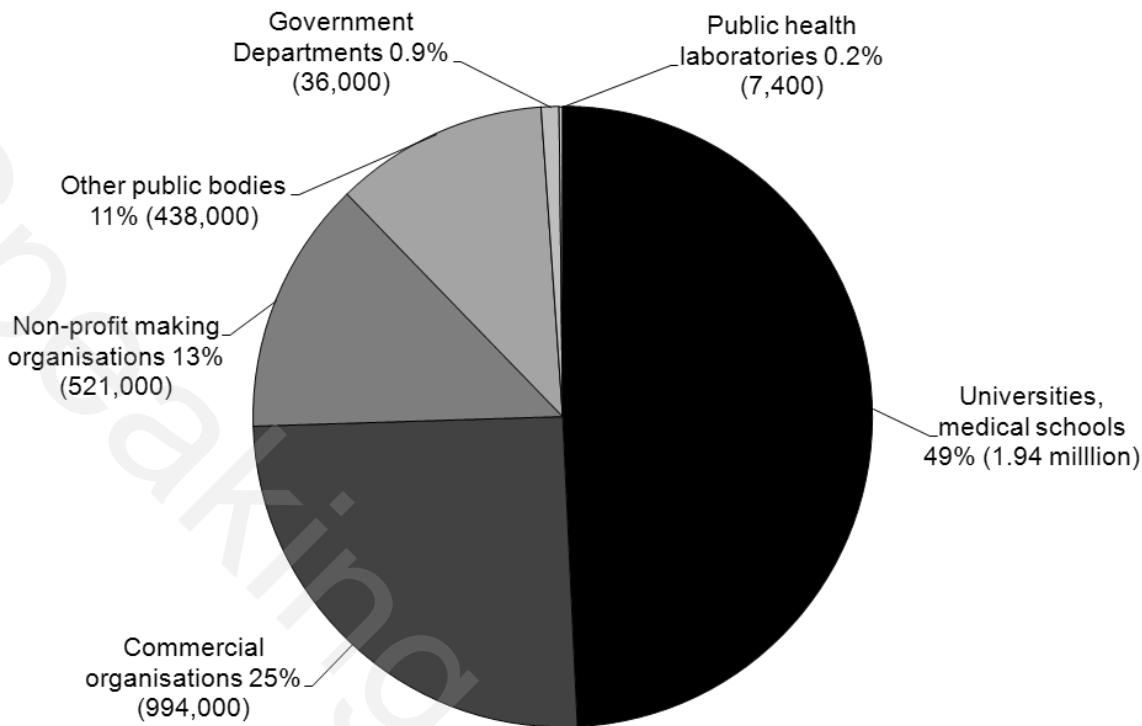
Type of establishment

(See data table 11)

Of the total 3.94 million procedures completed in 2016, as Figure 6 shows:

- universities accounted for 49% (1.94 million) and held 79% of the 3,189 project licences
- commercial organisations accounted for 25% (994,000) and held 8% of project licences
- non-profit organisations accounted for 13% (521,000) and held 6% of project licences
- other public bodies accounted for 11% (438,000) and held 5% of project licences

Figure 6: Total procedures by establishment type, 2016



Severity

(See data tables 3.1, 3.2 and 8)

This is the third year for which information on the actual severity of procedures has been collected (see section on changes to data collection from 2014 in the [user guide](#)). It is likely that there were initially some inconsistencies in the interpretation and reporting of severity. Statisticians believe the reporting of this information has become more consistent as data suppliers have become more familiar with the new reporting requirements.

The severity of procedural harms (i.e. excluding harms caused to animals as a result of non-procedural events such as transport and housing) is assessed as one of five categories:

- **sub-threshold:** when a procedure was authorised under a project licence but did not actually cause suffering above the threshold of regulation (ASPA Section 2(1)), i.e. was less than the level of pain, suffering, distress or lasting harm that is caused by inserting a hypodermic needle according to good veterinary practice.
- **non-recovery (under general anaesthesia):** when the entire procedure was carried out under general anaesthesia without recovery.
- **mild:** the key characteristic of mild procedures is that any pain or suffering experienced by an animal is, at worst, only slight or transitory and minor so that the animal returns to its normal state within a short period of time.
- **moderate:** the characteristic of moderate procedures is that they do cause a significant and easily detectable disturbance to an animal's normal state, but this is not life threatening. Most surgical procedures carried out under general anaesthesia and with good post-operative analgesia (i.e. pain relief) would be classed as moderate.

- **severe:** the characteristics of severe procedures are that they cause a major departure from the animal's usual state of health and well-being. It would usually include long-term disease processes where assistance with normal activities such as feeding and drinking are required or where significant deficits in behaviours/activities persist. It includes animals found dead unless an informed decision can be made that the animal did not suffer severely prior to death.

Full details of severity assessment and classification are found in Annex 8 of the European Directive and in the Home Office guidance notes.¹⁷

Of the 2.02 million experimental procedures completed in 2016:

- 12% (235,000) were assessed as sub-threshold, compared with 13% (268,000) in 2015
- 8% (154,000) were assessed as non-recovery¹⁸, compared with 6% (123,000) in 2015;
- 46% (938,000) were assessed as mild, compared with 51% (1.06 million) in 2015
- 29% (581,000) were assessed as moderate, compared with 24% (502,000) in 2015
- 6% (114,000) were assessed as severe, compared with 6% (123,000) in 2015

Of the 1.91 million genetically altered animals created/bred in 2016:

- 67% (1.28 million) were assessed as sub-threshold, compared with 55% (1.13 million) in 2015
- 0.1% (1,500) were assessed as non-recovery, compared with 0.2% (3,300) in 2015
- 29% (546,000) were assessed as mild, compared with 39% (806,000) in 2015
- 3% (50,000) were assessed as moderate, compared with 3% (65,000) in 2015
- 2% (40,000) were assessed as severe, compared with 3% (62,000) in 2015

As Figure 7 shows, the severity assessments of procedures relating to the creation/breeding of genetically altered animals that were not used in further procedures, were lower overall than those given for experimental procedures.

¹⁷ See:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/276014/NotesActualSeverityReporting.pdf.

¹⁸ Non-recovery procedures are procedures performed entirely under general anaesthesia from which the animal does not recover consciousness.

Figure 7: Severity assessments by experimental procedures and creation/breeding of genetically altered animals, 2014 to 2016

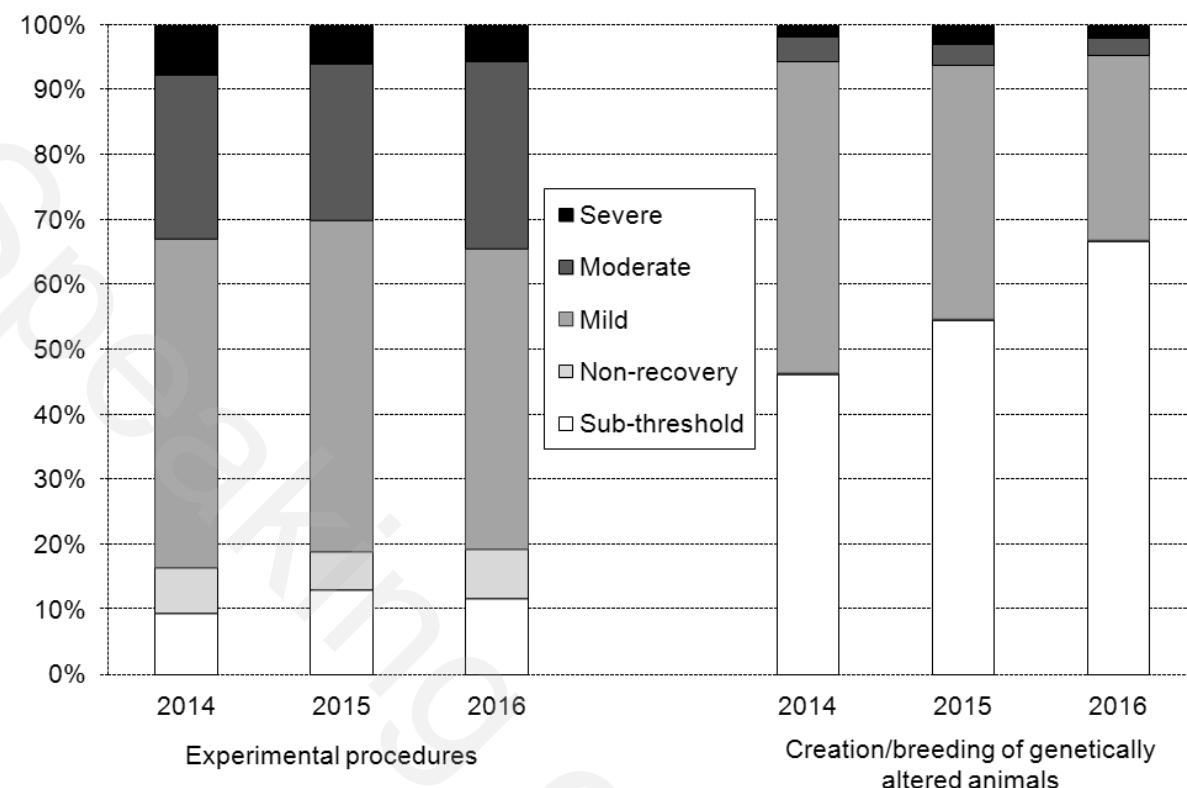


Chart notes:

2016 is the third year for which information on the actual severity of procedures has been collected. Statisticians believe the reporting of this information has become more consistent as data suppliers have become more familiar with the new reporting requirements (see introductory notes for more information).

The severity of genetically altered animals created/bred is assessed from:

- the phenotype of the animals, e.g. development of congenital disease (i.e. diseases present at birth) or tumours;
- in the case of animals that have no harmful phenotype but that have been biopsied specifically for genotyping¹⁹, the biopsy procedures will generally be assessed as mild;
- the animals assessed as severe in this category are largely animals within breeding colonies that were found dead and where the death of the animal was either a result of its phenotype or, more commonly, unexplained (all animals found dead are reported as severe unless an informed decision can be made that the animal did not suffer severely prior to death);
- a small number of the animals used to create new lines of genetically altered animals will have been subjected to surgical or minor procedures such as the injection of drugs; these will be classed as moderate.

¹⁹ Genotyping is the process of taking a sample of tissue (a biopsy) and then testing it to determine the genetic make-up of an animal.

Experimental procedures

(See data tables 1 to 7.4)

Introduction

Experimental procedures include all animals used in basic research, regulatory use, translational/applied research, protection of the natural environment, higher education and training, preservation of species, and forensic enquiries. It excludes the use of animals for the creation of new lines of genetically altered animals and the breeding of established lines of genetically altered animals that were not used in further regulated procedures. However, experimental procedures do include genetically altered animals that were used in regulated procedures.

Species used in experimental procedures

(See data table 1)

Figure 8 shows that of the 2.02 million experimental procedures completed in 2016:

- mice accounted for 60% (1.22 million)
- fish²⁰ accounted for 14% (287,000)
- rats accounted for 12% (239,000)
- birds²¹ accounted for 7% (150,000);
- other species²² accounted 6% (114,000)

Experimental procedures involving specially protected species (i.e. horses²³, dogs²⁴, cats, and non-human primates²⁵) accounted for 0.9% (18,000) of experimental procedures in 2016. Of those, horses accounted for 8,900, dogs accounted for 4,900, primates accounted for 3,600 and cats accounted for 190 procedures.

Comparing experimental procedures for 2016 with 2015:

- there were increases in experimental procedures involving:
 - guinea pigs, up 20% (4,400) to 26,000, similar to the number in 2014
 - domestic fowl, up 9% (12,000) to 138,000, whilst procedures involving 'other birds' fell by 18% (2,500) to 12,000
 - rabbits, up 9% (1,300) to 15,000
 - sheep, up 3% (1,300) to 48,000

²⁰ Data on all fish species are grouped together here but data on zebrafish and other fish species are collected and published separately.

²¹ Data on all bird species are grouped together here but data on domestic fowl, common quail and other bird species are collected and published separately.

²² Includes guinea pigs, Syrian hamsters, Chinese hamsters, Mongolian gerbils, all other rodents, rabbits, ferrets, all other carnivores, pigs, goats, sheep, cattle, all other mammals, reptiles, *Rana temporaria* and *pipiens*, *Xenopus laevis* and *tropicalis* and all other amphibians. This information is grouped together here but data on these species are collected and published separately.

²³ Includes donkeys and cross-bred horses.

²⁴ Data on all dog species are grouped together here but data on beagles and other dog species are collected and published separately.

²⁵ Data on all primate species are grouped together here but data on cynomolgus monkeys, rhesus monkeys and marmosets and tamarins are collected and published separately.

- there were decreases in experimental procedures involving:
 - rats, down 7% (19,000) to 239,000, similar to the number in 2014;
 - mice, down 4% (49,000) to 1.22 million
 - fish, down 2% (7,000) to 287,000 overall, within which:
 - the number of zebrafish procedures increased 28% (42,000) while procedures involving 'other fish' fell by 34% (49,000)
- No procedures involved the use of reptiles or cephalopods in 2016

Figure 8: Experimental procedures by species, 2016

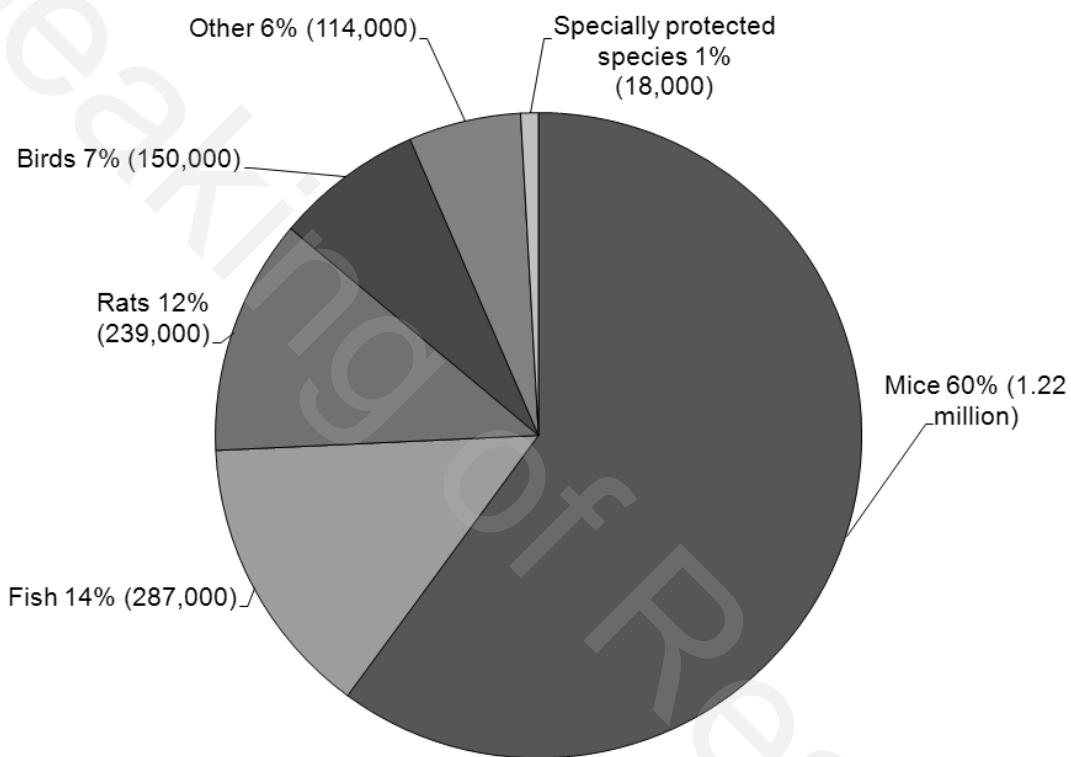


Chart notes:

Specially protected species are horses (8,900 procedures), dogs (4,900 procedures), non-human primates (3,600 procedures) and cats (190 procedures).

Use of mice, rats, and fish in experimental procedures

(See data table 1)

Figure 9 shows trends in the number of procedures involving the three most commonly used species (mice, rats and fish). The number of experimental procedures involving mice, the most frequently used species of the three throughout the series, rose overall from 1.14 million in 2007 to 1.28 million in 2012. The figure then fell by 5% between 2012 and 2016 to 1.22 million procedures.

With the exception of 2015, the number of procedures involving rats fell each year between 2007 and 2016, decreasing from 373,000 to 239,000 overall.

The number of procedures involving fish varied between 2007 and 2016, ranging from 257,000 in 2007 to 482,000 in 2008. Compared with 2015, the number of procedures

involving fish decreased by 2% to 287,000 in 2016.

The availability of genetically altered zebrafish has led to an increase in the use of this species in basic and applied biomedical research. This is reflected in data on the use of zebrafish now being separately collected from other fish species, following the inclusion of zebrafish in Schedule 2 of the Animal (Scientific Procedures) Act 1986. In 2016, zebrafish accounted for 66% (190,000) of all experimental procedures on fish.

Figure 9: Experimental procedures involving mice, rats and fish, 2007 to 2016

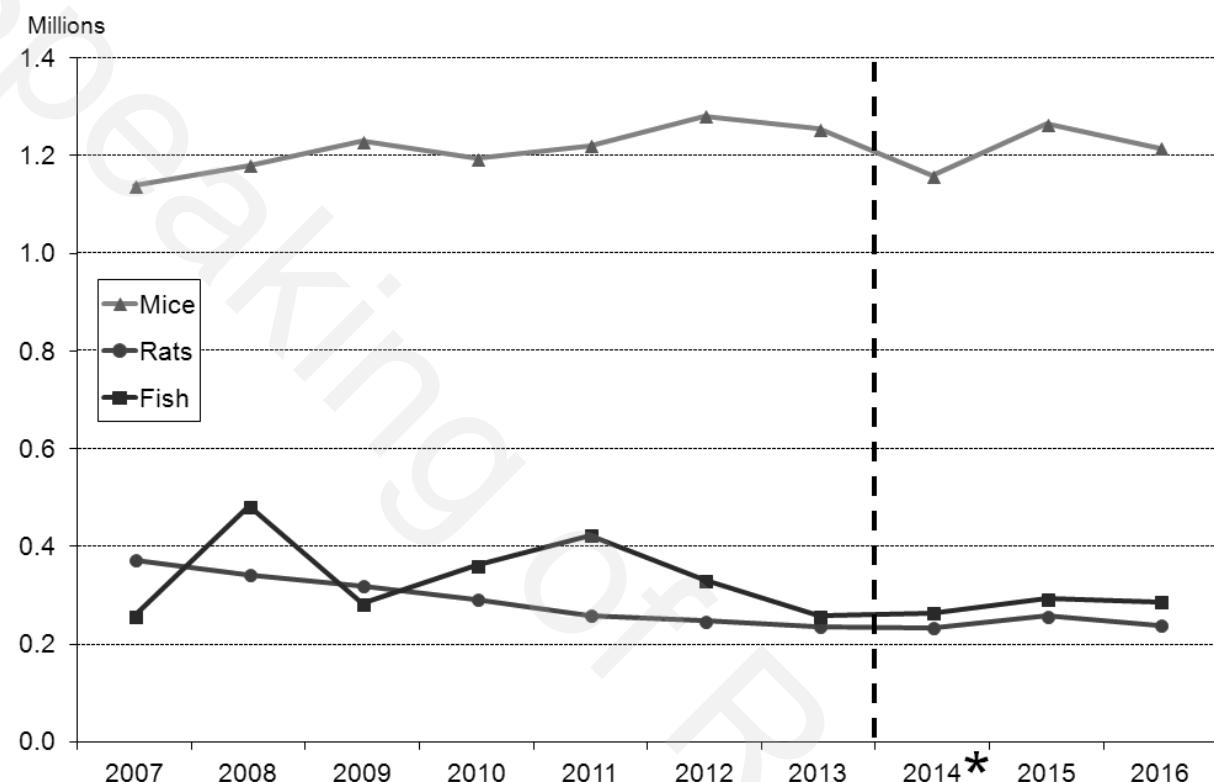


Chart notes:

* The data collection methodology changed in 2014, which resulted in some under-reporting for that year (see section on changes to data collection from 2014 in the [user guide](#)).

Use of primates in experimental procedures

(See data table 1)

Figure 10 shows trends in the number of procedures involving Old World and New World monkeys from 2007 to 2016. The use of Old World monkeys has been more common throughout the period. Old World monkeys, which are predominately used for regulatory purposes, are considered more relevant models for some human conditions compared with New World monkeys. Since 2013, for Old World monkeys, separate breakdowns have been collected for cynomolgus macaques and rhesus macaques.

From 4,200 procedures in 2008, the use of Old World monkeys then fell to 2,100 in 2011. Subsequently, the figure rose to 3,500 in 2015. Since then, the figure has fallen by 3% to 3,400 procedures in 2016.

The number of procedures involving the use of New World monkeys rose from 370 in 2008 to 1,100 in 2010. Changing patterns of research have led to an overall decline in their use, as seen by the numbers falling by 88% (980) since 2010 to 130 procedures in 2014; there

has since been a small increase to 200 procedures overall in 2016.

Figure 10: Experimental procedures involving Old World and New World monkeys, 2007 to 2016

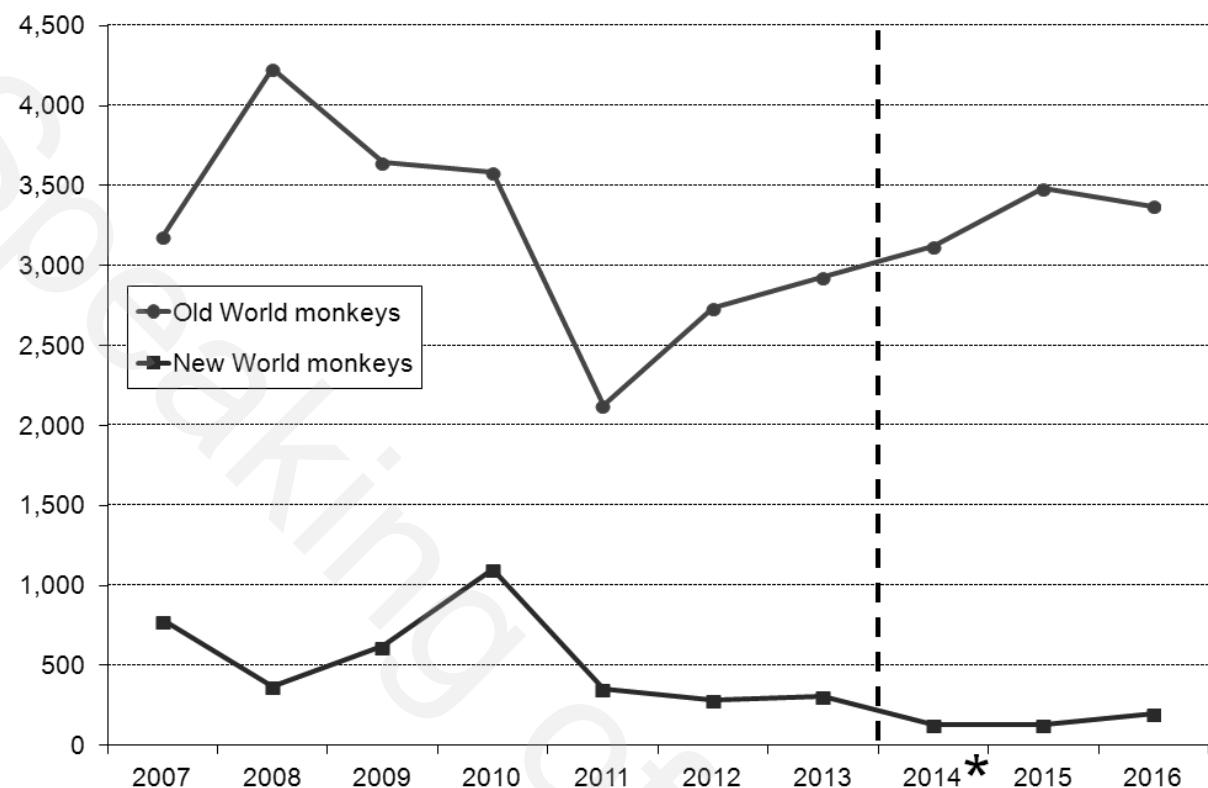


Chart notes:

Throughout the period, New World monkeys used in procedures were marmosets and tamarins, and Old World monkeys used were cynomolgus macaques and rhesus macaques.

* The data collection methodology changed in 2014, which resulted in some under-reporting for that year (see section on changes to data collection from 2014 in the [user guide](#)).

Species on which no experimental procedures were completed in 2016

(See data table 1)

In 2016, no experimental procedures were completed involving:

- various primate species (the use of great apes has not been permitted since 2013, although great apes have not been used since the 1986 Act was implemented in 1987)
- reptiles
- cephalopods²⁶

Place of birth and generation of animals used in experimental procedures

(See data tables 2.1 to 2.3)

Figures are presented here on the place of birth of animals used for the first time in

²⁶ Marine invertebrate animals such as an octopus or squid.

experimental procedures in 2016. Information on the place of birth of re-used animals is not collected.

Species listed in Schedule 2 of the Animal (Scientific Procedures) Act 1986 (see Appendix B, paragraph 15) must be purpose bred, unless the Secretary of State has specifically authorised sourcing from elsewhere (e.g. wild-caught birds and small rodents). This is generally only authorised when there is a scientific justification for doing so. There is no requirement for species not listed in Schedule 2 to be purpose bred.

Excluding non-human primates (covered below), of the 1.95 million animals used in experimental procedures for the first time in 2016 (including species listed and not listed in Schedule 2):

- 98% (1.91 million animals) were born in the UK (1.80 million of these animals were born at a licensed establishment)
- 2% (32,000 animals) were born in the EU (31,000 of these animals were born at a registered breeder)
- 0.2% (4,700 animals) were born in the rest of Europe
- 0.5% (9,900 animals) were born in the rest of the world

All 2,400 primates used for the first time in experimental procedures in 2016 were purpose bred. Of those 2,400 primates:

- 63% (1,500 primates) were born in Africa
- 27% (650 primates) were born in Asia
- 11% (260 primates) were born in the UK at a licensed establishment
- 0.2% (6 primates) were born at a registered breeder in the EU

Also, of the 2,400 primates used for the first time in experimental procedures in 2016:

- 71% (1,700 primates) originated from self-sustaining colonies²⁷
- 29% (700 primates) were from a second generation, or greater, primate (i.e. grandparent or earlier generation were wild-caught)

Genetic status of animals used in experimental procedures

(See data table 4)

Genetically altered animals are reported separately according to whether or not they have a harmful phenotype (i.e. a harmful physical or biochemical defect). Many lines of genetically altered animals do not exhibit any harmful phenotype and are visually and behaviourally indistinguishable from wild type animals. Some show a harmful phenotype from birth, e.g. immune deficient mice; others are overtly normal at birth but exhibit a harmful phenotype, such as developing tumours, as they age. Animals are reported as being without a harmful phenotype if used/killed at an age prior to the development of the harmful effect.

²⁷ As defined in the Animals (Scientific Procedures) Act 1986, a colony of animals is a self sustaining colony if:

(a) the colony is kept in captivity in a way that ensures the animals are accustomed to humans;
(b) the colony consists only of animals that have been bred in captivity; and
(c) the colony is sustained only by animals being bred within the colony or animals being sourced from other colonies that meet paragraphs (a) and (b).

In 2016, 29% (580,000) of experimental procedures involved genetically altered animals without a harmful phenotype and 7% (149,000) involved genetically altered animals with a harmful phenotype.

As Figure 11 shows, in 2016 there were 729,000 experimental procedures involving genetically altered animals, a rise of 1% (9,600) compared with the previous year. This continues the increasing trend seen in the past 9 years; since 2007 the number of procedures involving genetically altered animals has risen by 36% (194,000). In 2016, the proportion of experimental procedures which used genetically altered animals was 36%.

In contrast, the number of experimental procedures *not* involving genetically altered animals fell by 5% between 2015 and 2016 to 1.29 million procedures, continuing the downward trend from 1.65 million procedures in 2008.

Figure 11: Experimental procedures by genetic status of animal, 2007 to 2016

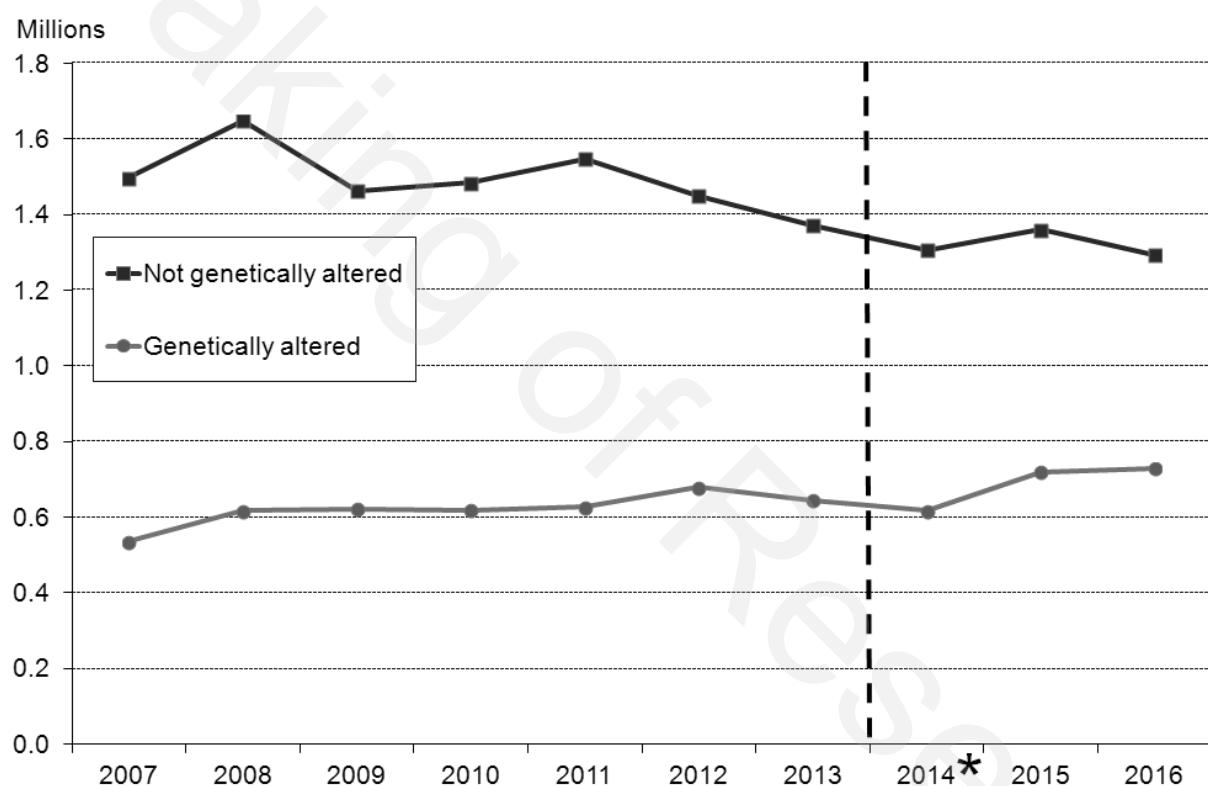


Chart notes:

* The data collection methodology changed in 2014, which resulted in some under-reporting for that year (see section on changes to data collection from 2014 in the [user guide](#)).

Prior to 2014, data were collected separately on genetically modified animals and animals with a harmful genetic mutation. Since 2014, data on these are now collected together as genetically altered animals with or without a harmful phenotype. The definitions for genetically altered animals are fully comparable between data prior to and subsequent to the change in 2014.

Severity assessments of animals used in experimental procedures

(See data tables 3.1 and 3.2)

The 2016 collection is the third year in which information on the actual severity of procedures has been collected (see introductory notes, changes to the data collection section).

Severity assessments by purpose are presented below. As Figure 12 shows, this varies

according to the type of procedure, with regulatory purposes tending to have the most severe assessments and basic research tending to have the most sub-threshold assessments.

Figure 12: Severity assessments of experimental procedures by purpose, 2016

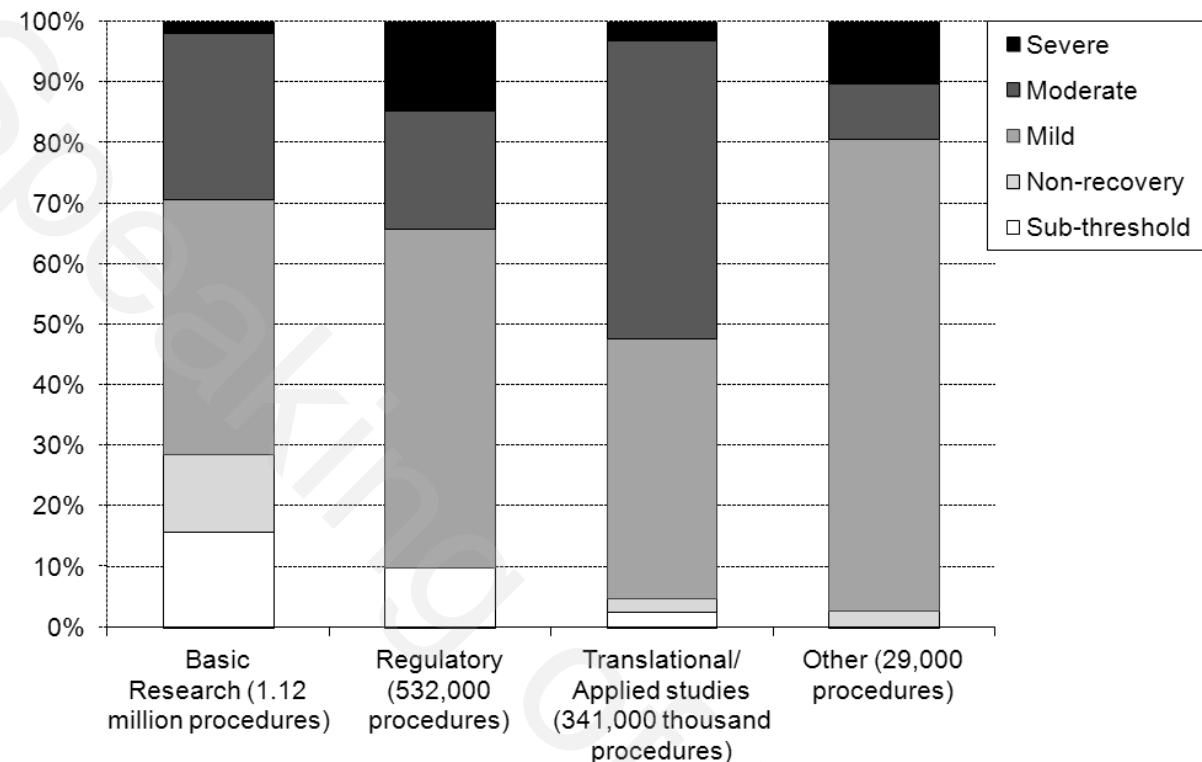


Chart notes:

2016 is the third year for which information on the actual severity of procedures has been collected. Statisticians believe the reporting of this information has become more consistent as data suppliers have become more familiar with the new reporting requirements (see introductory notes for more information).

'Other' refers to protection of the environment, higher education or training, and preservation of species.

Purpose of experimental procedures

(See data tables 5 to 7.4)

Basic research

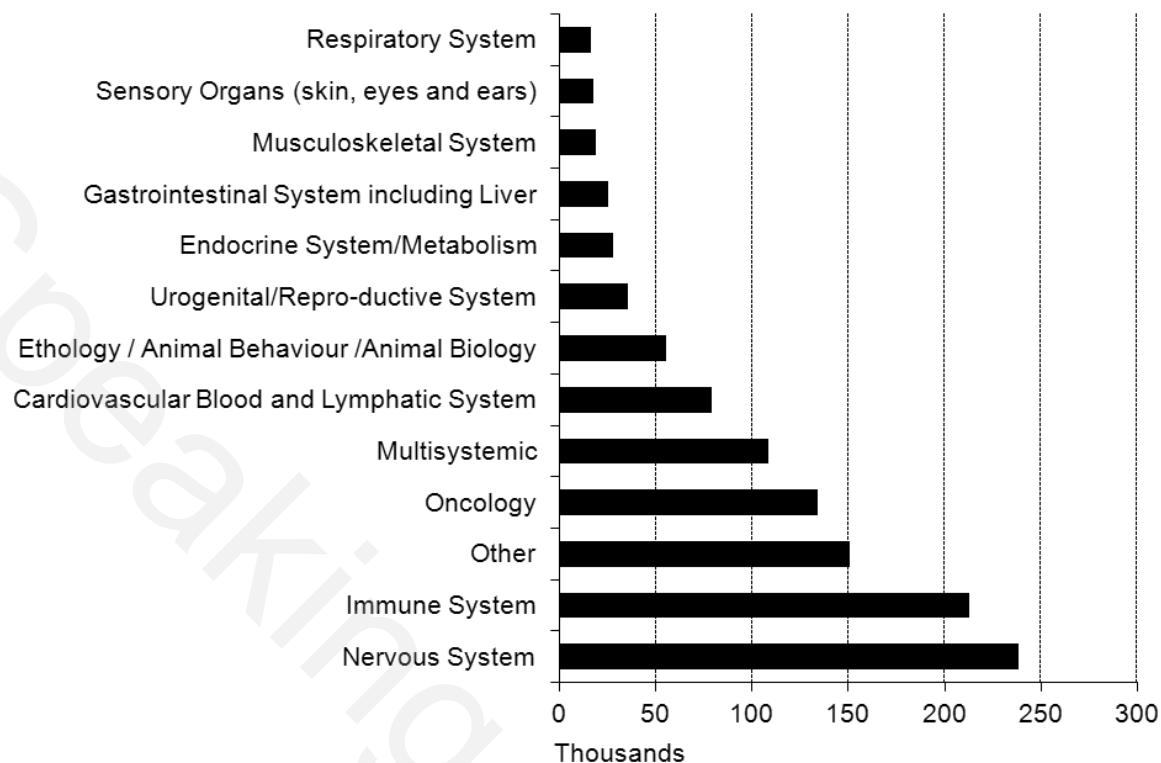
(See data table 5)

In 2016, 1.12 million procedures were undertaken for basic research purposes; as Figure 13 shows, the three most common were:

- targeted at the nervous system, 21% (239,000)
- targeted at the immune system, 19% (213,000)
- for the study of oncology, 12% (134,000)

Basic research purposes listed as 'Other' include parasitology (including the production of parasites), cell biology, genetics, and embryology and development biology.

Figure 13: Procedures undertaken for basic research, by sub-purpose, 2016



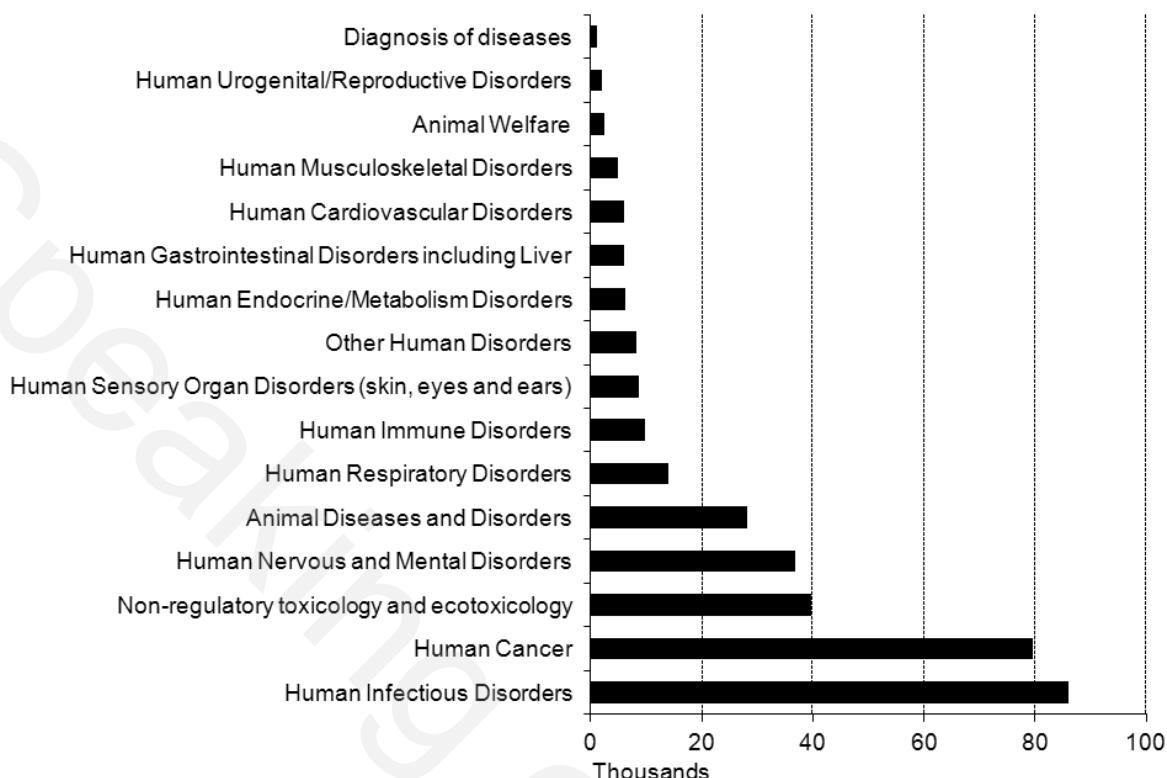
Translational/applied research

(See data table 6)

In 2016, 341,000 procedures were undertaken for translational/applied research purposes; as Figure 14 shows, the three most common were:

- human infectious disorders, 25% (86,000)
- human cancer, 23% (80,000)
- non-regulatory toxicology and ecotoxicology, 12% (40,000)

Figure 14: Procedures undertaken for translational/applied research, by sub-purpose, 2016



Regulatory use

(See data tables 7.1 to 7.4)

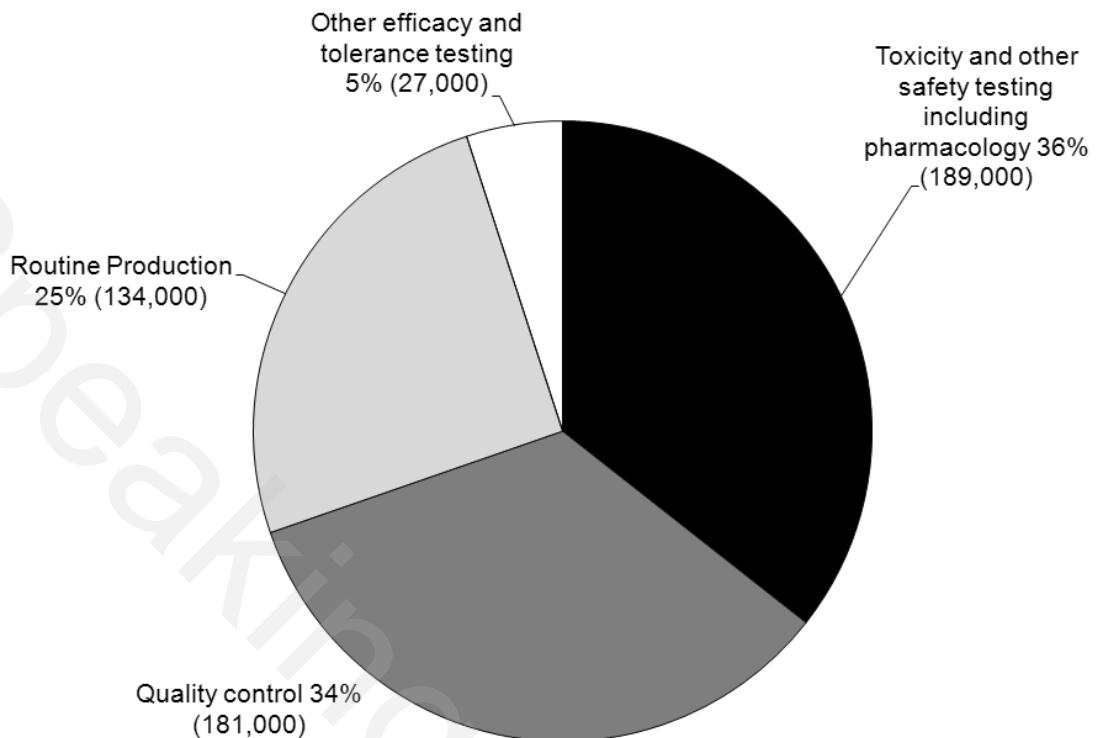
This category includes all procedures carried out to satisfy legal requirements including the production of substances to legal specification, such as material for diagnostic tests (e.g. blood products), studies to evaluate the safety or effectiveness of pharmaceuticals, and studies to evaluate the safety of other chemicals.

In 2016, 532,000 procedures were undertaken for regulatory use. Of those, as Figure 15 shows:

- 36% (189,000) were for toxicity and other safety testing including pharmacology, of which:
 - other types of regulatory tests or procedures accounted for 80% (151,000)
 - acute and sub-acute toxicity testing methods accounted for 10% (19,000)
 - ecotoxicity²⁸ accounted for 8% (15,000)
- 34% (181,000) were for the quality control of marketed medicines
- 25% (134,000) were for routine production, e.g. for vaccines and diagnostic reagents

²⁸ Ecotoxicity studies in animals relate to toxicity studies that are legislatively required to demonstrate the environmental safety of a substance.

Figure 15: Regulatory use procedures by type, 2016

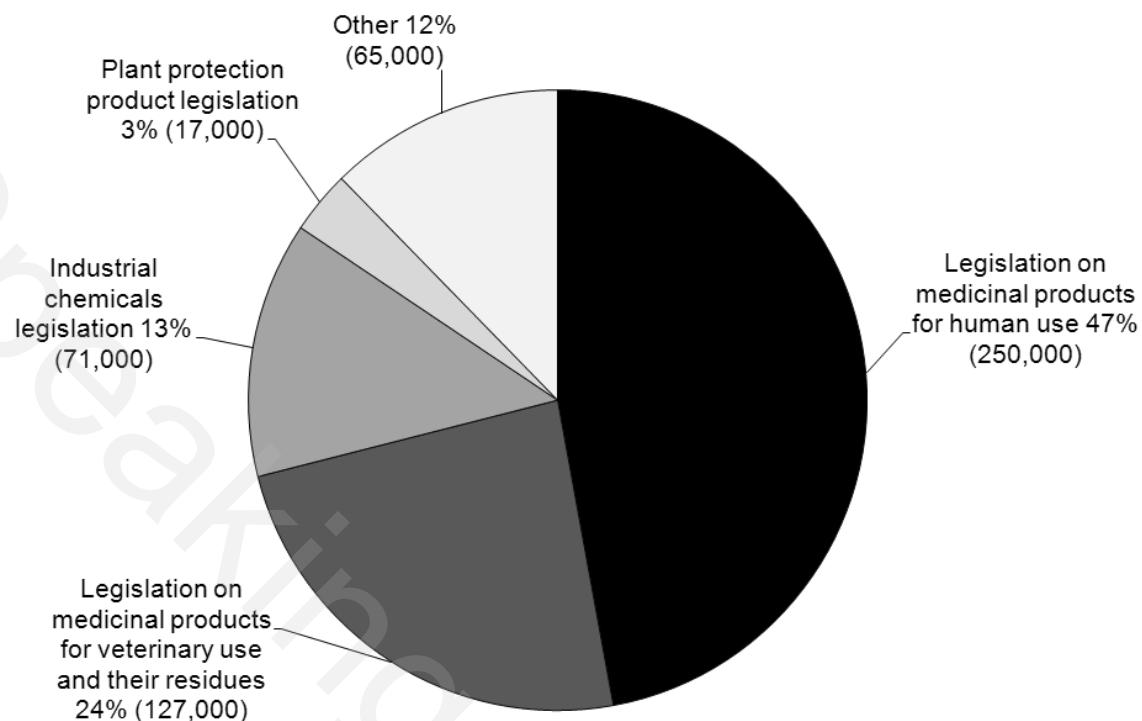


Legislative requirements
(See data table 7.2)

In 2016, of the 532,000 procedures undertaken for regulatory use, as Figure 16 shows:

- 47% (250,000) involved legislation on medicinal products for human use
- 24% (127,000) involved legislation on medicinal products for veterinary use (and their residues)
- 13% (71,000) involved industrial chemicals legislation

Figure 16: Regulatory procedures by legislation, 2016



Origin of legislative requirement
(See data table 7.3)

In 2016, of the 532,000 procedures undertaken for regulatory testing:

- 96% (509,000) satisfied both UK and EU legislative requirements
- 4% (22,000) satisfied non-EU legislative requirements
- 0.02% (100) satisfied only UK legislative requirements

Creation/breeding of genetically altered animals
(See data tables 1 and 8 to 10)

The creation/breeding of genetically altered animals includes the use of animals for the creation of new lines of genetically altered animals and the breeding of established lines of genetically altered animals that were not used in further regulated procedures. This category also includes some animals that were bred with the intention of producing genetically altered animals, but resulted in non-genetically altered animals being born (5% (89,000) of animals in this category in 2016). In addition, some animals used for the creation of a new genetic line will also have been genetically normal animals (e.g. those used for superovulation). Almost all of the animals (99%) used in procedures for the creation/breeding of genetically altered animals were born at a licensed establishment in the UK.

In 2016, 1.91 million genetically altered animals were created/bred but not used in further procedures, accounting for 49% of the total procedures in 2016. Of the 1.91 million genetically altered animals created/bred, nearly all involved mice, 86% (1.65 million); zebrafish, 13% (248,000); and rats, 0.6% (11,000).

Creation of new lines of genetically altered animals

(See data tables 9.1 to 9.3)

Of the 1.91 million genetically altered animals created/bred but not used in further procedures in 2016, 12% (226,000) were for the creation of new lines of genetically altered animals. This category includes the initial stages of the creation of a novel transgenic²⁹ or mutant³⁰ line of animal until that line becomes established. Of the 226,000 animals used in 2016 to create new lines of genetically altered animals:

- 96% (217,000) were for basic research purposes – of those, 23% (50,000) were genetically altered and had a harmful phenotype
- 4% (9,800) were for translational/applied studies – of those, 7% (700) were genetically altered and had a harmful phenotype

Maintenance of established lines of genetically altered animals

(See data table 10)

Of the 1.91 million genetically altered animals created/bred but not used in further procedures in 2016, 88% (1.69 million) were for the maintenance of established lines of genetically altered animals. These are lines of genetically altered animals that are stably transmitted (i.e. where the genetic trait is transmitted to offspring in the expected proportion and with the expected severity) and have been bred for at least two generations. Of the 1.69 million animals bred in 2016 for the maintenance of established lines of genetically altered animals:

- 75% (1.27 million) were genetically altered but did not have a harmful phenotype
- 22% (368,000) were genetically altered and did have a harmful phenotype
- 3% (51,000) were not genetically altered and were, for example, wild type offspring of heterozygous parents

Techniques of specific interest

The following information on specific techniques, where the Home Office has policies related to these areas, was also collected in 2016:

- 1,700 procedures for regulatory use (industrial chemicals legislation) involved the testing of household product ingredients
- no animals were used for alcohol research, the production of monoclonal antibodies from ascetic fluid, or the testing of tobacco products or cosmetics

Use of neuromuscular blocking agents and anaesthesia

The use of neuromuscular blocking agents (NMBA)³¹ was recorded in 18 of the 3,189 returns. All 18 returns reported using anaesthesia³².

²⁹ A transgenic animal or strain is one containing novel genes that have been inserted by laboratory manipulation.

³⁰ A mutant animal or strain is one where the genes of the animal have either naturally mutated or have been induced to change by the application of a chemical or other mutation-inducing substance.

³¹ Neuromuscular blocking agents relax skeletal muscles and induce paralysis.

³² Local or general anaesthesia, with the latter rendering an animal unconscious.

Rodenticide trials

It is impracticable to collect accurate figures on the number of animals used in field trials of rodenticide substances³³. However, two returns indicated that such field trials occurred in 2016.

Use of animals of endangered species

Returns were required on the use of animals listed in Annex A of European Council Regulation (EC) No 338/97 and not within the scope of Article 7(1) of that Regulation. One return (out of 3,189) indicated using animals in this category in 2016, specifically wild birds in research relevant to those species.

International comparisons

Northern Ireland collects figures on the same basis as Great Britain. These are published separately by the Department of Health, Northern Ireland.³⁴

Previously, data compiled by EU countries and submitted to the European Commission used a narrower, but common, definition of animal experiments. The main differences between the EU's and the UK's figures were that the EU's figures were based on the numbers of animals used, not on the numbers of procedures, and excluded the creation/breeding of genetically altered animals. However, for data relating to 2014 onwards, following the newly implemented European Directive 2010/63/EU (see [user guide](#), changes to the data collection from 2014 section) other EU countries have now begun including the creation/breeding of some genetically altered animals in their figures.

The latest EU-wide data,³⁵ based on the previous narrower definition, are for 2011 and some of the key points are as followed:

- the total number of animals used for experimental and other scientific purposes in 2011 (with one Member State reporting for 2010) was 11.5 million, which represents a reduction of over half a million animals used in the EU from the number reported in 2008
- rodents and rabbits represent 80% of the total number of animals used in the EU; mice are the most commonly used animal species, accounting for 61% of the total use, followed by rats at 14%
- no great apes have been used in the EU since 1999; furthermore, there has been a substantial decrease in the use of non-human primates

³³ Rodenticides are a category of pest control chemicals intended to kill rodents. Rodenticide trials are field trials of such chemicals and are occasionally undertaken by commercial companies that produce them to assess safety and efficacy aspects of their use.

³⁴ See: <https://www.health-ni.gov.uk/publications/statistics-scientific-procedures-living-animals-northern-ireland>.

³⁵ Seventh report from the Commission to the Council and the European Parliament on the statistics on the number of animals used for experimental and other scientific purposes in the Member States of the European Union COM(2013)859/final, available at: http://ec.europa.eu/environment/chemicals/lab_animals/reports_en.htm.

Returns, project licences, establishment licences, and personal licences

(See data table 11)

Statistical returns are required each year for every project licence in force for part or all of the year. For data relating to 2016, returns were received for 3,189 project licences, all of those in force for part or all of the year. Of the 3,189 project licences:

- procedures were completed under 2,552 project licences (2,541 covered countable procedures and 11 covered only non-countable procedures)
- no procedures were completed under 637 project licences

There were 2,631 project licences in force at the end of 2016 compared with 2,656 at the end of 2015. There were 167 establishment licences in force authorising places where work was carried out at the end of 2016, compared with 173 at the end of 2015. There were 542 project licences granted during the year.

In 2014 the Home Office started the process of moving from a paper-based to an electronic licensing system and all active personal licences had to be converted to an electronic licence. This conversion programme has now been complete and as at the end of 2016 there were 16,178 licences in force. At the end of December 2013, prior to the start of the conversion programme there were 16,112 active personal licences in force.

Tables

Organisation chart

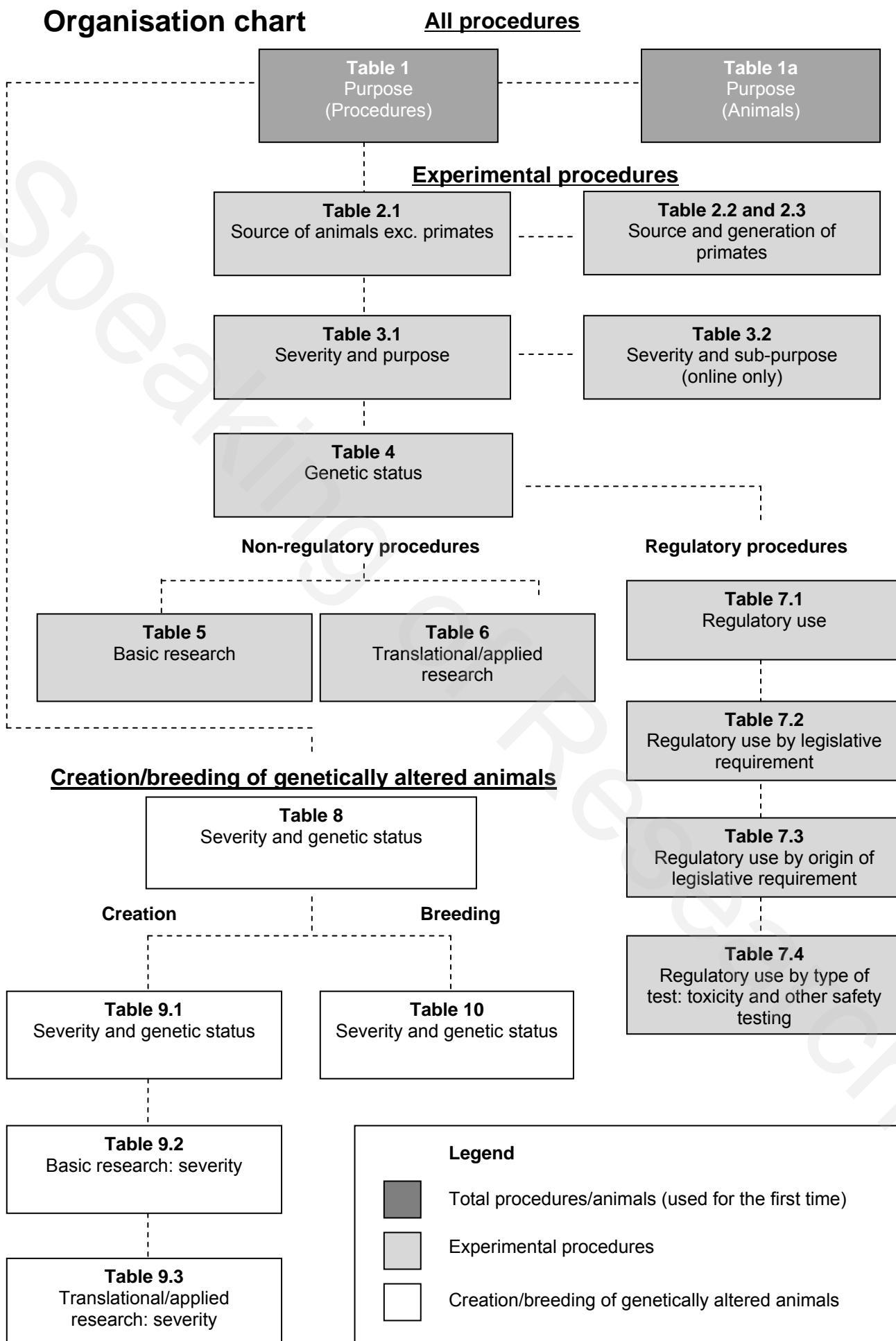


Table 1 Number of procedures by species of animal and purpose of the procedure

Great Britain 2016

Species of animal	Experimental purpose of procedure (excluding creation & breeding)						Creation & breeding of GA animals not used in experimental procedures	Total procedures	% of total procedures
	Basic Research	Translational/ Applied research	Protection of the natural environment	Preservation of species	Higher education or training	Forensic enquiries			
Mammal									
Mouse (<i>Mus musculus</i>)	830,514	190,064	590	35	629	0	194,089	1,215,921	72.8
Rat (<i>Rattus norvegicus</i>)	62,059	42,597	3,156	0	670	0	130,359	10,548	6.3
Guinea-pig (<i>Cavia porcellus</i>)	18,624	1,087	0	0	98	0	6,377	26,841	249,389
Hamster (Syrian) (<i>Mesocricetus auratus</i>)	117	475	0	0	0	0	647	1,239	0.7
Hamster (Chinese) (<i>Cricetulus griseus</i>)	0	0	0	0	0	0	0	0	0.0
Mongolian Gerbil (<i>Meriones unguiculatus</i>)	208	28	0	0	0	0	0	230	0.0
Other rodent (other Rodentia)	1,376	41	72	32	0	0	0	236	0.0
Rabbit (<i>Oryctolagus cuniculus</i>)	4,322	912	0	0	2	0	10,195	1,521	0.0
Cat (<i>Felis catus</i>)	138	52	0	0	0	0	0	15,431	0.4
Beagle (<i>Canis lupus familiaris</i>)	300	1,064	0	0	0	0	0	0	0.0
Other dog (other <i>Canis</i>)	194	131	0	0	0	0	0	4,607	0.1
Ferret (<i>Mustela putorius furo</i>)	53	404	0	0	8	0	0	325	0.0
Other carnivore (other Carnivora)	77	53	69	36	0	0	0	476	0.0
Horse and other equid (Equidae)	668	168	1,700	0	0	0	0	0	0.0
Pig (<i>Sus scrofa domesticus</i>)	519	2,813	180	0	8	0	0	5,358	0.2
Goat (<i>Capra aegagrus hircus</i>)	29	165	0	0	0	0	0	20	0.1
Sheep (<i>Ovis aries</i>)	3,521	2,396	5,930	0	0	0	0	214	0.0
Cattle (<i>Bos primigenius</i>)	1,837	596	376	0	0	0	0	47,904	1.2
Primate									0.1
New World monkey									
Marmoset and tamarin	125	72	0	0	0	0	0	197	0.0
Old World monkey									
Cynomolgus monkey (<i>Macaca fasciolaris</i>)	13	361	0	0	0	0	2,866	3,240	0.1
Rhesus monkey (<i>Macaca mulatta</i>)	95	25	0	0	0	0	12	0	0.0
Other mammal (other Mammalia)									
502	6	125	168	0	0	0	0	801	4
Bird									
Domestic fowl (<i>Gallus domesticus</i>)	7,833	13,306	0	0	0	0	117,294	138,433	3.6
Quail (<i>Colinus coturnix</i>)	5	0	0	0	0	0	0	0	0.0
Other bird (other Aves)	5,942	443	129	272	0	0	4,752	11,558	0.3
Reptile (Reptilia)									
0	0	0	0	0	0	0	0	0	0.0
Amphibian									
Rana (<i>temporaria and pipiens</i>)	225	0	0	0	0	0	0	225	0.0
Xenopus (<i>laevis and tropicalis</i>)	8,841	0	0	0	16	0	0	1,889	0.3
Other amphibian (other <i>Amphibia</i>)	723	0	0	146	0	0	0	869	0.0
Fish									
Zebrafish (<i>Danio rerio</i>)	117,002	72,580	0	127	7	0	0	189,716	438,050
Other fish (other Pisces)	55,492	10,678	13,749	973	0	0	15,992	885	97,769
Cephalopod (Cephalopoda)	0	0	0	0	0	0	0	0	0.0
Total	1,121,354	340,517	26,076	1,789	1,438	0	531,509	2,022,683	3,936,723
% of total	28.5	8.6	0.7	0.0	0.0	0.0	13.5	51.4	100.0

Table 1a Number of animals used for the first time in procedures by species of animal and purpose of the procedure

Species of animal	Experimental purpose of procedure (excluding creation & breeding)						Creation & breeding of GA animals not used in experimental procedures	Total animals used for the first time in procedures	% of total animals used for the first time in procedures
	Basic Research	Translational/ Applied research	Protection of the natural environment	Preservation of species	Higher education or training	Forensic enquiries			
Mammal									
Mouse (<i>Mus musculus</i>)	828,386	189,845	590	35	629	0	193,909	1,213,394	74.0
Rat (<i>Rattus norvegicus</i>)	59,743	41,339	3,156	0	670	0	130,127	235,035	10,548
Guinea-pig (<i>Cavia porcellus</i>)	18,624	1,087	0	0	98	0	6,377	26,186	245,583
Hamster (Syrian) (<i>Mesocricetus auratus</i>)	117	475	0	0	0	0	630	1,222	0
Hamster (Chinese) (<i>Crictetus griseus</i>)	0	0	0	0	0	0	230	230	0
Mongolian Gerbil (<i>Meriones unguiculatus</i>)	178	28	0	0	0	0	0	0	0
Other rodent (other Rodentia)	1,376	41	72	32	0	0	0	206	0.0
Rabbit (<i>Oryctolagus cuniculus</i>)	4,261	909	0	0	2	0	8,535	13,707	0
Cat (<i>Felis catus</i>)	91	52	0	0	0	0	0	143	0.0
Beagle (<i>Canis lupus familiaris</i>)	16	266	0	0	0	0	0	3,326	0.1
Other dog (other Canis)	73	131	0	0	0	0	0	204	0.0
Ferret (<i>Mustela putorius furo</i>)	53	404	0	0	8	0	11	476	0.0
Other carnivore (other Carnivora)	77	53	69	36	0	0	0	235	0.0
Horse and other equid (Equidae)	213	84	0	0	0	0	76	373	0.0
Pig (<i>Sus scrofa domesticus</i>)	495	2,692	180	0	8	0	1,801	5,176	268
Goat (<i>Capra aegagrus hircus</i>)	29	165	0	0	0	0	0	214	0.0
Sheep (<i>Ovis aries</i>)	3,049	2,160	0	0	0	0	275	5,484	191
Cattle (<i>Bos primigenius</i>)	1,678	554	376	0	0	0	978	3,586	0
Primate									
New World monkey									
Marmoset and tamarin	122	56	0	0	0	0	0	178	0
Old World monkey									
Cynomolgus monkey (<i>Macaca fasciularis</i>)	0	50	0	0	0	0	2,147	2,197	0.1
Rhesus monkey (<i>Macaca mulatta</i>)	29	24	0	0	0	0	12	65	0.0
Other mammal (other Mammalia)	502	3	125	168	0	0	0	798	4
Bird									
Domestic fowl (<i>Gallus domesticus</i>)	7,715	13,306	0	0	0	0	117,024	138,045	1,427
Quail (<i>Coturnix coturnix</i>)	5	0	0	0	0	0	0	5	0
Other bird (other Aves)	5,590	325	34	272	0	0	4,752	10,973	0
Reptile (Reptilia)	0	0	0	0	0	0	0	0	0.0
Amphibian									
Rana (<i>temporaria and pipiens</i>)	225	0	0	0	0	0	0	225	0
Xenopus (<i>laevis and tropicalis</i>)	3,866	0	0	0	0	0	0	3,866	1,759
Other amphibian (other Amphibia)	723	0	0	146	0	0	0	869	885
Fish									
Zebrafish (<i>Danio rerio</i>)	116,927	72,580	0	127	7	0	0	189,641	247,659
Other fish (other Pisces)	55,492	10,678	13,749	973	0	0	15,992	96,884	97,769
Cephalopod (Cephalopoda)	0	1,109,655	337,307	8.7	18,351	0.5	1,739	1,422	0
Total	28,7	1,109,655	337,307	8.7	18,351	0.5	0.0	485,940	1,953,464
% of total								50.5	49.5
								0	0
									100.0

Table 2.1 Place of birth of animals used for the first time in experimental procedures by species of animal (excludes non-human primates)

Species of animal	Place of birth					% of total
	Animals born in the UK at a licensed establishment	Animals born in the UK but not at a licensed establishment	Animals born elsewhere in the EU at a registered breeder	Animals born elsewhere in the EU but not at a registered breeder	Animals born in rest of Europe	
Mammal						
Mouse (<i>Mus musculus</i>)*	1,186,683	12	20,949	0	61	5,689
Rat (<i>Rattus norvegicus</i>)*	228,493	2,713	3,548	0	0	1,213,394
Guinea-pig (<i>Cavia porcellus</i>)*	26,186	0	0	0	0	235,035
Hamster (Syrian) (<i>Mesocricetus auratus</i>)*	48	0	954	0	0	26,186
Hamster (chinese) (<i>Cricetulus griseus</i>)*	230	0	0	0	0	1,222
Mongolian Gerbil (<i>Meriones unguiculatus</i>)*	206	0	0	0	0	230
Other rodent (other Rodentia)	390	1,090	0	0	1	206
Rabbit (<i>Oryctolagus cuniculus</i>)	11,803	0	950	0	40	1,521
					954	13,707
Cat (<i>Felis catus</i>)	0	48	95	0	0	0
Beagle (<i>Canis lupus familiaris</i>)	1,828	0	118	0	0	143
Other dog (other <i>Canis</i>)	2	202	0	0	0	3,326
Ferret (<i>Mustela putorius furo</i>)	476	0	0	0	0	204
Other carnivore (other Carnivora)	0	225	0	10	0	0
Horse and other equid (<i>Equidae</i>)	79	274	0	20	0	373
Pig (<i>Sus scrofa domesticus</i>)	1,428	3,158	557	33	0	5,176
Goat (<i>Capra aegagrus hircus</i>)	2	210	0	2	0	214
Sheep (<i>Ovis aries</i>)	2,174	2,953	0	357	0	5,484
Cattle (<i>Bos primigenius</i>)	563	2,971	0	51	1	3,586
					0	0
Other mammal (other Mammalia)	117	513	168	0	0	798
Bird						
Domestic fowl (<i>Gallus domesticus</i>)	106,579	28,644	2,602	220	0	138,045
Quail (<i>Coturnix coturnix</i>)	5	0	0	0	0	5
Other bird (other Aves)	4,575	6,109	48	177	0	64
Reptile (Reptilia)						
	0	0	0	0	0	0
Amphibian						
Rana (<i>temporaria</i> and <i>pipliens</i>)*	0	225	0	0	0	225
Xenopus (<i>laevis</i> and <i>tropicalis</i>)*	3,334	0	33	0	499	3,866
Other amphibian (other Amphibia)	0	787	4	60	0	889
Fish						
Zebrafish (<i>Danio rerio</i>)*	188,863	0	440	0	0	189,641
Other fish (other Pisces)	35,543	55,739	253	309	4,669	96,884
Cephalopod (Cephalopoda)	0	0	0	0	0	0
Total	1,799,607	105,873	30,719	1,239	4,732	9,854
% of total	92.2	5.4	1.6	0.1	0.2	0.5
						100.0

* Denotes species listed in Schedule 2; pigs and sheep are only listed in Schedule 2 if they are genetically altered.

Table 2.2 Place of birth of non-human primates¹ used for the first time in experimental procedures by species of primate

Great Britain 2016		Place of birth								
Species of primate		Animals born in the UK at a licensed establishment	Animals born at a registered breeder elsewhere within EU	Animals born in rest of Europe	Animals born in Asia	Animals born in America	Animals born in Africa	Animals born elsewhere	Total	% of total
Primate										
New World monkey		172	6	0	0	0	0	0	178	7.3
Marmoset and tamarin										
Old World monkey		32	0	0	0	640	0	1,525	0	90.0
Cynomolgus monkey (<i>Macaca fascicularis</i>)		53	0	0	12	0	0	0	65	2.7
Rhesus monkey (<i>Macaca mulatta</i>)										
Total		257	6	0	652	0	1,525	0	2,440	100.0
% of total		10.5	0.2	0.0	26.7	0.0	62.5	0.0	100.0	

1. All primate species are listed in Schedule 2 of the Animals (Scientific Procedures) Act 1986.

Table 2.3 Generation of non-human primates¹ used for the first time in experimental procedures by species of primate

Great Britain 2016		Generation						
Species of primate		F0	F1	F2 or greater	Self-sustaining colony	Total	% of total	
Primate								
New World monkey								
Marmoset and tamarin		0	0	6	172	178	7.3	
Old World monkey		0	0	678	1,519	2,197	90.0	
Cynomolgus monkey (<i>Macaca fascicularis</i>)		0	0	17	48	65	2.7	
Rhesus monkey (<i>Macaca mulatta</i>)								
Total		0	0	701	1,739	2,440	100.0	
% of total		0.0	0.0	28.7	71.3	100.0		

1. All primate species are listed in Schedule 2 of the Animals (Scientific Procedures) Act 1986.

Table 3.1 Experimental procedures by species of animal¹, severity and purpose of the procedure, page 1 of 2

Great Britain 2016

Species of animal	Actual Severity	Experimental purpose of procedure							Total	% of species total
		Basic Research	Translational/ Applied research	Protection of the natural environment	Preservation of species	Higher education or training	Forensic enquiries	Regulatory		
Mouse (<i>Mus musculus</i>)	Sub threshold	135,741	7,448	0	0	0	0	28	143,217	11.8
	Non - recovery	99,521	4,006	0	4	85	0	83	103,699	8.5
	Mild	322,582	84,583	456	31	544	0	65,564	473,760	39.0
	Moderate	255,774	88,556	100	0	0	0	55,480	399,910	32.9
	Severe	16,896	5,471	34	0	0	0	72,934	95,335	7.8
Rat (<i>Rattus norvegicus</i>)	Total	830,514	190,064	590	35	629	0	194,089	1,215,921	100.0
	Sub threshold	1,205	36	0	0	0	0	38,576	39,817	16.7
	Non - recovery	23,786	3,057	0	0	581	0	128	27,552	11.5
	Mild	15,737	21,590	324	0	62	0	55,628	93,341	39.1
	Moderate	20,202	17,356	43	0	27	0	35,261	72,889	30.5
Guinea-pig (<i>Cavia porcellus</i>)	Severe	1,129	558	2,789	0	0	0	766	5,242	2.2
	Total	62,059	42,597	3,156	0	670	0	130,359	238,841	100.0
	Sub threshold	0	0	0	0	0	0	0	0	0.0
	Non - recovery	17,959	54	0	0	79	0	0	18,092	69.1
	Mild	173	582	0	0	19	0	2,758	3,532	13.5
Other rodent ²	Moderate	454	332	0	0	0	0	1,413	2,199	8.4
	Severe	38	119	0	0	0	0	2,206	2,363	9.0
	Total	18,624	1,087	0	0	98	0	6,377	26,186	100.0
	Sub threshold	72	0	0	0	0	0	0	72	2.2
	Non - recovery	14	0	0	0	0	0	0	14	0.4
Rabbit (<i>Oryctolagus cuniculus</i>)	Mild	1,309	266	72	30	0	0	716	2,393	74.2
	Moderate	299	203	0	0	0	0	146	648	20.1
	Severe	7	75	0	2	0	0	15	99	3.1
	Total	1,701	544	72	32	0	0	877	3,226	100.0
	Sub threshold	68	0	0	0	0	0	262	330	2.1
Cat (<i>Felis catus</i>)	Non - recovery	1,634	147	0	0	2	0	74	1,857	12.0
	Mild	2,334	279	0	0	0	0	7,822	10,435	67.6
	Moderate	284	393	0	0	0	0	2,010	2,687	17.4
	Severe	2	93	0	0	0	0	27	122	0.8
	Total	4,322	912	0	0	2	0	10,195	15,431	100.0
Dog ³	Sub threshold	10	0	0	0	0	0	0	10	5.3
	Non - recovery	0	0	0	0	0	0	0	0	0.0
	Mild	127	52	0	0	0	0	0	179	94.2
	Moderate	1	0	0	0	0	0	0	1	0.5
	Severe	0	0	0	0	0	0	0	0	0.0
Ferret (<i>Mustela putorius furo</i>)	Total	138	52	0	0	0	0	0	190	100.0
	Sub threshold	16	1	0	0	0	0	0	17	0.3
	Non - recovery	15	0	0	0	0	0	91	106	2.1
	Mild	463	945	0	0	0	0	2,322	3,730	75.6
	Moderate	0	244	0	0	0	0	821	1,065	21.6
Horse and other equid (<i>Equidae</i>)	Severe	0	5	0	0	0	0	9	14	0.3
	Total	494	1,195	0	0	0	0	3,243	4,932	100.0
	Sub threshold	0	0	0	0	0	0	0	0	0.0
	Non - recovery	3	0	0	0	8	0	11	22	4.6
	Mild	11	284	0	0	0	0	0	295	62.0
Pig (<i>Sus scrofa domesticus</i>)	Moderate	37	120	0	0	0	0	0	157	33.0
	Severe	2	0	0	0	0	0	0	2	0.4
	Total	53	404	0	0	8	0	11	476	100.0
	Sub threshold	0	0	0	0	0	0	5	5	0.1
	Non - recovery	0	0	0	0	0	0	0	0	0.0
Other ungulate ⁴	Mild	656	113	1,700	0	0	0	6,403	8,872	99.2
	Moderate	12	55	0	0	0	0	4	71	0.8
	Severe	0	0	0	0	0	0	0	0	0.0
	Total	668	168	1,700	0	0	0	6,412	8,948	100.0
	Sub threshold	26	111	0	0	0	0	50	187	3.5
Other mammal (other <i>Mammalia</i>)	Non - recovery	126	184	0	0	8	0	0	318	5.9
	Mild	348	2,387	180	0	0	0	1,472	4,387	81.9
	Moderate	19	127	0	0	0	0	311	457	8.5
	Severe	0	4	0	0	0	0	5	9	0.2
	Total	519	2,813	180	0	8	0	1,838	5,358	100.0
Sub threshold	21	94	0	0	0	0	0	0	115	0.2
	Non - recovery	16	384	0	0	0	0	0	400	0.8
	Mild	4,818	2,338	6,265	0	0	0	36,675	50,096	96.3
	Moderate	528	341	34	0	0	0	509	1,412	2.7
	Severe	4	0	7	0	0	0	8	19	0.0
Other mammal (other <i>Mammalia</i>)	Total	5,387	3,157	6,306	0	0	0	37,192	52,042	100.0
	Sub threshold	104	0	0	0	0	0	0	104	10.0
	Non - recovery	0	0	0	0	0	0	0	0	0.0
	Mild	449	48	193	203	0	0	0	893	86.2
	Moderate	15	11	1	0	0	0	0	27	2.6
	Severe	11	0	0	1	0	0	0	12	1.2
	Total	579	59	194	204	0	0	0	1,036	100.0

Table 3.1 Experimental procedures by species of animal¹, severity and purpose of the procedure, page 2 of 2

Great Britain 2016

Species of animal	Severity	Experimental purpose of procedure							% of species total	
		Basic Research	Translational/ Applied research	Protection of the natural environment	Preservation of species	Higher education or training	Forensic enquiries	Regulatory		
Primate	Sub threshold	0	6	0	0	0	0	0	6	0.2
	Non - recovery	7	3	0	0	0	0	16	26	0.7
	Mild	101	378	0	0	0	0	1,604	2,083	58.4
	Moderate	123	62	0	0	0	0	1,249	1,434	40.2
	Severe	2	9	0	0	0	0	9	20	0.6
	Total	233	458	0	0	0	0	2,878	3,569	100.0
Bird	Sub threshold	247	56	0	0	0	0	5,489	5,792	3.9
	Non - recovery	116	0	0	0	0	0	0	116	0.1
	Mild	12,119	12,004	129	272	0	0	110,815	135,339	90.2
	Moderate	1,283	1,531	0	0	0	0	4,995	7,809	5.2
	Severe	15	158	0	0	0	0	747	920	0.6
	Total	13,780	13,749	129	272	0	0	122,046	149,976	100.0
Amphibian	Sub threshold	931	0	0	0	0	0	0	931	9.4
	Non - recovery	6	0	0	0	0	0	0	6	0.1
	Mild	7,900	0	0	0	16	0	0	7,916	79.5
	Moderate	54	0	0	0	0	0	0	54	0.5
	Severe	898	0	0	146	0	0	0	1,044	10.5
	Total	9,789	0	0	146	16	0	0	9,951	100.0
Fish	Sub threshold	36,327	482	0	0	0	0	7,236	44,045	15.4
	Non - recovery	2,143	0	0	0	7	0	5	2,155	0.8
	Mild	102,774	20,407	11,697	657	0	0	5,357	140,892	49.2
	Moderate	28,426	58,054	2,050	443	0	0	1,684	90,657	31.6
	Severe	2,824	4,315	2	0	0	0	1,710	8,851	3.1
	Total	172,494	83,258	13,749	1,100	7	0	15,992	286,600	100.0
All species	Sub threshold	174,768	8,234	0	0	0	0	51,646	234,648	11.6
	Non - recovery	145,346	7,835	0	4	770	0	408	154,363	7.6
	Mild	471,901	146,256	21,016	1,193	641	0	297,136	938,143	46.4
	Moderate	307,511	167,385	2,228	443	27	0	103,883	581,477	28.7
	Severe	21,828	10,807	2,832	149	0	0	78,436	114,052	5.6
	Total	1,121,354	340,517	26,076	1,789	1,438	0	531,509	2,022,683	100.0

1. Some species were not displayed on this table as they were not used in any relevant procedures in 2016.

2. "Other rodent" includes Syrian hamster (*Mesocricetus auratus*), Chinese hamster (*Cricetulus griseus*), Mongolian gerbil (*Meriones unguiculatus*), and other rodents (other *Rodentia*).

3. "Dog" includes beagles (*Canis lupus familiaris*) and other dogs (other *Canis*).

4. "Other ungulate" includes goat (*Capra aegagrus hircus*), sheep (*Ovis aries*), and cattle (*Bos primigenius*).

Table 4 Experimental procedures by species of animal and genetic status

Great Britain 2016

Species of animal	Genetic status			Total	% of total
	Not genetically altered	Genetically altered without a harmful phenotype	Genetically altered with a harmful phenotype		
Mammal					
Mouse (<i>Mus musculus</i>)	639,919	434,753	141,249	1,215,921	60.1
Rat (<i>Rattus norvegicus</i>)	234,196	3,708	937	238,841	11.8
Guinea-pig (<i>Cavia porcellus</i>)	26,186	0	0	26,186	1.3
Hamster (Syrian) (<i>Mesocricetus auratus</i>)	1,239	0	0	1,239	0.1
Hamster (Chinese) (<i>Cricetulus griseus</i>)	230	0	0	230	0.0
Mongolian Gerbil (<i>Meriones unguiculatus</i>)	236	0	0	236	0.0
Other rodent (other <i>Rodentia</i>)	1,521	0	0	1,521	0.1
Rabbit (<i>Oryctolagus cuniculus</i>)	15,431	0	0	15,431	0.8
Cat (<i>Felis catus</i>)	190	0	0	190	0.0
Beagle (<i>Canis lupus familiaris</i>)	4,595	0	12	4,607	0.2
Other dog (other <i>Canis</i>)	325	0	0	325	0.0
Ferret (<i>Mustela putorius furo</i>)	476	0	0	476	0.0
Other carnivore (other <i>Carnivora</i>)	235	0	0	235	0.0
Horse and other equid (<i>Equidae</i>)	8,948	0	0	8,948	0.4
Pig (<i>Sus scrofa domesticus</i>)	5,358	0	0	5,358	0.3
Goat (<i>Capra aegagrus hircus</i>)	214	0	0	214	0.0
Sheep (<i>Ovis aries</i>)	47,884	20	0	47,904	2.4
Cattle (<i>Bos primigenius</i>)	3,924	0	0	3,924	0.2
Primate					
New World monkey					
Marmoset and tamarin	197	0	0	197	0.0
Old World monkey					
Cynomolgus monkey (<i>Macaca fascicularis</i>)	3,240	0	0	3,240	0.2
Rhesus monkey (<i>Macaca mulatta</i>)	132	0	0	132	0.0
Other mammal (other <i>Mammalia</i>)	801	0	0	801	0.0
Bird					
Domestic fowl (<i>Gallus domesticus</i>)	138,051	354	28	138,433	6.8
Quail (<i>Coturnix coturnix</i>)	5	0	0	5	0.0
Other bird (other <i>Aves</i>)	11,538	0	0	11,538	0.6
Reptile (<i>Reptilia</i>)					
	0	0	0	0	0.0
Amphibian					
Rana (<i>temporaria and pipiens</i>)	225	0	0	225	0.0
Xenopus (<i>laevis and tropicalis</i>)	7,290	1,567	0	8,857	0.4
Other amphibian (other <i>Amphibia</i>)	869	0	0	869	0.0
Fish					
Zebrafish (<i>Danio rerio</i>)	42,954	139,776	6,986	189,716	9.4
Other fish (other <i>Pisces</i>)	96,884	0	0	96,884	4.8
Cephalopod (<i>Cephalopoda</i>)	0	0	0	0	0.0
Total	1,293,293	580,178	149,212	2,022,683	100.0
% of total	63.9	28.7	7.4	100.0	

Table 5 Experimental procedures (non-regulatory) by species of animal: basic research

Species of animal	Basic Research										Ethology/ Animal Behaviour/ Animal Biology	Other	Total	% of total
	Oncology	Cardiovascular- Blood/ Lymphatic System	Nervous System	Respiratory System	Gastrointestinal System including Liver	Musculoskeletal System	Immune System	Urogenital/ Reproductive System	Sensory Organs (skin/ eyes and ears)	Endocrine System/ Metabolism				
Mammal														
Mouse (<i>Mus musculus</i>)	124,108	61,632	142,748	12,499	20,470	16,689	198,947	31,870	13,878	23,178	79,529	4,371	100,595	830,514
Rat (<i>Rattus norvegicus</i>)	366	6,344	27,753	3,220	801	79	723	444	389	1,902	4,084	356	15,988	62,059
Guinea-pig (<i>Cavia porcellus</i>)	0	181	113	0	0	62	0	3	108	0	73	0	17,79	18,624
Hamster (Syrian) (<i>Mesocricetus auratus</i>)	0	0	0	0	0	16	0	67	0	0	0	0	34	117
Hamster (Chinese) (<i>Cratogeomys griseus</i>)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mongolian Gerbil (<i>Meriones unguiculatus</i>)	0	0	14	0	0	0	0	0	0	20	0	0	0	0
Other rodent (other Rodentia)	6	0	18	0	0	0	20	917	0	0	173	44	198	0
Rabbit (<i>Oryctolagus cuniculus</i>)	0	399	7	0	103	0	1,720	40	36	0	392	0	1,625	4,322
Cat (<i>Felis catus</i>)	0	24	1	0	0	18	0	0	0	0	24	71	0	138
Beagle (<i>Canis lupus familiaris</i>)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other dog (other Canis)	0	0	8	0	32	0	35	0	0	0	0	0	77	0
Ferret (<i>Mustela putorius furo</i>)	0	0	32	15	0	0	0	0	0	6	0	0	0	53
Other carnivore (other Carnivora)	0	0	0	0	0	0	0	0	0	6	0	0	0	0
Horse and other equid (<i>Equidae</i>)	0	0	0	12	0	20	112	0	0	0	524	0	0	668
Pig (<i>Sus scrofa domesticus</i>)	5	67	5	91	85	0	113	25	10	0	58	0	60	519
Goat (<i>Capra aegagrus hircus</i>)	0	0	0	0	0	0	24	0	0	0	0	0	0	0
Sheep (<i>Ovis aries</i>)	0	93	31	135	21	98	116	279	0	0	295	296	2,157	3,521
Cattle (<i>Bos primigenius</i>)	0	0	0	95	105	0	263	13	0	1,066	291	0	4	1,837
Primate														
New World monkey	0	0	49	0	0	0	0	0	0	0	0	0	0	125
Marmoset and Tamarin	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Old World monkey	0	0	0	0	0	0	0	0	0	0	0	0	0	13
Cynomolgus monkey (<i>Macaca fascicularis</i>)	0	54	24	0	0	0	0	0	0	0	0	0	0	95
Rhesus monkey (<i>Macaca mulatta</i>)	0	432	0	0	0	0	0	0	0	0	0	0	0	0
Other mammal (other Mammalia)	0	0	0	0	0	0	0	117	0	0	0	0	323	62
Bird														
Domestic fowl (<i>Gallus domesticus</i>)	0	0	0	0	0	3,631	92	131	16	28	720	245	414	2,556
Quail (<i>Coturnix columba</i>)	0	0	0	0	0	0	0	0	0	5	0	0	0	5
Other bird (other Aves)	0	432	0	0	0	0	14	0	0	8	0	0	5,232	256
Reptile (Reptilia)														
Amphibian														
Rana (<i>temporalis and pipiens</i>)	0	0	0	0	0	0	0	0	0	0	0	0	225	0
Xenopus (<i>laevis and tropicalis</i>)	221	333	1,124	0	0	0	0	2,119	126	44	1,569	90	3,215	8,841
Other amphibian (other Amphibia)	0	0	0	0	0	0	0	0	0	0	0	667	0	723
Fish														
Zebrafish (<i>Danio rerio</i>)	9,233	9,457	66,544	0	1	1,689	7,061	168	3,337	0	2,894	10,209	6,409	117,002
Other fish (other Pisces)	0	5	40	0	66	6	2,517	702	0	269	18,850	32,974	64	55,492
Cephalopod (<i>Cephalopoda</i>)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	133,939	79,021	238,511	16,642	25,392	18,816	212,741	35,802	17,946	27,905	108,607	55,475	150,557	1,121,354
% of total	11.9	7.0	21.3	1.5	2.3	1.7	19.0	3.2	1.6	2.5	9.7	4.9	13.4	100.0

Table 6 Experimental procedures (non-regulatory) by species of animal: translational/applied research, page 1 of 2

Great Britain 2016

Species of animal	Translational/applied research					
	Human Cancer	Human Infectious Disorders	Human Cardiovascular Disorders	Human Nervous and Mental Disorders	Human Respiratory Disorders	Human Gastrointestinal Disorders including Liver
Mammal						
Mouse (<i>Mus musculus</i>)	78,734	34,559	3,697	18,503	8,400	5,248
Rat (<i>Rattus norvegicus</i>)	440	1,815	2,092	14,665	5,242	781
Guinea-pig (<i>Cavia porcellus</i>)	0	424	0	0	422	0
Hamster (Syrian) (<i>Mesocricetus auratus</i>)	0	388	0	0	0	0
Hamster (Chinese) (<i>Cricetulus griseus</i>)	0	0	0	0	0	0
Mongolian Gerbil (<i>Meriones unguiculatus</i>)	0	28	0	0	0	0
Other rodent (other Rodentia)	0	41	0	0	0	0
Rabbit (<i>Oryctolagus cuniculus</i>)	0	128	155	18	11	62
Cat (<i>Felis catus</i>)	0	0	0	0	0	0
Beagle (<i>Canis lupus familiaris</i>)	0	0	0	0	0	0
Other dog (other Canis)	0	0	0	0	0	0
Ferret (<i>Mustela putorius furo</i>)	0	381	0	0	0	0
Other carnivore (other Carnivora)	0	0	0	0	0	0
Horse and other equid (Equidae)	0	0	0	0	0	0
Pig (<i>Sus scrofa domesticus</i>)	3	0	45	96	26	14
Goat (<i>Capra aegagrus hircus</i>)	0	0	0	0	0	0
Sheep (<i>Ovis aries</i>)	0	25	0	4	0	0
Cattle (<i>Bos primigenius</i>)	0	21	0	0	0	0
Primate						
New World monkey						
Marmoset and tamarin	0	0	0	24	0	0
Old World monkey						
Cynomolgus monkey (<i>Macaca fascicularis</i>)	0	41	0	0	0	0
Rhesus monkey (<i>Macaca mulatta</i>)	0	25	0	0	0	0
Other mammal (other Mammalia)	0	0	0	0	0	0
Bird						
Domestic fowl (<i>Gallus domesticus</i>)	404	0	0	0	0	0
Quail (<i>Coturnix columba</i>)	0	0	0	0	0	0
Other bird (other Aves)	0	63	0	0	8	0
Reptile (<i>Reptilia</i>)						
Amphibian						
<i>Rana temporaria</i> and <i>pipiens</i>)	0	0	0	0	0	0
<i>Xenopus laevis</i> and <i>tropicalis</i>)	0	0	0	0	0	0
Other amphibian (other Amphibia)	0	0	0	0	0	0
Fish						
Zebrafish (<i>Danio rerio</i>)	12	48,129	0	3,626	0	654
Other fish (other Pisces)	0	0	0	0	0	0
Cephalopod (<i>Cephalopoda</i>)						
Total	79,593	86,068	5,989	36,935	14,123	6,105
% of total	23.4	25.3	1.8	10.8	4.1	2.9
						2,080
						1.814

Table 6 Experimental procedures (non-regulatory) by species of animal: Translational/applied research , page 2 of 2

Species of animal	Translational/applied research						Total	% of total
	Human Sensory Organ Disorders (skin, eyes and ears)	Human Endocrine/ Metabolism Disorders	Other Human Disorders	Animal Diseases and Disorders	Animal Welfare	Diagnosis of diseases		
Mammal								
Mouse (<i>Mus musculus</i>)	8,287	2,965	4,745	1,207	136	884	0	0.026
Rat (<i>Rattus norvegicus</i>)	222	3,296	3,181	20	217	102	0	8,726
Guinea-pig (<i>Cavia porcellus</i>)	0	0	178	0	0	0	0	22
Hamster (Syrian) (<i>Mesocricetus auratus</i>)	0	0	0	0	0	0	0	0,087
Hamster (Chinese) (<i>Cricetulus griseus</i>)	0	0	0	0	0	0	0	475
Mongolian Gerbil (<i>Meriones unguiculatus</i>)	0	0	0	0	0	0	0	0
Other rodent (other Rodentia)	0	0	0	0	0	0	0	0,0
Rabbit (<i>Oryctolagus cuniculus</i>)	150	0	0	107	0	3	0	179
Cat (<i>Felis catus</i>)	0	0	0	0	52	0	0	52
Beagle (<i>Canis lupus familiaris</i>)	0	0	0	0	54	0	0	969
Other dog (other Canis)	0	0	0	0	131	0	0	131
Ferret (<i>Mustela putorius furo</i>)	0	0	0	0	18	0	0	404
Other carnivore (other Carnivora)	0	0	0	0	53	0	0	53
Horse and other equid (<i>Equidae</i>)	0	0	0	140	25	3	0	168
Pig (<i>Sus scrofa domesticus</i>)	63	4	0	1,206	1,147	0	0	121
Goat (<i>Capra aegagrus hircus</i>)	0	0	0	0	163	0	0	165
Sheep (<i>Ovis aries</i>)	0	16	0	1,649	200	53	0	2,396
Cattle (<i>Bos primigenius</i>)	0	0	0	256	349	0	0	596
Primate								
New World monkey								
Marmoset and tamarin	0	0	24	0	0	0	0	24
Old World monkey								
Cynomolgus monkey (<i>Macaca fasciularis</i>)	0	0	0	0	0	0	0	320
Rhesus monkey (<i>Macaca mulatta</i>)	0	0	0	0	0	0	0	0
Other mammal (other <i>Mammalia</i>)	0	0	0	0	6	0	0	6
Bird								
Domestic fowl (<i>Gallus domesticus</i>)	0	0	0	12,888	14	0	0	13,306
Quail (<i>Coturnix coturnix</i>)	0	0	0	0	0	0	0	0
Other bird (other Aves)	0	0	0	166	138	68	0	443
Reptile (<i>Reptilia</i>)	0	0	0	0	0	0	0	0
Amphibian								
Rana (<i>temporaria and pipiens</i>)	0	0	0	0	0	0	0	0,0
Xenopus (<i>laevis and tropicalis</i>)	0	0	0	0	0	0	0	0,0
Other amphibian (other <i>Amphibia</i>)	0	0	0	0	0	0	0	0,0
Fish								
Zebrafish (<i>Danio rerio</i>)	0	0	52	0	0	0	0	20,108
Other fish (other Pisces)	0	0	0	10,340	100	36	0	10,678
Cephalopod (<i>Cephalopoda</i>)	0	0	0	0	0	0	0	0,0
Total	8,722	6,281	8,180	28,287	2,459	1,156	0,3	340,517
% of total	2,6	1,8	2,4	8,3	0,7	0,3	0,0	100,0

Table 7.1 Experimental procedures by species of animal: regulatory use

Great Britain 2016

Species of animal	Routine Production			Quality control			Other efficacy and tolerance testing	Toxicity and other safety testing including pharmacology	Total	% of total
	Blood based products	Monoclonal antibody production (ascites)	Other	Batch safety testing	Pyrogenicity testing	Other quality controls				
Mammal										
Mouse (<i>Mus musculus</i>)	511	0	0	6,253	0	130,973	23,666	1,138	31,548	194,089
Rat (<i>Rattus norvegicus</i>)	1,019	0	0	42	0	640	0	1,272	127,386	130,359
Guinea-pig (<i>Cavia porcellus</i>)	0	0	0	521	0	3,848	1,511	0	497	6,377
Hamster (Syrian) (<i>Mesocricetus auratus</i>)	0	0	11	0	0	0	0	150	56	647
Hamster (Chinese) (<i>Cricetulus griseus</i>)	0	0	0	0	0	0	0	0	230	230
Mongolian Gerbil (<i>Meriones unguiculatus</i>)	0	0	0	0	0	0	0	0	0	0
Other rodent (other Rodentia)	0	0	0	0	0	0	0	0	0	0
Rabbit (<i>Oryctolagus cuniculus</i>)	206	0	421	55	2,472	1,510	0	30	5,501	10,195
Cat (<i>Felis catus</i>)	0	0	0	0	0	0	0	0	0	0
Beagle (<i>Canis lupus familiaris</i>)	0	0	0	0	0	0	0	147	3,096	3,243
Other dog (other Canis)	0	0	0	0	0	0	0	0	0	0
Ferret (<i>Mustela putorius furo</i>)	0	0	0	0	0	0	0	0	11	11
Other carnivore (other Carnivora)	0	0	0	0	0	0	0	0	0	0
Horse and other equid (Equidae)	0	0	6,334	0	0	37	0	41	0	6,412
Pig (<i>Sus scrofa domesticus</i>)	0	0	0	20	0	262	0	967	589	1,838
Goat (<i>Capra aegagrus hircus</i>)	2	0	0	0	0	0	0	0	18	20
Sheep (<i>Ovis aries</i>)	15	0	35,745	8	0	153	3	133	0	36,057
Cattle (<i>Bos primigenius</i>)	0	0	0	0	0	547	0	459	109	1,115
Primate										
New World monkey	0	0	0	0	0	0	0	0	0	0
Marmoset and tamarin	0	0	0	0	0	0	0	0	0	0
Old World monkey	0	0	0	0	0	0	0	0	0	0
Cynomolgus monkey (<i>Macaca fascicularis</i>)	348	0	0	0	0	0	0	64	2,454	2,866
Rhesus monkey (<i>Macaca mulatta</i>)	0	0	0	0	0	0	0	0	12	12
Other mammal (other Mammalia)	0	0	0	0	0	0	0	0	0	0
Bird										
Domestic fowl (<i>Gallus domesticus</i>)	875	0	88,923	280	0	5,835	60	19,649	1,672	117,294
Quail (<i>Colinus coturnix</i>)	0	0	0	0	0	0	0	0	0	0
Other bird (other Aves)	0	0	0	0	0	0	0	1,845	2,907	4,752
Reptile (Reptilia)									0	0
Amphibian										
Rana (<i>temporalia</i> and <i>pipiens</i>)	0	0	0	0	0	0	0	0	0	0
Xenopus (<i>laevis</i> and <i>tropicalis</i>)	0	0	0	0	0	0	0	0	0	0
Other amphibian (other <i>Amphibia</i>)	0	0	0	0	0	0	0	0	0	0
Fish										
Zebrafish (<i>Danio rerio</i>)	0	0	0	0	0	0	0	0	0	0
Other fish (other Pisces)	0	0	60	0	1,385	628	812	13,107	15,992	30
Cephalopod (Cephalopoda)										
Total	2,976	0	131,434	7,239	2,472	145,190	26,298	5,0	189,193	531,509
% of total	0.6	0.0	24.7	1.4	0.5	27.3	4.9	5.0	35.6	100.0

Table 7.2 Experimental procedures by species of animal: regulatory use by legislative requirement

Species of animal	Testing by legislation						Total	% of total			
	Legislation on medicinal products for human use	Legislation on medicinal products for veterinary use and their residues	Medical devices legislation	Industrial chemicals legislation	Plant protection product legislation	Biocides legislation	Food legislation including food contact material	Cosmetics legislation	Other		
Mammal											
Mouse (<i>Mus musculus</i>)	174,631	12,529	871	4,067	1,475	178	45	76	0	217	36.5
Rat (<i>Rattus norvegicus</i>)	52,232	296	338	61,230	11,108	2,594	1,739	98	0	724	130,359
All other rodent ¹	5,941	1,307	6	0	0	0	0	0	0	0	7,254
Rabbit (<i>Oryctolagus cuniculus</i>)	5,580	1,510	777	572	619	32	0	0	0	0	10,195
Cat (<i>Felis catus</i>)	0	0	0	0	0	0	0	0	0	0	0
Dog	2,654	112	0	0	0	146	0	0	0	0	331
Ferret (<i>Mustela putorius furo</i>)	0	0	0	0	0	0	0	0	0	0	0
Other carnivore (other <i>Carnivora</i>)	0	0	0	0	0	0	0	0	0	0	0
Horse and other equid (<i>Equidae</i>)	0	78	0	0	0	0	0	0	0	0	6,334
Pig (<i>Sus scrofa domesticus</i>)	541	1,241	2	0	0	0	0	54	0	0	1,838
Other ungulate ²	10	1,350	17	0	34	0	0	34	0	35,747	37,192
Primate											
New World monkey	0	0	0	0	0	0	0	0	0	0	0
Old World monkey	2,878	0	0	0	0	0	0	0	0	0	2,878
Other mammal (other <i>Mammalia</i>)	0	0	0	0	0	0	0	0	0	0	0
Bird											
Reptile, amphibian	284	105,252	0	0	2,889	0	0	0	0	12,726	0
Fish	5,718	3,379	0	0	5,217	1,209	345	0	0	0	895
Cephalopod	0	0	0	0	0	0	0	0	0	0	0
Total	250,469	127,054	2,011	71,086	17,480	3,149	1,784	12,988	0	45,488	531,509
% of total	47.1	23.9	0.4	13.4	3.3	0.6	0.3	2.4	0.0	8.6	100.0

1. "All other rodent" includes guinea pig (*Cavia porcellus*), Syrian hamster (*Mesocricetus auratus*), Mongolian gerbil (*Meriones unguiculatus*), and other rodents (other *Rodentia*).2. "Other ungulate" includes goat (*Capra aegagrus hircus*), sheep (*Ovis aries*), and cattle (*Bos primigenius*).

Table 7.3 Experimental procedures by species of animal: regulatory use by origin of legislative requirement

Great Britain 2016

Species of animal	Legislative requirement			Total	% of total
	Legislation satisfying EU requirements	Legislation satisfying only UK requirements	Legislation satisfying Non-EU requirements only		
Mammal					
Mouse (<i>Mus musculus</i>)	175,808	0	18,281	194,089	36.5
Rat (<i>Rattus norvegicus</i>)	129,821	76	462	130,359	24.5
Guinea-pig (<i>Cavia porcellus</i>)	5,248	0	1,129	6,377	1.2
Hamster (Syrian) (<i>Mesocricetus auratus</i>)	641	0	6	647	0.1
Hamster (Chinese) (<i>Cricetulus griseus</i>)	230	0	0	230	0.0
Mongolian Gerbil (<i>Meriones unguiculatus</i>)	0	0	0	0	0.0
Other rodent (other <i>Rodentia</i>)	0	0	0	0	0.0
Rabbit (<i>Oryctolagus cuniculus</i>)	8,478	0	1,717	10,195	1.9
Cat (<i>Felis catus</i>)	0	0	0	0	0.0
Beagle (<i>Canis lupus familiaris</i>)	3,243	0	0	3,243	0.6
Other dog (other <i>Canis</i>)	0	0	0	0	0.0
Ferret (<i>Mustela putorius furo</i>)	11	0	0	11	0.0
Other carnivore (other <i>Carnivora</i>)	0	0	0	0	0.0
Horse and other equid (<i>Equidae</i>)	6,412	0	0	6,412	1.2
Pig (<i>Sus scrofa domesticus</i>)	1,826	0	12	1,838	0.3
Goat (<i>Capra aegagrus hircus</i>)	18	2	0	20	0.0
Sheep (<i>Ovis aries</i>)	36,039	18	0	36,057	6.8
Cattle (<i>Bos primigenius</i>)	1,115	0	0	1,115	0.2
Primate					
New World monkey					
Marmoset and tamarin	0	0	0	0	0.0
Old World monkey					
Cynomolgus monkey (<i>Macaca fascicularis</i>)	2,866	0	0	2,866	0.5
Rhesus monkey (<i>Macaca mulatta</i>)	12	0	0	12	0.0
Other mammal (other <i>Mammalia</i>)	0	0	0	0	0.0
Bird					
Domestic fowl (<i>Gallus domesticus</i>)	116,681	0	613	117,294	22.1
Quail (<i>Coturnix coturnix</i>)	0	0	0	0	0.0
Other bird (other <i>Aves</i>)	4,746	0	6	4,752	0.9
Reptile (<i>Reptilia</i>)					
Amphibian					
Rana (<i>temporaria and pipiens</i>)	0	0	0	0	0.0
Xenopus (<i>laevis and tropicalis</i>)	0	0	0	0	0.0
Other amphibian (other <i>Amphibia</i>)	0	0	0	0	0.0
Fish					
Zebrafish (<i>Danio rerio</i>)	0	0	0	0	0.0
Other fish (other <i>Pisces</i>)	15,992	0	0	15,992	3.0
Cephalopod (<i>Cephalopoda</i>)					
Total	509,187	96	22,226	531,509	100.0
% of total	95.8	0.0	4.2	100.0	

Table 7.4 Experimental procedures by species of animal: regulatory use by type of test - toxicity and other safety testing including pharmacology, page 1 of 2

Species of animal	Acute and sub-acute toxicity testing methods			Other type of regulatory test or procedure							
	LD50 and LC50	Other lethal methods	Non-lethal methods	Skin irritation/corrosion	Skin sensitisation	Eye irritation/corrosion	Repeated dose toxicity	Genotoxicity	Reproductive toxicity	Developmental toxicity	Safety testing in food and feed area
Mammal											
Mouse (<i>Mus musculus</i>)	9,721	0	1,697	0	4,586	0	9,002	786	529	164	0
Rat (<i>Rattus norvegicus</i>)	1,164	326	4,580	14	0	0	29,130	2,733	36,226	42,481	0
All other rodent ¹	0	0	497	0	0	0	286	0	0	0	0
Rabbit (<i>Oryctolagus cuniculus</i>)	12	0	98	252	0	128	372	0	0	2,323	2,167
Cat (<i>Felis catus</i>)	0	0	0	0	0	0	0	0	0	0	0
Dog	0	0	230	0	0	0	2,248	0	0	0	12
Fox (Canis lupus)	0	0	0	0	0	0	0	0	0	0	0
Porcupine (<i>Erethizon dorsatum</i>)	0	0	0	0	0	0	0	0	0	0	0
Other carnivore (other Carnivora)	0	0	0	0	0	0	0	0	0	0	0
Horse and other equid (Equidae)	0	0	0	0	0	0	0	0	0	0	0
Pig (<i>Sus scrofa domesticus</i>)	0	0	66	0	0	0	336	0	0	0	48
Other ungulate ²	0	0	0	0	0	0	0	0	0	0	53
Primate											
New World monkey	0	0	0	0	0	0	0	0	0	0	0
Old World monkey	0	0	295	0	0	0	1,680	0	0	0	0
Other mammal (other Mammalia)	0	0	0	0	0	0	0	0	0	0	0
Bird											
Reptile, amphibian	0	0	0	0	0	0	0	0	0	0	0
Fish	35	0	0	0	0	0	0	0	0	0	646
Cephalopod	0	0	0	0	0	0	0	0	0	0	0
Total	11,204	326	7,463	266	4,586	128	43,054	3,746	39,078	44,812	179
% of total	5.9	0.2	3.9	0.1	2.4	0.1	22.8	2.0	20.7	23.7	0.1
											1.2

Table 7.4 Experimental procedures by species of animal: regulatory use by type of test - toxicity and other safety testing including pharmacology, page 2 of 2

Species of animal	Other type of regulatory test or procedure			Ecotoxicity				Other type of toxicity or safety test	Total	% of total
	Neurotoxicity	Kinetics	Pharmo-dynamics	Acute toxicity	Chronic toxicity	Reproductive toxicity	Biaccumulation			
Mammal										
Mouse (<i>Mus musculus</i>)	0	1,368	804	0	0	0	0	0	1,878	31,548
Rat (<i>Rattus norvegicus</i>)	280	2,232	3,320	0	176	0	0	0	1,768	127,386
All other rodent ¹	0	0	0	0	0	0	0	0	0	67.3
Rabbit (<i>Oryctolagus cuniculus</i>)	0	65	40	0	0	9	0	0	783	0.4
Cat (<i>Felis catus</i>)	0	0	0	0	0	0	0	0	35	2.9
Dog	0	47	136	0	0	0	0	0	0	0.0
Ferret (<i>Mustela putorius furo</i>)	0	0	0	0	0	0	0	0	423	3,096
Other carnivore (other Carnivora)	0	0	0	0	0	0	0	0	11	0.6
Horse and other equid (Equidae)	0	0	0	0	0	0	0	0	0	0.0
Pig (<i>Sus scrofa domesticus</i>)	0	83	32	0	0	0	0	0	24	0.0
Other ungulate ²	0	54	0	0	0	0	0	0	20	0.1
Primate										
New World monkey	0	0	0	0	0	0	0	0	0	0.0
Old World monkey	0	155	140	0	0	0	0	0	196	2,466
Other mammal (other Mammalia)	0	0	0	0	0	0	0	0	0	0.0
Bird										
Reptile, amphibian	0	93	0	0	66	0	2,361	0	102	4,579
Fish	0	0	0	0	0	0	0	0	0	0.0
Cephalopod	0	0	0	0	3,544	8,066	0	389	4,27	13,107
Total	280	4,097	4,472	0	3,786	8,066	2,370	389	4,457	189,193
% of total	0.1	2.2	2.4	0.0	2.0	4.3	1.3	0.2	2.4	100.0

1. "All other rodent" includes guinea pig (*Cavia porcellus*), Syrian hamster (*Mesocricetus auratus*), Chinese hamster (*Cricetulus griseus*), Mongolian gerbil (*Meriones unguiculatus*), and other rodents (other Rodentia).

2. "Other ungulate" includes goat (*Capra aegagrus hircus*), sheep (*Ovis aries*), and cattle (*Bos primigenius*).

Table 8 Creation of new lines and maintenance of established lines of genetically altered animals (not used in experimental procedures) by species of animal¹, severity and genetic status

Great Britain 2016

Species of animal	Actual severity	Genetic status			Total	% of species total
		Not genetically altered	Genetically altered without a harmful phenotype	Genetically altered with a harmful phenotype		
Mouse (<i>Mus musculus</i>)	Sub threshold	17,636	885,391	217,552	1,120,579	67.9
	Non - recovery	54	1,065	28	1,147	0.1
	Mild	51,626	256,646	139,366	447,638	27.1
	Moderate	10,540	16,140	16,565	43,245	2.6
	Severe	73	10,078	27,754	37,905	2.3
	Total	79,929	1,169,320	401,265	1,650,514	100.0
Rat (<i>Rattus norvegicus</i>)	Sub threshold	13	3,774	1,353	5,140	48.7
	Non - recovery	0	0	0	0	0.0
	Mild	112	1,344	3,058	4,514	42.8
	Moderate	147	54	195	396	3.8
	Severe	22	48	428	498	4.7
	Total	294	5,220	5,034	10,548	100.0
Pig (<i>Sus scrofa domesticus</i>)	Sub threshold	0	175	0	175	65.3
	Non - recovery	0	0	0	0	0.0
	Mild	0	32	0	32	11.9
	Moderate	60	0	1	61	22.8
	Severe	0	0	0	0	0.0
	Total	60	207	1	268	100.0
Other ungulate ²	Sub threshold	0	24	0	24	12.6
	Non - recovery	0	0	0	0	0.0
	Mild	0	0	0	0	0.0
	Moderate	167	0	0	167	87.4
	Severe	0	0	0	0	0.0
	Total	167	24	0	191	100.0
Other mammal ³	Sub threshold	0	0	0	0	0.0
	Non - recovery	0	0	0	0	0.0
	Mild	4	0	0	4	100.0
	Moderate	0	0	0	0	0.0
	Severe	0	0	0	0	0.0
	Total	4	0	0	4	100.0
Bird	Sub threshold	7	466	0	473	33.1
	Non - recovery	0	0	0	0	0.0
	Mild	105	644	0	749	52.5
	Moderate	0	0	135	135	9.5
	Severe	0	0	70	70	4.9
	Total	112	1,110	205	1,427	100.0
Amphibian	Sub threshold	0	1,094	300	1,394	74.6
	Non - recovery	0	0	0	0	0.0
	Mild	79	307	0	386	20.7
	Moderate	0	14	50	64	3.4
	Severe	0	25	0	25	1.3
	Total	79	1,440	350	1,869	100.0
Fish	Sub threshold	3,570	140,558	5,184	149,312	59.9
	Non - recovery	29	292	3	324	0.1
	Mild	4,440	83,408	5,006	92,854	37.3
	Moderate	187	4,309	1,225	5,721	2.3
	Severe	6	998	4	1,008	0.4
	Total	8,232	229,565	11,422	249,219	100.0
All species	Sub threshold	21,226	1,031,482	224,389	1,277,097	66.7
	Non - recovery	83	1,357	31	1,471	0.1
	Mild	56,366	342,381	147,430	546,177	28.5
	Moderate	11,101	20,517	18,171	49,789	2.6
	Severe	101	11,149	28,256	39,506	2.1
	Total	88,877	1,406,886	418,277	1,914,040	100.0

1. Some species were not displayed on this table as they were not used in any relevant procedures in 2016.

2. "Other ungulate" includes goat (*Capra aegagrus hircus*), sheep (*Ovis aries*), and cattle (*Bos primigenius*).

3. "Other mammal" includes other carnivores (other *Carnivora*) and other mammals (other *Mammalia*).

Table 9.1 Creation of new lines of genetically altered animals (not used in experimental procedures) by species of animal¹, severity and genetic status

Species of animal	Actual severity	Basic research by genetic status			Translational/applied research by genetic status			Total by genetic status			% of species total
		Not genetically altered	Genetically altered without a harmful phenotype	Genetically altered with a harmful phenotype	Not genetically altered	Genetically altered without a harmful phenotype	Genetically altered with a harmful phenotype	Not genetically altered	Genetically altered without a harmful phenotype	Genetically altered with a harmful phenotype	
Mouse (<i>Mus musculus</i>)	Sub threshold	7,485	55,244	23,038	661	4,174	0	8,146	59,418	23,038	90,602
	Non - recovery	8	207	18	0	433	0	8	640	18	666
	Mild	23,198	21,077	19,468	205	1,791	259	23,403	22,888	19,727	65,998
	Moderate	4,780	4,009	3,767	497	309	441	5,277	4,318	4,208	13,903
Rat (<i>Rattus norvegicus</i>)	Severe	5	552	597	0	14	1	5	566	598	1,169
	Total	35,476	81,089	46,888	1,363	6,721	701	36,839	87,810	47,589	172,238
	Sub threshold	6	74	0	0	0	0	6	74	0	80
	Non - recovery	0	0	0	0	0	0	0	0	0	0
Pig (<i>Sus scrofa domesticus</i>)	Mild	24	0	0	0	0	0	24	0	0	24
	Moderate	41	0	0	0	0	0	41	0	0	41
	Severe	0	1	0	0	0	0	0	1	0	1
	Total	71	75	0	0	0	0	71	75	0	146
Sub threshold	Sub threshold	0	151	0	0	0	0	0	0	151	0
	Non - recovery	0	0	0	0	0	0	0	0	0	0
	Mild	0	20	0	0	12	0	0	32	0	32
	Moderate	60	0	1	0	0	0	60	0	1	61
Severe	Severe	0	0	0	0	0	0	0	0	0	0
	Total	60	171	1	0	12	0	60	183	1	244
	Sub threshold	0	24	0	0	0	0	0	24	0	24
	Non - recovery	0	0	0	0	0	0	0	0	0	0
Other ungulate ²	Mild	0	0	0	0	0	0	0	0	0	0
	Moderate	167	0	0	0	0	0	167	0	0	167
	Severe	0	0	0	0	0	0	0	0	0	0
	Total	167	24	0	0	0	0	167	24	0	191
Bird	Sub threshold	7	127	0	0	9	0	7	136	0	143
	Non - recovery	0	0	0	0	0	0	0	0	0	0
	Mild	51	216	0	22	83	0	73	289	0	372
	Moderate	0	0	0	0	0	0	0	0	0	0
Amphibian	Severe	0	0	0	0	0	0	0	0	0	0
	Total	58	343	0	22	92	0	80	435	0	515
	Sub threshold	0	491	300	0	0	0	0	491	300	791
	Non - recovery	0	0	0	0	0	0	0	0	0	0
Fish	Mild	0	166	0	0	0	0	0	166	0	166
	Moderate	0	0	50	0	0	0	0	0	50	50
	Severe	0	0	0	0	0	0	0	0	0	0
	Total	0	657	350	0	0	0	0	657	350	1,007
All species	Sub threshold	812	17,860	0	0	529	0	812	18,389	0	19,201
	Non - recovery	0	6	3	0	0	0	0	6	3	9
	Mild	223	28,175	1,987	0	77	0	223	28,252	1,987	30,462
	Moderate	0	1,045	745	0	0	0	0	1,045	745	1,790
	Severe	0	232	1	0	263	0	0	495	1	496
	Total	1,035	47,318	2,736	0	869	0	1,035	48,187	2,736	51,958
All species	Sub threshold	8,310	73,971	23,338	661	4,712	0	8,971	78,683	23,338	110,992
	Non - recovery	8	213	21	0	433	0	8	646	21	675
	Mild	23,496	49,654	21,455	227	1,963	259	23,723	51,617	21,714	97,054
	Moderate	5,048	5,054	4,563	497	309	441	5,545	5,363	5,004	15,912
	Severe	5	785	598	0	277	1	5	1,062	599	1,666
	Total	36,867	129,677	49,975	1,385	7,694	701	38,252	137,371	50,676	226,269

1. Some species were not displayed on this table as they were not used in any relevant procedures in 2016.

2. "Other ungulate" includes goat (*Capra aegagrus hircus*), sheep (*Ovis aries*), and cattle (*Bos primigenius*).

Table 9.2 Creation of new lines of genetically altered animals (not used in experimental procedures) by species of animal¹ and severity: basic research

Species of animal	Actual severity	Basic Research										Total	% of species total	
		Oncology	Cardiovascular Blood and Lymphatic System	Nervous System	Respiratory System	Gastrointestinal System including Liver	Musculoskeletal System	Immune System	Urogenital/ Reproductive System	Sensor/ Organs (skin, eyes and ears)	Endocrine System/ Metabolism	Ethology/ Animal Behaviour/ Animal Biology		
Mouse (<i>Mus musculus</i>)	Sub threshold	24,172	2,347	9,403	0	2,039	634	19,644	2,579	780	2,074	21,651	0	444
	Non - recovery	0	8	208	0	0	0	0	0	0	0	17	0	0
	Mild	6,227	3,464	2,945	81	667	1,499	6,475	2,080	784	562	36,675	2	2,282
	Moderate	2,311	153	1,052	0	291	568	2,154	444	443	859	3,720	0	561
Rat (<i>Rattus norvegicus</i>)	Severe	309	14	272	0	7	5	201	11	0	37	286	0	12
	Total	33,019	5,986	13,980	81	3,004	2,706	28,474	5,114	2,007	3,532	62,349	2	3,299
	Sub threshold	0	0	6	0	0	0	0	74	0	0	0	0	0
	Non - recovery	0	0	0	0	0	0	0	0	0	0	0	0	0
Pig (<i>Sus scrofa domesticus</i>)	Mild	0	0	0	0	0	0	0	0	0	0	0	0	0
	Moderate	0	0	1	0	0	0	0	0	0	0	0	0	0
	Severe	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	3	0	0	0	0	0	0	0	0	0	0
Other ungulate ²	Sub threshold	0	0	2	0	0	0	0	0	0	0	125	0	24
	Non - recovery	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	0	0	0	0	0	0	0	0	0	0	10	0	0
	Moderate	0	0	0	0	0	0	0	0	0	0	60	0	61
Bird	Severe	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	2	22	0	0	0	0	0	0	0	0	232
	Sub threshold	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non - recovery	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphibian	Mild	0	0	0	0	0	0	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0
	Severe	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish	Sub threshold	0	0	168	0	0	0	0	0	0	300	198	0	104
	Non - recovery	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	0	0	0	0	0	0	0	0	0	51	0	145	0
	Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0
All species	Severe	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	201	168	0	0	0	0	0	300	198	0	401
	Sub threshold	601	454	3,724	0	0	1,141	470	143	4,271	0	3,812	0	140
	Non - recovery	3	0	0	0	0	0	0	6	0	0	0	0	0
	Mild	1,513	2,492	14,705	0	0	0	1,027	421	151	2,762	0	5,689	0
	Moderate	299	552	1,15	0	0	0	55	214	192	0	0	0	0
	Severe	0	1	18	0	0	0	22	0	190	0	0	2	0
	Total	2,416	3,499	18,562	0	0	2,245	1,111	676	7,033	0	9,523	0	6,024
	Sub threshold	24,773	2,803	13,303	22	2,039	1,775	20,340	2,725	5,351	2,272	25,591	0	4,625
	Non - recovery	3	8	208	0	0	0	6	0	0	0	17	0	0
	Mild	7,740	6,107	17,950	81	667	2,526	6,977	2,282	3,546	562	42,519	2	3,946
	Moderate	2,610	756	1,167	0	291	623	2,394	636	443	859	3,967	0	919
	Severe	309	15	290	0	7	27	202	201	0	37	288	0	12
	Total	35,435	9,689	32,618	103	3,004	4,951	29,919	5,844	9,340	3,730	72,382	2	9,502

1. Some species were not displayed on this table as they were not used in any relevant procedures in 2016.

2. 'Other ungulate' includes goat (*Capra aegagrus hircus*), sheep (*Ovis aries*), and cattle (*Bos primigenius*).

Table 9.3 Creation of new lines of genetically altered animals (not used in experimental procedures) by species of animal¹ and severity: translational/applied research

Species of animal		Actual severity	Translational/applied research												Total	% of species total
			Human Cancer	Human Infectious Disorders	Human Cardiovascular Disorders	Human Nervous and Mental Disorders	Human Respiratory Disorders	Human Gastrointestinal Disorders including Liver	Human Musculoskeletal Disorders	Human Immune Disorders	Human Endocrine and Metabolism Disorders	Other Human Disorders	Animal Diseases and Disorders	Plant Diseases		
Mouse (<i>Mus musculus</i>)	Sub threshold	4,113	0	35	1	0	18	0	243	341	0	0	11	73	0	4.8%
	Non -recovery	0	0	408	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	1,330	0	0	228	0	209	0	287	28	0	0	0	25	0	4.9
	Moderate	658	0	0	60	0	0	0	0	15	0	370	45	99	0	2.2%
	Severe	13	0	0	1	0	0	0	0	1	0	0	0	0	0	0.2
	Total	6,114	0	443	290	0	227	0	531	384	0	370	56	197	0	8.7%
	Sub threshold	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non -recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sub threshold	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non -recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sub threshold	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non -recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sub threshold	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non -recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Severe	263	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
	Total	461	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sub threshold	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non -recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Severe	263	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	461	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sub threshold	121	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non -recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Severe	263	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	461	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sub threshold	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non -recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Severe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	All species	4,113	0	35	1	0	18	0	243	341	0	0	23	82	0	5.3%
	Sub threshold	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Non -recovery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mild	1,330	0	0	228	0	209	0	287	28	0	0	25	0	0	4.4
	Moderate	658	0	0	60	0	0	0	0	15	0	0	20	45	99	2.4%
	Severe	13	0	0	1	0	0	0	0	1	0	0	0	0	0	0.2
	Total	6,114	0	443	290	0	227	0	396	531	0	370	88	303	0	9.7%

1. Some species were not displayed on this table as they were not used in any relevant procedures in 2016.

Table 10 Maintenance of established lines of genetically altered animals (not used in experimental procedures) by species of animal¹, severity and genetic status

Great Britain 2016

Species of animal	Actual severity	Genetic status			Total	% of species total
		Not genetically altered	Genetically altered without a harmful phenotype	Genetically altered with a harmful phenotype		
Mouse (<i>Mus musculus</i>)	Sub threshold	9,490	825,973	194,514	1,029,977	69.7
	Non - recovery	46	425	10	481	0.0
	Mild	28,223	233,778	119,639	381,640	25.8
	Moderate	5,263	11,822	12,357	29,442	2.0
	Severe	68	9,512	27,156	36,736	2.5
	Total	43,090	1,081,510	353,676	1,478,276	100.0
Rat (<i>Rattus norvegicus</i>)	Sub threshold	7	3,700	1,353	5,060	48.6
	Non - recovery	0	0	0	0	0.0
	Mild	88	1,344	3,058	4,490	43.2
	Moderate	106	54	195	355	3.4
	Severe	22	47	428	497	4.8
	Total	223	5,145	5,034	10,402	100.0
Pig (<i>Sus scrofa domesticus</i>)	Sub threshold	0	24	0	24	100.0
	Non - recovery	0	0	0	0	0.0
	Mild	0	0	0	0	0.0
	Moderate	0	0	0	0	0.0
	Severe	0	0	0	0	0.0
	Total	0	24	0	24	100.0
Other mammal ²	Sub threshold	0	0	0	0	0.0
	Non - recovery	0	0	0	0	0.0
	Mild	4	0	0	4	100.0
	Moderate	0	0	0	0	0.0
	Severe	0	0	0	0	0.0
	Total	4	0	0	4	100.0
Bird	Sub threshold	0	330	0	330	36.2
	Non - recovery	0	0	0	0	0.0
	Mild	32	345	0	377	41.3
	Moderate	0	0	135	135	14.8
	Severe	0	0	70	70	7.7
	Total	32	675	205	912	100.0
Amphibian	Sub threshold	0	603	0	603	70.0
	Non - recovery	0	0	0	0	0.0
	Mild	79	141	0	220	25.5
	Moderate	0	14	0	14	1.6
	Severe	0	25	0	25	2.9
	Total	79	783	0	862	100.0
Fish	Sub threshold	2,758	122,169	5,184	130,111	66.0
	Non - recovery	29	286	0	315	0.2
	Mild	4,217	55,156	3,019	62,392	31.6
	Moderate	187	3,264	480	3,931	2.0
	Severe	6	503	3	512	0.3
	Total	7,197	181,378	8,686	197,261	100.0
All species	Sub threshold	12,255	952,799	201,051	1,166,105	69.1
	Non - recovery	75	711	10	796	0.0
	Mild	32,643	290,764	125,716	449,123	26.6
	Moderate	5,556	15,154	13,167	33,877	2.0
	Severe	96	10,087	27,657	37,840	2.2
	Total	50,625	1,269,515	367,601	1,687,741	100.0

1. Some species were not displayed on this table as they were not used in any relevant procedures in 2016.

2. "Other mammal" includes other carnivores (other *Carnivora*) and other mammals (other *Mammalia*).

Table 11 Procedures and project licences by type of licensed establishment

Type of licensed establishment ²	Number of project licences where countable ¹ procedures were completed in 2016 by number of procedures						Number of procedures		
	Number of procedures						Number of project licences where only non-countable ¹ procedures were completed in 2016	Total number of project licences where no procedures were completed in 2016	% of total
	1 to 50	51 to 100	101 to 200	201 to 400	401 to 600	601 to 800	801 to 1,000	More than 1,000	Total
Public health laboratories	5	2	0	4	1	2	0	2	16
Universities, medical schools	349	243	222	303	192	126	90	478	2,003
Government departments	14	7	6	7	2	1	3	8	48
Other public bodies	17	11	9	10	8	5	5	127	150
Non-profit-making organisations	22	11	18	17	1	4	2	85	160
Commercial organisations	29	11	20	26	13	9	12	67	187
Total	436	285	275	366	219	150	112	698	2,541
									11
									637
									3,189
									3,936,723
									100.0

1. Procedures on adult or free-living animals (including neonatal and juvenile mammals, and newly hatched birds) are counted.

Details of procedures on immature forms (e.g. larvae, embryos, fish fry) are not counted unless they have reached the free-feeding stage (e.g. zebrafish fry from 5 days post-fertilisation and tadpoles).

Animals in the wild involved in rodenticide trials are also not counted. However, information is collected on the number of project licences which undertook rodenticide trials (2 returns in 2016).

2. This table previously included 'NHS Hospitals' as a type of licensed establishment. Following a review of the category, the establishments within this group have been re-allocated to more appropriate categories.

Appendix A: Revisions and other supplementary information

Revisions

It is standard practice across all Home Office statistical releases to incorporate revisions to previous years' data in the latest release. Corrections and revisions follow the Home Office's statement of compliance with the Code of Practice for Official Statistics³⁶.

One of the returns in 2015 initially reported the severity level of 1,230 procedures involving mice, for the maintenance of established genetically altered animals, not used in other procedures, as severe. After publication in July 2016, following further investigation by the Home Office, the number of procedures was revised to 1,200, with severity assessments being amended to mild for 920 procedures, moderate for 90 procedures, and severe for 190 procedures. The 2015 publication was not amended following this revision as it was deemed disproportionate and an unnecessary use of limited resources.

Confidentiality

Detailed information on the work of individual project licence holders is not readily identifiable in this publication.

Uses of the statistics

The statistics are used to inform the development of policies on animal use in scientific work, and provide information for the scientific community, animal welfare organisations and the general public.

Acknowledgements

Statisticians in the Chief Statistician's Unit, which is part of the Home Office Analysis & Insight Directorate, prepared this statistical release. They are grateful for the contribution of project licence holders who provided the mandatory returns on which this report is based.

Further information

This statistical release is available online at:

<https://www.gov.uk/government/statistics/statistics-of-scientific-procedures-on-living-animals-great-britain-2016>. The website also includes:

- data tables which include the (unrounded) 2016 figures detailed in this report
- an accompanying user guide for the statistics

Forthcoming publications are pre-announced on the statistics release calendar on the GOV.UK website: <https://www.gov.uk/government/statistics/announcements>.

³⁶ See:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/341674/ho-compliance-state-aug14.pdf, specifically, revisions and corrections section.

Information about research and testing using animals can be found at:
<https://www.gov.uk/research-and-testing-using-animals>.

Information about the Animals in Science Committee can be found at:
<https://www.gov.uk/government/organisations/animals-in-science-committee>.

Information about the National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs) can be found at:
<http://www.nc3rs.org.uk/>.

Information relating to Northern Ireland is published by the Department of Health and can be found at:
<https://www.health-ni.gov.uk/publications/statistics-scientific-procedures-living-animals-northern-ireland>.

Feedback and enquiries

If you have any feedback or enquiries about this publication, please email the Chief Statistician's Unit, the Home Office Unit which produced the statistics, at:
CSU.Statistics@homeoffice.gsi.gov.uk or write to: Chief Statistician's Unit, 14th Floor, Lunar House, 40 Wellesley Road, Croydon, CR9 2BY.

Appendix B: General system of control under the Animals (Scientific Procedures) Act 1986

Introduction

1. The Animals (Scientific Procedures) Act 1986 puts into effect a rigorous system of controls on scientific work on living animals, including the need for:
 - a. both the researcher and the project to be separately licensed;
 - b. stringent safeguards on animal pain and suffering; and
 - c. general requirements to ensure the care and welfare of animals.

The Act implements the requirements of European Directive 2010/63/EU.

2. Operation of the Act is a reserved issue in Great Britain, with the Home Office administering the legislation in England, Scotland and Wales. The Act is separately administered in Northern Ireland.

Scope of the Act

3. The 1986 Act controls any experimental or other scientific procedure applied to a 'protected animal' that may have the effect of causing that animal pain, suffering, distress or lasting harm. Such work is referred to in the Act as a 'regulated procedure'.
4. 'Protected animals' are defined as all living vertebrate animals, except man, plus cephalopods. The definition extends to fetal, larval or embryonic forms that have reached specified stages in their development.
5. Under the Act, an animal is regarded as 'living' until "the permanent cessation of circulation or complete destruction of its brain". Procedures carried out on decerebrate animals are also subject to the controls of the Act.
6. The definition of a regulated procedure encompasses:
 - a. most breeding of animals with genetic defects;
 - b. production of antisera and other blood products;
 - c. the maintenance and passage of tumours and parasites;
 - d. the administration for a scientific purpose of an anaesthetic, analgesic, tranquilliser or other drug to dull perception.

Killing an animal requires licence authority in certain circumstances.

7. The controls of the 1986 Act do not extend to procedures applied to animals in the course of:
 - a. non-experimental clinical veterinary practice, non-experimental agricultural practice or practices undertaken for the purposes of recognised animal husbandry;
 - b. the administration of any substance or article to an animal for research purposes in accordance with an animal test certificate granted under the Veterinary Medicines Regulations 2013³⁷;

³⁷ Statutory Instrument 2013/2033; see Part 1, Sect 3(2)(b)
<http://www.legislation.gov.uk/uksi/2013/2033/contents>.

- c. the ringing, tagging or marking of an animal, or the application of any other humane procedure for the primary purpose of enabling an animal to be identified, provided that it causes only momentary pain or distress (or none at all) and no lasting harm.
- 8. Three kinds of licence are required for all work controlled by the 1986 Act. The procedures must be part of a programme of work authorised by a project licence and the person applying the regulated procedures must hold a personal licence. In addition, the place where the work is carried out must be licensed to do so. No work may be done unless the procedure, the animals used and the place where the work is to be done are specifically authorised in both project and personal licences.

Personal licences

- 9. A personal licence is the Home Secretary's endorsement that the holder is a suitable and competent person to carry out specified procedures on specified animals, under supervision where necessary. Applicants must be over 18 and are required to give details of their qualifications, training and experience. Those who have not previously held a Home Office licence need the endorsement of the named training and competency officer. Satisfactory completion of an accredited training course is also required before a personal licence will be issued.
- 10. In 2014 the Home Office started the process of moving from a paper-based to an electronic licensing system and all active personal licences had to be converted to an electronic licence. This conversion programme has now been complete and as at the end of 2016 there were 16178 licences in force. At the end of December 2013, prior to the start of the conversion programme there were 16,112 active personal licences in force. Personal licences continue to be in force until revoked but they must be reviewed at least every five years.

Project licences

- 12. A project licence is granted when the Home Secretary considers that the use of living animals in a programme of work, for a purpose permitted by the Act, is justified and the methods proposed appropriate.
- 13. In deciding whether and on what terms to authorise the project, the likely adverse effects on the animals used must be weighed against the potential benefits (to humans, other animals or the environment) that are expected to accrue from the work. Adequate consideration must also have been given to the feasibility of using alternative methods not involving living animals.
- 14. The holder of a project licence undertakes overall responsibility for the scientific direction and control of the work. New project licence applicants are required to complete an accredited training course before the licence will be granted.

Establishment licences

- 15. Except where otherwise authorised in a project licence (for example, for field work at a specified place and time), any place where work is carried

out under the Act must be licensed. Establishments that breed certain types of animal listed in Schedule 2 of the Act for use in scientific procedures ('breeding establishments'), and establishments that obtain such animals from elsewhere and supply them to laboratories ('supplying establishments') must hold an appropriate licence to do so. Animals listed in Schedule 2 are mice, rats, guinea pigs, hamsters, gerbils, rabbits, cats, dogs, ferrets, non-human primates, pigs (if genetically modified), sheep (if genetically modified), common quail (*Coturnix coturnix*), amphibians (of the species *Xenopus laevis*, *Xenopus tropicalis*, *Rana temporaria* and *Rana pipiens*), and zebrafish.

16. Licensed establishments are required to nominate a person to be responsible for the day-to-day care of animals and a veterinary surgeon to advise on their health and welfare.
17. There were 167 establishment licences in force on 31 December 2016. Of those, 166 were registered as user establishments, 115 as breeding establishments and 73 as supplying establishments. These figures add up to more than the total number of establishments because a single establishment may fall into more than one of the categories. For example, an establishment may be registered as both a breeder and user of animals.

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