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# The Humane Killing of Animals under Schedule 1 to the Animals (Scientific Procedures) Act 1986

Code of Practice

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Presented pursuant to Act Eliz. II 1986 c.14 Section 21  
(Animals (Scientific Procedures) Act 1986)

*Ordered by The House of Commons  
to be printed 13 January 1997*

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# CODE OF PRACTICE FOR THE HUMANE KILLING OF ANIMALS UNDER SCHEDULE 1 TO THE ANIMALS (SCIENTIFIC PROCEDURES) ACT 1986 (issued under Section 21)

## 1. INTRODUCTION

1.1 This Code of Practice is issued as guidance to the amended Schedule 1 of the Animals (Scientific Procedures) Act 1986. (The revised Schedule 1 is attached as Appendix 1). It replaces Chapter 4 of the Code of Practice for the Housing and Care of Animals Used in Scientific Procedures (HC107; 1989). The Code has been prepared after consultation with those representing scientists and animal welfare interests and advice from the Animal Procedures Committee. It is issued under Section 21 of the Animals (Scientific Procedures) Act 1986.

## 2. THE LEGISLATION

2.1 Killing a protected animal *for a scientific purpose* at a designated establishment does not require a licence if a method listed in Schedule 1, appropriate to the animal, is used. However, if another method is used, the killing is a regulated procedure and requires personal and project licence authority.

2.2 Under Section 15 of the Act, when regulated procedures have been completed and the animal is suffering or is likely to suffer adverse effects, the person who applied the regulated procedure must cause it to be killed immediately by an appropriate method under Schedule 1 or by another method as authorised by the personal licence.

2.3 If animals which are surplus to requirements are to be killed, Section 10(5) of the Act requires that the Certificate of Designation carries conditions restricting the methods used. The method must be appropriate under Schedule 1 to the Act or must otherwise be authorised by the Secretary of State through a special condition added to the Certificate of Designation. The animals affected are:

- (i) any protected animal kept in a designated scientific procedure establishment for experimental or other scientific purposes but not subjected to a regulated procedure;
- (ii) any animal of a type listed in Schedule 2 to the 1986 Act which is kept within a designated breeding or supplying establishment for breeding or for supply for use in regulated procedures but is not so used or supplied.

2.4 In accordance with Section 10(6)(a) of the Act, all certificate holders must ensure that there is always a person available, not necessarily a personal licensee, who is competent to kill animals by an authorised method. It is the duty of the certificate holder to make sure that all those in the establishment who have contact with animals are aware of the people who are competent to kill animals by Schedule 1 or other authorised methods.

2.5 All animals in the designated user establishment found to be suffering unnecessarily, whether associated with a regulated procedure or not, must be either treated effectively or killed humanely without delay. In the case of an animal undergoing a regulated procedure, this is a prime responsibility for the personal licensee under condition 14 of the licence. In other circumstances, or if the personal licensee is not available, Section 6(6)(b) of the Act requires that the day-to-day care person and/or the named veterinary surgeon must take steps to ensure that the animal is cared for and, if necessary, killed by an appropriate Schedule 1 method or another method approved by the Secretary of State.

2.6 Similar conditions apply in designated breeding and supplying establishments. Section 7(6) provides for the named day-to-day care person and/or the named veterinary surgeon to ensure that any animal whose health or

welfare is giving rise to concern shall be cared for and, if necessary, killed humanely by an appropriate Schedule 1 method or a method approved by the Secretary of State.

2.7 Under Section 10(2)(b) of the Act, there is an inviolable termination condition applied as condition 14 to all personal licences. If an animal undergoing a regulated procedure shows signs of severe pain or distress which cannot be alleviated, the personal licensee must ensure that it is killed painlessly without delay by a method appropriate under Schedule 1 or another method authorised by the personal licence.

2.8 In accordance with Section 18(3) of the Act, and condition 10 of the personal licence, an inspector may require that an animal be killed immediately by an appropriate Schedule 1 or other method authorised by a personal licence should the inspector consider that a protected animal is undergoing excessive suffering. Under Section 22(3)(b), failure of a personal licensee to comply with this condition constitutes a criminal offence.

### 3. SAFEGUARDS FOR HUMANE KILLING

3.1 As with all husbandry procedures, animals should be handled sympathetically but firmly and with care. This requires that the staff involved have the necessary assurance and skills based on appropriate training. Guidance on a modular training course was issued by the Home Office to all certificate holders in February 1993. It has been published in the 1992 Annual Report of the Animal Procedures Committee (CM 2301) as Appendix IV—Education and Training of Personnel under the Animals (Scientific Procedures) Act 1986.

3.2 As a general rule, animals to be killed should be removed from the immediate presence of others. Conditions whereby animals might become frightened or antagonised should be avoided. The requirements for different species need to be taken into account with advice from the named veterinary surgeon and named day-to-day care person.

3.3 When using methods which do not cause instantaneous death, the aim should be to induce unconsciousness as quickly as possible using a method which ensures that animals remain unconscious until they die.

3.4 Physical methods of killing animals are quick and are humane if carried out competently in the context of routine handling with which the animal is familiar. It is essential, however, that the physical method is only employed by those who are trained and fully confident that they can perform the technique which is appropriate to the size and species of animal. No person should be expected to kill an animal unless they are willing and feel confident to do so in the prescribed manner.

3.5 The certificate holder must ensure that all personnel who are expected to kill animals are competent to do so. This does not preclude others from killing animals, when they are acting in the interests of the animal in an emergency, provided that they are capable of killing humanely by a Schedule 1 or other approved method.

3.6 Early developmental stages, protected by Section 1(2) of the Act, are considered separately. Appropriate methods for humane killing of foetal, larval and embryonic forms are set out in Section B of Schedule 1. Animals used in laboratories vary considerably in their state of development at birth and probably, therefore, in their level of sentience. Some are very dependent on the nest and the mother (mice, rats and rabbits) while others are capable of a more independent and active life at birth (guinea-pig and ungulates); each group needs appropriate care.

3.7 It is accepted that killing a pregnant animal by a Schedule 1 method in the later stages of gestation normally leads to the death of the foetus. There is no evidence to suggest that the death of the unborn animal would be distressful and inhumane provided direct physical injury to the foetus is avoided. Killing the

pregnant dam by a Schedule 1 method does not require licence authority. Project and personal licence authority is required to use the live foetus in a regulated procedure after the half-way stage of gestation.

#### 4. ENSURING ANIMALS ARE DEAD

4.1 Whatever method of humane killing is used, death must be confirmed before animals are disposed of or left unattended. According to Section 1(4) of the 1986 Act, “an animal shall be regarded as continuing to live until the permanent cessation of the circulation or the destruction of its brain”. Schedule 1 includes an opening section listing secondary precautions which must be taken to ensure that the animal is indeed dead.

**4.2 Confirmation of permanent cessation of the circulation.** An effective circulation should have ceased when there is no detectable pulse or heart beat. But feeling a peripheral pulse or identifying the heart beat is not easy, particularly in small rodents and certain other laboratory animals. In such cases, care needs to be taken in deciding that an animal is dead on the basis of failure to confirm cardiac activity or establish that there is an effective circulation. In some instances the heart may continue to beat for a long time after destruction of the brain, especially in reptiles, fish and amphibians and hypothermic or very young mammals. Errors can and should be avoided. Provided the animal is unresponsive to painful stimuli, death should be confirmed whenever possible by section of the heart and great vessels before disposal of the carcase.

**4.3 Destruction of the brain.** Destruction in this context means a permanent loss of brain function, not necessarily physical destruction of brain structure. This is normally achieved by a severe concussion to the cranium, physical injury to the brain stem, ischaemic injury by irreversible interference with the blood supply or profound and permanent depression of neuronal activity by anaesthetic agents. When the brain is no longer functioning there will be no reflex response to a stimulus, such as touching the cornea in mammals and birds. Ischaemic brain injury or anaesthetic overdose will result in respiration becoming shallow and slow and then ceasing altogether. Occasional movements and irregular gasping breaths may occur as a result of terminal spinal or brain stem reflex activity. Death should not be assumed until all signs of reflex activity have ceased.

**4.4 Dislocation of the neck.** In small animals, death can be ensured by dislocation of the neck. An effective gross dislocation of the upper cervical spinal column causes a massive ascending and descending injury to the spinal cord and brain stem ensuring terminal unconsciousness, disruption of vital mid-brain centres with ensuing cardio-respiratory failure. The dislocation should be confirmed by palpation.

**4.5 Exsanguination.** Exsanguination will abolish the blood supply to the brain and ensure that the animal is dead. Exsanguination is normally achieved by severing the major blood vessels close to the heart, or in the neck or abdomen.

**4.6 Onset of rigor mortis.** At the onset of rigor mortis, all the muscles become stiff to the extent that the limbs and the spine feel rigid. The time it takes for a dead animal to go into rigor mortis will vary depending on its size, physiological state before death and the environmental temperature. While rigor mortis is a sure sign of death, rigidity is not necessarily permanent and may be seen in other circumstances.

**4.7 Mechanical disruption.** It is essential to confirm that the animal is insensitive and does not respond to a painful stimulus before it is placed in the macerator. Carcasses of small animals may be destroyed by passing them through a blender or macerator.



## 5. DISPOSAL OF CARCASSES

5.1 It is essential to confirm that animals are dead before disposal.

5.2 Wherever possible, carcasses should be disposed of on site by incineration or through a macerator. Measures should be taken to prevent exposure of carcasses to the general public.

5.3 Carcass disposal must comply with the relevant clinical waste and incineration legislation. Infected, toxic or radioactive carcasses must not be disposed of in such a manner as to present a hazard. Hazardous material for disposal must comply with statutory controls and all other forms of local protective regulations under the guidance of the safety officer.

5.4 Special conditions apply to the disposal of farm animal carcasses. The advice of the named veterinary surgeon should be followed.

## 6. APPROPRIATE METHODS OF HUMANE KILLING —SCHEDULE 1

6.1 The following notes provide general guidance on the application of each method in the revision of Schedule 1 attached as Appendix 1. Inclusion under Schedule 1 exempts a method of killing from project and personal licence controls. The methods listed are reasonably straightforward so that they may be performed consistently in a humane manner by someone with appropriate training. Otherwise, the techniques should only be performed by those who are qualified and authorised under other statutes, e.g. licensed slaughtermen and veterinary surgeons.

6.2 Whilst it is expected that the guidance set out below shall be applied in all but exceptional circumstances, it is not intended as a working manual and is neither comprehensive nor mandatory. Further details can be obtained from published texts or standard operating procedures prepared for use within designated establishments.

### A. Methods for animals other than foetal, larval and embryonic forms.

#### 1. **Overdose of an anaesthetic using a route and an anaesthetic agent appropriate for the size and species of animal: appropriate for all animals.**

An overdose of an anaesthetic agent is a method of humane killing applicable to the full range of animals. The aim should be to induce unconsciousness as quickly as possible thus limiting any potential distress from the slow onset of unconsciousness associated with a loss of coordination and control.

In larger species, intravenous injection of an anaesthetic agent is preferred because it produces the most rapid loss of consciousness. In smaller laboratory species, where intravenous injection involves more handling and restraint, the intraperitoneal route is preferred to minimise distress. Direct injection into the heart through the chest wall in the conscious animal can be painful and should not be used.

**NOTE** — Neuromuscular blocking agents are not anaesthetic agents and should never be used for, or in conjunction with, Schedule 1 methods of killing.

Death by inhalation of anaesthetic agents in larger animals is slower and they are often difficult to restrain. Diving animals can hold their breath for long periods making fast induction of unconsciousness by inhalation difficult. However, this method is acceptable for smaller laboratory animals. Animals should not be allowed to come into contact with liquid volatile anaesthetic agents which can be irritant.

Personnel should be protected from anaesthetic gases and vapours by the use of a fume cupboard or some other effective scavenging system.

The usual method for fishes, amphibians and *Octopus vulgaris* is immersion in water containing an appropriate anaesthetic agent until all reflexes are lost, and opercular or other respiratory movement has stopped.

2. **Exposure to carbon dioxide gas in a rising concentration: appropriate for rodents, rabbits and birds up to 1.5kg.**

Inhalation of higher concentrations of carbon dioxide produces a slightly irritant or fizzy sensation in the nasal mucous membrane as the gas goes into solution. A rising blood concentration has a direct effect on the brain producing unconsciousness, first stimulating then depressing the rate of breathing. The initial stimulation of breathing enhances the uptake of the gas. Unconsciousness is due to a direct narcotic effect of carbon dioxide rather than hypoxia resulting from a lowered oxygen concentration in the inspired air. A controllable, metered source of carbon dioxide gas should be used and not the solid material (dry ice). Induction of narcosis is faster in the smaller laboratory animals and therefore causes less distress. For this reason, it is only allowed in Schedule 1 for rodents, rabbits and birds up to 1.5kg body weight.

A simple chamber with a lid and a means to introduce a controlled flow of carbon dioxide can be used. The animal is placed in the empty chamber and the carbon dioxide gas, being heavier than air, will accumulate at the lower level. Small animals become unconscious quickly as the rising gas concentration reaches about 30 per cent, and they die when it reaches approximately 70 per cent. Animals may be left in the chamber until rigor mortis is observed, or removed and death ensured by exsanguination or neck dislocation. The chamber should be emptied, flushed clear of residual carbon dioxide and cleaned after each batch of animals has been killed.

3. **Dislocation of the neck: appropriate for rodents up to 500g, rabbits up to 1kg, birds up to 3kg.**

The aim should be to carry out a swift, complete dislocation of the neck at the level of cervical vertebrae 1 to 3. This causes massive injury to the brain stem and spinal cord with immediate loss of consciousness. Neck dislocation is a straightforward method of killing small mammals and birds. Training for neck dislocation can be provided as a means of ensuring death in animals first killed by anaesthetic or carbon dioxide overdose. Only those who are willing, have been trained and can demonstrate that they have the skill should be allowed to kill animals by dislocation of the neck, particularly towards the upper end of the body weight limit.

4. **Concussion of the brain by striking the cranium: appropriate for rodents and rabbits up to 1kg, birds up to 250g, amphibians and reptiles up to 1kg (with destruction of the brain before the return of consciousness) and fishes (with destruction of the brain before the return of consciousness).**

Only those who have been trained on recently killed animals and have been assessed by the instructor as being competent for the species and size of animal should be allowed to use this method. "Striking the cranium" means either striking the cranium against a solid object (e.g. the edge of a bench) or striking the cranium with a blunt instrument. The concussive blow should be directed at the cranium with sufficient force to cause immediate loss of consciousness and probably death. After concussion, death should be confirmed by exsanguination or neck dislocation.

**CAUTION** The brain of amphibians, reptiles and fishes is extremely tolerant to hypoxia. It cannot be assumed therefore that the effects of concussion will be irreversible, or that even subsequent decapitation would necessarily destroy brain function in time to avoid the return of sentience. In the case of amphibians, reptiles and fishes, if the brain is not destroyed by the initial blow, there must be no delay in destroying the brain by a penetrating probe or by a blow sufficient to cause a severe brain contusion with fracture of the cranial bones, or disposal through a macerator.

5. **One of the recognised methods of slaughter set out below which is appropriate to the animal and is performed by a registered veterinary surgeon, or, in the case of the method described in paragraph (ii) below, performed by the holder of a current licence granted under the Welfare of Animals (Slaughter or Killing) Regulations 1995.**

(i) **Destruction of the brain by free bullet, or**

(ii) **captive bolt, percussion or electrical stunning followed by destruction of the brain or exsanguination before the return of consciousness.**

**Appropriate for ungulates (hoofed animals).**

These are standard methods used for killing horses, cattle, sheep, goats, deer and pigs in slaughterhouses and by veterinary surgeons. These are often the methods of choice for ungulates after use in scientific procedures. They require considerable skill and specialised equipment which must be maintained carefully. Schedule 1 therefore includes these methods only for those who have been trained and are accountable under other statutory controls.

**B. Methods for foetal, larval and embryonic forms.**

Section 2 of the 1986 Act includes within the definition of a protected animal any mammal, bird or reptile from the mid-point of the gestation or incubation period for the relevant species and any fish or amphibian from the developmental stage at which it becomes capable of independent feeding. For the sole protected invertebrate (*Octopus vulgaris*), the relevant developmental stage is that at which there is the capacity for independent feeding.

When considering methods used for killing the foetus, embryo or larva, the state of development should be taken into account. Because some mammals, birds and reptiles are highly developed at birth, they merit special precautions during the last few hours or days of gestation or incubation. Others are less well developed at birth and may be less aware and therefore less likely to perceive pain. Those who have to kill developing animals must choose the method least likely to cause distress to the animal.

1. **Overdose of an anaesthetic using a route and anaesthetic agent appropriate for the size, stage of development and species of animal: appropriate for all animals.**

Injectable anaesthetics can usually be administered by the intravenous or intraperitoneal routes in large embryos and foetuses but this is not always feasible for killing some earlier and less advanced forms such as early chick embryos. Small foetuses, embryos and larvae can be killed by immersion in anaesthetic agents.

2. **Refrigeration, or disruption of membranes, or maceration in apparatus approved under appropriate slaughter legislation or exposure to carbon dioxide in near 100 per cent. concentration until they are dead: appropriate for birds, and reptiles.**

Refrigeration of chick embryos can be carried out by simply placing the eggs in a refrigerator at or below 4 degrees Celsius for more than 4 hours. Disruption of the egg membranes, for example, by opening the shell and tearing the allantois and amnion with forceps, is also effective and humane.

Chick embryos can be killed by passing the eggs through a macerator similar to those used for day old chicks and unhatched eggs see EC Regulation COM(91)136. Intact embryonated eggs and exposed embryos or larvae can be killed by keeping them in near 100 per cent. carbon dioxide gas for a long time until they are dead.

**NOTE** — special care is required for reptile eggs because the developing embryo may be well advanced and, like the recently hatched animal, resistant to chilling and hypoxia. In all reptile embryos, death should be ensured by overdose of an anaesthetic agent, maceration or immersion in a tissue fixative.

3. **Cooling of foetuses followed by immersion in cold tissue fixative: appropriate for mice, rats and rabbits.**

Foetuses taken from a freshly killed pregnant mouse, rat or rabbit are not at an advanced stage of cerebrocortical development. After removal from the uterus of the dead mother, they can be allowed to cool until reflex activity has slowed, to the extent that they have stopped moving. Then they may be killed by immersion in cool (4 degrees Celsius) tissue fixative. This technique is considered to be humane and demands little skill.

4. **Decapitation: appropriate for mammals and birds up to 50g.**

Small foetuses and avian embryos can be killed easily by decapitation which is a humane way of ensuring the foetus or embryo is dead. Larger foetuses from animals that produce more precocious offspring are excluded by the weight restriction of 50g. Decapitation can be carried out simply with a strong pair of sharp scissors.

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# Appendix 1—SCHEDULE 1 (Revised February 1997)

## SCHEDULE 1—APPROPRIATE METHODS OF HUMANE KILLING

Sections 2, 6, 7, 10, 15(1) and 18(3)

1. Subject to paragraph 2 below, the methods of humane killing listed in Tables A and B below are appropriate for the animals listed in the corresponding entries in those tables only if the process of killing is completed by one of the methods listed in sub-paragraphs (a) to (f) below:

- (a) confirmation of permanent cessation of the circulation
- (b) destruction of the brain
- (c) dislocation of the neck
- (d) exsanguination
- (e) confirming the onset of *rigor mortis*
- (f) instantaneous destruction of the body in a macerator.

2. Paragraph 1 above does not apply in those cases where Table A specifies one of the methods listed in that paragraph as an appropriate method of humane killing.

### A. Methods for animals other than foetal, larval and embryonic forms

### Animals for which appropriate

- |  |  |
|--|--|
| 1. Overdose of an anaesthetic using a route and an anaesthetic agent appropriate for the size and species of animal  | All animals  |
| 2. Exposure to carbon dioxide gas in a rising concentration  | Rodents, Rabbits and Birds up to 1.5 kg  |
| 3. Dislocation of the neck   | Rodents up to 500g<br>Rabbits up to 1kg<br>Birds up to 3kg   |
| 4. Concussion of the brain by striking the cranium   | Rodents and Rabbits up to 1kg<br>Birds up to 250g<br>Amphibians and reptiles up to 1kg (with destruction of the brain before the return of consciousness)<br>Fishes (with destruction of the brain before the return of consciousness) |
| 5. One of the recognised methods of slaughter set out below which is appropriate to the animal and is performed by a registered veterinary surgeon, or, in the case of the methods described in paragraph (ii) below, performed by the holder of a current licence granted under the Welfare of Animals (Slaughter or Killing) Regulations 1995 (a). | Ungulates  |
| (i) Destruction of the brain by free bullet, or  |  |
| (ii) captive bolt, percussion or electrical stunning followed by destruction of the brain or exsanguination before return of consciousness   |  |

**B. Methods of foetal, larval and embryonic forms**

1. Overdose of an anaesthetic using a route and anaesthetic agent appropriate for the size, stage of development and species of animal
2. Refrigeration, or disruption of membranes, or maceration in apparatus approved under appropriate slaughter legislation, or exposure to carbon dioxide in near 100 per cent. concentration until they are dead
3. Cooling of foetuses followed by immersion in cold tissue fixative
4. Decapitation

**Animals for which appropriate**

All animals

Birds  
Reptiles

Mice, Rats and Rabbits

Mammals and Birds up to 50g

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