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

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# Code of practice for the housing and care of animals used in scientific procedures



[Contents](#) | [Previous](#) | [Next](#)

## **PART 1: 2. Housing and environment**

2.1. The purpose of this Code of Practice is to establish standards for the care of laboratory animals and for designing and constructing animal facilities.

2.2. In scientific work involving living animals, the most reliable results are likely to be obtained by using healthy animals that are well adapted to their housing conditions and, in quantitative assays or comparisons, precision is increased if those animals are uniform.

2.3. The 1986 European Convention (20) provides that:

*"Any animal used or intended for use in a procedure shall be provided with accommodation, and environment, at least a minimum of freedom of movement, food, water and care, appropriate to its health and well-being. Any restriction on the extent to which an animal can satisfy its physiological and ethological needs shall be limited as far as practicable. In the implementation of this provision, regard should be paid to the guidelines for accommodation and care of animals set out in Appendix A to this Convention. "*

2.4. These principles have been borne in mind throughout the preparation of this Code.

2.5. All animals, except when undergoing regulated procedures licensed under the Act, are subject to other controls. For example, the Protection of Animals Act 1911 (1912 Scotland; in Northern Ireland, the Welfare of Animals Act (NI) 1972) prohibits causing or permitting any unnecessary suffering. The Animal Health Act 1981 and Diseases of Animals (NI) Order 1981 apply in respect of notifiable diseases and the Wildlife and Countryside Act 1981, and Wildlife (NI) Order 1985, relate to the taking of wild animals.

2.6. The Agriculture (Miscellaneous Provisions) Act 1968 relates to farm animals and attention is drawn to the various Codes of Recommendations for the Welfare of Livestock issued under that Act by the Ministry of Agriculture, Fisheries and Food

(MAFF Codes; 38) . In Northern Ireland, similar codes may be issued by the Department of Agriculture under the Welfare of Animals Act (NI) 1972.

2.7. Where animal facilities do not conform to the standards of this Code, it is expected that modifications necessary for the well-being of the animals will be made without delay. New facilities must meet the standards, but nothing in this Code is intended to imply that absolute uniformity is in itself desirable, or to make a case for change to achieve uniformity for its own sake. Inspectors will consider, as part of their enquiries, whether the facilities, or any proposed changes, are acceptable before making a recommendation to the Secretary of State on applications for licences and certificates of designation.

2.8. Those responsible for laboratory animals should be thoroughly trained in their care and familiar with the basic requirements of their animals under normal and experimental conditions. They need to be fully aware of the legal and moral responsibilities of using animals in scientific procedures. They must appreciate also the importance of, and be competent in, correct animal handling and restraint, and in the procedures which they will be carrying out (51).

2.9. Under the Health and Safety at Work Act 1974, the person in charge of a unit is required to ensure that it is a safe and healthy place in which to work. Staff should be aware of the action to be taken in case of accident, fire or other emergencies, and of the potential existence of zoonotic organisms. Occupational asthma caused by exposure to laboratory animals is a prescribed disease. For further information, see 27 4, 34, 50, 52.

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## **THE ANIMAL HOUSE**

2.10. An animal house should be designed, sited and constructed to provide a suitable environment, including any special requirement for exercise or social contact for the species to be housed, and should incorporate facilities sufficient for the activities carried out within it. When substantial alterations to the premises are proposed, the Inspector should be consulted at an early stage.

2.11 . When siting an animal house, consideration should be given to the activities in the adjacent buildings and any effect these may have on the welfare of the animals . An animal facility forming part of a larger complex should be designed to be self-contained. Wild, stray or pet animals should not be able to gain entry to any part of the animal house, including stores and personnel areas. Special care should be taken where drains and other services pierce the walls or floors to ensure that they have been properly proofed against rodents and insects (45).

### **Security**

2.12. The animal house and its facilities should be designed to prevent animals escaping. It is also proving necessary to protect animal facilities against illegal entry by unauthorised persons. Advice should be taken about security from Crime Prevention Officers from the local police or other experts during the design of new facilities or modifications of existing premises.

### **Animal Rooms**

2.13. For the purpose of this Code, an animal room means the room normally used to house stock, breeding or experimental animals or one which is used for the

performance of minor non-surgical procedures.

2.14. Animal rooms should be constructed of impervious materials, with easily cleanable surfaces which are resistant to attack from the chemicals used to clean or fumigate the rooms. Consideration should be given to using materials which are least likely to crack and craze. Floor finishes should be non-slip whether wet or dry. All joints between door frames and wall etc. should be sealed. Floor to wall, wall to ceiling and wall to wall junctions should be coved for easy cleaning.

2.15. Animal rooms should be protected against ingress by pests, such as wild rodents and insects; special care should be taken where drains are present (45). Services should be installed in such a way that they are either buried within the fabric of the building, boxed in or clear of the wall surface for easy cleaning. When the fabric of the building is penetrated, the holes created should be sealed.

2.16. Design should take into account the fact that building maintenance may disturb animals and disrupt experiments. Services should be installed to be accessible from outside and with fittings that can be removed by the staff for maintenance or repair elsewhere. If possible, provision should be made for the addition of new services during the lifespan of the building, for instance by the insertion of spare ducting in the walls.

2.17. Farm animals in pens generally require more robust wall and floor finishes and there should be no projections which may present a hazard to animals or staff. Farm animals which are kept in animal houses should be given at least as much room as recommended in the Code issued by MAFF (38). For some procedures the standards of environment and housing required may be much higher than where animals are kept under farm conditions. Exercise areas should be provided for larger farm animals but, in some cases, such facilities may be impracticable from an experimental, environmental, disease control or security point of view.

2.18. Maximum stocking levels are limited primarily by the adequacy of the ventilation system. The stocking density for each room for each species likely to be housed should be calculated and be readily available (see para 2.52). Any smell of ammonia probably reflects overstocking, too little ventilation, inadequate cleaning, or a combination of these factors; the causes should be investigated and rectified.

2.19. Species that are incompatible, for example predator and prey, or animals requiring different environmental conditions or of different health status, should not be housed in the same room nor, in some cases, within smell or earshot.

2.20. Precautions should be taken in animal rooms to minimise the exposure of personnel to hazards which may arise from the incorrect handling of animals, for example bites and scratches, allergens and infections (65) and to prevent exposure to hazardous treatments intended for, or applied to, the animals.

2.21. Animals inoculated with infective agents which are transmissible to man or to other animals held on the premises should be contained within an area reserved for this purpose.

2.22. There should be special provision to house animals that are ill or injured, including facilities for isolation, if necessary.

2.23. Breeding animals should normally be held separately from animals in procedures. According to the microbiological and genetic quality of animal desired,

different levels of separation and physical barrier will be required between breeding and other areas.

2.24. Adequate arrangements should be provided for the receipt of incoming animals. Animals brought into an animal house should not put at risk animals which are already there. Space should be provided for acclimatisation and quarantine, where appropriate.

### **Procedure rooms**

2.25. General and specialist procedure rooms should be provided as appropriate. Major surgery and euthanasia should not be performed in rooms where animals are normally housed or where other conscious animals are undergoing procedures.

2.26. Where surgery is to be performed, suitable operating facilities should be provided, including separate preparation areas for the animals, equipment and staff. There should be a post-operative recovery area.

2.27. Surgery from which animals are to recover will normally be carried out under appropriate clean or aseptic conditions in a designated operating room.

Minor procedures may be carried out in a designated area within the animal room or in a separate room designed for this purpose.

2.28. All establishments should have access to facilities for diagnostic investigation, post-mortem examinations and the collection of samples for examination elsewhere. These rooms may not necessarily be in the animal house.

### **Service areas and support facilities**

2.29. The design and construction of service and circulation areas should normally be of the same standard as the experimentation areas. The building should be planned to prevent cross-contamination between clean and dirty equipment. Corridors should be wide enough for easy movement of personnel and equipment.

2.30. Service areas are subject to rough treatment and wall surfaces should be resistant to impact damage, with guard rails to protect walls and corners. Surfaces and corners should be easy to clean. Adequate floor drainage should be provided in wash areas, with sufficient ventilation to remove excess heat and humidity.

2.31. There should be adequate storage space; corridors should not be used for storage. Separate stores should be provided for food, bedding, cages, cleaning materials and other items. Special facilities may be required for handling and storing chemicals.

2.32. Food and bedding stores should be clean, dry, vermin and insect proof. In addition, food stores should be cool and sunless and provided with ventilation. Perishable foods should be stored in cold rooms, refrigerators or freezers.

2.33. A vermin-free collection area should be provided for waste, prior to its disposal. Special arrangements should be made for handling carcasses and radioactive or other hazardous material.

### **Facilities for staff**

2.34. Personnel facilities should include staff and record rooms, sufficient changing

rooms, decontamination areas, first aid and toilet facilities and space for storing protective and outdoor clothing etc.

2.35. Animal care personnel may be present at times when normal catering facilities may not be available; special arrangements or facilities for meals may therefore be needed. Smoking, eating and drinking should be prohibited in all areas other than those staff areas specifically reserved for such activities.

### **Staffing**

2.36. Sufficient suitably-qualified staff must be available at all times to care for the animals, including during weekends, holiday periods and when the normal staff are absent e.g. due to sickness. Only competent staff should be given responsibility for the care and husbandry of animals.

### **Training**

2.37. The person named in the certificate of designation of the premises as responsible for the day-to-day care of animals should ensure that adequate training is provided for all personnel. The degree of training required will depend on the activities being carried out.

2.38. Information on training and courses in laboratory animal science and technology are available from the Business and Technician Education Council, the Institute of Animal Technology, the Institute of Biology, the Royal College of Surgeons, the Royal College of Veterinary Surgeons and the Royal Veterinary College, University of London. Several pharmaceutical companies arrange courses for their own staff (51).

### **The named veterinary surgeon**

2.39. Under section 6(5)(b) of the Act, it is a requirement for certification as a designated establishment that there is a named veterinary surgeon (or in exceptional circumstances, another suitably qualified person) to provide advice on the health and welfare of the animals. It is important that he or she has knowledge of the needs of laboratory animals and of all the procedures in use.

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## **THE ENVIRONMENT**

2.40. Experimental results may be influenced by environmental conditions (13) and animals should be kept under conditions that favour a consistency of response to scientific procedures. Unstable environmental conditions are likely to introduce avoidable variability into biological responses. To demonstrate any experimental response against such a variable background generates a requirement for greater animal usage if the result is to be statistically valid. Good control of variables such as ventilation, humidity, temperature, lighting and noise can therefore contribute both to good science and to the minimisation of animal use. Conditions should not override the welfare of the animals concerned unless necessary to achieve the scientific objective. For breeding, a controlled daily fluctuation in temperature may be positively beneficial.

### **Temperature**

2.41. Animal room temperatures should be carefully controlled and continuously

monitored by instruments which are checked at least once daily. The limits within which room temperatures should generally be maintained are set out in para 5.1. The equipment, insulation and design of the building should be such as to ensure that these temperatures can be maintained in both winter and summer.

2.42. The target should be to maintain the room temperature in a band width of 4 degrees Centigrade, the whole of the band lying within the optimal range indicated. If an animal's thermoregulatory ability has been affected by anaesthesia or other scientific procedures, a higher room temperature or more bedding material should be provided.

2.43. It should be noted that temperatures within the cages will often be higher than room temperatures. Even in rat cages with grid floors in a room with adequate ventilation, the temperature can be 3-6 degrees above room temperature, according to the position of the cage in the room (14). If bedding material is present, the animal can manipulate its own immediate environment and provide a warm nest for its young.

2.44. Temperature regulation should ensure that there are no undue fluctuations within or between rooms and so avoid causing unnecessary stress. In the majority of establishments it is desirable to provide a cooling system for rooms containing rodents and rabbits to comply with the upper limitations for room temperatures. If this is not available ad hoc methods, such as reduction of stocking densities, may be necessary to avoid heat stress.

2.45. Animals kept outdoors or under farm conditions indoors will be maintained at ambient temperature. For some species? shade or shelter will be required in the summer: in winter, there may be a need for access to shelter as well as additional heat and food.

2.46. Requirements for birds vary according to species (38, 65).

2.47. Reptiles and amphibians are unable to control their body temperature except by behaviour. Each species has a temperature range within which it will feed and behave normally. The aim in the laboratory should be to provide this (65). Where amphibians are maintained at low temperatures, they and their environment should still be checked daily.

2.48. Fish should be kept as close to their natural environmental temperature as practicable (31) .

### **Relative Humidity**

2.49. Extreme variations in relative humidity can have adverse effects on the well-being of animals (14) and, by affecting the rate of heat loss, can influence activity and food intake (59).

2.50. The relative humidity in animal rooms should normally be maintained at 55% + or - 10% . Prolonged periods below 40% or above 70% should be avoided. In most cases, some form of humidification will be required. Chickens are more tolerant than mammals and a range 30-70% is acceptable (44).

2.51. For most amphibians and some reptiles, 70% is desirable but 'dry' reptiles should be kept at 40-60%. Some other amphibians and reptiles may require humidity outside those ranges (5, 21, 55).

## Ventilation

2.52. The functions of the ventilation system are:

- (i) to regulate within prescribed limits temperature and humidity;
- (ii) to reduce the levels and spread of odours, noxious gases, dust and infectious agents;
- (iii) to provide sufficient air of an appropriate quality.

2.53. The ventilation rate of the room should be related to its stocking density and to the heat generated by animals and equipment in the room (thermal load). In fully-stocked rooms for rodents and lagomorphs, 15-20 changes of fresh or conditioned air per hour distributed throughout the room are normally adequate. For cats, dogs and primates, 10-12 changes per hour may be adequate. Fewer air changes may be acceptable where stocking densities are low.

2.54. The air distribution system should deliver as even a proportion of air to each cage or animal as possible whilst avoiding draughts (15). Careful attention should be given to air inlet and outlet positions to ensure good air circulation and avoid draughts and noise disturbance. In general, environmental conditions for both staff and animals will be improved by higher rates of air changes and properly directed air flow.

2.55. The ventilation system can be used to create differential air pressures within the building as part of a 'barrier' system. 'Clean' areas are generally maintained at higher pressure and 'hazardous' areas at lower pressure than those adjacent to them to minimise the leakage of 'dirty' air into 'cleaner' areas and the escape of airborne hazards into the air outside the premises. This is effective only if the supply air is itself clean or is suitably filtered to be free from contaminants.

2.56. For further information on farm animal housing, see 8, 10, 11, 38. For further information on laboratory animals, see 14, 15, 37.

## Lighting

2.57. Most laboratory mammals are either crepuscular or nocturnal. Their eyes are adapted, therefore, to dim light conditions. Light-induced retinal damage occurs principally in albino animals and most severely when periods of darkness are too short to allow recovery (7, 27, 61, 68, 70). The important aspects of light are its intensity, wavelength and photoperiod.

- (i) Intensity-350-400 lux at bench level is adequate for routine experimental and laboratory activities. Care may be required to avoid undesirably high levels inside cages (14, 42), especially for albino animals.
- (ii) Wavelength-few laboratory animals other than primates (and perhaps cats) have colour vision although there is some evidence that wavelength can nevertheless have an effect (48, 53, 54). There is no evidence to indicate that either fluorescent or incandescent lights have adverse effects.
- (iii) Photoperiod-the importance of light to dark (L:D) cycles in regulating circadian rhythms and stimulating and synchronising breeding cycles is well documented (13).

For the majority of laboratory animals a daily cycle of 12:12 hours is suitable. The circadian 'clock' of some species may be affected as much by light pulses of less than one second during the dark phase as by a long photoperiod; thus it may be important not to turn on lights during the dark period (13,22) . On the other hand, intervals of darkness during the light period are not known to be disruptive. Where animals are maintained on reverse photoperiod, daily inspections of the animals must still be undertaken.

(iv) Dawn and dusk-for some species of primates, birds and fish a simulated dawn and dusk may be required. This can be provided by the use of either automated dimmer switches or low wattage bulbs that remain on into, or during, the period of darkness (60).

## **Windows**

2.58. Windows allow fluctuations in light intensity during daylight and in photoperiod throughout the year and natural lighting may have a beneficial effect on staff. However, they can interfere with temperature control, particularly if they admit direct sunlight, and be a weak point in the security of the building.

## **Noise**

2.59. The control of noise is important in the care of laboratory animals (13,25) . Loud, unexpected and unfamiliar sounds are probably more disruptive than constant sounds. There is no indication that constant background noise, such as that generated by air-conditioning and similar equipment, is harmful to animals providing it is not too loud. The ability of such sounds to mask other noise is, however, unproven (24, 41).

2.60. Because different species have the ability to hear sounds of different pitch/frequency (13, 47) and loudness (13, 40), and because of the variations in sounds that can occur in animal houses, it is not possible to give firm recommendations for noise levels.

2.61. However, it has been found empirically that if the general background sound level in an empty animal room can be kept below about 50dB (A); below a noise rating curve of 45; and free from distinct tonal content, then it is unlikely that there will be damage to animals or personnel when the room is in use (11).

2.62. Excessive noise and vibration most commonly arise from imperfectly balanced rotating or reciprocating machinery which is usually sited in a plant room. Vibration is most often noticeable during machine start-up (i.e. low-frequency movement) when some machines have to pass through a critical (resonant) speed before reaching their normal operating condition. Such disturbances may not be important if the machine operates for long periods. Machines which switch in and out, however (perhaps due to a thermostatic or other operational controller), may require special precautions. Vibrations transmitted by machines through their base to the building structure may be felt at considerable distances from the plant, in extreme cases even in neighbouring buildings (11).

## **Special environments**

2.63. There have been several developments aimed at increasing the separation between animals and personnel to provide, amongst other things, protection from dangerous pathogens (2) and to contain other hazardous substances, such as

potential carcinogens and allergens. Devices used include filter caps and bonnets, environmental chambers, filter-racks, safety cabinets and isolator systems (15). All can be effective if used properly and each has its advantages and disadvantages. As their use can lead to a false sense of security, expert advice should be sought before selection, particularly with the more sophisticated and hence generally more expensive equipment.

### **Emergency alarms and stand-by systems**

2.64. A technologically-dependent animal facility is a vulnerable entity. It is strongly recommended that such facilities are appropriately protected to detect hazards such as fires and the breakdown of essential equipment such as ventilation fans, air heaters, coolers etc., and the intrusion of unauthorised persons. Care should be taken to ensure that where possible the operation of the alarm system causes the minimum of disturbance to the animals; an example of this is the use of the so-called 'silent' fire alarm which is inaudible to small rodents (16).

2.65. Animal facilities which rely heavily on electrical or mechanical plant for environmental control and protection will need stand-by equipment in order to maintain essential services and emergency lighting systems (it should be borne in mind that certain species will not eat in the absence of light) as well as to ensure that alarm systems themselves do not fail to operate.

2.66. The heating and ventilation system should be equipped with monitoring devices to enable the staff to be assured at all times that it is working satisfactorily and maintaining the correct environmental conditions.

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