National Centre
for the Replacement
Refinement & Reduction
of Animals In Research

NC3Rs Guidelines:

Non-human primate accommodation, care and use

Pioneering Better Science

The 3Rs

Replacement

Methods which directly replace or avoid the use of animals in experiments where they would otherwise have been used. Replacement benefits research by accelerating the development and use of human relevant tools, utilising the latest technologies.

Reduction

Methods which minimise the number of animals used per experiment or study, either by obtaining comparable levels of information from fewer animals, or by obtaining more information from the same number of animals, thereby avoiding further experiments. Reduction benefits research by ensuring appropriately designed and considered animal experiments that are robust and reproducible.

Refinement

Methods that minimise the pain, suffering, distress or lasting harm that may be experienced by animals, and which improve their welfare, throughout their lifetimes and during all aspects of their use. Refinement benefits research by avoiding disturbances in the behaviour, physiology and immunology of animals which can lead to variation in experimental results.

Contents

Introduction

The National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs) was established by the Government in 2004 to accelerate the development and uptake of technologies and approaches that minimise the use and suffering of laboratory animals (commonly referred to as the 3Rs). It is the UK's major funder of 3Rs research, fosters industry-academic collaborations to commercialise 3Rs technologies, and drives changes in policy, practice and regulations relating to animal research.

The NC3Rs, Medical Research Council (MRC), Biotechnology and Biological Sciences Research Council (BBSRC), Engineering and Physical Sciences Research Council (EPSRC), Academy of Medical Sciences (AMS), Royal Society, Wellcome Trust and other member charities of the Association of Medical Research Charities (AMRC) support the principles of the 3Rs and expect high standards of accommodation and care for animals used in research which they fund. All UK research using animals in scientific procedures that may cause pain, suffering, distress or lasting harm must comply with the Animals (Scientific Procedures) Act 1986 (ASPA), amended in 2012, and its associated codes of practice. However, the funding bodies are also committed to exceeding legal minima and to introducing and implementing standards that reflect contemporary good practice (see 'Responsibility in the Use of Animals in Bioscience Research' **www.nc3rs.org.uk/responsibility-use-animals-bioscience-research**).

Use of non-human primates in research

A small proportion of the research and early career awards funded by the NC3Rs, MRC, BBSRC, EPSRC, AMS, Royal Society, Wellcome Trust and other AMRC charities involve the use of non-human primates (hereinafter primates): usually long tailed macaques (*Macaca fascicularis*), rhesus macaques (*M. mulatta*) and common marmosets (*Callithrix jacchus*)[1]. The funding bodies recognise concerns about the use of primates in research, and the difficulties associated with meeting the environmental, behavioural and social needs of these highly intelligent animals in a laboratory environment. To help address these important issues, the NC3Rs, in partnership with the funding bodies, has produced these guidelines on primate accommodation, care and use.

The guidelines apply to any research involving primates conducted in the UK and abroad which is funded by the NC3Rs, MRC, BBSRC, EPSRC, AMS, Royal Society, Wellcome Trust or other AMRC charities. They complement the peer review process for grant applications involving primates, which takes into account welfare standards and implementation of the 3Rs through the involvement of the NC3Rs (see 'Integrating the 3Rs into publicly funded research' www.nc3rs.org.uk/integrating-3rs-publicly-funded-research).

The scope of the guidelines

The guidelines were developed by reviewing the published literature and through consultation with the scientific community, veterinary and animal care staff, the Animals in Science Regulation Unit Inspectorate, and animal welfare organisations. They represent a framework for applying and reviewing the expectations of the funding bodies in the humane use of primates.

This 2017 update of the guidelines incorporates and replaces the 2004 LASA/MRC document 'Key Considerations in the Breeding of Macaques and Marmosets for Scientific Purposes'.

The guidelines set out contemporary good practice in the use of primates in biomedical, biological, veterinary and behavioural research, and include principles relating to the breeding, sourcing, housing, capture, handling, restraint and training of primates, experimental design, and the provision of technical and veterinary care and support. Implementation of the principles in the guidelines is a condition of receiving funds for primate research from the funding bodies. The funding bodies, however, accept that there may be rare circumstances, for example to protect staff working under high level biocontainment, in which it may not be possible to fully implement the guidelines. This is judged case-by-case as part of the NC3Rs' input into the peer review processes of the funding bodies.

Putting the guidelines into practice

Researchers (staff and grant holders) and their host establishments are responsible for applying the guidelines. The Animal Welfare and Ethical Review Body (AWERB) (or international equivalent, such as the Institutional Animal Care and Use Committee) plays a key role in ensuring implementation of the 3Rs and high standards of animal welfare. It is therefore recommended that the AWERB should be central to implementing the guidelines.

Questions on compliance with these guidelines may be asked of the applicant/s, AWERB or named persons under the ASPA as part of the peer review process for grant applications. The NC3Rs may be asked by the funding bodies to give advice on compliance.

[1] The use of great apes in scientific procedures was formally banned in the UK in 1997. The majority of UK funding bodies do not support research involving great apes. The BBSRC funds a small amount of non-invasive (mainly behaviour-based) research with great apes.

1

Breeding

1.1 Principles of breeding and supply

Compared to most mammals, primates have long gestation periods and maternal dependency times and do not reach sexual maturity for several years. This is particularly true of macaques; however, even marmosets do not reach maturity until their second year. This means that primate breeders have to predict demand some years in advance. Scientists however, are often unable to anticipate their needs so far ahead. These factors can make it hard to manage a breeding colony and match supply to demand. Forward planning and communication are necessary to overcome these difficulties.

1.1.1 Close communication between breeders and researchers is essential to match supply and demand as closely as possible, and to ensure continuity of husbandry and care at user establishments. Every effort should be made to ensure there is adequate communication at a national level to optimally match overall supply and demand, and to avoid unnecessary importation with the associated stress of long-distance transport.

1.1.2 Users should endeavour to provide feedback on the subsequent 'performance' of primates supplied for experimental programmes so that information on the suitability of use can be incorporated into future breeding plans.

1.1.3 Users should make every effort to ensure that their anticipated requirements are realistic.

1.1.4 Unless there is scientific justification, researchers should not restrictively specify characteristics of animals such as gender or weight because this may cause an unnecessary surplus.

1.1.5 Individual records should be maintained of all aspects of breeding, husbandry, health and training to provide each animal with a 'passport' that should accompany the animal throughout its life.

1.2 Selection of breeding stock

Appropriate selection of breeding stock is needed to guard against excessive inbreeding and to select for favourable anatomical and behavioural characteristics, and against undesirable characteristics. The aim should be to produce high-quality breeding and stock animals that are well adapted to the captive situation. Selection programmes carefully managed to achieve these goals have the potential to improve animal welfare and the quality of scientific data obtained.

1.2.1 Animals chosen for breeding should be selected on the basis of health, genealogy, behaviour, temperament, conformation, potential reproductive performance and mothering ability. All of these characteristics should be regularly reviewed.

1.2.2 Parental care is learnt in marmosets. Both males and females selected for breeding should have experience of rearing at least two sets of sibling offspring within their natal group.

1.2.3 Primates which show abnormal behaviours or are nervous or fearful should preferably not be selected as replacement breeders.

1.2.4 The duration of an animal's breeding life should be determined by both its condition and its role within the colony.

1.2.5 The health status of any primates introduced into an existing colony should not compromise the existing health profile or staff safety.

1.2.6 Given the animal welfare concerns, including those associated with capture, wild-caught primates should not be introduced into breeding colonies.

1.3 Peri-parturient and post-natal care

Birth can be a stressful process for both the mother and the offspring. Not all decisions with respect to issues such as hand-rearing and suitability of males for breeding are straightforward. Breeding establishments should therefore consider these issues in advance and have strategies in place to cope with welfare issues pertaining to the newborn infants and the mother.

1.3.1 Pre-natal (i.e. gestation) stress can alter the stress responsivity of the offspring. Care should be taken to minimise stressors for pregnant primates.

1.3.2 It may be necessary to use contraceptives to provide a recuperative period, or for colony management purposes to avoid disrupting stable family groups. Veterinary advice should be sought.

1.3.3 Birth by caesarean section should not be permitted on more than two occasions. In such cases, careful consideration should be given to the subsequent fate of the mother, who may be retained to sustain the offspring and group dynamics; if retained, attention may need to be given to contraceptive techniques.

1.3.4 With higher calorie diets, the incidence of triplet and quadruplet births in marmosets has increased, but the parents are rarely able to raise more than two offspring by themselves. In such cases, all of the infants can be raised by cooperative feeding (always keeping them together when removed from their parents for supplemental feeding).

An alternative management practice is to allow two infants to remain with the parents, and to promptly euthanise the other/s to avoid unnecessary suffering or rejection. In such cases, tissues should be collected for research purposes wherever possible.

1.3.5 It may sometimes be necessary to foster or hand-rear marmosets or macaques but animals should not be maintained in isolation. They may subsequently be unsuitable for breeding, or for use in scientific research programmes, but may facilitate human-animal socialisation programmes.

1.4 Weaning and segregation

The removal of offspring from the breeding colony into peer groups is stressful for all animals involved. Every effort should be made to minimise any unnecessary stress to the animals, and disruption to the group dynamics.

1.4.1 Captive-bred macaques are frequently weaned (removed from their mother) earlier than the mother would naturally stop caring for them in the wild, in order to provide appropriately sized stock for experimental use, or to maintain health status. In other cases it is simply the management practice of the facility. Given the welfare implications of early weaning (e.g. stress involved in separation from parents, changed nutritional status, disturbed behavioural and physical development) it is important that weaning ages are reviewed regularly to ensure that the practices are as humane as possible and fully justified.

1.4.2 Macaque offspring should be kept for as long as possible in their natal groups, to ensure normal behavioural development. Where early separation from the mother is necessary, this should not normally occur before the infant is 10–14 months old, but weight, health and behavioural criteria should be used to determine the most appropriate age for the welfare of each individual animal.

1.4.3 Male macaques destined for breeding stock should preferably remain in the natal group until puberty and females permanently, so that they develop the behavioural competence to reproduce and rear their own offspring successfully.

1.4.4 Marmoset offspring should be retained in family groups for as long as possible, and space allows (group sizes in the wild rarely exceed 14–16 individuals). A less desirable option, but a potential management tool in large colonies, is to wean offspring into same-sex peer groups at eight to 14 months. This needs to be carried out with care to minimise aggression.

1.5 Socialisation

Welfare can be improved and stress minimised by ensuring that primates are well socialised with humans early in life and trained to cooperate with husbandry and other procedures. Familiarity with humans makes it possible for animal care staff to observe uninterrupted behaviour patterns and identify any animals showing precursors to abnormal behaviours so that appropriate remedial action can be taken.

1.5.1 Primates should be regularly socialised with humans (e.g. hand feeding), preferably with different members of the animal care staff, veterinarians and researchers. Due regard must be given to protecting the health of the animals against diseases that may be transmitted from humans.

1.5.2 Cage design, for example walk-in cages or customised rooms, should be used to encourage primates to feel more confident approaching humans.

1.5.3 Where primates are to be handled relatively frequently by researchers, there is benefit in desensitising to handling during early development.

2

Source and transport

The source and transport of primates are important factors in determining the overall welfare impact of their use in research.

2.1 Use of captive-bred primates

2.1.1 All primates used in the laboratory should be captive-bred and come from a source in the country of use wherever possible[2].

2.1.2 UK researchers purchasing rhesus macaques are required to obtain their animals from the MRC Centre for Macaques (**cfminfo@har.mrc.ac.uk**). Where there is justification for using macaques from in-house breeding colonies, these should adhere to the principles set out above.

2.1.3 All primates used in the laboratory should be the offspring of animals born in captivity (i.e. F2 generation or later), or sourced from self-sustaining colonies, to avoid use of wild-caught animals as breeding stock.

2.1.4 Efforts should be made to source primates from breeding establishments where the animals are well socialised to humans and prepared for their future use, to ensure they are fit for purpose and to optimise their future welfare.

2.1.5 Every effort should be taken to minimise the journey times and any associated distress caused by transport.

[2] The BBSRC funds some behavioural and biological research with primates in their natural habitats and held in zoos.

2.2 Use of wild primates

"Wild primates" used in research are those either studied *in situ* as free-living animals, or captured from the wild for breeding or use in the laboratory.

2.2.1 The funding bodies will not normally fund research involving the use of wild-caught primates. Applicants proposing to use wild-caught primates will have to make a special case justifying why captive-bred animals cannot be used.

2.2.2 Studies of free-living primates in their natural habitats can cause disruption, particularly if feeding, capture, marking or scientific procedures are involved. Investigators studying free-living animals should take precautions to minimise interference with individuals, as well as the populations and ecosystems of which they are a part. Persons trapping primates should be adequately trained and competent in humane methods of capture. Holding facilities in the field should have standards equivalent to those set out in the 'IPS International Guidelines for the Acquisition, Care and Breeding of Nonhuman Primates' (www.internationalprimatologicalsociety.org/policy.cfm).

2.2 Image credit:
Hannah Buchanan-Smith

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Experimental design and reporting

Experimental design is an important consideration for scientific, ethical and economic reasons.

3.1 All applications for funding must include full justification for the species and numbers of primates required for each experiment, and describe how the principles of the 3Rs have been implemented (see 'Updated RCUK guidance for funding applications involving animal research' **http://www.rcuk.ac.uk/media/news/150415/**).

3.2 When planning any research project, researchers should perform a thorough search of the published literature to ensure that they are aware and take account of new opportunities to apply the 3Rs and to improve the value of their work.

3.3 A statistician or other appropriate expert in study design should be consulted to ensure robust experimental design and statistical analysis. Alternatively, applicants can use the NC3Rs Experimental Design Assistant for this purpose (**https://eda.nc3rs.org.uk/**).

3.4 Experiments should be adequately powered to detect biologically meaningful effects. Where relevant, methods to minimise bias should be used, such as randomisation in the allocation of animals to treatment groups and blinding in the assessment of outcomes. The statistical analysis methods should be appropriate for the experimental design and hypothesis.

3.5 Researchers conducting safety assessment studies of pharmaceuticals should take account of the best practice identified by the NC3Rs-industry data sharing activities and implement the published recommendations, where applicable (www.nc3rs.org.uk/animals-drug-discovery-and-development).

3.6 Where experiments involve scientific procedures, the most refined method should be used. This will involve careful consideration of the experimental aims, animals (species and individuals), staff and techniques involved (i.e. those that have the least negative welfare impact).

3.7 Where experiments have the potential to cause harm to primates, researchers should identify humane endpoints for each experiment (www.nc3rs.org.uk/humane-endpoints), before the work starts and after consulting the literature and the Named Veterinary Surgeon (NVS) and Named Animal Care and Welfare Officer (NACWO) (or their equivalents outside of the UK).

3.8 The implementation of humane endpoints should be monitored and recorded during the experiment (e.g. using score sheets). Humane endpoints should be continually reviewed and refined to minimise suffering, as required.

3.9 Researchers should ensure that they report *in vivo* studies in accordance with the ARRIVE Guidelines (www.nc3rs.org.uk/ARRIVE), taking into account the specific editorial policies of the journal concerned.

3.10 Every effort should be made to publish all research findings, regardless of statistical significance, and to exploit additional mechanisms of knowledge transfer to achieve maximum impact.

Accommodation and environment

Captive primates must be provided with a complex and stimulating environment that promotes good health and psychological well-being and provides full opportunity for social interactions, exercise and to express a wide range of behaviours appropriate to the species.

4.1 Accommodation

4.1.1 The AWERB should review the accommodation and environment annually to ensure that the principles described below are applied.

4.1.2 The accommodation should provide primates with sufficient space to carry out their normal locomotor and behavioural repertoire (e.g. resting, running, climbing, leaping, foraging and social interactions). It should take into consideration the age and condition of the primates.

4.1.3 The 'Home Office Code of Practice for the Housing and Care of Animals Bred, Supplied or Used for Scientific Purposes', Annex III of Directive 2010/63/EU and Appendix A to the Council of Europe Convention ETS 123 set out minimum, rather than optimal, space allocations. Wherever primates are used, every effort should be placed on exceeding these minimum space allocations in order to provide primates with a complex and varied environment and greater opportunity for exercise and expression of species-typical behaviours.

4.1.4 The volume and height of the cage or enclosure are particularly important for primates, which flee upwards when alarmed. Their cages and enclosures should be floor to ceiling high wherever possible, with adequate perching to allow all animals to move up to heights where they feel more secure.

4.1.5 Double-tiered cages should not be used since they restrict the amount of vertical space available to the animals.

4.1.6 Special justification should be given for using cages with grid floors (e.g. compelling scientific or veterinary reasons) as this restricts the opportunity to provide substrate and foraging.

4.1.7 In the case of macaques housed in conventional steel caging, cages should be linked to a 'play' area or enclosure which increases the opportunities for exercise and social interaction. They should have unlimited access to this area unless it is necessary to confine them for scientific, husbandry, veterinary or welfare purposes.

4.1.8 Where security permits, the accommodation should have natural light.

4.2 Social housing

Social interactions are one of the most important factors influencing the well-being of primates. Social housing promotes a wide range of species-typical behaviours and decreases the risk of abnormal behaviours developing, and/or reduces their duration and frequency.

4.2.1 Primates should be socially-housed in groups of species-typical social structure, taking into account their age and sex and the nature of the scientific procedures or study. For some studies, it may be necessary to house the primates in compatible pairs.

4.2.2 Careful monitoring and management is necessary to ensure harmonious groupings or pairings and to minimise any aggression. Housing should be designed to minimise the impact of aggressive encounters (e.g. provision of visual barriers) and to ensure that dominant animals cannot restrict their cage mates' access to other parts of the cage or enclosure, or monopolise resources such as perches and water spouts.

4.2.3 Primates should not be housed singly unless there is exceptional scientific or veterinary justification. Where single housing is unavoidable, it must be for the shortest possible time. The funding bodies will require full justification for any procedure or study which requires single housing, and details of the additional resources that will be provided for the welfare of these animals. Single housing should not be used as a justification for reducing the animals' space allowance.

4.2.4 If pair-mates are temporarily separated, for example for daily behavioural testing, the duration of separation should be minimised. The remaining animal should be monitored for separation anxiety, as well as the effectiveness of steps taken to alleviate it.

4.3 Environmental enrichment

Environmental enrichment is an animal behaviour principle that seeks to enhance the quality of captive animal care by identifying and providing the environmental stimuli necessary for optimal psychological and physiological well-being. The key concept behind enrichment is giving animals a degree of choice and control over their environment.

4.3.1 Facilities should have a goal-orientated enrichment programme that satisfies a range of needs in the physical/structural, social, food-based, cognitive/occupational and sensory domains. See the NC3Rs Macaque Website (www.nc3rs.org.uk/macaques) and Common Marmoset Care (www.marmosetcare.com) for examples of enrichment strategies in each of these domains. The addition of a single perch, mirror and toy to a conventional metal cage is not an acceptable environmental enrichment programme.

4.3.2 The impact of the environmental enrichment programme and any new forms of enrichment provided should be regularly and critically reviewed for their effectiveness. The potential dangers of any new enrichment items should be carefully considered and assessed before their use.

4.3.3 As noted above, social housing in species-typical group structures with compatible individuals is the most effective enrichment technique to prevent abnormal behaviours developing.

4.3.4 Cages and enclosures should be furnished to encourage primates to express their full range of species-typical behaviours. Depending on the species, this should normally include complexity though provision for resting, running, climbing, leaping and foraging opportunities, as well as novelty.

4.3.5 The vertical and horizontal dimensions of the cage and enclosure should be exploited fully by incorporating shelves, logs, ladders, climbing structures, branches, hammocks, swings, ropes and objects to manipulate.

4.3.6 Shelves, ladders and branches should be made from wood wherever possible, even though they will have to be replaced more often. Wooden furniture for gnawing and scent-marking is particularly important for marmosets.

4.3.7 The cage and enclosure should provide the animals with an area of privacy (e.g. through the use of visual barriers). For resting, macaques should be provided with fixed elevated shelving and marmosets with nest boxes or equivalents.

4.3.8 To reduce boredom, novelty should be regularly introduced into the environment (e.g. by providing novel enrichment devices that respond to the primates). Use of cage furniture should be periodically assessed and re-arranged to ensure space is used appropriately.

4.3.9 A varied diet should be provided, which is nutritionally balanced, as a source of environmental enrichment and to promote pleasurable states.

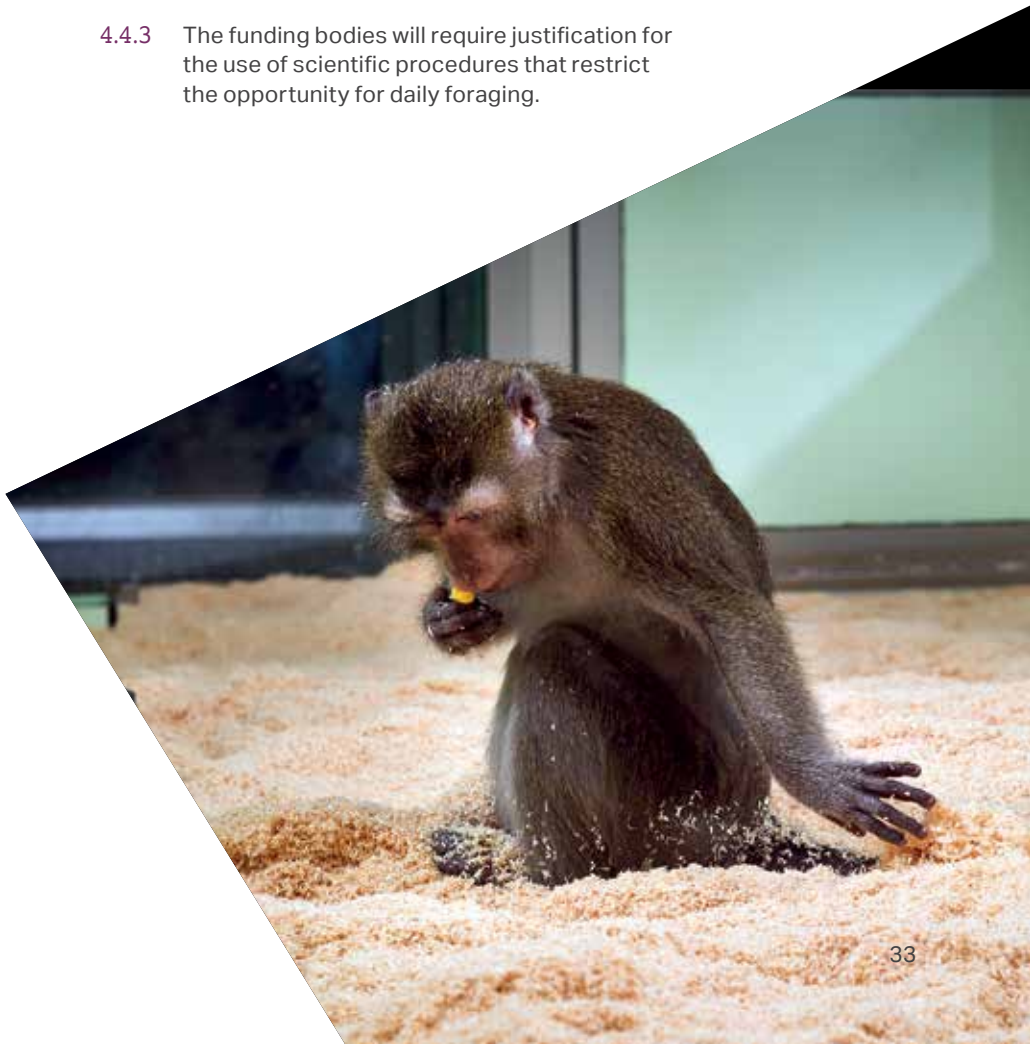
4.4 Foraging

Foraging enhances welfare and minimises the expression of abnormal behaviours.

4.4.1 All primates should be given the opportunity to perform extended bouts of foraging behaviour on a daily basis, by scattering fine food items in litter or substrate on the floor (e.g. wood shavings), and by using devices that encourage foraging activity (e.g. puzzle feeders). For marmosets, foraging devices should include artificial gum trees, and they should be provided in the upper parts of the cage or enclosure.

4.4.2 In studies where food restriction or control is unavoidable, consideration should be given to how the animals can be provided with daily foraging without compromising scientific objectives (e.g. by providing foraging material of a low calorific value, or after the animals have completed any procedures).

4.4.3 The funding bodies will require justification for the use of scientific procedures that restrict the opportunity for daily foraging.



5

Capture, handling, restraint and training

There can be significant benefits, both for animal welfare and meeting scientific objectives, by ensuring that primates are familiar and well socialised with humans, and that primate-human interactions are positive experiences for the animals.

5.1 The AWERB should review the methods of capture, handling, restraint and training of the primates annually to ensure the principles described below are applied.

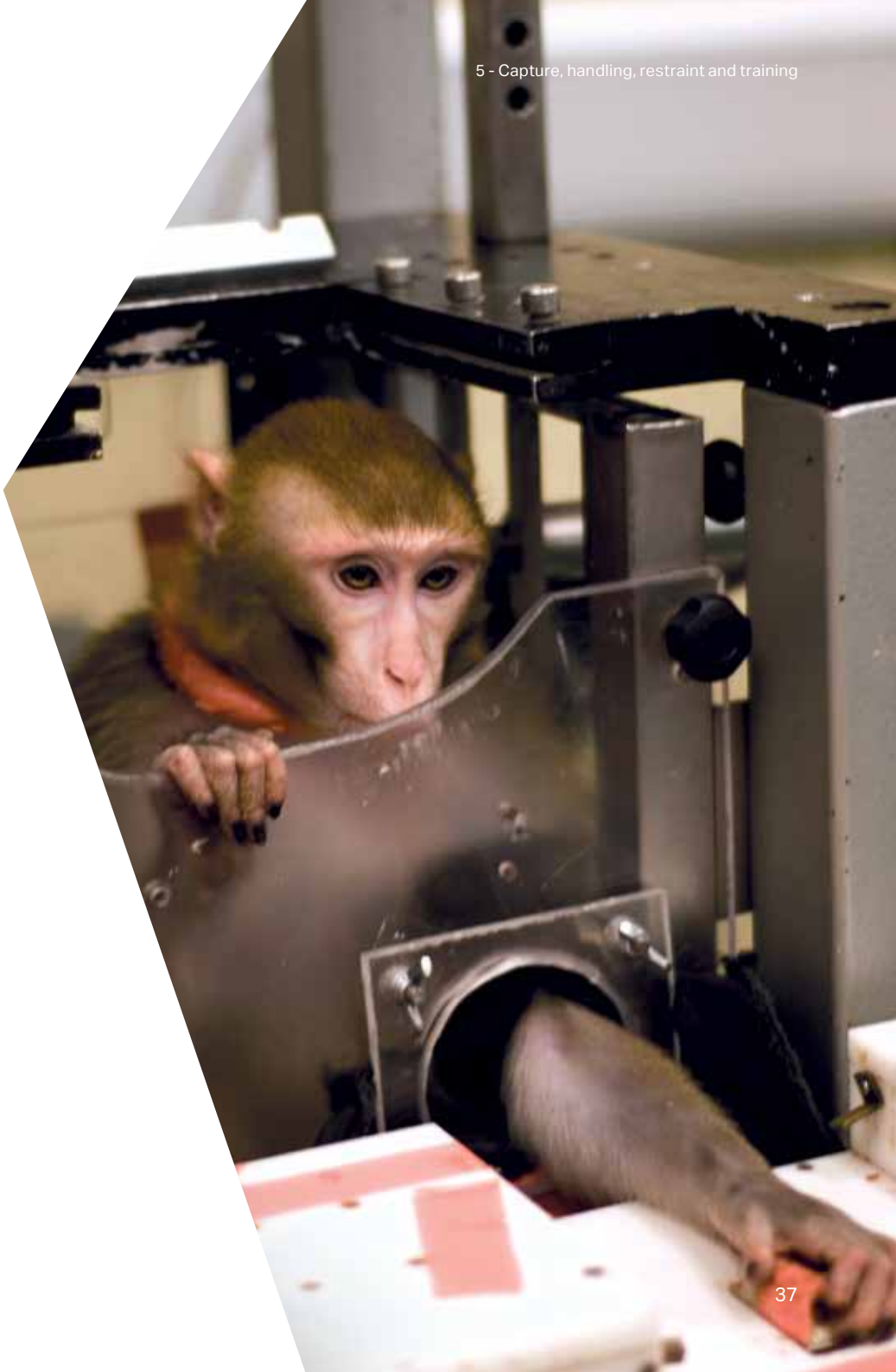
5.2 Methods of capture, handling, restraint and training should seek to minimise any stress to the animals. The routine use of squeeze-back cages, nets and pole-and-collar should be actively discouraged because more humane methods are available.

5.3 Positive reinforcement techniques should be used to train primates to cooperate with capture, handling, restraint, husbandry and research procedures (e.g. weighing, body checks, dosing, sampling). Sufficient time should be allowed for this before studies commence. Standard Operating Procedures should be used to improve consistency in animal training and monitoring.

5.4 Where food or fluid control is used as a motivator for training and performance on behavioural, cognitive or other tasks, the recommendations of the NC3Rs working group on this topic should be followed (www.nc3rs.org.uk/refining-food-and-fluid-control-behavioural-neuroscience-macaques).

5.5 Where restraint is necessary, it should be for the shortest possible time.

5.6 Repeated sedation should not be used in circumstances where conducting the procedure/s in conscious, trained animals would be better for the welfare of the animals involved.



6

Veterinary care and welfare assessment

All primates should be given the highest standards of veterinary care and an environment that supports good welfare.

6.1 Veterinary care should be reviewed annually by the AWERB. This review should include research protocols (e.g. anaesthesia, analgesia and humane endpoints) and be carried out by the NVS and NACWO (or their equivalents) in conjunction with AWERB members. It should also include confirmation that the facilities are suitably equipped for the procedures undertaken.

6.2 Veterinary staff should have appropriate training and experience in primate health and well-being. Resources should be provided to allow continuing professional development.

6.3 The welfare of primates used and bred for research should be optimised. This involves promoting positive emotional states (usually evidenced by behaviours such as play, social grooming, resting in body contact and foraging) as well as minimising harm. Optimising welfare is likely to improve quality of science, because animals with poor welfare show disturbed behaviour, physiology and immunology, which can lead to variation in experimental results, impairing the reliability and repeatability of studies.

6.4 Researchers, veterinarians and animal care staff should keep abreast of, and utilise, the latest validated methods for assessing primate welfare. Ideally an integrated welfare assessment framework, involving a combination of behavioural (e.g. body postures, facial expressions, and vocalisations), physiological and clinical measures, should be used to obtain the best assessment of welfare state.

6.5 Attention should be paid to the welfare requirements of individual animals, and the potential for cumulative suffering due to the effects of repeated procedures over time.

7

Staff

Ensuring that staff members have the proper attitude, training, motivation and skills is key to maintaining a 'culture of care'.

7.1 The annual review by the AWERB should include staff numbers, training and professional development.

7.2 Staff at all levels should be knowledgeable about the natural history, biology and behaviour of the species they are working with or caring for. The NC3Rs Macaque Website (**www.nc3rs.org.uk/macaques**) and Common Marmoset Care (**www.marmosetcare.com**) should be consulted as sources of this information. Staff should also have a good understanding of how the laboratory environment and scientific procedures can affect primate well-being, so that appropriate care can be given to provide the best possible quality of life and to minimise any pain, suffering, distress or lasting harm.

7.3 Staff should be trained to recognise early indicators of abnormal behaviour, pain and distress, to deal with them promptly and to prevent their occurrence in the future.

7.4 A consistent and predictable routine can improve primate welfare, particularly predictability for negatively valenced events, as it allows the primates to relax at other times. Care staff should pay attention to the signals the primates may be using to predict such events, and make these consistently reliable.

7.5 Facilities should have sufficient trained and competent technical and veterinary staff, and appropriate infrastructure, to ensure high standards of care and welfare at all times.

7.6 Sufficient time and resources should be allocated to allow regular review of all aspects of primate care (animal health and well-being, procedures, humane endpoints, handling, socialisation, training, and environmental enrichment).

7.7 All staff should receive appropriate training for the duties they are required to perform. Their competence and the level of supervision and support required should be regularly assessed and recorded.

7.8 There should be a well-resourced programme of continuing professional development for all staff.

7.9 Staff should be actively encouraged to extend their knowledge and experience, and to spread good practice, by visiting other establishments and by attending meetings and symposia on primate care and welfare, such as the annual NC3Rs Primate Welfare Meeting (www.nc3rs.org.uk/primatewelfaremeeting) and NHP NACWO Network.

7.10 Information on appropriate training courses and meetings can be obtained from the NC3Rs events calendar (www.nc3rs.org.uk/events).

8

Fate of the animals

Careful consideration should be given at the project planning stage to the fate of the animals at the end of the programme of work.

8.1 Re-use of primates can decrease the number of animals used overall. However, there are ethical considerations against as well as for re-use, and also legal restrictions in Europe under Directive 2010/63/EU. In circumstances where there is conflict between reduction and refinement, it is preferable to use more animals if this means that the harm caused to each individual animal is significantly reduced.

8.2 Animals that have undergone scientific or other procedures may subsequently be used for breeding. Appropriate approval should be secured from the relevant authorities to allow for this.

8.3 Older breeding animals may be considered for research, but this should be determined only by their suitability for, and the conditions of, use. Substantial changes to husbandry routines need to be carefully introduced and the animal's welfare monitored closely.

8.4 Where an animal is to be euthanised, the most refined method should be used and every effort made to utilise and share tissues and blood products.

8.5 The funding bodies support the retirement of animals wherever possible and appropriate, provided that all statutory requirements (e.g. ASPA) are met; a high-quality, well-resourced and secure environment can be found to provide long-term accommodation and care; and it is the opinion of the NVS and NACWO (or their equivalents) that the animal will adapt well to the new conditions, including the social environment. The NC3Rs is able to assess the suitability of potential new homes.

9

Disseminating and implementing the 3Rs

The funding bodies fully support the principles of the 3Rs.

9.1 Developments in the 3Rs should be widely disseminated to colleagues and peers, ideally through publication in an appropriate journal.

9.2 Grant holders and staff should include details of how they have implemented the 3Rs in their publications and final/progress reports.

9.3 The funding bodies will consider requests for resources for implementing the 3Rs in grant applications and during the lifetime of the award. Some of the funding bodies will recognise the publishing of significant and original contributions to the development of the 3Rs in reviews of their establishments and in progress reports on grants.

9.4 The funding bodies encourage their researchers to work with animal welfare scientists and ethologists to develop a programme of primate welfare research (for example projects, see **www.nc3rs.org.uk/macaques/nc3rs-research**).

References

The following references list includes key resources on the use and care of primates. These should be complemented by regular searches of the published literature. The policies and guidance of the funding bodies relating to animal research are available on their respective websites.

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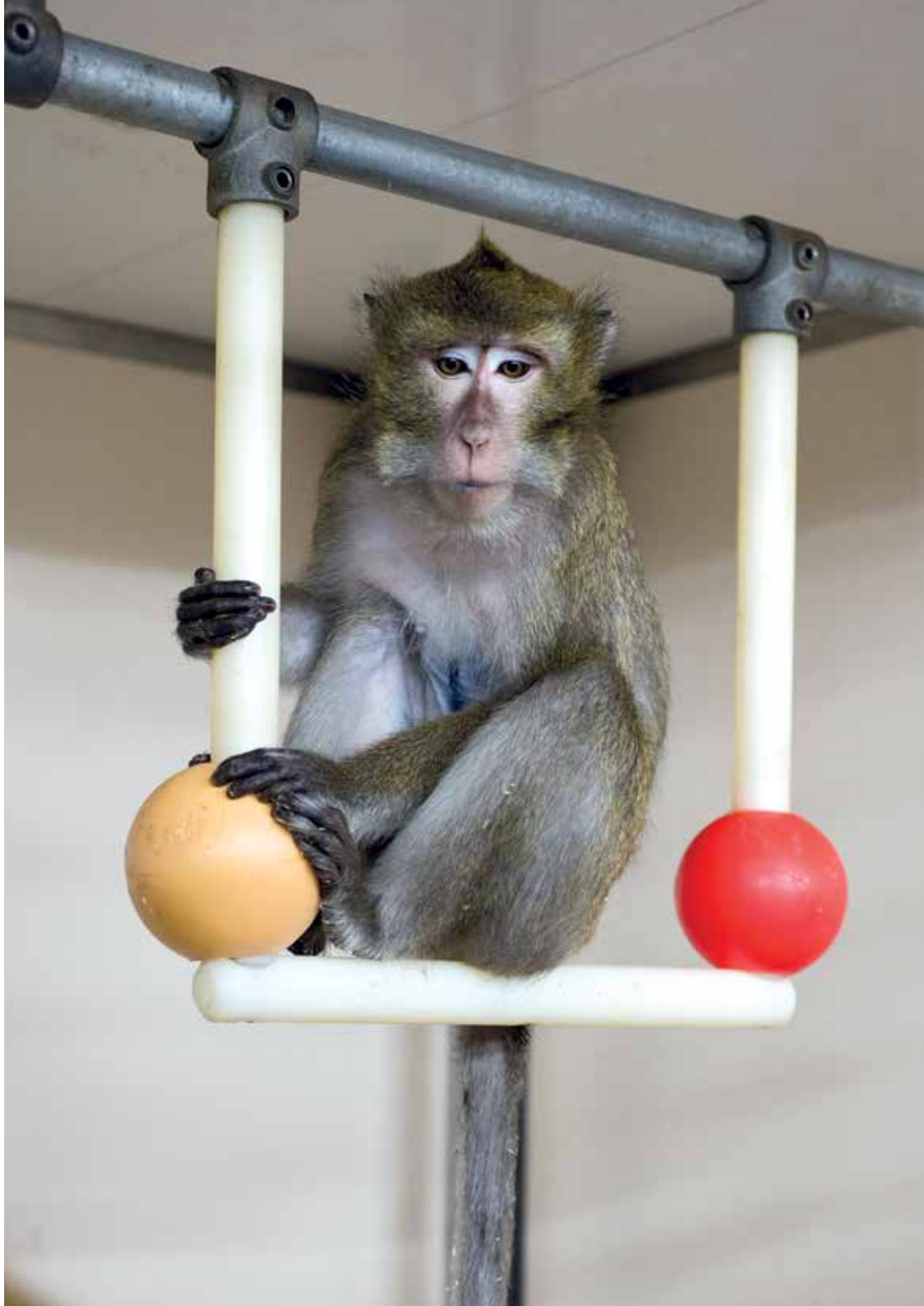
Further resources

Further resources on primate accommodation, care and use can be found on the NC3Rs website.

Primate welfare:
www.nc3rs.org.uk/welfare-non-human-primates

Experimental design:
www.nc3rs.org.uk/experimental-design

Animals in drug discovery and development:
www.nc3rs.org.uk/animals-drug-discovery-and-development



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