Social Housing of Large Primates: Methodology for Refinement of Husbandry and Management

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Summary — Improvement of primate facilities is potentially costly, and is constrained by health and safety considerations and by limited experience in smaller units. During the last decade, most units have progressed from two-tier, single housing on grid floors, but there are still opportunities for refinements to reduce contingent suffering. The methodology of housing rhesus monkeys loose in rooms without cages has been documented in a video presentation. The animals have defined health status, but routine room maintenance and animal handling encourage close staff contact, generating health and safety concerns. The management changes have resulted in less aggressive, more-cooperative animals that are less stressed by capture. There are more natural behaviours, together with decreased animal and staff stress, resulting in better experimental models. The cages remain cleaner, releasing staff to spend more time on positive reinforcement training. There is better use of available space, and experimental immunology studies have been included within the breeding colony. The project has demonstrated a way of providing a management system that results in major benefits to animal welfare, staff morale and to the quality of the scientific studies undertaken. The methodology is now being used in an experimental unit housing animals for neuroscience. Continuing challenges include some social unrest within groups, managing animal health and maintaining high levels of personnel safety.

Key words: *handling, health, husbandry, primates, safety.*

Introduction

Part of Oxford University's rhesus colony consists of 100 breeding females, kept in 15 single-male harem groups. Babies are removed from their mothers into groups at between about 10 and 15 months of age. Once the juveniles have settled, they are used in a variety of research projects or kept as future breeding stock. A programme of housing reform has been undertaken over the last few years to provide the animals with more opportunities to demonstrate a more natural behavioural repertoire and to enable easier, more relaxed, interactions with research and care staff. Video recordings demonstrate the changes in behaviour that have occurred by showing groups of animals of similar age, the only difference being the caging system in which they were held. The differences observed in the video, whilst not based on systematic observation, nevertheless reflect the experience of those who work daily with the animals. The video was made, not by remote use of cameras, but by filming in the room and actually in the enclosures. The animals had seen neither the camera nor the cameraman before, thus demonstrating their ability to cope with a novel situation.

Materials, Methods and Procedures

The animals were kept in an indoor environment on a light:dark cycle that varied from 8:16 to 16:8 hours to mimic seasonal variations. The temperature and humidity were kept within the UK Home Office *Code of Practice for Housing and Care of Animals in Designated Breeding and Supply Establishments* (1), and animals were managed according to the Advisory Committee on Dangerous Pathogens (ACDP) guidelines (2). The daily diet consisted of commercial pelleted diet (Harlan Teklad 2055 global 25% protein primate diet) with a variety of fresh fruits and vegetables, depending on the season, and commercial forage mix (B&K Universal) placed in deep litter of sawdust. Prior to the start of the study, all breeding groups were kept in stainless steel cages based on a modular system (Modular Systems Ltd), usually three modules per group. Each module had a 1.2m × 1.2m floor area and was 2.0m high. The cages had solid floors on which foraging material was provided, wooden shelves at 0.6m height and wooden platforms at 1.2m height. Each module had a crush back mechanism in the lower 1.2m section to facilitate restraint of the animals.

In the facility, some of the rooms were relatively small, such that, in some cases, there was only one cage of animals per room. A programme of refinement of the animals' accommodation was started, which first involved simply removing the front of a conventional cage so that the animals had access to the whole room. A double door was installed by using a framework of wood, supporting 8-gauge wire mesh, 2.5cm by 5cm. Lights and electrical fit-

tings were protected with the same wire mesh, and the walls were protected by use of ceramic tiles and grouting designed for swimming pool use. These alterations involved minimal expense. After the initial success with this method of housing, rooms were then planned without any cages at all. Laminate material (Forex) was used to protect the walls and the same method for creating a double door and protecting light fittings was used. The laminate wall material was not as successful as the ceramic tiles, and it suffered some damage from the monkeys.

Video footage comparing the behaviour of animals loose in a room in which the cage fronts had been removed with that of a similar group who were still living in a cage showed that the latter tended to spend more time up on the higher two levels. A female in this group often showed stereotypic circling behaviour, and the male showed aggression toward the care staff. The female was apprehensive of his presence and there was a background noise of barking, indicating unrest. By contrast, within a room with no cage in it, but which was open with wooden climbing frames and toys, the animals were visibly relaxed. The male confidently came to the handler to take food and sat on the floor with the handler, posing no threat. Indeed, the whole group came down to join in, including the juveniles. The background noise in this area was contented grunts; there was no barking or aggression. Young babies soon became bold, and even mothers with newborn infants brought their young down when just a few hours old.

Staff do not wear full protective clothing as the colony has a defined high health status (3). Achieving this was the outcome of several years' work (4, 5), and this project to refine the housing and husbandry would not have been possible until this status had been reached, due to the many health and safety considerations.

Once the juveniles reached weaning age, they were moved with their half siblings and mixed with others of similar age. These juvenile animals were also keen to interact with the care staff, having done so whilst infants. They spread out around the room and were quite relaxed, despite the presence of the camera and the cameraman, whom they had never seen before, inside their area. Comparing the behaviour of these animals with that of a group of juveniles of similar age and background, but kept in a cage environment, demonstrated that the latter remained at a high level and rushed from one end of the cage to the other in a group. They huddled nervously, showed aggression toward each other and clasped each other for reassurance and comfort. By contrast, the group in the open room readily went down to the ground and appeared confident.

The animals remained in the enclosure when it was cleaned out and did not get in the way of the care staff. The monkeys kept these areas much cleaner than conventional cages, and it was only necessary to do a full clean every two to three weeks, reducing the disturbance to the animals. Twice weekly, areas of damp substrate, usually under water nozzles, were removed.

This type of housing was not just applied to the breeding colony; it was also used for experimental animals in immunology programmes, and the same methodology is now being applied to animals used for neuroscience. Catching the monkeys in this housing situation was not difficult or stressful. After a brief period of training the animals would stand quietly for an injection, for example, for routine injections of medications or for tranquilisation, if needed. The male did not interfere with this procedure. This was far less traumatic for both the animal and the staff than using a catching net or crush cage. Juvenile animals, such as are used in many experimental programmes, were readily caught by hand.

Discussion and Conclusions

A newborn macaque possesses the potential for a range of developmental outcomes. What actually occurs depends on the stimuli that are provided in its early environment. Social deprivation in early life will produce a range of undesirable behaviours, emotional and motivational disturbances and communication deficits (6). Neurotic monkeys will not breed well and make aggressive and dangerous cage mates, leading to difficulties for other animals and for both care and research staff. Social interaction is central to the survival of primates. They have long developmental periods, ensuring them the opportunity to learn from older individuals, and they are capable of extensive modification of their behaviour as a function of experience (7). The changes we have been making to the housing of the colony allow them to interact with each other and to develop these normal social relationships, as well as encouraging them to interact with care staff and research staff in a way that does not pose a threat to staff safety and is stress free for the animals. Our aim is to improve the welfare of the monkeys by giving them an environment in which they will freely exhibit natural behaviours, both for breeding and experimental monkeys, and these changes will continue to progress. This will enable the use of primates in justifiable research programmes to be better supported by altering the balance of costs versus benefits, leading to improvements in human health and medical care.

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References

1. Home Office (1995). *Code of Practice for Housing and Care of Animals in Designated Breeding and Supply Establishments*. London, UK: HMSO.
2. Advisory Committee on Dangerous Pathogens (1998). *Working Safely with Simians: Management of Infection Risks*. London, UK: Health and Safety Executive.
3. FELASA Working Group on Non-Human Primate Health (Weber, H., Berge, E., Finch, J., Heidt, P., Kaup, F-J., Perretta, G., Verschere, B. & Wolfensohn, S.) (1999). Health monitoring of non-human primate colonies. *Laboratory Animals* **33** (Suppl. 1), 3–18.
4. Wolfensohn, S.E. (1998). *Shigella* infection in macaque colonies: case report of an eradication and control program. *Laboratory Animal Science* **48**, 330–333.
5. Wolfensohn, S.E. & Gopal, R. (2001). Interpretation of serological test results for Simian Herpes B virus. *Laboratory Animals* **35**, 315–320.
6. Harlow, H.F. (1958). The nature of love. *American Psychologist* **13**, 573–685.
7. Lindburg, D.G. (1991). Ecological requirements of macaques. *Laboratory Animal Science* **41**, 315–322.