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Caring for non-human primates in biomedical research facilities: scientific, moral and emotional considerations

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Abstract

Animal care for nonhuman primates in biomedical facilities has undergone major changes in the past few decades. Today, most primate facilities have dedicated and highly trained animal care technicians who go to great efforts to ensure the physiological and psychological well being of the primates in their charge. These caretakers work closely with the animals, and as a result, often develop strong relationships with them. Once discouraged and considered a potential threat to scientific objectivity, such positive relationships are now seen as important components to animal care. Positive interactions between caretakers and primates can benefit the primates by reducing their stress and improving their overall well-being which can, in turn, help the scientific endeavor. Further, providing the best possible care is our moral responsibility. However, there can also be emotional costs associated with caring for nonhuman primates in research facilities, particularly when animals become ill or have to be euthanized. Facilities can do much to help ease this conflict. High quality and conscientious animal care is good for the animals, good for the science, and good for public perception of research facilities.

Keywords

animal care; positive reinforcement training; animal well-being; animal memorial

Animal care for nonhuman primates [NHPs] in biomedical facilities has undergone major changes in the past few decades. At the start of the 20th century, there were few mandatory requirements for captive animals in research environments. Many researchers and veterinarians did not believe that animals had complex mental states or could feel pain. This attitude has changed as the scientific community has learned more about animal behavior and the effects of research and husbandry practices on behavior and physiology of research subjects.

Today, animal care practice consists of more than simply feeding animals and removing waste. Biomedical facilities have dedicated and highly trained animal care technicians, who are taught to notice the signs of pain and distress in the animals. Most primate facilities have at least one full time veterinarian; the larger primate centers typically have several, some of whom are specialists in areas such as dentistry or surgery. Further, an increasing number of primate facilities have one or more behaviorists who attend to the psychological well being of the primates. In many ways, the care that is provided to NHPs at research facilities is analogous to that enjoyed by well-insured citizens of the U.S. Such high-quality care requires the dedication and devotion of those working with the primates, especially the caretakers who often form very close relationships with these animals. While this level of

care is vital to the scientific endeavor, there are inherent and undeniable ethical and emotional challenges and dilemmas associated with forming close relationships with subjects of animal research. This commentary will discuss some of the scientific, moral, and emotional issues associated with caring for nonhuman primates in research facilities.

Scientific considerations of caring

Simply put, high quality science depends on high quality animal care. It has long been established that animals who are sick or are in pain or distress are not reliable subjects for most scientific studies. Psychosocial stressors can alter the hypothalamic-pituitary-adrenal axis as well as cardiovascular function [e.g., Gerber et al. 2002; von Holst 1998] in nonhuman primates and other laboratory animals. Reproductive and immunological functions may also be compromised by emotional stress [Betha et al. 2008; Rogers et al. 1999]. These physiological and immunological changes can affect a variety of research outcomes. Because individuals can vary widely in their physiological and behavioral response to stress, stress can increase experimental variability [Schapiro 2000; Weed and Raber 2005]. Additionally, stressed or emotionally compromised animals have a greater risk of developing maladaptive behaviors such as self-directed aggressive behavior [e.g., Novak 2003], which can also adversely affect research. Therefore, high quality animal care, which includes identifying and reducing distress, is important for optimal scientific validity.

There are many animal care practices in place today that can help decrease stress and increase well being for nonhuman primates in biomedical facilities. One such practice is promoting a strong, positive relationship between the caretaker and the nonhuman primates [Reinhardt 1997]. This relationship can be formed through positive daily interactions such as providing enrichment [Bayne et al. 1993], or play [Baker 2004; Manciocco et al. 2009]. Positive interactions with caretakers can reduce abnormal behavior, increase species appropriate behaviors such as grooming, and improve well being for a variety of primates, including marmosets, macaques and chimpanzees [Baker 2004; Bayne et al. 1993; Manciocco et al. 2009; Reinhardt 1997; Waite et al. 2002]. These relationships can also promote coping skills [Rennie and Buchanan-Smith 2006] and help mitigate stress reactivity towards novel objects or situations. For example, Miller and colleagues [Miller 1986] found that chimpanzees were less anxious when confronted with novelty in the presence of their trusted caretaker than when the caretaker was absent. Further, such bonds can facilitate the research by allowing human observers to approach the animals easily and safely [Lehman 1992]. Primates are more likely to sit calmly in the front of their cage when they trust their caretakers than when they do not. This relaxed response to the presence of humans can facilitate daily observations and health checks as well as research procedures.

Another practice that can improve well-being for NHPs is the use of positive reinforcement training (PRT) to train animals to cooperate with common husbandry and research procedures such as remaining stationary for injection. Positive reinforcement training is a type of training in which the trainer reinforces desired behaviors (e.g., presenting a body part) by rewarding the subject when it performs the behavior [e.g., Pryor 1999]. These techniques have been used to successfully train primates to perform various tasks, such as present a body part for injection [Priest 1991; Schapiro et al. 2003], take oral medications [Klaiber-Schuh and Welker 1997], and remain stationary for venipuncture [Coleman et al. 2008; Laule et al. 1996]. PRT techniques can reduce the stress and fear associated with common management procedures [e.g., Bassett et al. 2003; Laule et al. 2003], and thus reduce stress-related variability in data. In addition, training can reduce the need for pharmacological restraint. Ketamine HCl, an anesthetic agent commonly used to sedate primates, has been correlated with increased cortisol levels [Crockett et al. 2000], decreases

in leukocytes [Hall and Everds 2003], and decreases in appetite after recovery [Crockett et al. 2000; Springer and Baker 2007], all of which can affect various research paradigms.

Promoting positive interactions between human and nonhuman primates can help decrease stress and improve well being of NHPs. However, it must be done in a thoughtful and informed manner, as it can backfire even with the most dedicated animal care technicians. While caretakers generally have the best interest of the animals at heart, they sometimes make decisions based on their own perception of what animals want, which is not always good for the NHP or the science. One example of this issue occurs with favoritism. Most, if not all, caretakers develop particularly strong attachments to one or a few selected animals in their care. They often spend more time with these favorites, providing additional treats or toys. Not only can this favoritism lead to a decrease in technician attentiveness to other animals [Russow 2002], it can also have consequences for the favorite primate and, in turn, the research. Often, the favored animal has traits or characteristics that make it appealing to more than one caretaker. If each of these caregivers provides extra treats to a particular NHP, it can lead to unhealthy weight gain. In addition, playing favorites with one individual in a room can upset the dynamics in the room. At our facility a favorite monkey (“Sammy”) received extra treats from his caretakers. Sammy, a relatively low ranking monkey, was located across from a dominant animal in the room. Every time Sammy received treats, the dominant monkey, who had not received anything, threatened him. Unable to threaten back because of his subordinate status, Sammy responded by biting himself. After figuring out these dynamics, we moved the monkeys and the self-biting stopped. We also cautioned the caretakers against providing extra treats to only their favorite animal, as it can have unintended consequences for that individual.

There are other examples of how good intentions on the part of caretakers can result in untoward outcomes. Research subjects may be prohibited from receiving particular items such as food treats or other enrichment due to the scientific protocols. Some caretakers “feel bad” for NHPs with these protocol restrictions, and secretly provide them with prohibited items. The technicians generally do this because of the sympathy they feel for the NHPs, but it can have repercussions for the research. Similarly, primate infants reared in the nursery are often given excessive human attention by well meaning care staff. However, this human interaction is sometimes provided at the expense of providing more species-appropriate interactions with conspecifics. Primates reared without appropriate conspecific socialization early in development are at a higher risk of developing behavioral problems later in life [e.g., Bellanca and Crockett 2002; Novak 2003; Rommeck et al. 2009].

Facilities can help to reduce these kinds of inappropriate, though well-intentioned, interactions by teaching technicians and caretakers about primate behavior and how to properly interact with captive NHPs. At our facility, we talk about these issues with new animal care staff. We also bring up the example of Sammy when we train new caregivers on how to interact with monkeys. We remind them to pay attention to all the animals in the room, not just their favorite. We have also found it very helpful for investigators to explain their research protocols to caretakers, particularly if the study involves some sort of protocol restriction. Caretakers and others are less likely to break the protocol (e.g., provide restricted items) if they understand why the restriction is important to the study.

Moral considerations of caring

The past few decades there has been growing debate about the use of animals, particularly NHPs, in the laboratory. This debate is beyond the scope of this commentary. However, few would disagree that when animals are used in research, we have a moral and ethical responsibility to provide them with humane, high quality care and ensure that they are free

from unnecessary pain or distress. This idea is implicit in policy statements or guidelines of many professional organizations that deal with primates in research facilities, including the American Society of Primatology [ASP 2001], the International Primatological Society [IPS 2007], the American Psychological Association [APA 1992] and the American Association of Laboratory Animal Science [AALAS 2007].

What constitutes morally acceptable practices in animal care is defined by the institution as well as the community in which the institution is located. Of course there are some practices, such as animal abuse, that are not acceptable at any institution. However, research facilities have different and unique cultures, and animal care and research practices morally acceptable in one facility may be unacceptable in others. This point is illustrated in a study by sociologist Arnold Arluke [Arluke and Sanders 1996] in which he interviewed animal care and research technicians at two primate facilities. At one facility, the technicians viewed the primates as objects, and often used intimidation and physical strength to get the primates to perform certain tasks (e.g., move into a transfer box). The technicians at the second facility treated the primates with respect, and had a great deal of empathy for them. These technicians often spent their breaks with the primates. Not surprisingly, the health and well being of the primates was better in the second facility than the first [Arluke and Sanders 1996]. While animal care practices in general have evolved since the publication of this study, differences in technician attitudes as well as acceptable practices across primate facilities remain. For example, some facilities forbid technicians from naming their primates, while others encourage this practice as a way to improve the human-animal bond.

There are ways in which administrators and managers can foster a positive culture of animal care in their facilities. Managers and supervisors directly influence the work force by their hiring practices. The managers at the second facility in Arluke's study [Arluke and Sanders 1996] hired people who considered themselves "animal people" and showed interest in the primates during interviews. Many of their hires also had some ambivalence about using animals in research [Arluke and Sanders 1996]. In addition, managers and supervisors can ensure that caretakers have adequate time to interact with the primates in their care. This time could be spent providing enrichment, training, or engaging in other positive interactions with the NHPs. Because it is often not directly related to husbandry or research tasks, this time is often skipped when technicians are busy. However, this time should be protected and prioritized as a long-term investment that is necessary for developing bonds between caretakers and primates. Further, the Institutional Animal Care and Use Committee (IACUC) has a significant role in setting the moral tone for the facility. The IACUC ensures that the facility meets its moral and ethical responsibilities of animal care. In addition, the IACUC is responsible for making sure that all protocols adhere to the "Three R's"; Reduction, Refinement, and Replacement [Russell and Burch 1959], and has the power to prevent protocols that do not follow these principals from proceeding. The IACUC can therefore influence the culture of caring within the institution by supporting and promoting exemplary animal care practices.

Resolving the moral issues related to primates in research is at least as difficult for those who work in the field as it is for the general public because of the relationships that are formed with the animals. While most caretakers agree, in principle, with the need for animals in research, they may still feel morally conflicted about their role in it. The duality of working with animals that are used in research may result in feelings of guilt or uneasiness in care staff [Arluke 1999]. Caretakers may feel morally conflicted by caring for the NHPs on the one hand, and participating in invasive studies on them on the other. They may feel particularly conflicted if they do not see how the study will advance human or animal health. Even with knowledge about a study's greater good, caretakers may still feel uneasy if a study is not ethically acceptable to them, if the study is invasive, or if the study

involves a particular individual (i.e., a favorite animal). Harold Herzog [2002] proposed several ways in which research institutions can help reduce the moral conflict faced by caretakers and others. First, institutions can publically acknowledge that these moral conflicts exist. Second, scientists can explain the importance of their studies, as well as the reasons why certain procedures are necessary to those working closely with the animals. Third, institutions can help reduce moral dilemmas faced by caretakers by providing them a voice in ethical decisions. Sitting on committees that oversee the use of animals, such as the IACUC helps caretakers feel like their opinions and moral concerns are being considered. Lastly, institutions can support the formation of strong bonds between caretakers and the animals. Such bonds not only help caretakers feel like they are doing something good for the animals which can help assuage guilt, but they can also promote better care.

Providing excellent care not only helps the caretaker and the science (as well as the primates), but is also one of the best ways we have to address the ethical and moral concerns of the general public regarding the use of animals in research. At our facility, we find that the public is more accepting of the use of animals when they are comfortable with the care the animals are receiving. We provide tours for over 3,000 persons each year, during which visitors learn about the science that is being conducted, and about the care our animals receive. Several of these visitors are conflicted about the need for animals in research, but are generally reassured when they learned how much effort is expended by the care staff on behalf of the animals, and the extent to which laws protect research animals and provide for their welfare.

Emotional considerations of caring

Benefits of caring

The majority of caretakers in biomedical laboratories today chose that career because they have a strong interest in animals [Chang and Hart 2002]. As a result, most caretakers develop some sort of emotional connection to the animals for whom they care [Arluke 1999]. The ability to work closely with animals, particularly monkeys or apes is generally rewarding to caretakers. The opportunity to engage in positive interactions with the animals leads to increased morale and job satisfaction, which in turn lead to better care and improved animal well being [Waite et al. 2002]. In addition, there are other emotional benefits to caring for NHPs, including improved self worth, increased knowledge about animals, and a sense of doing something for the greater good.

Costs of caring

There are also emotional costs associated with caring for nonhuman primates in research facilities. It can be emotionally difficult for technicians when animals under their care become ill or have to be euthanized for humane or scientific reasons. It is particularly difficult for animals with whom they have developed a bond. Because of the emotional investment, the loss of a nonhuman primate can be similar to the loss of a pet or a friend. Many caretakers report feeling depressed after a primate for whom they cared is euthanized.

An increasing number of institutions are taking steps to help address the emotional consequences of caring for animals by providing their staff with the opportunity to pay tribute to the animals [Herzog 2002; Iliff 2002]. These tributes can take several forms, from memorial plaques to religious ceremonies. In Japan and other Asian countries, it is not uncommon for research facilities to have annual memorial ceremonies as a way to pay respect to the animals [Iliff 2002]. These ceremonies are often religious, but may be secular as well. For example, the Primate Research Institute (PRI) at Kyoto University in Japan, has held a "Monkey Memorial Service" every year since 1973 [Asquith 1983]. These services honor the monkeys who died of either natural or research-related causes at the PRI during

the year. The attendees gather at a stone monument and listen to various speakers, who may include PRI administrators, veterinarians and Buddhist priests. Speakers often talk about their own personal experiences with the primates. Flowers are then offered to the spirits of the deceased monkeys. While less common than in Asia, such tributes are gaining popularity in the US and Canada. In 1993 the University of Guelph, Ontario, Canada was the first North American university to hold such a tribute. Their memorial was designed to acknowledge and raise awareness about the animals used for teaching and research [Taylor and Davis 1993]. Other facilities that have tributes to animals utilized in research include Merck Research Laboratories [Iliff et al. 2000], University of Washington School of Medicine [Lynch and Slaughter 2001], and State University of New York, Delhi [Iliff 2002]. At the Oregon National Primate Research Center, we are currently building an animal remembrance, consisting of a plaque dedicated to the animals and a private area in which the caretakers and others can go to reflect. Regardless of its exact nature, this sort of tribute allows animal caretakers- as well as the scientists and others- a way to recognize the loss as well as the important contributions the animals have made. It also provides people with an opportunity to discuss and share their feelings in a supportive environment.

Conclusions

One important outcome of high quality animal care is the close relationship that often forms between the caretaker and the primate. This relationship can be formed through positive daily interactions (e.g., providing enrichment; [Bayne et al. 1993], positive reinforcement training [Bayne 2002; Bloomsmith et al. 1997] or by unstructured interactions such as play [Baker 2004; Manciooco et al. 2009]. Once discouraged and considered a potential threat to scientific objectivity [Wofle 2002], such positive interactions are now encouraged by many facilities. Studies have shown that these sorts of relationships can benefit both the caretaker as well as the research animal [Davis 2002; Rennie and Buchanan-Smith 2006]. Of course, it is important to provide consistent care to animals on research studies. Finally, the moral and emotional consequences of caring for animals should not be ignored or minimized. Institutions and caretakers benefit when grief associated with the loss of animals is acknowledged and supported. High quality and conscientious animal care is good for the animals, good for the science, good for the caretakers, and good for public perception of research facilities.

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