

Position Statement

“Functionally Appropriate Nonhuman Primate Environments” as an Alternative to the Term “Ethologically Appropriate Environments”

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The American Society of Primatologists (ASP), the Association of Primate Veterinarians (APV), and the American College of Laboratory Animal Medicine (ACLAM) have come together to develop this position statement in which the term “functionally appropriate nonhuman primate environments” is proposed as a better descriptor and as an alternative to the previously used term, “ethologically appropriate environments” to describe environments that are suitable for nonhuman primates involved in biomedical research. In 2015, the United States Department of Agriculture requested comments on a petition which called for amending the Animal Welfare Act so that all research primates would be housed in “ethologically appropriate physical and social environments.” We are critical of this term because: (1) it does not provide clarification beyond that in current regulatory language; (2) it does not provide for balance between animal welfare goals and the reasons why the primates are housed in captivity; (3) it discounts the adaptability that is inherent in the behavior of primates; (4) it conveys that duplication of features of the natural environment are required for suitable holding environments; (5) objective studies reveal that environments that appear to be more ethologically appropriate do not necessarily better meet the needs of animals; and (6) using the term “ethology” is inherently confusing. We propose that the term “functionally appropriate nonhuman primate environments” be used instead, as it emphasizes how environments work for nonhuman primates, it better describes current activities underway to improve nonhuman primate welfare, and the balance that is achieved between meeting the needs of the animals and the requirements of the research in which they are involved.

Abbreviations: APHIS, Animal Plant Health Inspection Service; APV, Association of Primate Veterinarians; ASP, American Society of Primatologists; EAE, ethologically appropriate environments; IOM, Institute of Medicine; NHP, nonhuman primates.

Introduction

History of the Term “Ethologically Appropriate Environments”.

The term “ethologically appropriate environments” (EAE) was first published in the report of the Institute of Medicine (IOM) Committee on the Use of Chimpanzees in Biomedical and Behavioral Research.¹⁸ On page 4 of that report, the IOM committee wrote, “The animals (i.e., chimpanzees) used in the proposed research must be maintained either in ethologically appropriate physical and social environments or in natural habitats.” This new term, coined for environments specific to NIH-owned *Pan troglodytes*, was defined subsequently by the “Working Group on the Use of Chimpanzees in National Institutes of Health-Supported Research”. This Working Group, established after the acceptance of the IOM report, was to advise NIH on how to implement the recommendations from the report. The Working Group first defined “ethologically appropriate physical and social environments” as environments that “not only allow, but importantly, promote the full range of natural chimpanzee behaviors.”¹¹ The Working Group went on to define the requirements needed to meet the term “ethologically appropriate

environments” through a number of recommendations for chimpanzee care and management including: minimum social group size; available space; outdoor access year round with natural substrates; climbing, foraging and nesting opportunities; opportunities for choice and self-determination; behavioral specialists involved in their care; positive reinforcement training requirements; personnel training; and animal records requirements with individualized management plans for the chimpanzees. All of these recommendations were proposed as features of EAE specifically for *Pan troglodytes* used in research environments. In addition a process was outlined for evaluation of future chimpanzee research protocols with regard to these recommendations. However, with the November 18, 2015 announcement by the Director of NIH that all of the NIH-owned chimpanzees are now eligible for retirement from research,¹⁰ these recommendations and use of this term for chimpanzee care will not be implemented. To date the construct of EAE, applicable only to chimpanzees, is not being enforced during the transition plan of chimpanzees to sanctuaries. It is important to note that this term has not been tested, and the IOM Committee did not consider any species other than *Pan troglodytes*.

The chimpanzee specificity of the term “EAE” is known and documented. In his public comments to APHIS, Dr. Jay Kaplan, who was a member of the IOM Committee, states that the committee reached consensus that... “the term was meant to convey a performance rather than engineering standard, and was meant

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to be specific to chimpanzees, i.e., great apes.”¹⁹ He further states that, “Neither the IOM document nor the background discussions provide clarity concerning the application of the term ‘ethologically appropriate’ to monkeys or any species other than chimpanzees.”

In 2015, the United States Department of Agriculture’s Animal Plant Health Inspection Service (APHIS) requested comments on a petition submitted to them (“To Establish Criteria to Promote the Psychological Well-Being of Primates as Required by the Animal Welfare Act (7 U.S.C. § 2143(a)(2)(B)), Including Adopting the “Ethologically Appropriate Environments” Accepted by the National Institutes of Health with Respect to All Primates Used in Research”).²⁷ This petition called for amending the Animal Welfare Act so that all research NHP would be housed in “ethologically appropriate physical and social environments” as a minimum requirement for promoting their psychological well-being. The petition stated that, “...NIH’s newly accepted recommendations for ethologically appropriate environments for chimpanzees provide ... a baseline that should be adopted with appropriate modifications for all primates held in laboratories” (<https://www.regulations.gov/document?D=APHIS-2014-0098-0856>, p 4).

The ASP, APV, and ACLAM submitted comments on the petition, which included comments on the use of the term, “ethologically appropriate environments.” In this position statement we will review those points and propose an alternative term that we believe is more appropriate. While a final decision with regard to the outcome of the petition has not been made, the critiques of the terminology in the petition focused our attention on the need for a better term. We suggest that, whether the petition is accepted by USDA or not, the term “functionally appropriate nonhuman primate environments” is a superior descriptor for a performance standard applicable to the management of nonhuman primates. This term better describes what has been accomplished in the past and is more pertinent to the research setting.

Discussion

Critique of the Term “Ethologically Appropriate Environments”.

1. Additional Value is Questionable: The term “ethologically appropriate environments” does not provide additional clarification beyond that in current regulatory and scientific language. It is unclear how it differs from 1) the current language in the AWA, requiring that “physical environment in the primary enclosures must be enriched by providing means of expressing non-injurious species-typical activities.”;³⁵ 2) APHIS’s Primate Environmental Enhancement Team indicates that “facilities should be required to enhance the environment of nonhuman primates in a way that promotes the expression of a wide variety of positive, normal behavior”;¹ 3) common criteria for well-being such as the “... ability to engage in beneficial species-typical behavior”;²⁶ and 4) goals for environmental enhancement programs which state “the goal of behavioral management is to have animals that...display a variety of species-typical behavior.”²⁸ So there is already a long-standing set of principles and practices that address the goal of promoting species-typical behaviors through environmental modification, but what seems to be lacking is the best phrase to label this approach.

2. The Reasons NHPs are Kept in Human Care Should be Incorporated Into Determinations of Appropriate Environments: NHP research has been essential to understanding the biology and behavior of our closest living relatives, which in turn may impact conservation efforts and help solve human medical problems—both the basic biology of human disease as

well as treatments and cures for such diseases.³¹ Optimization of animal welfare is critical to the outcome and reproducibility of research with NHP. It is the importance and ultimate value of the research that is the justification for these primates being bred and held in captivity. Therefore, the approach to defining appropriate environments for NHP in research should include consideration for meeting the animals’ needs and accommodate the requirements for research minimizing confounds while providing functional environments that promote well-being. In a zoo setting the justification for the animals to be in captivity relates to public education and conservation. Appropriate animal environments in that context should provide both for animal care and achieving goals related to public education and conservation (see Maple and Perdue 2013 for a discussion). The use of environments that incorporate components found in nature may be more easily implemented in zoo settings and do not confound the mission. Since modifications to a “natural” environment are made in both research and zoo settings, it is important to assure that these modified environments effectively meet the animals’ needs by evaluating their impacts on animal welfare. The EAE term does not seem to provide for the balance between animal welfare goals and the animals’ value to research, public education or conservation because it implies requiring the natural environment that may be at odds with requirements to meet these other objectives.

3. Behavioral Flexibility of NHP is Ignored: The EAE term does not account for the flexibility and adaptability that is inherent in the behavior of NHP. Recent published volumes that deal with broad aspects of behavior and ecology of wild NHP attest to the diverse habitats, social settings, physical environments, and population structures that define the more than 400 species of wild NHP.^{5,16,25,36} Wild NHP occupy positions on a broad continuum of habitat use from relative specialists (e.g., South American uacaris that inhabit flooded forests; gibbons that are limited to intact tropical forests in Asia) to relative generalists (e.g., several species of macaques, baboons, vervets, capuchins and marmosets). While species vary in their ability to respond to environmental conditions, most NHP naturally adapt to a wide range of physical settings. NHP in general are also relatively large-brained and long-lived mammals with slow reproductive rates, although they express some variability in socio-sexual strategies. Thus wild NHP express considerable intra-specific variation in habitat use and social structure on the basis of geography, ecology, demography, and season. It is not surprising that NHP living in captivity, particularly in research colonies, tend to be ecological and social generalists. Rhesus macaques, for example, are highly adaptable as indicated by their success in maintaining populations in many different environments including cities (e.g., the so-called “weed species” of macaques as noted by Richard et al.)³² Because wild NHP can exhibit considerable intra-specific variation with regard to their behavior, diets, use of space and social grouping patterns, there is no single environment that is “ethologically appropriate” for any given species. The behavioral flexibility that is inherent in the behavior of these NHP allows them to adapt behaviorally and physiologically to a variety of physical and social conditions. The term EAE fails to acknowledge this flexibility, while a functional approach does. The care of research NHP should be conducted within a context of understanding the effects of ecological and environmental influences on behavior, the degree of behavioral adaptability of the species involved, and the scientific research that is conducted on the species, to determine the range of appropriate conditions for housing and care. Such conditions should be carefully and empirically evaluated using

the scientific method. A functional environment will meet the needs of the animal living in it, including eliciting the expression of a range of species-typical behaviors.

4. Duplication of the Wild is Not Necessary for Promoting Welfare: The EAE term conveys that a duplication of features of the natural environment is required to create suitable holding environments (see “Confusion in Applying the Term Ethology to the Captive Setting”, below), but the more important factor is how the environment functions for animals. This focus on function currently guides environmental enhancement programs for laboratory NHP, which aim to provide opportunities for species-appropriate behavior without necessarily replicating conditions in the wild. From this perspective, it may not matter to the monkey if she climbs a tree, or a telephone pole—she just needs the opportunity to climb. Attempting to precisely mimic wild conditions misses the mark of what is required for the health and well-being of NHP. Psychological and physical needs may be met without replicating the conditions in which NHP live in the wild, and there is a wide variety of ways to do this. For example, there is a burgeoning body of quantitative research empirically demonstrating that non-natural stimuli such as computer testing, music, videotapes, television viewing, positive human-animal interactions and training can provide enriching opportunities and have positive outcomes on multiple measures of the psychological well-being of NHP.^{2,3,4,9,14,17,37}

5. Naturalistic Appearance of Environments Not Always Most Effective: Environments that appear to be more ethologically appropriate do not necessarily better meet the needs of animals living in human care. The design of naturalistic animal environments in many modern zoos strives to match both the functional and the aesthetic aspects of natural settings²⁹—so that the enclosures work well for the animals and also appear naturalistic to zoo visitors, which has been shown to provide added educational value.²¹ However, even in naturalistic zoo enclosures, the animals sometimes prefer non-naturalistic components of their environment. For example, even in large outdoor enclosures with grass and trees, gorillas preferred being near their holding building, a very unnatural element of their enclosure, and most of the gorillas spent more time than would be expected near walls in their enclosure.²⁹ One recent study reported on an analysis of 1,381 naturalistic and non-naturalistic animal enclosures in 63 Spanish zoos and concluded that naturalistic environments are not required to provide suitable environments for zoo animals.¹³ To assess the suitability of the environment provided within each enclosure, seven aspects related to the animals’ main biological requirements were analyzed. A relationship was found between naturalistic designs and the suitability of the environment for the species housed, such that most naturalistic enclosures (77.8%) provided suitable environments for their inhabitants, but importantly, a substantial proportion of non-naturalistic enclosures were also deemed suitable environments, although in a lower percentage (39.7%). All of the naturalistic environments which were judged to be non-suitable for the species failed to meet the criteria for appropriate space and structural elements to perform species-specific locomotor patterns. The study illustrates that a naturalistic design in itself is not a necessary characteristic of appropriate animal environments.

Even within zoos, the use of non-naturalistic technology has long been employed to promote zoo animal welfare. Markowitz^{23,24} was the first to attempt to use computerized and mechanized technologies to encourage animals to engage in problem-solving, species-typical locomotion, working for food, and hunting. Forthman-Quick¹⁵ described an integration of the

views of two groups within the zoo community at that time: some felt the best approach to habitat design was mimicking animals’ natural physical and social environments, while others felt an increased use of technology or “environmental engineering” led to more desirable outcomes for animals. Forthman-Quick concluded that both methods should be used to help zoos best care for their animals. More recently, technology such as computer touchscreens³⁰ is gaining popularity as it adds complexity, cognitive challenge, and novelty to the environments. Both zoo professionals and zoo visitors have positive attitudes about technology and want to increase its use.^{7,30} So there is a long history of zoos successfully using non-naturalistic elements in animal enclosures because they improve the function of the environment for the animal residents. Some zoo-based welfare scientists have concluded that “...natural behaviors should be an important consideration for many aspects of zoo management, but replicating the wild environment may not always lead to optimal animal welfare.”²²

6. Confusion in Applying the Term Ethology to the Captive Setting: Using the term “ethology” when referring to features of captive environments is inherently confusing because ethology is the scientific discipline of animal behavior that typically focuses on behavior under natural conditions, and views behavior as an evolutionarily adaptive trait. While ethologists have studied animal behavior in a variety of contexts (including in captivity), the core meaning of ethology is associated with scientists who study animal behavior in the wild, with an emphasis on species-typical behavior patterns in this condition. Avoiding the use of the word “ethology” keeps the focus on animals living in human-made environments, rather than using a word that potentially obscures this focus.

Proposed New Term: “Functionally Appropriate Nonhuman Primate Environments”. Since the construct of EAE has not yet been put into use, and it has a number of weaknesses as just described, it is timely to propose an alternative term that has a number of advantages over that phrase. The ASP, APV, and ACLAM agree that an alternative to EAE is needed, and propose the more applicable term “functionally appropriate nonhuman primate environments” (FAPE) be used instead.

This term will better apply to the environments of NHP involved in biomedical research, and it may apply to other settings as well. A functional environment could include elements of the natural environment (e.g., grass, trees), or it could have a more basic structure, but still elicit appropriate behavior from the animals and improve wellbeing, particularly if they are housed in socially-relevant configurations with adequate environmental stimulation. Desirable characteristics of appropriate environments should be identified based on function, rather than a superficial resemblance to the physical and social environments of wild NHP. FAPE better describes the activities being implemented at this time, and the balance that is achieved between meeting the animal welfare needs and the goals of the research in which they are involved. This approach recognizes the importance of both the physical and social environments to successful management and animal welfare. Since there are multiple strategies for addressing the behavioral needs of NHP, choices can be made among a variety of effective methods to allow tailoring of the environments to the requirements of research studies. Behavioral scientists in research facilities work closely with biomedical research scientists and veterinarians to make decisions and to modify study design and procedures to maximize the well-being of study subjects.

To identify what characteristics of the environment are the most useful in promoting species-typical behavior (i.e., the

combination of environmental enhancements that contribute to physical, social and psychological well-being), the use of objective scientific analysis is required. Various environmental conditions must be implemented and tested, so the relative benefits of each can be demonstrated. Established metrics for evaluating psychological well-being are already developed and should be employed. Such metrics have been derived from formalized behavioral assessments and physiological measures of stress and other measures of physical health,^{6,8,12,20,33,34} which allow assessment of the ability of a particular environment to support the welfare of NHP.

A Process for Further Development of the Construct of “Functionally Appropriate Nonhuman Primate Environments”. This position paper introduces the term FAPE, and it will be important to further refine this term by expanding upon the significant amount of study that has informed and improved the environments of NHPs involved in biomedical research. This process of refinement will require a multi-step process and input from experts in several fields. This process should include a thorough literature review of the behavior and ecology for each species or group of closely-related species of NHP held in laboratories. The literature from studies of the species in the wild and in captivity must be critically evaluated for relevance to welfare. Interviews with experts in the care of the species should be completed, as well as interviews with those who study the species in the wild environment. Next, a convergence of thinking from scientists and others working with the species in laboratories, zoos, and in the field, on major environmental features needed by the species to support their welfare should be identified. A “gap analysis” should be then conducted to isolate those crucial areas that have not yet been fully addressed in the scientific literature for each species or group of closely-related species so that future research could be planned. Research funding will need to be made available so that scientifically rigorous, quantified approaches can be taken to generate the needed information for each species. This process would focus research funding on areas that are agreed to be the most meaningful for continued rigorous investigation and would help to develop a cohesive, organized approach within the industry. Finally, a mechanism should be developed for integrating established and future research findings into standards for identifying environments that meet these criteria.

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