Report on Primate Experimentation in the United States

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Executive Summary

More than 105,000 primates are currently held in 15 federal laboratories, 159 research facilities, and seven federally-funded National Primate Research Centers. The majority of experiments on primates are conducted with taxpayer dollars.

Common species of primates used in laboratories include macaques, baboons, marmosets, tamarins, and squirrel monkeys.

The vast majority of primates exhibit abnormal behaviors in laboratory housing. They experience immense suffering before, during, and after approved experimental procedures even when protocols are correctly followed. Behavioral and physiological abnormalities in captive primate populations contribute to poor data and skew experimental results.

Federal animal protection laws exist but dictate only minimum standards for primate care. These laws are routinely waived or violated. Loopholes allow experimenters to evade even basic standards. Problems with enforcement are also widespread, as fines are too small to be effective deterrents and licenses are rarely permanently revoked.

Awareness of violations referenced in this report come from several sources, including United States Department of Agriculture (USDA) Animal and Plant Health Inspection (APHIS) inspection reports, veterinary records, whistleblower testimony, and undercover investigations.

I. Introduction

In the United States, there are 15 federal laboratories and 159 research facilities that use primates in experimentation. Many of these institutions receive contracts or grants from the government; however, government and facility reports document widespread suffering and habitual violations of federal animal protection laws. Leading scientists acknowledge that the majority of experimental results cannot be reliably translated to humans.[1,2] Consequently, there is little to show for the considerable investment made by the American public and the costs borne by the animals. Unnatural laboratory settings do not meet the ethological needs of intelligent, vulnerable primates and introduce

[1] Bailey, J. (2014). Monkey-based research on human disease: The implications of genetic differences. *Alternatives to Laboratory Animals, 42*(5), 287-317.

[2] Pound, P., & Bracken, M. B. (2014). Is animal research sufficiently evidence based to be a cornerstone of biomedical research? *The BMJ, 348*, g3387.

confounding variables stemming from confinement-induced stress, further undermining the value of the study data.

In this report, we will first describe the experience of primates in U.S. facilities, focusing on two large research centers as examples. Next, we will discuss the problems with government and institutional oversight, limitations in the value of experiments on primates in furthering our understanding of human disease and biology, and impediments to meeting the complex physiological and psychological needs of primates in the laboratory setting.

II. Pain, misery, and abuse in federally-funded and private primate facilities

The attached table briefly outlines a history of violations and other problems at the seven federally-funded National Primate Research Centers (NPRCs), four Contract Research Organizations (CROs), and a handful of other research institutions. Information for this table was compiled primarily from United States Department of Agriculture (USDA) Animal and Plant Health Inspection (APHIS) inspection reports and also includes data obtained from veterinary records, whistleblower testimony, and undercover investigations.

The National Institutes of Health (NIH)-supported Yerkes National Primate Research Center housed at Emory University in Atlanta, GA, exemplifies the difficulties with primate experimentation. According to records dating back to 1997, primates at Yerkes have suffered accidental deaths stemming from negligence or inadequately trained personnel. Primates died from starvation, strangulation, suffocation, heat stroke, pneumonia, asphyxiation from their own vomit, self-mutilation, being run through a scalding cage washer, having painful abscesses all over the body, severe pulmonary emphysema due to an improperly connected anesthesia apparatus, seizures, exsanguination, unsafe housing and handling, fighting and attacks, dermatitis, trauma and shock, sepsis, bleeding and swelling of the brain, diabetes, necrotic gut, wounds, having blood in the lungs, hepatitis, abdominal problems, and for "unknown reasons."

In institutionally-approved experimental protocols, infants were purposefully paired with mothers who would reject, restrain, drag, crush, roughly groom, throw, hit, bite, sit and step on, and abusively carry their babies.[3] Other infants were separated from their mothers, restrained in wooden boxes, and tormented with loud noises. In addition to being subject to experimental procedures, animals were denied adequate, safe, and sanitary living spaces and psychological enrichment, were driven to self-induced alopecia, and endured starvation and procedures that did not contribute to the objectives of the studies.

Between 1996 and 2007, the USDA fined Emory more than $30,000 for willful violations of the Animal Welfare Act (AWA), including an incident in which a squirrel monkey was

[3] Maestripieri, D., et al. (2006). Early maternal rejection affects the development of monoaminergic systems and adult abusive parenting in rhesus macaques (Macaca mulatta). *Behavioral Neuroscience, 120*(5), 1017-1024.

killed when she was left in her cage and sent through a boiling hot industrial cage washer, and in which personnel forcibly restrained monkeys with duct tape.[4] For many research facilities, these fines are minimal in comparison to their funding, and do little to enforce adherence to AWA provisions. To put the Emory fines into perspective, according to NIH Research Portfolio Online Reporting Tools (RePORT), the university received a total of $245,856,492 in NIH funding in fiscal year 2007.

Shin Nippon Biomedical Laboratories, or SNBL, a Japanese-owned contract research organization with animal facilities in Everett, WA, and Alice, TX, is representative of commercial primate laboratories. Since 2002, primates at SNBL have suffered unintentional deaths resulting from trauma during capture, tuberculosis, starvation, fighting, toxicity, overcrowding, being run through a scalding cage washer, strangulation, entrapment, excessive restraint, hyperthermia, multiple organ failure, dehydration, hypoglycemia, suffocation, internal bleeding, and "unknown causes." Other primates, in addition to being subject to experimental procedures, were forced to live in unclean and unsafe enclosures; were denied adequate veterinary care, humane euthanasia, safe food and water, the minimum living space required by federal regulations, and relief from pain and distress. They endured unnecessary and unapproved surgical procedures, excessive dosing with toxic substances, weight loss, skin rash, diarrhea, spinal contusion, injuries from fighting, starvation, necrotic lesions, lethargy, dehydration, entrapment, excessive force while handling causing bloodied noses, bruises, broken digits, near crushing, hypothermia, intimidation and torment from caretakers, tails being broken by slams in cage doors, continuous and frequent blood draws that destroyed veins, twisting of wrists resulting in swelling and injury, restraint for hours, denial of food, and being hooked to metal tethers and infused constantly with cold intravenous saline causing constant shivering and teeth chattering.

Between 2006 and 2009, SNBL was fined $46,195 by the USDA for violations of the AWA, a paltry sum considering several government agencies—including the Department of Defense, the Centers for Disease Control and Prevention, and the Department of Health and Human Services—have signed contracts with SNBL worth more than $1 million. Despite these fines, the abuse of primates at SNBL continues and in 2016, after the USDA took the rare step of filing a lawsuit against SNBL for numerous infractions including the deaths of 38 monkeys, the company's license to sell primates was suspended for just 30 days (over the less busy holiday season) and the company was issued a paltry fine of $185,000.[5] Despite SNBL's long history of scofflaw behavior,[6] the USDA has refused to permanently revoke SNBL's license.

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[4] People for the Ethical Treatment of Animals (PETA) (2011). Monkey Breaks Out of Laboratory. Accessed 05 17, 2017. http://www.peta.org/blog/monkey-breaks-cruel-lab/

[5] People for the Ethical Treatment of Animals (PETA) (2016). Laboratory Gets Slap on the Wrist for Chronic Monkey Abuse. Accessed 05 17 2017. http://www.peta.org/blog/peta-protesters-flank-primate-laboratory-demand-closure/

[6] People for the Ethical Treatment of Animals (PETA) (2012) Imprisoned and Poisoned at SNBL: A Whistleblower Case. Accessed 05 17, 2017. http://www.peta.org/features/imprisoned-poisoned/

As these examples and the attached table demonstrate, violations of even the most basic humane standards run rampant in research facilities, and inadequate sanctions for AWA violations fail to motivate facilities to improve their practices. Furthermore, no experiments are prohibited by law, the AWA dictates only minimum standards for primate care, and allows experimenters to ignore these woefully inadequate standards provided they supply any sort of scientific justification, however specious.

III. Oversight of primate experimentation is ineffective

The AWA, enacted in 1966, decrees what the USDA deems to be the "minimum accepted standard" for the "treatment of animals in research, exhibition, transport, and by dealers."[7] The AWA and Animal Welfare Regulations (AWR) outline specific standards regarding the housing, husbandry, and transportation of primates.[8] However, research facilities repeatedly fail to adhere to these basic tenets set forth by federal law and the federal agency charged with enforcing these laws fails to hold them accountable.

In the early 1980s, a People for the Ethical Treatment of Animals (PETA) investigation into experiments being conducted by NIH-supported researcher Edward Taub at the Institute for Behavioral Research in Silver Spring, Maryland, prompted the introduction of several bills in the House and Senate addressing the treatment of animals in laboratories. The Silver Spring Monkeys case, as it came to be known, and the exposure of a baboon head wound laboratory at the University of Pennsylvania, where staff mocked severely-brain damaged primates, helped bring about the 1985 Improved Standards for Laboratory Animals Act, which included requirements for laboratories to address the psychological well-being of primates and mandated the formation of institutionally-based committees called Institutional Animal Care and Use Committees (IACUCs) to oversee research on AWA-regulated species at USDA-registered institutions.[9]

Since the passage of the 1985 amendment to the AWA, multiple government reports have documented failures on the part of IACUCs to carry out their legally mandated responsibilities, inadequacies in the USDA's oversight of research facilities, and ineffective enforcement of the AWA. In September 2005, the USDA Office of the Inspector General (OIG) published a scathing audit report describing a climate in which laboratories view fines for AWA violations as a "cost of conducting business."[10] The report noted that at almost one-third of facilities, IACUCs failed to ensure that experimenters considered alternatives to painful procedures. The report cited this failure on the part of IACUCs as being the *most frequent* AWA violation. The report further documented the failure of IACUCs to ensure that animals receive adequate veterinary

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[7] 9 C.F.R § 3.75-3.92

[8] *Animal Welfare Act.* Accessed 05 16, 2017. https://www.nal.usda.gov/awic/animal-welfare-act.

[9] Adams, B. A., Larson, J. (n.d.) Legislative History of the Animal Welfare Act: Introduction. Accessed 05 24, 2017. https://www.nal.usda.gov/awic/legislative-history-animal-welfare-act-introduction

[10] Office of the Inspector General, United States Department of Agriculture (2014) Audit Report: APHIS Animal Care Program inspection and enforcement activities, Report no. 33002-3-SF. http://www.usda.gov/oig/webdocs/33002-03-SF.pdf

care and to ensure that unnecessary or repetitive experiments are not performed on animals. In December 2014, a USDA OIG audit of USDA oversight of research facilities and its enforcement of the AWA determined that penalties for AWA violations were reduced by an average of 86 percent from AWA's authorized maximum penalty, even though these cases involved animal deaths and other serious violations. The OIG deemed that "reductions to this degree are too lenient and may not serve as an adequate deterrent for violators especially in cases involving egregious violations."[11]

In addition, OIG documented that IACUCs "are not always adequately monitoring experimental procedures on animals" due to insufficient or inadequate training, inconsistent monitoring, and lack of accurate reporting. OIG found that this deficiency therefore "reduced assurance that protocols are properly completed, approved, and adhered to and that animals are always receiving basic humane care and treatment."[11]

IV. The false assumption that experiments on primates are useful or necessary

In December 2011, following great public outcry over the use of chimpanzees in biomedical research, the National Academies of Sciences' Institute of Medicine (IOM) published a landmark report concluding that chimpanzee use in behavioral and biomedical research was "largely unnecessary."[12] A subsequent report issued by the National Institutes of Health (NIH) further determined that "research involving chimpanzees has rarely accelerated new discoveries or the advancement of human health for infectious diseases."[13] As a result, NIH cut funding for most of its invasive chimpanzee experiments, established new oversight mechanisms specific to chimpanzee use, and made plans to retire most federally-owned chimpanzees in laboratories to sanctuaries. Until that point, NIH had widely funded, conducted, and advocated for experiments on chimpanzees. The NIH and IOM reports reflect an impoverished review process in the oversight of experiments involving animals—and underscore the necessity of conducting comprehensive and systematic reviews to ensure that information gleaned from animal studies in a particular area of research is, in fact, advancing our knowledge in that area. Certainly, in light of the conclusion of the NIH and IOM reports that chimpanzees—our closest relatives with whom we share more than 98 percent of our DNA—have not markedly helped to advance our understanding of infectious diseases in humans, it seems highly suspect that other primates, with whom we share approximately 93 percent of our DNA, would offer more reliable data. Here we will give just a few examples of fields of research where evidence does not support the continued use of primates in experimentation.

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[11] Office of the Inspector General, United States Department of Agriculture (2014) Animal and Plant Health Inspection Service Oversight of Research Facilities. Accessed 05 16, 2017. https://www.usda.gov/oig/webdocs/33601-0001-41.pdf.

[12] Altevogt, B. M., et al. (2011). *Chimpanzees in Biomedical and Behavioral Research: Assessing the Necessity*. National Academies Press. Ed. Institute of Medicine (US) and National Research Council (US) Committee on the Use of Chimpanzees in Biomedical and Behavioral Research

[13] National Institutes of Health (NIH) (2013). Council of Councils Working Group on the Use of Chimpanzees in NIH-Supported Research. Accessed 05 17, 2017. https://dpcpsi.nih.gov/council/pdf/FNL_Report_WG_Chimpanzees.pdf

A. HIV/AIDS

In contrast to the sterile laboratory environment where considerable effort is taken to reduce variability, the real world is rife with rich complexity not captured in animal laboratories. Experimental animals are kept in pathogen-free environments and conditions that might contribute to disease in human patients, such as microbial infections, everyday germs, and allergens, are absent, likely altering the acquisition and course of the virus. Scientists have admitted that even after costly animal experiments, human data is still needed to determine if a drug is fit for the clinical setting. Rao and Alving of the U.S. Military HIV Research Program stated that "human clinical trials still appear to be the only reliable way to determine whether an HIV vaccine candidate will have activity or efficacy in humans."[14] In a comprehensive review of preclinical and clinical data, Bailey reported that of 85 candidate vaccines that were tested in 197 clinical trials, zero were successful; some drugs even increased the risk of HIV infections compared to the placebo.[15] As the associate editor of *BMJ* declared, "When it comes to testing HIV vaccines, only humans will do."[16]

Genetic and immune system differences between primates and humans weaken primate infectious disease research. For example, human T cells, lacking the siglecs (or "brakes") of some primate T-cells, respond differently to infection and to treatment.[17] Also, the primate TRIM5-alpha gene codes for a restriction factor that impacts responsiveness to retroviruses such as simian immunodeficiency virus (SIV), conferring some primates with greater resistance to infection, a function mostly lost in human TRIM5-alpha.[18]

Importantly, infected primate colonies are a public health risk. A paper by Roberts and Andrews states:

> During the past 60 years, individuals responsible for primate importation programs have observed morbidity and mortality typically associated with infectious disease outbreaks. These outbreaks have included infectious agents such as tuberculosis, Herpesvirus sp., simian hemorrhagic fever, and filovirus infections such as the Ebola and Marburg viruses. Some outbreaks have affected both animal and human populations. These epizootics are attributable to a variety of factors, including increased population density, exposure of naïve populations to new infectious agents, and stress.[19]

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[14] Rao, M., Alving, C. R. (2016). Adjuvants for HIV Vaccines. *Current Opinion- HIV and AIDS, 11*(6), 585-592.

[15] Bailey, J. (2008). An Assessment of the Role of Chimpanzees in AIDS Vaccine Research. *Alternatives to Laboratory Animals, 36*, 381-428.

[16] Tonks, A. (2007). Quest for the AIDS Vaccine. *BMJ, 334*, 1346-1348.

[17] Nguyen, D. H., et al. (2006). Loss of Siglec expression on T lymphocytes during human evolution. *PNAS, 103*(20), 7765-7770.

[18] Song, B., et al. (2005). Retrovirus Restriction by TRIM5alpha Variants from Old World and New World Primates. *Journal of Virology, 79*(7), 3930-3937.

[19] Roberts, J. A., Andrews, K. (2008). Nonhuman Primate Quarantine: Its Evolution and Practice. *ILAR Journal, 49*(2), 145-156.

Funding for infectious disease research currently being funneled into primate experiments would be better spent if allocated toward improving animal-free methods of research, particularly microfluidic technologies and mathematical models, sparing animals from painful diseases and safeguarding human workers and nearby populations from the potential for deadly outbreaks.

B. Neuroscience

The presumed necessity of primates in neuroscience research is based more on assumption and habit than on significant evidence. The argument that primates should be used for neuroscience studies because their brains more closely resembles humans' than do the brains of mice or rats is not sufficient proof that the primate is a particularly good model. Further, the argument that primate research has led to significant findings in the past when more sophisticated technologies were not available is not justification for its continued use when alternative methods now exist.

Experimenters point out that humans and primates share many neurological similarities; however, in such complex systems, small discrepancies lead to broad functional disparities, and thus varying physiological responses and outcomes. In the brain, humans and chimpanzees, our closest living relatives, have differential expression of approximately 34 percent of genes,[20] not taking into account differences in splice variants or protein translation.

Proponents of animal experimentation often cite neurodegenerative disease research as benefiting from the use of primates, when for this field especially, primate experimentation has not translated to treatments for humans beyond initial clinical stages. For Alzheimer's disease (AD), the clinical failure rate for new drugs is 99.6 percent and there have been no new discoveries aimed at slowing the progression of the disease for 10 years.[21]

Failures of clinical trials can partially be attributed to the unnatural ways in which neurodegenerative disease animal models are created. No non-human species develops AD, PD, Huntington's disease (HD), or amyotrophic lateral sclerosis (ALS) naturally, so physical and chemical lesioning and systemic administration of toxins are used to mimic symptoms of these diseases. Not only do these methods demonstrate lack of construct validity in animal models, but toxins act as acute stressors and as such create a response in these animals that is not present in human patients. The acute and immediate nature of many neurodegenerative disease models, along with the common use of young instead of aged animals, fails to capture the progressive nature of the disorders they aim to mimic.

[20] Arora, G., Polavarapu, N., McDonald, J. F. (2009). Did natural selection for increased cognitive ability in humans lead to an elevated risk of cancer? *Medical Hypotheses*, *73*, 453-456.

[21] Pistollato, F., et al. (2016). Alzheimer disease research in the 21st century: past and current failures, new perspectives and funding priorities. *Oncotarget*, *7*(26), 38999-39016.

Following a review of AD research, an interdisciplinary panel recommended that funding be moved away from animal studies and toward more promising techniques involving patient-derived induced pluripotent stem cell (iPSC) models, 'omic' technologies (genomics, proteomics, etc.), in silico models, neuroimaging, and epidemiological studies.[22] "Mini-brains," or 3D brain microphysiological systems, utilize iPSC-derived human cells to reproduce synaptic connections, neuron-glial interactions, and microenvironments that are uniquely human.[23] Technologies such as these have the opportunity to provide rapid knowledge about the human brain that primate research has failed over many decades to achieve. Continuing to fund experiments in which the so-called animal model only attempts to mimic the species of interest—humans—draws resources away from improving upon promising human-relevant imaging, microfluidic, and *in vitro* methods.

Finally, neuroscience research often involves a high degree of suffering for primates, as experiments are often invasive, lengthy, and psychologically traumatizing. The brain of an animal in a laboratory, subject to deprivation, isolation, and other adverse and unnatural events, is not a suitable surrogate for the brain of a human living in a diverse and interactive society.

V. Primates in laboratories are denied everything that is natural and important to them

A. Natural history of primates

More than 105,000 primates are held in laboratories in the United States.[24] Common species of primates used in laboratories include macaques, baboons, marmosets, tamarins, and squirrel monkeys. Of these, macaques comprise the overwhelming majority (98 percent), with callitrichids (marmosets and tamarins) also common. While there are wide variations in feeding behaviors, social structure, and environments for all species of primates in their natural setting, all primates engage in the following natural behaviors.

- Foraging for food
- Resting and sleeping
- Negotiating complex social groups and hierarchies
- Developing vigilance systems and establishing territory
- Breeding and caring for offspring (many species will cooperatively raise offspring)
- Engaging in problem solving and high levels of personal choice and control over their environment

[22] Pistollato, F., et al. (2016). Alzheimer disease research in the 21st century: past and current failures, new perspectives and funding priorities. *Oncotarget, 7*(26), 38999-39016.

[23] Pamies, D., et al. (2016). A Human Brain Microphysiological System Derived from Induced Pluripotent Stem Cells to Study Neurological Diseases and Toxicity. *ALTEX, 2*, 1609122

[24] USDA APHIS. (2016) Annual Report Animal Usage by Fiscal Year. https://www.aphis.usda.gov/animal_welfare/downloads/7023/Annual-Reports-FY2015.pdf

It is difficult to address the complex social, psychological, and physical health needs of primates in the artificial laboratory setting. As a result, primates in laboratories suffer from high rates of abnormal behaviors and physiological derangements due to chronic stress.

B. Common abnormal behaviors

In a 2003 study that examined abnormal behaviors in laboratory-housed rhesus macaques, of the 362 monkeys surveyed, 321 exhibited at least one abnormal behavior, and many demonstrated multiple abnormalities.[25] While this study was restricted to just one laboratory, a 2017 study found that 89 percent of primates housed in laboratories suffer from behavioral abnormalities due to chronic stress and the inability to express natural behaviors.[26] Additionally, in another study 14 percent of monkeys exhibited self-injurious behavior, the most extreme and damaging form of behavioral abnormality.[27] According to primate expert Dr. Mollie Bloomsmith, "abnormal behaviors are generally interpreted to indicate that the environment is lacking in some way to adequately support the well-being of the primate."[3]

Common abnormal behaviors include:

- Stereotypies – pacing, rocking, head twisting, bouncing
- Abnormal oral behaviors –regurgitation and re-ingestion, eating feces, smearing feces
- Self-directed behaviors – digit sucking, eye poking, self-clasping
- Saluting – repeatedly pressing the hand to the head, a precursor to self-injurious behavior
- Pulling out and eating hair, either one's own or a partner's
- Bizarre postures, including floating limb syndrome in which an arm or leg moves in a strange fashion and the monkey does not seem to recognize the limb as his or her own. Monkeys often attack their own limbs as a result.
- Self-injurious behavior (biting, self-mutilation that can lead to significant injury and morbidity, and euthanasia in extreme cases)

Common laboratory practices, such as individual housing at a young age, housing individually for long periods, greater numbers of procedures and blood draws, and nursery rearing (away from their own mothers) have been linked to the development of abnormal behaviors.[2] Additionally, factors such as being reared indoors, being moved to new rooms often, social separations, lower cage levels, and smaller cages also cause

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[25] Lutz, C., Well, A., & Novak, M. (2003). Stereotypic and self-injurious behavior in rhesus macaques: A survey and retrospective analysis of environment and early experience. *American Journal of Primatology*, *60*(1), 1-15.

[26] Bloomsmith, M. (2017) Understanding abnormal behavior and fear-related behavior in primates. USDA Nonhuman Primate Welfare Symposium, March 28-29, 2107. Kansas City, MO.

[27] Novak, M. (2003). Self-injurious behavior in rhesus monkeys: New insights into its etiology, physiology, and treatment. *American Journal of Primatology*, *59*(1), 3-19.

chronic stress leading to behavioral derangements.[28] Even when primates are housed in pairs, which has been shown to mitigate some of these issues, social groups are frequently split up when one or more of the monkeys are needed for studies.

C. Rearing practices

Laboratory housed primates who are reared in isolation or in nurseries are at high risk for abnormal behaviors. Primates are often removed from their mothers at birth to be bottle-fed and either housed singly or in cohort groups with an inanimate surrogate mother. In addition to the extreme trauma and distress that infants suffer when removed from their mothers at a young age, these primates frequently develop abnormal behaviors, particularly stereotypies, floating limb syndrome, and self-injurious behavior.[29] They are difficult to treat and to house socially in the future, because they do not recognize or understand normal monkey behavior. Floating limb syndrome, in particular, is now thought to be almost solely the result of unnatural rearing practices.[30]

D. Hair loss

Alopecia, or hair loss, is a common problem in rhesus macaques, who as previously noted are the most frequently used species in experimentation. A 2013 survey of 1,258 laboratory-housed rhesus macaques found that rates of alopecia ranged from 34 percent to 86 percent, with an average of 49 percent. Rates of hair pulling were found to be substantially lower than rates of overall hair loss, ranging from 0.6 percent to 20.5 percent.[31] This leaves the vast majority of hair loss in laboratory housed primates unaccounted for and its cause not well understood. Factors such as housing conditions, nutritional deficiencies, skin disorders, aging, and reproductive state may contribute to alopecia. However, stress of the captive environment is a primary contributing factor, and hair loss is a sign of poor welfare.[7] More recently, anecdotal evidence has emerged that may indicate a link between indoor housing, which is the norm for laboratory-housed primates, and lack of exposure to sunlight to hair loss. Primates relocated from laboratories to an outdoor sanctuary have regained their hair.[32]

E. Chronic stress in the laboratory environment

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[28] Gottlieb, D., Capitanio, J., & McCowan, B. (2013). Risk factors for stereotypic behavior and self-biting in rhesus macaques (Macaca mulatta): Animal's history, current environment, and personality. *American Journal of Primatology, 75*(10), 995-1008.

[29] Vandeleest, Mccowan, & Capitanio. (2011). Early rearing interacts with temperament and housing to influence the risk for motor stereotypy in rhesus monkeys (Macaca mulatta). *Applied Animal Behaviour Science, 132*(1), 81-89.

[30] Coleman, K. (2017). Personal communication. 4th Symposium on Social Housing of Laboratory Animals, May 1-5, 2017. Atlanta, GA.

[31] Lutz, C., Coleman, K., Worlein, J., & Novak, M. (2013). Hair Loss and Hair-Pulling in Rhesus Macaques (Macaca mulatta). *Journal Of The American Association For Laboratory Animal Science, 52*(4), 454-457.

[32] Bagnall, K. (2017). Managing abnormal behaviors. USDA Nonhuman Primate Welfare Symposium, March 27-28, 2017. Kansas City, MO.

Primates housed in laboratories and breeding facilities have all aspects of their natural lives taken from them and are unable to express normal and healthy behaviors. They suffer from a lack of access to space, outdoors, sunlight, compatible social partners, foraging opportunities, and adequate resting areas. In addition, primates are subjected to frequent handling and restraint, blood draws, invasive procedures, social isolation, sparse accommodations, and relocation. All of these factors lead to chronic and inescapable stress that affects primates both psychologically and physiologically. In time, persistent stress leads to a readjustment of the primate's physiological system and constant increased levels of stress hormones in the body. This creates increased energy demands on all systems of the body and leads to immune suppression, resulting in a constant state of "wear and tear" on the primate's body.[33]

In addition, self-injurious behaviors are associated with dysregulation of the hypothalamic-pituitary-adrenal axis, which controls stress reactions in animals and humans. Monkeys with self-injurious behavior have a depressed cortisol reaction to mild stressors, indicating that they do not demonstrate normal physiological responses to stress.[34]

F. Why chronic stress and abnormal behaviors matter

The high prevalence of abnormal behaviors in the laboratory setting is of concern for two reasons. First, abnormal behaviors are strongly associated with compromised welfare and impaired psychological well-being. Monkeys who do not show behavioral abnormalities are likely under just as much stress, without expressing the compensatory behavior. As such, there are insurmountable obstacles to addressing the psychological, social, and health needs of any primate in the artificial laboratory environment.

Second, monkeys suffering from chronic stress and behaviorial abnormalities do not produce normal levels of cortisol in response to stressful events. Because cortisol affects all systems of the body, including cardiovascular, immune, metabolic, and reproductive, abnormal stress responses skew data from experiments, compromise research results, and contribute to the failure of results to translate from nonhuman primates to humans.

G. The insufficiencies of laboratory housing and management

Current regulations and guidance have been shown to be inadequate to meet the diverse needs of primates in a laboratory setting. The use of specious "scientific" justifications to secure IACUC approval to evade welfare regulations, frequently merely for the convenience of the facility or experimenter, means that for thousands of primates, minimum welfare recommendations are not being met. Standard operating procedures and routine conditions in the majority of U.S. laboratories—as manifest in lack of social housing, failure to minimize early life stress, failure to provide access to outdoor spaces

[33] Novak, Hamel, Kelly, Dettmer, & Meyer. (2012). Stress, the HPA axis, and nonhuman primate well-being: A review. *Applied Animal Behaviour Science, 143*(2-4), 135-149.

[34] Novak, M. (2003). Self-injurious behavior in rhesus monkeys: New insights into its etiology, physiology, and treatment. *American Journal of Primatology, 59*(1), 3-19.

and exercise areas, failure to ensure appropriate structure and enrichment of home cages, failure to employ trainers who would use positive reinforcement to train primates to "cooperate" in basic husbandry procedures, and failure to ameliorate noise and music—are entirely inappropriate.

1. Housing requirements are inadequate to meet needs

The AWA stipulates that primates weighing 6.6-22 pounds (a range most macaques fall into) must be housed in cages with a minimum floor area of 1.6 square feet and a height of 20 inches. The floor space roughly equates to three times the area occupied by a primate when standing on all fours. That is barely enough room to pace back and forth, let alone engage in a variety of natural movements. Standard laboratory cages consist of barren steel or concrete enclosures without substrate, a plastic toy and/or mirror, and possibly a perch. Nest boxes, an important source of well-being for callitrichids,[35] are rarely, if ever, provided. There are no opportunities to express natural behaviors such as climbing, swinging, quadrupedal walking and running, and foraging in this sparse environment. In the interest of saving money and space, cages are often stacked, and without appropriate visual barriers monkeys are unable to remove themselves from unwanted interactions with humans and other monkeys with whom they are in visual contact.

2. Social housing is beneficial but not implemented widely

Housing nonhuman primates in pairs or groups has been demonstrated to improve welfare; however, many facilities fail to implement this strategy. A review of documents submitted by laboratories to the USDA from 2010 to 2013 and previously publicly accessible through the USDA's Animal Care Information Systems database, determined that *thousands* of primates continue to be caged alone in laboratories on the basis of protocol-related justifications—and this number may be increasing. The analysis revealed a 76 percent increase in the number of facilities that reported single housing of primates from 2010 to 2013. Moreover, the percentage of laboratories reporting singly housed primates that failed to adequately report and justify single housing of primates—both of which are required by law—increased from 36 percent to 47 percent. In addition, some or all of the required information was improperly redacted from many facilities' reports. In other words, even as increasing numbers of facilities ignored the deleterious psychological and physiological harms suffered by primates who are caged alone, laboratories also made a concerted effort to conceal their practices from the public.[36]

[35] Tardiff, S. (2017). Functionally appropriate nonhuman primate environments for callitrichids. USDA Nonhuman Primate Welfare Symposium, March 27-28, 2017. Kansas City, MO.

[36] Chandna, A., Niebo, M., Lopresti-Goodman, S., & Goodman, J. (2015). Single Housing of Primates in US Laboratories: A Growing Problem with Shrinking Transparency. *Alternatives to Laboratory Animals*, *43*(3), P30.

The document review also revealed that laboratories sometimes permit single housing of primates for the sake of convenience rather than necessity, as illustrated by the following examples.

> a) In 2013, Oregon Health & Science University (OHSU) held 5,008 primates in its laboratories, 3,307 of whom were used in experiments. That year, the university permitted 957 primates—nearly 29 percent of the primates used in experiments—to be singly housed for experimental reasons. Some of the justifications had nothing to do with any protocol, for example "room design," while other justifications cited experimental procedures—such as surgical implants and food monitoring—for which other facilities have successfully socially housed primates. Notably, OHSU was not cited for jeopardizing the psychological well-being of primates for reasons such as "room design."
>
> b) In 2013, the National Institutes of Health (NIH) held 4,019 primates in its laboratories, 3,340 of whom were used in experiments. That year, NIH permitted 1,642—nearly half of the primates used in experiments—to be singly housed for experimental reasons. Other facilities had successfully socially housed primates who were used in protocols similar to those described in NIH's document.

Additionally, even populations of monkeys who are pair and group housed face frequent disruptions and separations within their social group, as their cagemates may be removed for studies for extended periods, or killed in the course of a terminal study. Primates have complex social systems and cannot simply be thrown together in the hopes that they get along. Rather, successful pair and group housing requires time-consuming assessments for compatibility by experienced staff members, and some previously paired monkeys are forced to live in isolation simply because a compatible cagemate is not available.[37] Given the requirements of the laboratory setting, it is not possible to socially house primates in ways that are consistently beneficial to their well-being.

3. Environmental enhancement plans

While the AWA stipulates that research facilities "develop, document, and follow an appropriate plan for environment enhancement adequate to promote the psychological well-being of nonhuman primates," facilities are frequently cited for not having a written plan that addresses environmental enhancement. Plans are found to lack specificity and often address only one component, that of environmental enrichment consisting of the provision of toys, without taking into consideration foraging, exploration, and social grouping. Additionally, plans often do not take into account the need to reassess whether the enrichment is appropriate and effective.[38] The guidelines for exemptions from enrichment programs are broad and ill-defined, and there is little burden on facilities and experimenters to seek out alternatives. Animals can be exempted from enrichment plans

[37] Truelove, M. (2017). Assessing behavioral compatibility in macaque pairs. 4th Symposium on Social Housing of Laboratory Animals, May 1-2, 2017. Atlanta, GA.

[38] Maginnis, G. (2017). Developing an environmental enhancement plan. USDA Nonhuman Primate Welfare Symposium, March 27-28, 2017. Kansas City, MO.

due to research protocols or health, condition, and behavior. However, exempted animals may not have their needs addressed if adequate reviews are not conducted by the attending veterinarian, and these primates can easily slip through the cracks.

4. Human interaction is not enrichment

Two main concepts that shape enrichment practices are that participation should be positive for the animal and voluntary; interactions with humans are often neither. Although humans deliver food and can provide affiliative interactions, it is important to recognize that interactions with humans may also be negatively reinforced through stressful and painful encounters—including capture and restraint, administration of aversive experimental substances, and so on. The presence of human caretakers even when not performing invasive or frightening techniques can still be stressful, and interestingly, self-directed behaviors in macaques are highest in the mornings, when caretakers are cleaning and feeding, and lowest when staff members are on their lunch breaks.[4]

Because participation in experiments is not voluntary, training for experimental protocols should not be considered enrichment. However, training based on positive reinforcement can be beneficial for primates when used to reduce uncertainty and increase control associated with routine husbandry procedures. For example, the number of blood draws to which a primate is subjected is documented as being a significant predictor of self-injury and pacing; primates can be taught to present their limbs for blood draws, limiting the stress suffered by the animals, but most facilities do not take this elementary step to reduce animals' risk for extreme psychological distress and stereotypic and self-injurious behavior.

5. Noise/music

Noise is a widely recognized stressor for a variety of animals used in laboratories, including primates. Aversive noise includes echo and amplification from metal to metal contact, ambient noise from fans, ventilation systems, and equipment, music, and voices from human caretakers. A 2006 study in the journal *Cognition* demonstrated that nonhuman primates will avoid music when they are allowed to do so. Not only did primates consistently choose silent conditions over those with music of various sorts, they avoided locations where they were previously subjected to music even during later sessions when there was none playing.[39]

The evidence is clear that music is aversive to primates and can cause distress. The lack of control over the stimulus in type and volume and the inability to escape from it may compound any unpleasantness of exposure to the sounds *per se*.

VI. Conclusion

[39] McDermott, J., & Hauser, M. D. (2007). Nonhuman primates prefer slow tempos but dislike music overall. *Cognition*, *104*(3), 654-668.

Despite their widespread and continued use in laboratory experiments, high rates of abnormal behavior, chronic stress, and hair loss demonstrate that even captive bred animals have not adapted to laboratory conditions, and indeed, primates bred in laboratory facilities show consistent maladaptive behavior and physiology across the board. Even if fully implemented, plans for enrichment and social housing cannot possibly meet their diverse needs, which include complex social interactions, foraging, climbing, problem solving, choice and control in their environment, and caring for offspring. In addition to the animal welfare implications of housing primates in laboratories, behavioral and physiological derangements in captive primate populations contribute to poor data and skew experimental results.

Current laws regarding the treatment of primates in laboratories are meager and inadequately enforced. Violations of federal law are met with a slap on the wrist, rendering the AWA essentially toothless. Animals suffer horribly both during approved experimental procedures and at the hands of uncaring and untrained staff. Perhaps worst of all, the justification for this abuse is flawed. Much evidence suggests that many areas of experimental use of non-human primates have not contributed significantly to human health.

Given the difficulties associated with meeting the physical and psychological needs of primates in laboratory settings and the problems inherent in reliably applying data from primates to humans, we should reconsider the allocation of enormous sums of money and resources into experiments on primates—and diverting those resources to relevant human-relevant research methods that offer greater promise for addressing human health concerns.

National Primate Research Centers (NPRCs)

The National Primate Research Center (NPRC) program is a network of seven research centers throughout the United States that were established and are funded by the National Institutes of Health.

	California	Oregon	Southwest	Tulane	Washington	Wisconsin	Yerkes
2016	Denied secure housing; Suffered broken legs Death via injuries from attacks	Death via strangulation			Suffered fractured arm	Denied secure housing; Suffered injuries requiring amputation of digits and tongues, dehydration; Death via dehydration	
2015	Denied adequate veterinary treatment, and adequate living space Forced to live in unsafe and unsanitary facilities; Suffered from chronic diarrhea and vomiting, stereotypic behaviors and self-mutilation, and a broken leg; Endured torment from staff; Death following self-mutilation	Denied necessary monitoring during experiments – allowed to drink alcohol to the point of needed resuscitation	Infants denied adequate care and euthanasia		Endured multiple invasive surgeries, resulting in complications, disfigurement, and death	Denied secure housing with compatible mates; Suffered injuries resulting in digit amputation	Denied adequate monitoring and assurance that procedures were necessary Death via unknown causes
2014			Denied protection from infectious disease; Suffered dismemberment and housing with incompatible		Denied safe handling and housing; Death of young via injuries after attacks from adults	Denied secure housing and trained handlers; Suffered injuries requiring surgery; Death via incorrect anesthesia practices	

			mates Death via hypothermia, injuries from attacks, and unsafe housing				
2013		Denied adequate and comfortable living space, adequate anesthesia and a sterile surgical environment; Forced to live in unsafe and unsanitary facilities Suffered hair loss, burns from heating pads, necrotic lesions from injections; Killed in fights; Death via choking and respiratory distress	Forced to live in unsafe, unsanitary facilities; Death via strangulation		Denied secure housing; Juveniles killed in attacks from adults	Suffered burns from heat lamps; Death via strangulation	Forced to live in vermin-infested facilities
2012		Denied adequate monitoring and veterinary care; Endured trauma, stress, and discomfort		Forced to live in unsanitary facilities; Death via dehydration and inadequate monitoring	2012-2015: Suffered from diarrhea, alopecia, rectal prolapse, enlarged sex skin, anorexia, bloody stool, infections, clipper abrasions, nose bleeds, petechia, wounds, dehydration, lethargy, anemia, bloody mucus, discolored urine, spine curvature, muscle wasting, skin lesions, erythema, pallor, green stool, distended abdomen, leukopenia, thrombocytopenia, swollen scrotum, some leading to death;	Death via unsafe enclosures for babies	Forced to live in unsanitary, vermin-infested facilities; Endured starvation and ill health beyond allowed extent, inadequately sized collars causing wounds, and unapproved veterinary procedures; Killed in an attack due to incorrect cage placement

					Endured biopsies, bone marrow aspirations, catheter implantations; Denied secure housing		
2011	Endured torment from staff who poked, drove vehicles at, flung gravel at animals, enough to drive a monkey to violently vomit	Babies endured torment from staring experimenters, Mr. Potato head dolls, and fake snakes; Pregnant mothers forced to smoke	Denied secure housing; Death via hypothermia				Denied secure housing; Death via strangulation
2010						Denied adequate anesthesia, properly trained handlers, and minimum oversight; Forced to live in unsafe, unsanitary, vermin-infested facilities;	Forced to live in unsanitary, vermin-infested facilities; Narrowly escaped death via cage washer
2009		Denied secure housing; Death via exposure to unapproved compounds, inadequate anesthesia, dehydration				Restrained in chairs for invasive experiments lasting up to 5 years; Deprived of food and water; Forced to live in isolation in unsafe and unsanitary facilities; Endured painful procedures; Denied assurance that animals were properly kept track of, assurance that less painful procedures could be substituted, minimum oversight, proper handling, and safe medicines	Forced to live in unsanitary, vermin-infested facilities
2008	Denied approved antibiotics	Endured surgical procedures by mistake; Death via sepsis due to sloppy surgical procedures			Denied adequate veterinary oversight and safe medicines; Death via suffocation	Suffered from eye issues including swelling/redness/discharge; wounds on ears and face; Denied assurance that standards were being met for care; For 2008 & 2009: Denied safe housing and adequate food; Suffered cuts and wounds needing surgery or sutures, bruising, vomiting, diarrhea, alopecia, swelling around skull and eye implants, self-mutilation, starvation, several dental problems, facial paralysis,	Death via improper blood collection causing exsanguination

						hematomas, traumatic encephalitis, intralesional hemorrhage, erythrophagocytosis, intestinal hemorrhage and inflammation, intestinal blockage, edema, cerebellar herniation, sinus infection, headaches, knee trauma, neuromuscular/skeletal disorder, muscle wasting, gastritis, hepatitis, amyloidosis, hyperplasia, arthritis, uveitis, limited vision, infection, chronic bladder disease, inflammatory bowel disease, weight loss, some leading to death	
2007	Deprived of water; Forced to undergo multiple surgical procedures on skull and eyes; Forced to have multiple cesarean births; Denied safe medicines and surgical materials	Electro-ejaculated to the point of injury; Made to undergo dangerous and prolonged delivery of dead fetus resulting in the mother's sepsis and death; Driven to stereotypies; Denied adequate veterinary care and handling, clean food; Tormented during simple cleaning procedures			Forced to endure multiple surgical procedures of many kinds, some not sanctioned or performed by mistake; Denied adequate and clean living space	Suffered from conjunctivitis, eye swelling and abscesses; Forced to live in isolation in unsanitary facilities; Deprived of water; Pulled by collars and waist belts and restrained by the head for hours while implanted with electrodes; Denied assurance that procedures were correct; Death via untreated intestinal obstruction and abdominal mass	Forced to live in unsafe, unsanitary, vermin-infested facilities; Infants separated from mothers and restrained in wooden boxes so that they could be tormented with loud noises
2006	Deprived of water; Forced to undergo multiple surgical procedures on skull and eyes; Denied minimum oversight;	Denied safe medicines	Dissected while alive and aware	Death via overcrowding	Forced to live in unsanitary facilities; Forced to undergo multiple surgical procedures on skull and eyes; Death via surgical complications	Endured scratches and bruises, fighting, incompatible cage mates; Suffered from alopecia, vomiting, diarrhea; Denied adequate anesthesia and veterinary care, safe enclosures, assurance that there weren't alternatives to experiments	Forced to live in unsafe, unsanitary, vermin-infested facilities; Infants were purposefully paired with mothers who would reject, restrain, drag, crush, roughly groom, throw, hit, bite, sit and step on,

	Forced to have multiple cesarean births						and abusively carry their babies; Death via inadequate anesthesia procedures, ataxia and seizures, self-mutilation, osteoarthritis, metastasized cancers, diabetes, starvation, shock while under anesthesia, heat stroke, meningitis, and unknown causes; Killed in fights **
2005	Deprived of water; Forced to inhale pesticides, ozone, smoke, drugs, asbestos, and other toxic substances; Forced to have multiple cesarean births			Forced to live in unsecure quarters allowing 50 to escape resulting in the death of 4	Denied environmental enrichment	Denied adequate veterinary care; Handled inappropriately and unsafely by untrained individuals; Forced to live in unsafe, unsanitary, vermin-infested facilities; Overheated; Denied minimum oversight; Death via intestinal obstruction	Forced to live in unsafe, vermin-infested facilities; Bound to hard, uncomfortable restraint chairs with nothing but duct tape; Denied adequate living space and safe medicines; Separated from mothers at birth; Death via pneumonia, blood in lungs, hepatitis, meningitis, and abdominal problems
2004	Death via hyperthermia				2003 - 2005: Forced to live in unsanitary facilities and in enclosures so dark flashlights were needed; Forced to live in isolation Denied minimum oversight; Suffered near exsanguination while fully conscious; Endured unnecessary and	Denial of adequate veterinary care; Forced to live in unsafe, unsanitary, vermin-infested facilities No assurance that experiments were consistent or necessary Death via cage washer	Forced to live in unsafe, unsanitary, vermin-infested facilities; Infected with SIV; Death via suffocation, self-mutilation, clinical trauma/shock, sepsis and bleeding/swelling in brain, pneumonia, diabetes, necrotic

					unapproved surgeries Death via suffocation, improper intubation, respiratory distress		gut, wounds
2003					Forced to live in unsafe, unsanitary housing without insurance of safe food or temperatures; Neglected on the weekends; Death via respiratory distress, sepsis;	Forced to live in isolation; 2003-2009: Suffered bruises, bites, blunted teeth, burns, swollen eye & eyelid, lacerations, anorexia, inflammation, trauma to hand, skin irritation, alopecia, wounds, stereotypies, avulsed fingernails, eye trauma, missing digits, vomiting, improperly sized collar, reactions to anesthesia, conjunctiva, lethargy, depression, gingivitis & tartar, amputation, chronic diarrhea, thinness, headaches, bone damage, staph infection, hemorrhage, weight loss, discolored urine, exposed bone, strep throat, soft stool, gas, imbedded eye coils, abdominal pain, dehydration Denied secure housing	Forced to live in unsafe, unsanitary, vermin-infested facilities; Death via asphyxiation from own vomit, self-mutilation, multifocal abscessation, starvation, unsafe housing
2002							Death due to cancer, meningitis, dermatitis, and unknown reasons
2001							Death via starvation, strangulation, heat stroke, pneumonia, unsafe housing and handling; Killed in fights
2000		Electro-ejaculated					Denied adequate living space and enrichment; Driven to self-induced alopecia
1998							Deprived of water (neglect)
1997							Death via cage washer
1987…					Driven to stereotypies		

Contract Research Organizations and Breeders

Some of these companies will test any product—including chemicals, drugs, pesticides, cosmetics, and other household products—on animals for any company with enough money to pay it to do. Some also breed primates to be sent to other facilities for use in experiments, such as NPRCs, NIH, or universities.

	Alpha Genesis	Charles River	Covance	Primate Products	SNBL
2016	Denied secure housing		Denied adequate veterinary care; Suffered alopecia, diarrhea, limb fractures	Death via entrapment	Denied adequate veterinary care; Forced to live in unsafe facilities; Death via internal bleeding
2015	2014-2015: Denied secure housing; Forced to live in unsafe, unclean, vermin-infested facilities; Death via hypothermia		Suffered orthopedic injuries due to improper handling	Denied adequate veterinary care and secure housing; Forced to live in unsafe, unclean, uncomfortable, & vermin-infested enclosures with no enrichment Endured aggressive handling, throwing, yanking, dragging, inadequate anesthesia, viewing procedures on other monkeys, being sprayed with bleach and soaked with water, neglect, unanaesthetized teeth pulling, tail pulling, bear attacks; Suffered head wounds, prolapsed rectums that were crudely pushed back in, alopecia, injuries from fights, starvation, dehydration, frostbite, amputation, injuries from fighting, Death via starvation, electrocution	Forced to live in unclean facilities; Death via suffocation
2014	Denied secure housing; Suffered dehydration, frost bite, amputation; Death via hypothermia, dehydration, neglect 2014-2016: Denied secure housing; Death via dart gun		Denied adequate veterinary care and acknowledgement of pain; Forced to live alone and in unsafe facilities; Suffered dehydration; Death via hyperthermia	Forced to live in unsafe and unclean facilities; Suffered hyperthermia	

	rupture of internal organs				
2013	Suffered fatal trauma to face, puncture wound, abdominal tear, evisceration, amputations	Kidnapped from natural home	Forced to live in unsafe facilities		Denied adequate veterinary care & enrichment; Forced to live alone & in unclean facilities Endured stressful capture techniques causing injury and hyperthermia Suffered dehydration, starvation; Death via multiple organ failure, dehydration, hypoglycemia, hyperthermia, injuries from fighting
2012	Denied safe, secure housing Death via hyperthermia, hypothermia		Forced to live alone and in unsafe facilities; Death via strangulation		Kidnapped from natural home; Forced to live in unsafe & unclean facilities; Denied trained caretakers; Death via hyperthermia
2011		Endured toxic chemical exposure; Death via gavage error	Forced to live in unsafe and unclean facilities; Suffered frostbite		Denied enrichment, secure housing Forced to live alone & in unclean facilities Endured excessive force while handling causing bloodied noses, bruises, broken digits, near crushing, intimidation and torment from caretakers, tails being deformed by slams in cage doors, continuous & frequent blood draws that destroyed veins, twisting of wrists resulting in swelling and injury, restraint for hours, denial of food, being hooked to metal tether with cold IV saline causing constant shivering and teeth chattering; Suffered bruising, hypothermia, dehydration Death during excessive restraint & drug exposure & via trauma, hyperthermia
2010	2010-2011: Denied adequate living space and minimum oversight; Forced to live in isolation with no sight of other monkeys in unsafe facilities	Suffered gastrointestinal abnormalities; Endured toxic chemical exposure	Denied minimum oversight; Forced to live in unsafe and unclean facilities; Suffered dehydration, entrapment; Endured unnecessary collection of seminal fluid and vaginal swabbing	Suffered severe gaping wounds, alopecia	Denied secure housing; Death via strangulation, entrapment
2009		Death via gavage error, cage wash	Denied enrichment Suffered stereotypies	Death during shipping	Denied adequate veterinary care, comfortable housing, adequate monitoring, adequate living space, access to water
2008		Endured cruel and inhumane treatment; Forced to live in unsafe facilities; Suffered edema,			

		inadequate analgesia, alopecia, hyperthermia; Death via hyperthermia, edema			
2007	Forced to live in unclean facilites		Denied assurance of adequate housing or food Forced to live in isolation		Death via cage washer
2006			Denied protection from infectious disease, pain acknowledgement Suffered tuberculosis Dissected while alive and aware		Denied minimum oversight, proper & safe medicines, secure housing, adequate living space, access to food & water, and pain relief; Forced to live in unclean facilities; Endured injection with toxic substances; Death via exposure to toxic substances
2005			Denied enrichment, properly trained and sober caretakers, safe medicine, humane euthanasia, adequate veterinary care, pain or distress acknowledgement Forced to live alone and in unsafe and unclean facilities Endured taunting and terrorizing; strangling, being soaked with water, nipple burning Suffered hematomas, bruises, blown-out veins, deep necrotic wound, alopecia, bloody rectal prolapse, stereotypies Death via aspiration		Denied adequate veterinary care, humane euthanasia, safe medicines and adequate living space; Endured exposure to toxic substances, purposefully lowered platelet counts Forced to live in unclean facilities; Suffered weight loss, skin rash, diarrhea, spinal contusion, injuries from fighting, starvation, necrotic lesions, lethargy, dehydration, entrapment, Death via starvation, injuries from fighting, overcrowding, unknown causes
2004		Forced to live in isolation without enrichment;			Denied adequate veterinary care and minimum oversight
2003		2003-2004: Denied properly trained caretakers; Death via electrocution			Denied adequate veterinary care and protection from infectious disease; Endured unapproved surgical procedures, excessive dosing with toxic substances; Death following toxicity
2002		2002-2003: Suffered grave wounds to sex skin; Death via injuries from fighting,			Denied secure housing; Death via hypothermia 2002-2006: Denied adequate veterinary care, minimum

		improper anesthesia, choking on vomit			oversight, relief from pain and distress, adequate monitoring, safe food and water, and adequate living space; Forced to live in unsafe and unclean facilities Death via starvation and other causes
2001					Denied protection from infectious disease and humane euthanasia; Death via trauma, tuberculosis

A Sampling of Universities and Facilities that Receive Federal Funding

	U of Louisiana-New Iberia	U of Oklahoma	U of Utah	UT Austin	UT Galveston
2016		Forced to live in unclean facilities; Denied adequately trained caretakers	Denied adequate monitoring during anesthesia, adequately trained caretakers, adequate veterinary care; Suffered burns; Death following burn injury		Denied adequate veterinary care, pain relief; Suffered Marburg infection, pain Death via Marburg virus
2015		Forced to live in unsafe and unclean facilities; Denied adequately trained caretakers; Endured being soaked with water during cleaning procedures; Suffered distress, shivering			Denied adequate veterinary care, acknowledgement of distress, safe/proper/adequate food, adequate monitoring; Suffered starvation, rashes, depression
2014		Denied minimum oversight, adequate monitoring during anesthesia, environmental enrichment; Forced to live alone in vermin-infested cavilities; Endured painful procedures without analgesia; Suffered stereotypies, agitation			
2013	Denied secure housing and adequate monitoring; Endured mishandling and entrapment; Suffered fractures, lacerations, hematoma; Death via cerebral hemorrhage	Denied adequate veterinary care and minimum oversight; Forced to live in unclean facilities Suffered lameness			
2012	Denied safe housing and adequate monitoring; Forced to live in unclean facilities; Suffered attacks from nearby monkeys, injuries to arms/hands				
2011	Death via entrapment in a chute				Forced to live alone
2010	Denied safe, secure housing, protection from the elements, environmental enrichment, and minimum oversight; Mishandled		Denied monitoring during anesthesia, aseptic surgical practices, safe medicines; Forced to live alone; Endured pain without analgesia, craniotomies;		Denied adequate veterinary care; Suffered agitation, bleeding gums, missing tooth, deteriorated body condition, alopecia, bullying; Death via possible starvation

			Suffered lacerations		
2009			Denied adequately trained caretakers, secure housing, environmental enrichment; Forced to live alone; Endured long-term water restriction Suffered stereotypies,	Forced to live in unsafe and unclean facilities	
2008				Denied secure housing; Death via gunshot	
2007	Denied secure housing; Mishandled	Denied environmental enrichment; Forced to live alone			
2006					
2005		Denied adequate monitoring			