A Review of Autopsy Reports on Chimpanzees in or from U.S. Laboratories

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SUMMARY

Approximately 1,000 chimpanzees are currently held in five federally owned or supported U.S. laboratories. This study reviews 110 autopsy reports on chimpanzees who died from 2001-2011 in laboratories or in sanctuaries who were from laboratories, in order to glean information about their pre-morbid health and causes of death. The findings raise questions about the health status of the chimpanzees remaining in laboratories. Most chimpanzees currently held are not in active protocols. The Chimpanzee Health Improvement, Maintenance, and Protection (CHIMP) Act of 2000 states that chimpanzees no longer “needed” for research “shall” be accepted into the federal sanctuary system, but criteria for when a chimpanzee is deemed no longer needed are not given. The assessment of no longer needed lies with the Secretary of Health and Human Services, who has left the decision to the discretion of the laboratories. This autopsy review revealed that the majority of chimpanzees who died in the laboratories had been suffering from significant chronic or incurable illnesses and most often had multi-system diseases that should have made them ineligible for future research on scientific as well as ethical grounds. The study’s findings are significant in establishing the need for defined criteria for chimpanzee retirement to sanctuary.

Key Words: chimpanzee, Pan troglodytes, autopsy review, mutli-system diseases, CHIMP Act, chimpanzee retirement, US Department of Health and Human Services
INTRODUCTION

Chimpanzees have been used in U.S. biomedical, air and space, and behavioral research since the early 1930s. As of May 2012, approximately 1,000 chimpanzees are held in U.S. laboratories. An estimated 80-90% of these individuals are not in active research protocols [1], [VandeBerg, J. (2008). Workshop communication at the International Primatological Society meeting, Edinburgh, UK.] Chimpanzee use has been steadily declining over the last 10-20 years. Chimpanzee use in hepatitis C research has declined by 50-60% over the past 30 years and is at an historic low, non-animal hepatitis C research has increased 80-fold over the same period [2], and AIDS-related chimpanzee studies fell by nearly 90% from 1998 to 2005 [3]. A decrease in the numbers housed and maintained in laboratories has not matched this trajectory. Since 2000, under the Chimpanzee Health Improvement, Maintenance, and Protection (CHIMP) Act, a chimpanzee can be euthanized only when it is “in the best interests of the chimpanzee involved, as determined by the system and an attending veterinarian” (42 U.S.C. §283m).

There is a “prohibition” against a chimpanzee being euthanized solely because s/he is no longer considered to be needed for research. Instead s/he shall be retired. While the CHIMP Act requires the Secretary to determine which chimpanzees are no longer needed and should be retired, the assessment of whether or not an individual chimpanzee is still “needed” for research has been left up to the laboratory housing that chimpanzee. As of August 2011, only 20% of the total 590 chimpanzees now living in all U.S. and one Canadian sanctuary (home to chimpanzees from U.S. research), were retired to federal sanctuary under the CHIMP Act (K. Allen, personal communication: “Of 161
chimpanzees retired to Chimp Haven under the CHIMP Act, 119 were alive as of January 6, 2012”; see Addendum). Most of the others were rescues from private laboratories.

There is currently widespread ethical, legislative, and scientific debate regarding the continuing use, housing, and maintenance of chimpanzees in U.S. laboratories and ten other scientifically advanced nations as well as the EU have ended, banned, or severely limited the use of chimpanzees. Based on anecdotal evidence from autopsies done at sanctuaries caring for chimpanzees rescued or retired from U.S. research facilities, chimpanzees used for decades in invasive research have been left with physical as well as psychological disabilities and often have organ damage, massive adhesions, and multiple other diseases. If these findings could be scientifically verified, then keeping chimpanzees who are diagnosed with multiple organ disease, terminal disease, or chronic stress and its accompanying physical and behavioral manifestations in laboratories for current or future research use would be contraindicated from both scientific as well as ethical perspectives since sick and chronically stressed chimpanzees are inherently poor research models. (Laboratory routines have been shown to cause animals to have statistically significant elevations of physiological stress indicators such as heart rate, blood pressure, and hormones including cortisol [4], [5] which could compromise the study’s validity [6]. Studies in human Post Traumatic Stress Disorder (PTSD) have shown acute stress to affect glucose metabolism and components of the immune system [7], as well as genetic pathways associated with the immune system [8], [9] all of which could confound infectious and other disease studies. Although these variables are often not reported [10], scientists caution against disregarding such effects [11–13].)
This review of autopsy reports confirms that the vast majority of chimpanzees suffered from multi-organ physical disease. However, the chimpanzees who died in the laboratories, rather than having been retired were either being used in research or presumably being held for future use. Housing and maintaining chimpanzees, even in the absence of active protocol use, carries a fiscal benefit to the housing institutions. The National Institutes of Health’s (NIH) National Center for Research Resources (NCRR) awards laboratories up to $67 per diem per chimpanzee and, on average, $40 per diem to five facilities currently housing, maintaining, or using chimpanzees. Between 39% and 71% (on average 51%) of the total grant awarded is allowed for “indirect” costs – expenses which do not need to be used for either direct chimpanzee research or care [14].

In order to determine the physiological state of chimpanzees who died in the last 10 years and were either in or from U.S. laboratories, a group of three independent board certified pathologists (Appendix A) were asked to review and summarize the chimpanzees’ autopsy reports, which had been performed by resident or outside veterinarians/pathologists at the laboratories’ or sanctuaries’ request. While this autopsy review could not nor was an attempt to ascertain a cause-effect relationship between chimpanzee illnesses/deaths and their research use history or the effects on them of the conditions of their laboratory confinement or use, the review was able to document causes of death and pre-morbid health status as identified in their autopsy reports (Figures 1 and 2). The reviewing pathologists all agreed that despite often incomplete or missing medical histories, no available research histories, the inferior quality of many of the autopsies, and the often incomplete nature of the written reports, the data did reveal the physical condition of the chimpanzees at the time of death and raised the question,
given their state of health, as to whether or not some, many, or most of those who died in laboratories should have been deemed eligible for retirement and offered months or years of sanctuary before their death.

Based on the autopsy reports, the pathologists all agreed that the majority (64% or more) of chimpanzees being held at the laboratories, presumably for current or future research, had been chronically sick. Questions about the decisions to hold them, despite their physical and psychological condition, are given added weight by the recent NIH directed Institute of Medicine’s [1] report that “most current biomedical research use of chimpanzees is not necessary” – a conclusion which has contributed to NIH’s formation of a specific Council of Councils to address population needs. In an official Request for Information from NIH [15] following the IOM’s recommendations, NIH asked for input on, “Factors to consider when advising on the size and placement of active and inactive populations of NIH-owned or-supported chimpanzees as a result of implementing the IOM recommendations….” The results of this review make a strong case for the need for NIH to clarify specific and consistent criteria by which retirement is determined.

**METHOD**

In July 2011, U.S. laboratories that house government owned or supported chimpanzees for research were sent Freedom of Information Act (FOIA) or state open records requests for autopsy reports on all government owned and/or supported chimpanzees who died at the facility from 2001 to 2011. (An autopsy is a thorough post-mortem exam of a corpse to determine the cause of death and the presence of other diseases or injuries. The term is interchangeable with necropsy, which is commonly used when referring to a nonhuman animal. The word autopsy is being used here to emphasize
the commonality between human and chimpanzee great apes and why both veterinary and human pathologists were used.) Facilities that received requests included: Alamogordo Primate Facility (APF, a holding facility for chimpanzees for research, most if not all with histories of prior research use. No research occurs at the facility. Instead chimpanzees are sent to requesting labs. Once “leased” in this way the chimpanzee cannot return to APF.), NM; MD Anderson Cancer Center (MD Anderson), TX; New Iberia Research Center (NIRC), LA; Southwest National Primate Research Center (Southwest), TX; Yerkes National Primate Research Center (Yerkes, Yerkes was sent a state open records request for autopsy reports on only their privately owned chimpanzees; they do not house any government owned chimpanzees.), GA; U.S. Food and Drug Administration (FDA), MD; and Centers for Disease Control and Prevention (CDC), GA.

The federal facilities (APF, CDC, and FDA) received federal FOIA requests. The private labs (MD Anderson, NIRC, Southwest, and Yerkes) were sent state open records requests because, as private facilities, they are not subject to FOIA.

Eight sanctuaries with chimpanzees from research (seven private and one U.S. government supported sanctuary) were asked to supply autopsy reports on their chimpanzees with research histories. The private sanctuaries (six in the U.S. and one in Canada with chimpanzees from a U.S. laboratory) included: Save the Chimps (STC), FL; Chimpanzee Sanctuary Northwest (CSNW), WA; Wildlife Waystation (WW), CA; Primarily Primates Inc. (PPI), TX; Cleveland Amory Black Beauty Ranch (Black Beauty), TX; Chimpanzee and Human Communication Institute (CHCI), WA; and Fauna Foundation (Fauna), Quebec, Canada. For Chimp Haven (CH), the federally supported sanctuary in LA, a request for autopsy reports was sent to the sanctuary and to NIH, the
federal agency that provides support for CH. For the sanctuary, we were directed to and submitted a “SCCC Protocol for the Study of Live Vertebrates” application for review by their board.

In response to our requests (Tables 1 and 2), we received 110 autopsy reports from three labs and two sanctuaries (70 from APF, 23 from NIRC, 1 from FDA, 12 from STC, and 4 from Fauna). The remaining three labs and six sanctuaries either did not respond, denied our request, or reported no autopsy records for that time span. The CDC stated their records “failed to reveal any documents pertaining to [our] request.” MD Anderson denied our request claiming “the requested information is [exempted] from disclosure.” Southwest and Yerkes did not respond to our request. Of the eight sanctuaries, STC and Fauna provided their autopsies. WW and CSNW had no autopsies for that time frame, PPI and CH denied our request, and CHCI and Black Beauty did not respond.

Once the autopsy reports were received, a master list of the original files was created and copies of the files were made with all identifying information regarding the lab or sanctuary, personnel, pathology lab, or autopsy pathologists redacted. The files were numbered and reorganized using a random number generator (http://stattrek.com/Tables/Random.aspx). The redacted and randomized reports were divided equally among the pathologists. One veterinary pathologist and two human pathologists (Appendix A) were enlisted to serve as objective reviewers of 110 autopsy reports on chimpanzees (Pan troglodytes) who had been used in research or confined for potential use. Each pathologist was offered a small honorarium for their services; two declined. Human as well as veterinary pathologists were enlisted to review the reports.
because most veterinary pathologists contacted claimed inadequate knowledge of chimpanzee disease or relevant human diseases. All board certified pathologists who agreed to participate felt that reviewing chimpanzee autopsy reports was within their scope of expertise provided they were not asked to ascertain any cause effect relationship between the cause of death and the chimpanzees’ research histories. Assured such conclusions were outside the scope of this study, they agreed to fulfill the parameters they were asked: to review chimpanzee autopsies previously performed by veterinarians/pathologists, summarize the causes and categories of death as well as any surrounding information relative to the length of such illness/es and health of the chimpanzee at the time of death, and tabulate this data from the written autopsy reports made available to them. Each pathologist was asked to review their set of autopsy reports and provide a final report that included determination of chronic or acute illnesses, the illness’s duration, cause of death (COD), indications of or likelihood of suffering and source of such, and any other observations or questions raised by the autopsies. The pathologists were asked to render their conclusions using a common template and an individualized narrative. The authors then compared the pathologists’ conclusions and found negligible variations in the various categories and prevalence of illness reported. Any unclear, disputed, or outlying data was omitted from final counts.

RESULTS

The autopsies received were dated from January 2001 to July 2011. The ages of the chimpanzees were between 9 ½ and 53 years old. Based on an age related study of laboratory values reported by Videan, Fritz, & Murphy [16], laboratory chimpanzees are considered elderly at 25 years for males and 30 years for females. The average age of
death of those whose ages were given was 29 years old. Fifteen percent had no age given. The females ranged in age from 9 ½ to 53 and the males from 14 to 51. The identified gender distribution was 49 females, 59 males, and two unidentified. The autopsy of one individual identified as female included a uterus but noted, “Sections of testis, epididymis, and seminal vesicle were also included with tissues submitted for this animal; the origin of these tissues is unknown.”

**Quality of Autopsies**

Of the resulting 110 autopsies, the reviewing pathologists considered a total of 46% “incomplete.” For example, some reports lacked significant data such as “sex designation, age, [or] weight.” One autopsy “reported only histology” and no gross findings whereas others “[were] comprised only of gross dissection data … [with] … no histopathology, toxicology, [or] microbiology.” Some described only selected organs, omitting possibly important others. In some cases, “tissues [were] described as autolyzed [i.e. delayed or improper fixation likely]” and most reports lacked clinical history. Another report offered conflicting information regarding date of death. The report described a 22 year old female chimpanzee as having been “diagnosed with systemic hypertension … on 10/28/06 … [and] … pronounced dead … on June 21, 2006” – four months prior to being diagnosed.

**Detailed Findings**

As a result of the overall poor quality of data relative to standards required in most human and veterinary settings, autopsy review was constrained. Nonetheless, it was possible to make certain conclusions. The autopsies revealed a range of both acute and
chronic pre-morbid illnesses. They also indicated the presence of avoidable injuries and serious illnesses identified only post mortem (Figures 1, 2, and 3).

A total of 38% of the chimpanzees had died suddenly. Others had died during treatment for a severe illness. Others did not include a clinical history that could help identify how the chimpanzee had died. A total of 35% individuals had been euthanized for humane reasons. An equal number of females (19) and males (19) had been euthanized (38% of the females and 32% of the males). Euthanasia comprised 38% of chimpanzee deaths at APF; 35% at NIRC; 25% at STC; and none at Fauna or FDA. Five of 36 cases had died of possibly preventable deaths including a 21 year old female who was euthanized for what was presumed to be a neoplasm but turned out to have been a benign lesion. There were several iatrogenic deaths (those said to have been caused by medical treatment or intervention such as anesthesia). At APF, three chimpanzees had been accidently electrocuted and two others died from anesthesia reactions after a routine blood draw or a dental extraction. Additionally, the autopsy of one chimpanzee who had died after a routine blood draw revealed her to have had a subdural hematoma (trauma induced bleeding around the brain). This raises the question as to whether her death was an anesthesia reaction as reported or was instead possibly caused from her fall after being darted for the procedure.

Many autopsies (39%) did not define a precise cause of death. For those that did, the predominant cause in males was cardiac disease (41%) and in females it was renal failure (18%). Significant cardiac and renal disease was found in many others in addition to those where it was the cause of death. The ages of chimpanzees with heart disease ranged from 14 to 53 years old with an average of 30. In total, 85 chimpanzees (77%) had
significant cardiac disease in which 57% was some cardiomyopathy, a disease of the heart muscle sometimes leading to hypertrophy, dilatation, fibrosis, arrhythmias, and sudden death. In other cases, gross findings were suggestive of cardiomyopathy but there was either no histologic examination done to confirm it nor a specific diagnosis given. Of those with cardiomyopathy, 39% were female and 61% were male which meant that 39% of all females had cardiomyopathy and 51% of all males. Other causes, or one of the causes, of death included renal 16%, infections 21%, or other pathology 28%.

Forty-eight percent of all the chimpanzees had significant renal disease at death. Half of these were females and half were males. Their ages ranged from 13 to 50 years old with an average age of 30. Fifty-three percent had significant liver disease – 22% of which were described as some form of hepatitis while another 24%, all male, were described as having fibrotic livers. Twenty-two percent had significant infections such as pneumonia, peritonitis, or abscess. Approximately 8% had pneumonia (6 females and 3 males). Thirty-one percent had enlarged or “congested” adrenal glands (10 females and 24 males). Thirty-three percent had significant abdominal adhesions, most of which were males (7 females and 29 males). Sixteen percent had intestinal or gastric ulcerations and/or petechial hemorrhages. Six had tracheal hemorrhages.

Thirty-nine percent of the chimpanzees in the laboratories had been identified in the autopsy’s clinical narrative as having been known to have had severe chronic illnesses (25% for eight months or more and, in some cases, for four or more years) prior to their death. A number of other chimpanzees (25%) were found to have chronic disease on autopsy which was likely to have been present for a significant length of time but had not been recognized before death. In other cases, records had no clinical history. It was
therefore not possible to determine if the illnesses had or had not been recognized or for how long they had been present. Overall, roughly 69% of all the chimpanzees had significant multiple organ disease (Figure 2).

**DISCUSSION**

The quality of the autopsy reports makes it difficult to evaluate the full prevalence of diseases seen in chimpanzees in or from laboratories. As such the frequencies of disease tabulated here reflect minimal incidences which could have in fact been much greater had the autopsy reports all met standard autopsy protocol. Nonetheless, from autopsy reports deemed suitable by the study’s pathologists, this study was able to show as noted in the data above, that a majority of the chimpanzees suffered from chronic illnesses and in most cases multi-organ disease. A major implication of the lack of rigorous autopsy protocol that would have included proper identifying information, clinical history, gross findings, and histology on all organs, etc., is that the results of the study very likely under-represent the true incidence of the findings. All of the reported numbers and categories of illness/injury may well have been higher, while other pathologies not noted might in fact have been present had all the autopsies been more comprehensive.

Further, it is unknown if all the chimpanzees who died during the study’s requested 10 year time span had autopsies performed on them. Thus, the number of autopsies received may or may not reflect the actual number of deaths over the defined 10 year period. Additionally, since some of the autopsies only examined certain organs, an assessment of the actual prevalence and severity of injury and disease was not possible. This was the case, for example, with the finding of adrenal enlargement. Most
of the autopsies did not examine or comment on the adrenal glands so the actual incidence of adrenal enlargement or other adrenal pathology is unknown and could have been greater than that stated. This particular omission, for example, is noteworthy given that adrenal pathology could have, among other things, been an indication of chronic stress.

Whether or not the illnesses were a direct result of the procedures done to them or infections given to them cannot be determined, nor was that the focus of the study. However, the fact that the chimpanzees had been sick is irrefutable. The data cannot be extrapolated to know with certainty whether or not living chimpanzees currently in laboratories do or do not have similar illnesses. However, it is reasonable to assume that many do, since those who died were being used or held as potential research subjects, just as are those currently in laboratories. Further, given the age ranges of both the population included in this review and those currently in laboratories, it is highly probable that both groups share similar histories of use and confinement. The chimpanzees included who died in sanctuary were all rescues from laboratories that closed and not a population who had been voluntarily retired after being deemed no longer “needed.” As such, they too represent a population that was either being used in or held for research.

Chimpanzees often mask symptoms but attentive caregivers and medical staff need to be able to detect subtle signs of progressive heart or kidney disease (e.g. lethargy, weight loss, loss of appetite, pallor, behavior changes, weakness, or even enlarged scrotums). Attention to such symptoms could possibly have led to more extensive premorbid examinations with earlier diagnosis and treatment of acute illnesses or recognition of significant chronic or life threatening disease. It was clear from the
autopsy reports that although many of those who died had been known to be seriously ill for quite some time, the illnesses of others had only become apparent after death. One reviewer pathologist commented that two chimpanzees who “had died from renal failure allegedly had signs of illness for only a few days prior to death leading me to suspect that either the observation of these animals was inadequate or [there was] inaccurate reporting of [the] disease observed.” Additionally, some of the chimpanzees with sudden death from cardiomyopathy had had an acknowledged prior history of cardiac arrhythmia which had not been considered significant enough to warrant retirement.

An additional finding in this review was the large number of chimpanzees with abdominal (and sometimes thoracic) adhesions. While some of the chimpanzee records revealed prior surgery or surgeries, most gave no surgical history. It is puzzling, therefore, why so many developed these adhesions. One plausible theory is that the adhesions could have been caused by the repeated anesthetic darting to which the chimpanzees were subjected. Only a small percentage of chimpanzees have been “trained” to sometimes accept a needle for anesthesia. Most are darted for everything from routine exams and blood tests to more invasive procedures. Many are known to have undergone hundreds of dartings [17] over the course of their years in research. The dart needles measure approximately 1 to 1 ½ inches long and are fired into the chimpanzee with a force of roughly 50 psi. A darted chimpanzee falls onto cement or steel barred floors sometimes from a high perch. In the presence of an anticipated darting, chimpanzees run and thrash about in attempts to avoid being hit. As a result, the laboratory records of chimpanzees in sanctuary document how they were often hit in all conceivable body parts – the scrotum, corner of an eye, lip, back, stomach, bottom of a
foot – and typically needed to be hit multiple times in order to achieve a “knockdown.” It is reasonable to assume (as documented by sanctuaries) that chimpanzees sometimes, even likely oft times, get darted in the abdomen and that the resultant introduction of bacteria or chemical could cause local inflammation and the development of adhesions.

Several chimpanzees had died needlessly, including three who had been accidentally electrocuted in their cages, one who had been euthanized for a presumed malignancy that turned out to be benign, one who had died after aspiration during dental work, one (cited previously) who had died after anesthesia for a routine blood draw or possibly from a subdural hematoma resulting from the “knockdown,” and one who had died of a bowel obstruction from an ingested hose.

The major finding, however, remains that an extremely large number of chimpanzees were known by the laboratory to have been severely chronically ill for more than 8 months prior to their death, and in some cases for more than 4 years. Some autopsy reports included phrases like “… on high risk list due to advanced heart disease, systemic hypertension, and chronic renal failure” or “… diagnosed with multiple chronic disease processes by veterinary staff, DNR (Do Not Resuscitate)” or … “on high risk list, DNR” or “… at high risk for sudden cardiac death” recorded often many months or even years before the chimpanzee died. Yet those chimpanzees had been kept in the laboratory, presumably for possible future research use.

This review raises significant concerns about other chimpanzees currently held in U.S. laboratories who because of their probable failing health should be deemed no longer suitable for research and retired. Both scientifically and ethically, the chimpanzees of this review who died in laboratories after acute, chronic, or missed or undiagnosed
terminal or debilitating illness were inappropriate research models. Given the distribution of ages, the percentages of males and females, and the inclusion of chimpanzees from several different laboratories (even those in sanctuary represented multi-laboratory rescues), the review suggests that the health and well-being of others now in laboratories would be similar and must be ascertained.

A substantial number of chimpanzees had been described as having been well but on autopsy had been shown to have had severe chronic heart or renal disease, problems which should have been detected and made them eligible for retirement. While laboratory directors have sometimes claimed that sick chimpanzees get better medical care in the laboratories [18–20] than in the sanctuaries and so should remain there, there is little evidence in this review to back their claims. According to the autopsy records, many (but not all) of the chimpanzees who died in a laboratory did have veterinary exams and did receive medications, but so did the chimpanzees who died in sanctuary. Despite the asserted level of medical care given them in the laboratories, however, many chimpanzees were not correctly diagnosed to be as sick as they were. Evidence also suggests that sometimes the laboratories did not take sufficient precautions to ensure their safety as in the repeated accidental electrocutions and the frequent deaths of infants (see Addendum).

**CONCLUSIONS**

Along with the ethical issue of whether or not sick and terminally ill chimpanzees should remain available for future research, there is ample scientific reason to remove them from consideration for current or potential research. Meaningful research necessitates that an animal used be healthy at the onset in order to be able to obtain
reliable and reproducible results. Findings from chimpanzees who were already ill would be impossible to interpret. Further, even if having a specific illness were deemed important to a given protocol, such research would not have been scientifically feasible since most of the chimpanzees had more than one significant concurrent disease, confounding the interpretation of any data obtained.

The results raise important questions and suggest that there is a significant probability that many of the chimpanzees now held or used in U.S. laboratories have chronic severe illnesses like those who have died. If so, these chimpanzees should be removed from research or possible research use and retired. Given the limited and questionable scientific necessity for them (confirmed in the IOM report), as well as the contemporary ethical and moral debate concerning their use, it would be unscientific as well as unethical for laboratories to retain sick chimpanzees (see Addendum).

The conclusions are clear. Distinct criteria for mandatory retirement must be established instead of leaving the decision up to the determinations of individual laboratories. Prior studies have documented the psychological suffering of chimpanzees in and from laboratories and the many ways that such stress could negatively affect research data. Chimpanzees manifesting outward symptoms of severe and chronic stress (over grooming, dissociative behaviors, withdrawn affect, etc.) should therefore be considered not needed or useful for research and be retired. As seen in this study, clear and strict criteria for retirement are necessary.

Based on the findings in this autopsy review, a significant number of chimpanzees now housed or maintained in U.S. laboratories for current or future research use are likely also suffering from chronic severe multi-organ medical illnesses and not useful for
research. Chimpanzees should be observed carefully for subtle changes indicative of illness or stress as well as have their yearly required exams include a thorough cardiac, hepatic, and renal evaluation. If found to have any cardiac enlargement (especially atrial dilatation or ventricular hypertrophy), arrythmia, elevated BUN, elevated liver functions, progressive weight loss, muscle wasting, or other signs of significant illness, then that individual should be retired from research and sent to sanctuary. Symptoms that are harbingers of severe chronic illness and/or the high likelihood of sudden death as well as the manifestations of psychological stress and suffering as previously described elsewhere must be included in newly defined and enforced criteria for chimpanzee retirement.

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ADDENDUM

1. Number of Chimpanzees Retired under the CHIMP Act

Since passage of the CHIMP Act, a total of 161 chimpanzees have been retired under the Act to Chimp Haven, the only federally supported chimpanzee sanctuary. As of January 2012, 119 of those chimpanzees were still living at Chimp Haven (K. Allen, personal communication, January 6, 2012). As such, an estimated 26% of those retired under the Act have died. The 161 chimpanzees retired under the Act since 2000 represents an average of approximately 16 chimpanzees per year or only 2 chimpanzees per year per federally supported or owned laboratory housing chimpanzees. The total number of chimpanzees held in all laboratories remains, as of January 2012, at an estimated 1,000. As of August 2011, a total of 590 chimpanzees were living in ten U.S. and one Canadian privately funded sanctuary. This 590 total includes the 119 living at Chimp Haven. The vast majority of the remaining 471 (590 minus 119) chimpanzees now in private sanctuaries (including those in the Canadian sanctuary) were retired or rescued from various U.S. private laboratories that had closed or ended their use of chimpanzees. None of these 471 were retired under provisions of the CHIMP Act.

2. Infanticides

Soon after this study was completed, 14 additional autopsies were obtained from NIRC on infants aged newborn to 8 months who had died between August 2000 and July 2008. The autopsies were each less than a page of largely external gross examinations with no internal organ examination or histopathology. All showed the infant deaths to have been from severe trauma, multiple fractures, bites, and abrasions inflicted by cage mates. Due to when they were received, they were outside the parameters of this review. The infants, however, deserve recognition and their autopsies deserve mention since they reveal severe trauma and negligence in providing adequate protection for them. Infanticide has been seen in the wild at times of socio-ecological stress. In the laboratories, the stress of captivity could also be a factor [21].

3. Autopsies from Privately Owned Chimpanzees

Twenty-seven additional autopsies of non-government owned chimpanzees from NIRC were received after the study was completed. Ten were of infants one year or younger. The remaining 17 ranged in age from eight to 34 years, with five females and 12 males. Of this total, 68% were noted to have multi-system disease.
REFERENCES


## TABLES

**Table 1**

*Breakdown of Lab Responses to Requests for Chimpanzee Autopsy Reports*

<table>
<thead>
<tr>
<th>Name of Lab</th>
<th>Response</th>
</tr>
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<tbody>
<tr>
<td>Alamogordo Primate Facility</td>
<td>Complied and sent 70 reports</td>
</tr>
<tr>
<td>MD Anderson Cancer Center</td>
<td>Denied request; claimed “the requested information is [exempted] from disclosure”</td>
</tr>
<tr>
<td>New Iberia Research Center</td>
<td>Complied and sent 23 reports (another 41 reports sent at a later date)</td>
</tr>
<tr>
<td>Southwest National Primate Research Center</td>
<td>Did not respond</td>
</tr>
<tr>
<td>Yerkes National Primate Research Center</td>
<td>Did not respond</td>
</tr>
<tr>
<td>Food and Drug Administration</td>
<td>Complied and sent 1 report</td>
</tr>
<tr>
<td>Centers for Disease Control and Prevention</td>
<td>Reported no reports available; claimed records “failed to reveal any documents pertaining to [our] request”</td>
</tr>
</tbody>
</table>
Table 2

Breakdown of Sanctuary Responses to Requests for Chimpanzee Autopsy Reports

<table>
<thead>
<tr>
<th>Name of Sanctuary</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chimp Haven</td>
<td>Denied request</td>
</tr>
<tr>
<td>Chimpanzee and Human Communication Institute</td>
<td>Did not respond</td>
</tr>
<tr>
<td>Chimpanzee Sanctuary Northwest</td>
<td>Reported no reports available</td>
</tr>
<tr>
<td>Cleveland Amory Black Beauty Ranch</td>
<td>Did not respond</td>
</tr>
<tr>
<td>Fauna Foundation</td>
<td>Complied and sent 4 reports</td>
</tr>
<tr>
<td>Primarily Primates</td>
<td>Denied request</td>
</tr>
<tr>
<td>Save the Chimps</td>
<td>Complied and sent 12 reports</td>
</tr>
<tr>
<td>Wildlife Waystation</td>
<td>Reported no reports available</td>
</tr>
</tbody>
</table>
FIGURES

Figure 1

Cause or One of Causes of Death

- Euthanasia
- Uncertain
- Cardiac
- Renal
- Infections
- Other

Percentages: 45%, 35%, 30%, 25%, 20%, 15%, 10%, 5%, 0%
Figure 2

Prevalence of Disease or Co-Existing Disease

- Cardiac
- Hepatic
- Renal
- Infections
- Intestinal hemorrhage, ulcerations, or inflammation
- Abdominal adhesions
- Enlarged adrenals
- Multi-system disease
Figure 3

Duration of Chronic Disease

- Known prior to death
- Known 8 or more months prior to death
- Documented only on autopsy (no clinical history given)
APPENDIX A

Pathologists

Nancy L. Harrison, MD
Board certified Pathologist
MD, University of Oklahoma College of Medicine 1986
Pathology Residency, University of California San Diego, 1991
Private practice for 25 years

Martha Hutchinson, PhD, MD
Board certified Pathologist
BS with honors, Iowa State University 1963
PhD, Purdue University, 1970
MD, Case Western Reserve University, 1974
Associate Professor of Pathology, Brown University
Consultant Pathologist, Women and Infant’s of Rhode Island
Author of over 100 manuscripts, book chapters, and abstracts in nutrition and pathology

Richard M. Jakowski, DVM, PhD
Board certified Veterinary Pathologist
BS with honors, University of Hartford, 1963
DVM with honors, Michigan State University, 1967
PhD, University of Connecticut, 1972
Author of over 40 journal articles and chapters on veterinary pathology
44 years experience
Associate Professor Emeritus, Tufts University School of Veterinary Medicine