



IN DEFENSE OF ANIMALS
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**Elephant Endotheliotropic Herpesvirus
in the North American Zoo Population:
An Urgent Call for Action**

**A Report by In Defense of Animals
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Appendix:

A1 – Chart of Houston Zoo Elephant History
(births, deaths, deaths due to EEHV, elephant transfers, etc.)

A2 – Chart of Dickerson Park Zoo Elephant History
(births, deaths, deaths due to EEHV, elephant transfers, etc.)

A3 – Chart of Rosamond Gifford Zoo Elephant History
(births, deaths, deaths due to EEHV, elephant transfers, etc.)

A4 - List of Asian Elephants Known to be Affected by EEHV in North
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I. Introduction

The 1995 discovery of a deadly virus primarily afflicting captive Asian elephants in North America should have sent shock waves through the zoo industry and radically changed the way these facilities operate. Instead, zoos continue to indiscriminately breed and transfer elephants between facilities, potentially spreading the Elephant Endotheliotropic Herpes Virus (EEHV) throughout the population of elephants in North America.

The December 1, 2007 death of a 16-month old elephant calf at Dickerson Park Zoo in Missouri brings the mortality rate from this fatal infection to 85 percent (23 deaths out of 27 reported cases).¹ EEHV usually afflicts young elephants under seven years old. The disease causes massive internal hemorrhaging and results in a horrible and painful death.

In Defense of Animals (IDA) based this report on a review of medical records, scientific literature, news reports, and findings reported at a 2007 zoo- and circus-sponsored research symposium. Among the report's findings:

- **At least 41% of North American zoos pose a high risk for transmission of the EEHV infection.** The virus has directly affected at least 17 of 41 North American facilities that are part of the Association of Zoos and Aquariums' Species Survival Plan (AZA SSP) for Asian elephants, and likely has affected many more.
- Infection with the deadly EEHV virus has accounted for **20% of Asian elephant deaths** in North America in the past 25 years and has killed 85 percent of elephants infected.²
- Three U.S. zoological institutions – Houston Zoo, Dickerson Park Zoo in Missouri, and Rosamond Gifford Zoo in New York appear to be major focal points for EEHV deaths and potential transmission to other zoos.
- The zoo industry has ignored the risks of EEHV transmission by continuing to breed elephants and transfer them between institutions, potentially spreading this disease widely among the North American elephant population. **These risks were clearly delineated in the study published six years ago – and six years after the 1995 discovery of the virus – in the Association of Zoo's and Aquarium's (AZA) own peer-reviewed scientific journal, Zoo Biology, which warned of the “substantial risks” for transmission of the virus by transferring elephants between institutions.**
- “High risk” zoos, including those associated with multiple deaths from EEHV, continue to breed Asian elephants and transfer them between facilities, despite the risk of spreading the virus and subjecting offspring to this fatal disease.

In light of these findings and the threat that EEHV poses to captive elephants, IDA is calling for an immediate halt to all breeding of Asian elephants and a severe restriction on transfers of Asian elephants between facilities.

II. Background on EEHV

EEHV is having a deadly impact on Asian elephants in captivity. Though first identified in 1995, little is known about this disease or its transmission. The virus is believed to cross species, jumping from African to Asian elephants³, infecting mainly young Asians (usually under 7 years of age) and producing a hemorrhagic disease so lethal it has an 85% mortality rate. EEHV is also believed to account for 30% of perinatal mortality (death immediately before or after birth).⁴

The EEHV virus is now considered the number-one killer of elephants under age one.⁵

While African elephants have also died from a form of EEHV (two reported deaths), Asian elephants are most gravely affected by this disease and by far represent the greatest number of deaths. The disease has accounted for 20 percent of Asian elephant deaths in North America in the past 25 years.⁶

The transmission of the virus from African to Asian elephants has occurred in the unnatural conditions in which elephants are held in zoos, where the two distinct species have been held together though they never would be found together in the wild.

The first outbreak of EEHV in the U.S. occurred in 1995 at the National Zoo in Washington, DC. Since the death of this “index case” and subsequent identification of the disease, more elephants were retroactively diagnosed. Since 1977, there have been 27 reported cases of EEHV in North America, with 23 deaths (21 Asian and 2 African) and four surviving animals.⁷ (See Appendix 4). The surviving elephants were treated early with the anti-viral drug Famcyclovir, however, there were nine elephants also treated with the drug who subsequently died.⁸

EEHV is known to have a sudden onset, killing elephants in a matter of days, and sometimes in a matter of hours, after symptoms first appear. Symptoms include swelling of the head, neck, trunk and thoracic limbs, cyanosis of the tongue, lethargy, mild colic, and intermittent refusal of food. The disease causes generalized hemorrhaging in the tongue, heart, and liver, and intestine.⁹ Death results from massive internal hemorrhaging and heart failure.¹⁰

There is no test for EEHV in seemingly healthy elephants and no vaccine. Definitive testing for EEHV is only possible when an elephant is actively shedding the virus or after death.¹¹

There are believed to be four distinct types of EEHV.¹² A new form was discovered in 2007 after the death of six-year-old Hansa at Seattle’s Woodland Park Zoo. In that case, despite daily checks for EEHV symptoms, zoo personnel did not recognize this new form of the virus, which did not present some symptoms typically associated with the disease.¹³ The fact that new forms of the disease are still being identified, along with the fact that so little is known about its transmission, is reason for the utmost caution at this time.

Individuals at high risk for infection include Asian elephants who have lived with or near African elephants, and elephants who are housed or have been housed in a facility where a case has occurred previously.¹⁴ Asian elephants may also transmit the disease to other Asians.¹⁵

III. The Role of Zoos in the Spread of EEHV

Unnatural captive conditions – specifically the housing of African and Asian elephants together – may have created the opportunity for the virus to cross species. While African and Asian elephants are now held separately in most zoos, many Asian elephants previously have been housed with African elephants and may have been exposed to the disease.

Preliminary results of an ongoing Smithsonian National Zoo study, approximately 10 percent of the North American Asian elephant population (including zoos and circuses) is, or has been, seropositive for EEHV, meaning that they have been exposed to the virus. Despite this information -- and despite the six-year-old warning of the risk of EEHV transmission in the zoo industry's own, peer-reviewed scientific journal, *Zoo Biology* -- zoos do not appear to have changed their elephant transfer practices. This is most recently exemplified by the November 2007 transfer of a bull elephant from Dickerson Park Zoo (an extremely high risk zoo – see below) to the Cincinnati Zoo.¹⁶

Among the zoo industry practices that can contribute to the spread of EEHV:

A. Elephant Transfers

Transfers between facilities increase the risk of EEHV transmission. The grave implications of this problem are highlighted in the 2001 peer-reviewed *Zoo Biology* study by Sadie Ryan and Steven Thompson, from the Department of Conservation and Science at Chicago's Lincoln Park Zoo, which documented that one elephant who died from EEHV had 272 indirect disease transmission possibilities in less than two years.¹⁷

The study also found that each zoo can spread infection in several ways, and that identification of risk levels and routes of transmission is complicated by lack of knowledge about how the disease becomes infectious and even fatal. The study concluded: “Thus, concerns are well founded that movement of specimens between institutions, such as those cooperating in an AZA SSP [Association of Zoos and Aquariums Species Survival Program], poses substantial risks of disease transmission.”¹⁸

Ryan and Thompson's conclusion that the number of contacts within and between the North American captive populations is surprisingly high is supported by IDA's review. IDA identified **the potential spread of EEHV infection to 18 separate zoos due to transfers of elephants into and out of just three “hot spot” institutions (Houston Zoo, Dickerson Park Zoo and Rosamond Gifford Zoo).**

B. Stress in the Zoo Environment

Stress can be a trigger for EEHV.¹⁹ Stress is endemic in the zoo environment due to lack of space, aggression between elephants, and inadequate social groups. Key stressors in zoos include transportation, pregnancy and birth, weaning of calves, changes in elephant group composition, and even disruptions in the environment.²⁰

C. Transfer of Elephants to Zoos From Circuses and Private Businesses

EEHV has been found in elephants at other captive elephant enterprises such as circuses and private businesses that use elephants for rides and entertainment.

A five-year-old Asian elephant named Jennie held by Carson and Barnes Circus died in 2004 due to EEHV, despite being treated with Famcyclovir.²¹ The facility holds both Asian and African elephants. Another facility reportedly affected by the disease is Have Trunk Will Travel in California.²² At Ringling Bros. Circus one elephant calf died from the virus²³ and another survived after receiving treatment.²⁴

Zoos known to have received elephants from Ringling Bros. Circus include Ft. Worth Zoo (Tex.), El Paso Zoo, Little Rock Zoo (Ark.), Lion Country Safari (Canada), Niabi Zoo (Ill.), Phoenix Zoo, and Miami MetroZoo. Oregon Zoo has received a bull elephant for breeding, Tusko, from Have Trunk Will Travel.

D. Breeding

There are known cases of vertical transmission – mother to calf – in elephants in Europe, where stillborn calves tested positive for EEHV.²⁵ Abortion has occurred, with EEHV being found in the fetal tissue.²⁶ Evidence suggests EEHV is responsible for stillbirths.²⁷

The transmission route of known herpes virus infections – through exchange of bodily fluids and close physical contact – suggests that a female elephant can become infected by a bull during breeding and subsequently pass the virus on to her calf. This suggests that artificial insemination, a procedure employed in many zoos today, would not reduce risk of transmission to females.

Zoos continue to breed elephants with little information about this virus and its mode of transmission and with an apparent disregard for the risk to both calves and mothers that this virus poses. This is especially disturbing in light of the fact that the virus appears to kill most often very young elephants.

A case in point is Woodland Park Zoo, a “high risk” facility following the 2007 death of Hansa (especially as the form of EEHV was previously unknown). Yet the Zoo plans to artificially inseminate Hansa’s mother, Chai, using semen from a bull at Canada’s African Lion Safari, a facility which itself has experienced two deaths from EEHV.²⁸ Did an already-infected Chai transmit this new form of EEHV to Hansa? Unless and until the Zoo can definitively and scientifically answer “No” to this question, the Zoo should not be involving Chai in any breeding whatsoever. Similarly, unless and until the zoo can definitively determine that the semen from this bull will not transmit EEHV, the zoo should not proceed with this endeavor.

IDA believes that Woodland Park Zoo would be grossly irresponsible if it proceeds with plans to inseminate Chai without knowing definitively how Hansa contracted the virus. Is another elephant at Woodland Park Zoo – perhaps Watoto, the zoo’s African elephant who continues to be housed with the Asians – a carrier of EEHV? This is yet another potential route of infection for any calf born at the facility.

In the absence of information about the mode of EEHV transmission and the infectious status of individual elephants, zoos are playing a potentially deadly game of Russian Roulette when they continue to breed and transfer elephants between institutions, again in disregard of the warning in the own study – published six years ago – in the zoo industry’s own peer-reviewed, scientific journal, *Zoo Biology*, warning about the “substantial risks” of EEHV transmission.

E. Other Potential Means of Transmission

Handlers that work with both Asian and African elephants in the same facility, especially those working in the “free contact” training system where there is close contact with the elephant, could act as vectors of the disease even if the two elephant species are housed separately.²⁹

IV. Facilities Affected by EEHV

A. “High Risk” Facilities as Defined by IDA

IDA’s review of available documentation for cases of EEHV reveals that 17 out of 41 (41%) North American facilities that comprise the Association of Zoos and Aquariums’ Species Survival Plan for Asian elephants have been directly affected by EEHV. These facilities:

- held an elephant who died from EEHV, suspected EEHV and administered drugs to an elephant;
- hold an elephant who was diagnosed and survived the disease;
- hold an elephant that tested positive for EEHV; and/or
- hold an elephant who has had herpes lesions. (one zoo).

These facilities include:

African Lion Safari (Ontario, Canada)*	National Zoo (Washington, DC)*
Brec’s Zoo (Baton Rouge, La.)	Niabi Zoo (Ill.)
Bronx Zoo (N.Y.)	Oklahoma City Zoo (Okla.)
Columbus Zoo*	Rosamond Gifford Zoo (NY)*
Dickerson Park Zoo (Mo.)*	Six Flags (Vallejo, Calif.)
Have Trunk Will Travel (Calif.)*	St. Louis Zoo (Mo.)*
Honolulu Zoo	Tulsa Zoo (Okla.)
Houston Zoo*	Woodland Park Zoo (Wash.)*
Louisville Zoo (Ken.)	

More than half of “high-risk” facilities have continued their Asian elephant breeding programs, even after the virus was identified at that facility. Those high-risk facilities that continue breeding programs are marked by asterisk above.

B. Zoos Potentially Contaminated Through Elephant Transfers

It is beyond the scope of this report to track all routes of transmission for involved facilities. As already stated, indirect elephant contacts can easily number in the hundreds, so it can be assumed that many more zoos than those listed above are also contaminated by EEHV.

The following list represents a small sample of zoos that potentially have been contaminated by the virus via elephant transfers from the above facilities (received elephants after an EEHV death had occurred or after an elephant was diagnosed and treated for the disease). Three of these facilities (marked by an asterisk below) have active elephant breeding programs, and at least one more plans to start one.

Buffalo Zoo	Phoenix Zoo
Cincinnati Zoo*	Point Defiance Zoo (Wash.)
Denver Zoo	Oregon Zoo*
Ft. Worth Zoo*	

V. Zoos That Appear to Be Focal Points for Infection and Spread of EEHV

The following case histories reveal certain facilities that appear to be focal points for EEHV, and that the transfers of elephants in and out of these facilities may have spread the virus to elephants in other zoos.

Houston Zoo

Houston Zoo has one of the worst histories for EEHV deaths, yet the Zoo continues to breed elephants, with a calf last born in 2006.

- **Five elephants born at Houston Zoo have died from EEHV**, the most recent in 2004. Each of these elephants was sired by the male elephant, “Thailand.” (See Appendix 4)
- Three of the elephants died after being sent to other zoos (African Lion Safari, Canada; Lincoln Park Zoo, Chicago; Berlin Zoo, Germany), meaning that **Houston Zoo was a potential nexus for spread of EEHV to at least three institutions, including two outside of the U.S.** (See Appendix 1.)
- Six stillbirths have been recorded at this facility.
- **Of 14 recorded births at Houston Zoo, only one elephant is alive today.**

Dickerson Park Zoo

Over a period of years, a number of female elephants were sent from other zoos to Dickerson Park Zoo for breeding with its bull, Onyx. Of 13 calves conceived at the zoo (Onyx sired 12): four elephants are still living, three were stillbirths, and six are dead. **Five of the calves were infected with EEHV; all but one died from the infection.** (See Appendix 4.) Onyx died in 2002.

EEHV-related events at Dickerson Park Zoo:

- Moola arrived from Milwaukee Zoo in 1986. Bred with Onyx and gave birth to two calves who were infected with EEHV. Chandra was treated and survived (transferred to Oklahoma City Zoo in 1998 at age 3). Haji died in 2002 (less than 3 years old).

Moola has since been bred with Sabu Hit, a bull who sired a calf (Ganesh born at Cincinnati Zoo; transferred to Columbus Zoo) who died of EEHV in 2005. Moola gave birth to Nisha in 2006. Nisha died on December 1, 2007.

- Patience bred with Onyx and gave birth to Kala, who died in 2000 from EEHV (age 2), just months after being transferred to Six Flags in Vallejo, Calif.
- Connie was bred with Onyx, resulting in a stillbirth in 1995. A second calf produced by the pair, Maiya, died from EEHV (age 2). A third calf, Asha, was transferred to Oklahoma City Zoo in 1998 with Chandra.
- Chai was transferred from Woodland Park Zoo to Dickerson Park Zoo for breeding (1980 to 1999). She was returned to Woodland Park Zoo where she gave birth to Hansa in 2000, who died at age six from a previously unknown form of the virus in 2007.
- Bozie was transferred from Lincoln Park Zoo to Dickerson Park Zoo for breeding (1987 to 1989). Bred with Onyx and gave birth to Shanti in 1990, who is now at Houston Zoo. Bozie was transferred to BREC's in 1997, but she was temporarily sent to Dickerson Park Zoo a second time in 1998. In 2001, Bozie's veterinary records state: "herpes lesions back."³⁰

Other events possibly related to EEHV:

- Tuffy was bred with Onyx. She died in 1992 after giving birth to Onyx's stillborn calf. Tuffy had been transferred between Dickerson Park Zoo and a private owner four times.
- Vicky was held by George Carden Circus and housed at Dickerson Park Zoo on four occasions. She gave birth at Dickerson Park Zoo, including one stillbirth (1997), and one calf, Pete, who lived only one day in 2000. Three other elephants held by the Circus were also kept at Dickerson Park Zoo on multiple occasions.

Dickerson Park Zoo may be a direct nexus for transmission of the EEHV virus to at least 10 zoos, including Brec's Baton Rouge, Cincinnati Zoo, Columbus Zoo, Denver Zoo, Houston Zoo, Milwaukee Zoo, Oklahoma City Zoo, Point Defiance Zoo, Six Flags (Calif.), Woodland Park Zoo. (See Appendix 2.)

In addition, Dickerson Park Zoo has potentially spread EEHV to at least two circuses that transferred elephants to and from the Zoo; one circus transferred multiple elephants to Dickerson Park Zoo on multiple occasions.

Elephants who spent time at Dickerson Park Zoo were potentially at risk of becoming EEHV carriers. Subsequent transfers of these elephants to yet other facilities could, of course, have spread the deadly virus even further.

Rosamond Gifford Zoo

Numerous zoos have transferred female elephants into and out of this facility for breeding with its bull, Indy. Indy sired two calves who died from EEHV: Preya, who died at this zoo in 2003, and Kumari, who died at National Zoo in 1995 and is considered the index case for EEHV infection in U.S. zoos. (See Appendix 4.)

- Shanti was transferred in from National Zoo in 1991 and returned in 1992. She gave birth to Kumari, who died from the virus in 1993. She later gave birth to a second calf, Kandula (different sire) who received medications on at least three occasions after EEHV was suspected. National Zoo also held an African elephant at that time.
- Ellie was transferred in from Jacksonville Zoo to breed with Indy; gave birth to Rani in 1996. Rani was later given medications after EEHV was suspected. Rani and Ellie were transferred to St. Louis Zoo in 2001.
- Babe's pregnancy resulted in a stillbirth and her death after an attempted C-section in 1990; Indy was the sire.
- Targa had a stillbirth in 2001 after breeding with Indy. Targa and her daughter Mali, who received anti-viral medications due to concerns about herpes infection, were transferred to African Lion Safari in Canada in 2006 for breeding.
- Siri, another female elephant at this zoo, was tested in 2005 and found to have high titers for EEHV, meaning that she has been exposed to an elephant shedding the virus at this zoo or another where she previously resided.

Two other elephants were temporarily brought to Rosamond Gifford Zoo for breeding, Jodi from Buffalo Zoo in (1987 to 2000) and Rosie from Have Trunk Will Travel (1996 to 1997). Zoo officials have publicly claimed they believe a female elephant brought from Buffalo Zoo carried EEHV to Rosamond Gifford Zoo.³¹

In total, Rosamond Gifford Zoo is a potential nexus for spreading EEHV infection to five other facilities, including St. Louis Zoo, African Lion Safari, Buffalo Zoo and Have Trunk Will Travel. (See Appendix 3.) Subsequent transfers of elephants out of these facilities could, of course, have spread the deadly virus even farther.

It should be noted that Indy previously was held at other facilities, including Oklahoma City Zoo (1979 to 1980) and Have Trunk Will Travel (1983).

VI. Conclusion

The above descriptions of possible EEHV infection routes barely scratch the surface of the complex web of elephant transfers between zoos and between zoos and circuses. Elephant veterinarian and reproduction specialist Dennis Schmitt has stated that it is not a matter of *if* a zoo will be affected by this deadly virus, but *when*.³² Since Dr. Schmitt is a consultant for over 50 different zoos and circuses, including Dickerson Park Zoo and many other high risk zoos identified in this report, he clearly speaks from personal experience.

Six years ago, the zoo industry's own, scientific, peer-reviewed study warned of the "substantial risks" of EEHV transmission. Thus far, the AZA's Species Survival Program, which manages North American elephant transfers and breeding within the program, has failed to act decisively to protect elephants. It has allowed "high risk" zoos associated with deaths due to EEHV, including Houston Zoo, Rosamond Gifford Zoo and Dickerson Park Zoo, to continue to breed elephants, and it has sanctioned transfers of Asian elephants to and to from "high risk" facilities.

Unfortunately, as long as elephant calves are considered major attractions that boost zoo attendance, even high risk zoos will desire to breed Asian elephants.

By continuing to breed elephants and transfer them between facilities without knowing definitively the infectious status of individual elephants or how disease is transmitted, zoos truly are playing Russian Roulette with elephant health and welfare. The result has been physical suffering and death of mostly young elephants and emotional suffering for the elephant mothers who have lost their calves. The zoo industry's irresponsible and inhumane actions on EEHV infection directly contradict zoos' claims that they are caring for and conserving elephants.

Based on this report's findings, and given the "substantial risks" of elephant transfers cited six years ago in the AZA's own peer-reviewed scientific journal *Zoo Biology*, IDA is calling for an immediate halt to the breeding of Asian elephants and a severe restriction on Asian elephant transfers between facilities, allowing such transfers only in extraordinary circumstances (i.e., a female elephant left alone after the death of a companion, severe aggression between elephants).

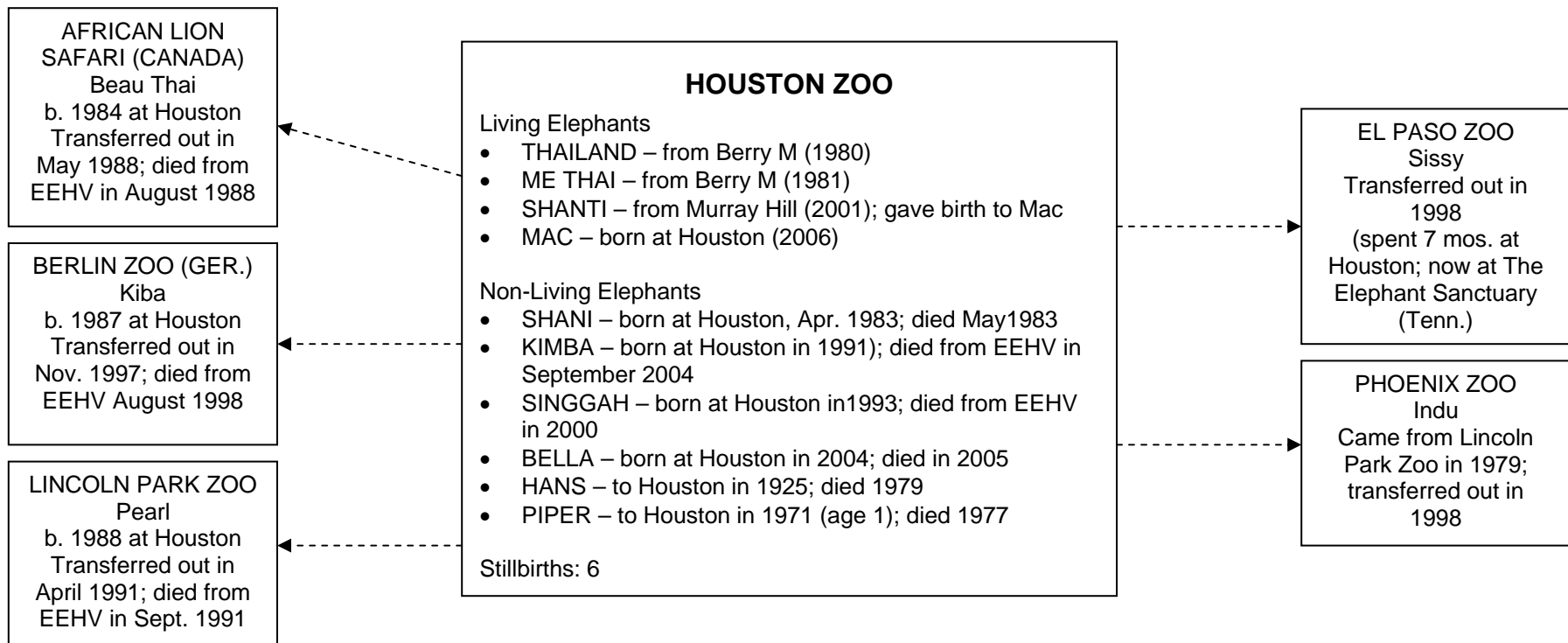
Sanctuaries would necessarily be exempt from the transfer restriction because these facilities house adult elephants, do not breed elephants and are an end point where elephants live out their lives and are not transferred elsewhere.

EEHV has been studied for more than a decade, yet still we know little about its transmission or even the number of elephants who may be carrying the disease. While continued studies of the disease are invaluable, zoos cannot wait for the results before taking more serious steps to stop the spread of this terrible disease.

The zoo industry should heed the six-year-old warning published in its own peer-reviewed scientific journal that elephant transfers pose "substantial risks" of EEHV transmission – risks that are exemplified not only by the profoundly disturbing history documented in this report, but also by Dr. Dennis Schmitt's 2007 warning that it is not a matter of *if*, but *when* a zoo will be affected by this deadly virus. The elephant victims of the zoo industry's disregard of its own warnings have suffered long enough.

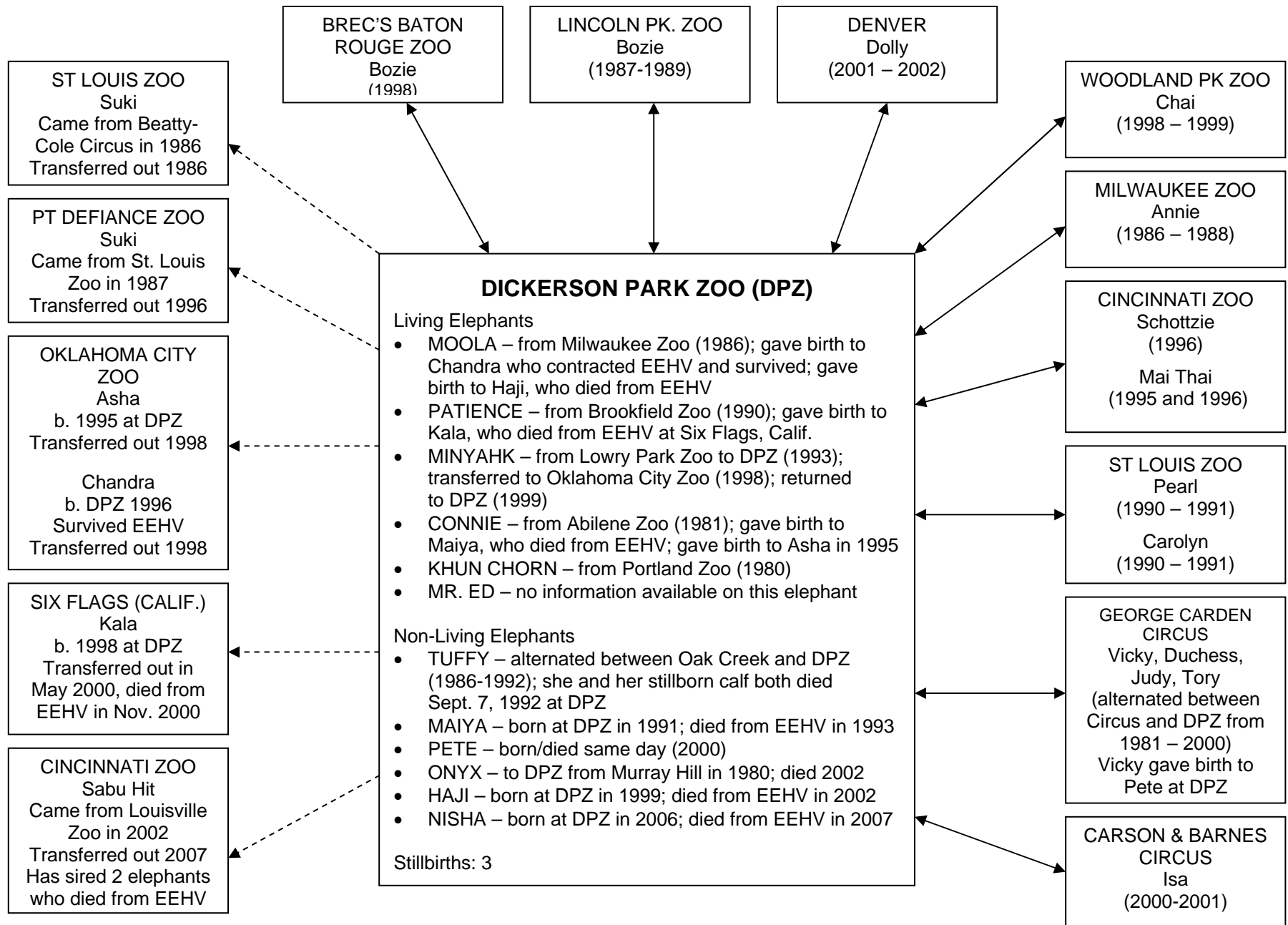
ENDNOTES

- ¹Based on figures presented by Richman, L., “Elephant Endothelialtropic Herpesvirus: Update” (Oral presentation) International Elephant Conservation Research Symposium, November 2-4, 2007, Orlando, FL..
- ² International Elephant Foundation newsletter. Vol. 2, 2006.
- ³ Johns Hopkins article, “Deaths of Zoo Elephants Explained – New Virus Discovered,” February 18, 1999. <http://www.hopkinsmedicine.org/press/1999/FEBRUARY/990218.HTM>. Accessed December 1, 2007.
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- ⁵ Tidwell, J., “Making Room for Elephants.” *Zoogoer*, March/April 2002. (Friends of the National Zoo publication)
- ⁶ International Elephant Foundation newsletter. Vol. 2, 2006.
- ⁷ Based on figures presented by Richman, L., “Elephant Endothelialtropic Herpesvirus: Update” (Oral presentation) International Elephant Conservation Research Symposium, November 2-4, 2007, Orlando, FL..
- ⁸ Ibid.
- ⁹ Fowler, M., In Biology, Medicine, and Surgery of Elephants. Blackwell Publishing, Ames, Iowa, 2006.
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- ¹³ Muluy, P., Hawkes, N., “Loss of a young Asian elephant to a newly-discovered Herpesvirus: An historical review of husbandry and behavior prior to death,” (Abstract and Oral Presentation) International Elephant Conservation and Research Symposium, November 2-4, 2007, Orlando, FL.
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- ¹⁸ Ibid.
- ¹⁹ Emanuelson, K., In Biology, Medicine, and Surgery of Elephants. Blackwell Publishing, Ames, Iowa, 2006.
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- ²³ Tidwell, J., “Making Room for Elephants.” *Zoogoer*, March/April 2002. (Friends of the National Zoo publication)
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- ²⁶ Fowler, M., In Biology, Medicine, and Surgery of Elephants. Blackwell Publishing, Ames, Iowa, 2006.
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- ³² Schmitt, D. EEHV Update (Oral presentation) International Elephant Foundation Conservation and Research Symposium, 2007, Orlando, FL.



Smaller boxes denote zoos that received elephants from or temporarily sent elephants to Houston Zoo.

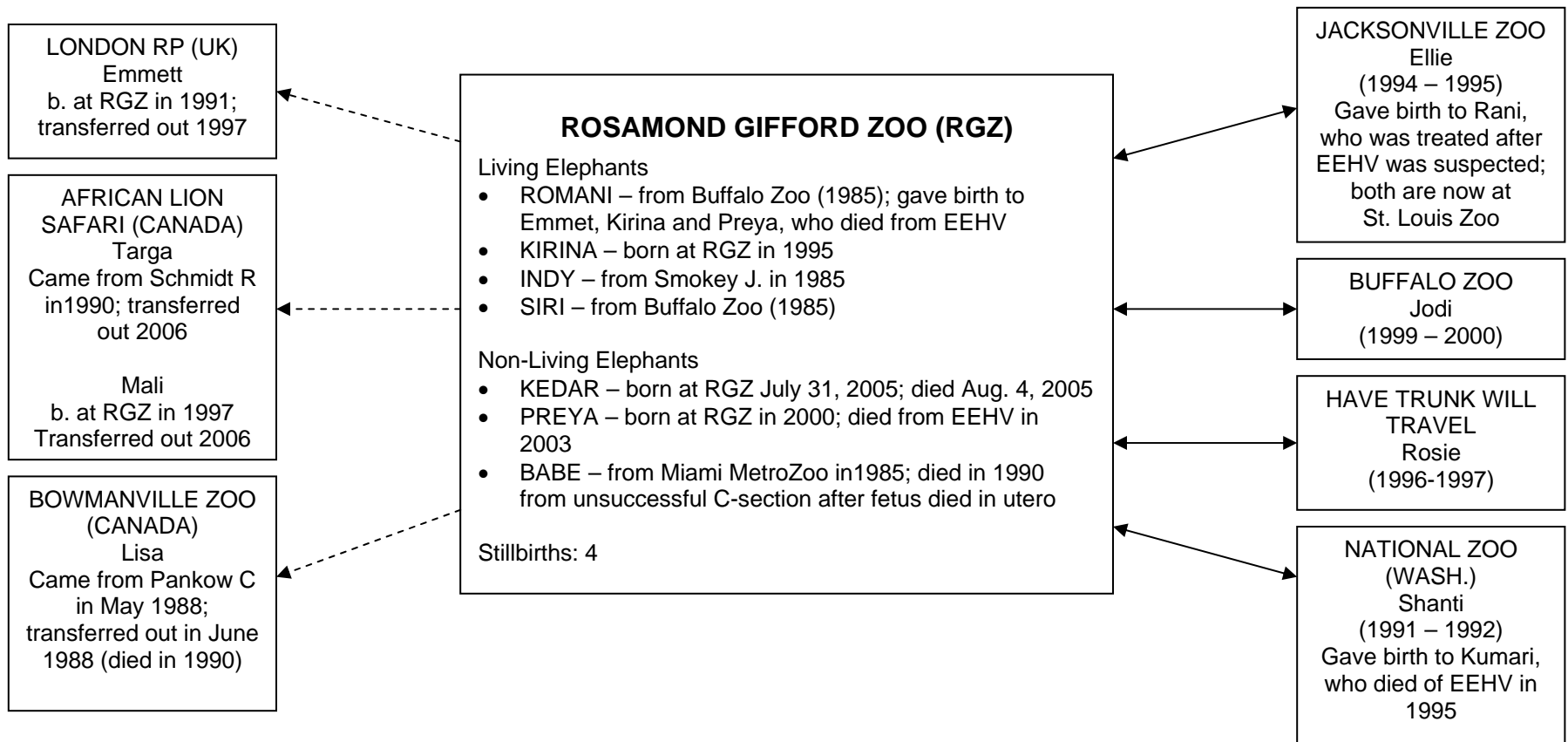
.....▶ Indicates elephant left DPZ for another facility. Years indicate period spent at DPZ.



Smaller boxes denote zoos that received elephants from or temporarily sent elephants to DPZ.

←→ Indicates elephant was temporarily transferred from another facility to DPZ, usually for breeding, then returned. Years indicate period spent at DPZ.

-----> Indicates elephant left DPZ for another facility. Years indicate period spent at DPZ.



Smaller boxes denote zoos that received elephants from or temporarily sent elephants to RGZ.

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KNOWN ASIAN ELEPHANTS AFFECTED BY EEHV IN NORTH AMERICA

ELEPHANT NAME	INSTITUTION (at time of death)	DATE AND PLACE OF BIRTH	OUTCOME
1. Astor	Bronx Zoo	August 20, 1981 Bronx Zoo	Death January 26, 1983
2. Gina	Canadian Zoological Systems, Ltd. (Ontario)	~1958 Wild Born	Death January 17, 1986
3. Jothi	Honolulu Zoo	~1982 Wild Born	Death December 25, 1987
4. Beau Thai	African Lion Safari (Ontario, Canada) Transferred on April 24, 1988	February 1, 1984 Houston Zoo	Death August 26, 1988
5. Pearl	Lincoln Park Zoo Transferred April 25, 1991	December 7, 1988 Houston Zoo	Death September 2, 1991
6. Maiya	Dickerson Park Zoo	July 26, 1991 Dickerson Park Zoo	Death February 28, 1993
7. Maverick	Tulsa Zoo	October 5, 1986 Tulsa Zoo	Death November 26, 1993
8. Kumari	National Zoo	December 14, 1993 National Zoo	Death April 26, 1995
9. Kiba	Berlin Zoo Transferred ~Nov. 18, 1997	December 31, 1987 Houston Zoo	Death August 30, 1998
10. Singgah	Houston Zoo	December 29, 1993 Houston	Death January 1, 2000
11. Kala	Six Flags (Calif.) Transferred May 10, 2000	May 17, 1998 Dickerson Park Zoo	Death November 29, 2000
12. Haji	Dickerson Park Zoo	November 28, 1999 Dickerson Park Zoo	Death June 7, 2002
13. Kathy Sh-Boom	Niabi Zoo Arrived August 5, 1965	November 25, 1960 India	Death November 21, 2002
14. Preya	Rosamond Gifford Zoo	February 10, 2000 Rosamond Gifford Zoo	Death April 12, 2003
15. Jennie	Carson & Barnes Circus	September 6, 1998 Carson & Barnes Circus	Death April 12, 2004
16. Kimba	Houston Zoo	July 17, 1991 Houston Zoo	Death September 5, 2004
17. Ganesh	Columbus Zoo	March 15, 1998 Cincinnati Zoo	Death August 23, 2005
18. Hansa	Woodland Park Zoo	November 3, 2000 Woodland Park Zoo	Death June 8, 2007
19. Nisha	Dickerson Park Zoo	July 18, 2006 Dickerson Park Zoo	Death December 1, 2007
20. Chandra	Dickerson Park Zoo Transferred to Oklahoma City Zoo December 1998	July 2, 1996 Dickerson Park Zoo	Survived
21. Baby Doc ¹	Ringling Bros. Circus	N/A Ringling Bros.	Survived (treated Nov. 1998 at age 18 mos.)
22. N/A ²	Ringling Bros. Circus	N/A	Death N/A
23. N/A ³	Have Trunk Will Travel	N/A	N/A

Note: Two African elephants also have died from EEHV (1991 and 1996).

¹ Grady, D., "Deaths of Captive Asian Elephants May Be Linked to Virus Found in Their African Zoomates." *New York Times*, February 19, 1999.

² Tidwell, J., "Making Room for Elephants." *Zoogoer*, March/April 2002. (Friends of the National Zoo publication)

³ Notes from International Elephant Foundation Conservation and Research Symposium, 2007. EEHV presentation by Gary Hayward.