

Technical Briefing: Tuberculosis as a zoonotic disease



The ability for certain diseases to cross the species barrier is determined by a number of factors which include the degree and amount of contact between the human and the infected animal. Although there are no direct confirmed cases of TB from a traveling circus, this does not mean that such transmission is not possible or that it has not occurred. As shown below, it is possible for TB to be passed from elephants to humans, even without direct physical contact.

“Emerging Infectious Diseases” is a peer reviewed journal published by the Centers for Disease Control and Prevention (CDC). According to a 2011 paper in the journal ¹, which cites other sources, in North America, there are ~270 Asian and ~220 African elephants, in a range of different facilities. Of these elephants ~12% of Asian and ~2% of African elephants are thought to be infected with *M tuberculosis*. If these figures are accurate, this would equate to approximately 36 animals with TB.

The paper describes the transmission of TB from elephants to administrative staff with no direct contact with elephants, at an elephant refuge. The problem of TB and its transmission between elephants and humans is complicated by the fact that “*no standard definition exists for latent TB in elephants, and no sound clinical criteria exist for diagnosing TB in elephants*”.

The authors suggest that the transmission was aided by the practice of washing the elephant quarantine area with a high pressure washer on a daily basis, which would have resulted in a dense mist of moisture which could then drift to the administration block. The paper reported that “*All 3 administrators who worked in these areas had no direct contact with elephants, but their TST [tuberculin skin test] results converted*”. The team explains the difficulties involved in this field of disease study as elephants which have negative TB test results may still be infected. The authors highlight how “*Knowledge gaps exist about the timing between elephant exposure, seroconversion, latent infection, active disease and shedding*”, showing how the situation regarding this disease is far from clear-cut ¹.



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The authors conclude that “*Captive elephants have emerged as an unanticipated source of M.tuberculosis infection among humans and therefore must be integrated in our strategies to control and eliminate TB*”¹.

A paper from The Veterinary Record stated how “*Zoo animals, especially animals such as elephants that can be handled, are in close and frequent contact with people who may be infected, thus enabling the disease to spread to the animals and back again to other people*”². The paper goes on to describe how the fact that the sources of the infection were not known may mean that “*cases of undetected M tuberculosis infection may be more common among captive elephants than has been reported*”.

A 1998 paper regarding the 1996 TB outbreak stated that “*This report describes the first case of zoonotic M.tuberculosis transmission. The epidemiological investigation strongly suggests M.tuberculosis transmission between humans and elephants*”. The paper mentions the risks connected with circuses and elephant rides; “*The risk for TB transmission from an animal with a case of active TB is higher for daily handlers than for persons with only brief contact, e.g. members of the public viewing a performance or receiving elephant rides*”³. This merely states that there are degrees of risk and that visiting the circus, although a low risk activity, is not without risk.

A public health note written by a veterinarian at the Los Angeles County Department of Health services stated that “*Various species of wild-life are susceptible for M. tuberculosis and it can present a problem when people and wildlife intermingle such as in wild animal compounds, zoos and circuses*”^{4,5}, another clear indication that being around infected animals, wherever the venue, does involve an element of risk. This is reiterated in a paper entitled “*Wildlife, Exotic Pets and Emerging Zoonoses*”⁶, which states that “*Exposure to captive wild animals at circuses or zoos can also be a source of zoonotic infection.*”

APHIS’s Policy 21⁷ concerns the control of TB in elephants. It outlines how “*Several elephants owned by licensed exhibitors have either tested culture positive for tuberculosis or have died due to this disease. In addition, elephants with tuberculosis can transmit the disease to other elephants, other animals, and, potentially, to humans*”. To this end, APHIS AC (Animal Care) requires periodic testing of all Animal Welfare Act (AWA) regulated elephants. In addition, an APHIS FAQ states that “*TB in elephants is a zoonotic disease with public health implications*”⁸. An animal care resource guide pertaining to tuberculosis management states that “*All employees in contact with elephants should be TB skin tested yearly*” and “*New employees should be tested prior to any contact with the elephants*”⁹.

However, as one study showed, it is not always apparent when an elephant has TB. The authors said, “*most elephants with active TB have no clinical signs of disease*”. The study pointed out that the only officially recognized test for TB in elephants, trunk wash culture, has serious limitations¹⁰.

Countries around the world have recognized the importance of banning non-domesticated animals from traveling circuses:

National measures to prohibit the use of wild animals, or selected species, have been adopted in: Austria, Belgium, Bolivia, Colombia, Costa Rica, Czech Republic, Denmark, India, Israel, Malta, Peru, Portugal, Singapore, Slovakia, Sweden and Taiwan. Similar laws are being discussed in: Brazil, Chile, Netherlands, Norway and United Kingdom. Due to public concerns, local town and city bans are in place in the US, UK, Brazil and many other countries.

ADI recently worked with the Bolivian Government on the relocation of circus animals following Bolivia’s ban on the use of all animals in traveling circuses. ADI assisted the Bolivian Congress from the inception of the new legislation.



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With offices in Los Angeles, London and Bogota, ADI is an international campaign and animal rescue organization with a commitment to securing progressive animal protection legislation around the globe. ADI has a worldwide reputation for providing video and photographic evidence exposing the behind-the-scenes suffering in the circus industry and supporting this evidence with scientific research on captive wildlife and transport.

References: 1. Murphee, R. et al (2011) “Elephant-to-Human Transmission of Tuberculosis, 2009”, *Emerging Infectious Diseases*, vol.17, no.3, pp.366-371; 2. Stenberg-Lewerin, S. et al (2005) “Outbreak of Mycobacterium tuberculosis infection among captive Asian elephants in a Swedish Zoo”, *The Veterinary Record*, vol.156, pp.171-175; 3. Michalak, K. et al (1998) “Mycobacterium tuberculosis infection as a Zoonotic Disease: Transmission between Humans and Elephants”, *Emerging Infectious Diseases*, vol. 4, no.2, pp.283-287; 4. Ryan, C.P. (1997) “Tuberculosis in Circus Elephants”, Southern California Veterinary Medical Association, January pp.8-9; 5. <http://www.lapublichealth.org/vet/pubs/veteltb.pdf> - accessed 09/03/11; 6. Chomel, B.B. et al (2007), *Emerging Infectious Diseases*, vol.13, no.1, pp.6-11; 7. http://www.aphis.usda.gov/animal_welfare/downloads/policy/policy21.pdf - accessed 09/03/2011; 8. http://www.aphis.usda.gov/animal_welfare/downloads/elephant/statpakfaq3-11.pdf - accessed 02/02/2011; 9. http://www.aphis.usda.gov/animal_welfare/downloads/manuals/eig/15.5_eig.pdf - accessed 09/03/2011; 10. Lyashchenko, K. P (2006) Tuberculosis in Elephants: Antibody responses to defined antigens of Mycobacterium tuberculosis, potential for early diagnosis, and monitoring of treatment. *Clinical and vaccine immunology* p: 772-732.