

19 November 2012

Dear Dr. Crawshaw:

This letter is to follow-up on the information provided in the correspondence dated August 11, 2012. There have been a number of peer-reviewed scientific publications that have examined the results of exposure of elephants to TB. One paper published this year prospectively studied 14 elephants that had been exposed to other culture-positive TB elephants and/or became seropositive by STAT-PAK and confirmatory tests (Lyashchenko, et al., 2012). All of these elephants eventually were diagnosed to have TB by confirmed culture, although it took up to 15 years in one case. Two elephants housed with a confirmed TB elephant diagnosed in 1996, became seropositive in 1996 and 1997. Although tested by trunk wash culture annually, they remained negative. However when daily pooled trunk wash samples were started in 2011, both animals were diagnosed positive by culture within 2 and 3 ½ weeks.

Similar studies have been published investigating transmission of TB among elephants and other exposed animals in zoos that were NOT in direct contact, yet became infected (see Lewerin, et al., 2005; Oh, et al., 2002). Currently, the Taronga Zoo in Australia is dealing with TB in imported elephants from Thailand that had been quarantined for several years, yet still started shedding when one of the elephants became pregnant and calved. This facility now has another seropositive elephant as well as TB in their chimp troop (Vogelnest, personal communication).

These scientific publications demonstrate that there is a risk of transmission from culture-positive and even seropositive elephants that have a strong probability of becoming culture positive, to other animals that are in contact, and even those that are not in direct contact but on the same premise as these animals.

As I've previously stated, based on this information there is a risk of transmission of tuberculosis from an infected elephant whether there or not there is direct contact with other elephants including potentially your elephants that may be relocated to a facility with a history of TB. At this time, it is difficult to provide a quantifiable risk since many factors will impact this. However, it is obvious that relocation to a facility where there is no history of tuberculosis presents a better option when considering risk for disease transmission.

Please feel free to contact me if you have any questions or wish to discuss this matter further.

Sincerely,



Michele Miller, DVM, PhD
AZA Elephant Taxon Advisory Group Veterinary Advisor
Palm Beach Zoo, Director of Animal Care and Conservation
1301 Summit Blvd. , West Palm Beach, FL 33405
561-833-7130 ext 224
mmiller@palmbeachzoo.org

August 11, 2012

Dear Dr. Crawshaw:

In consideration of your questions regarding risks of transmission of tuberculosis between elephants, there is still a lot of debate among experts in the field of mycobacteriology, epidemiology, and infectious disease as to the factors contributing to the risks. As you are aware a number of workshops have been held recently, and I would refer you to some of the presentations available at the website http://www.aphis.usda.gov/animal_welfare/pg.php?pg=Tuberculosis_In_Elephants, in particular the "Epidemiology of Tuberculosis in Elephants, 1994-2011, United States" by Dr. Kathleen Orloski and the presentation by Dr. Rendi Murphree, which shows indirect exposure through aerosolization of *M. tuberculosis* at an elephant sanctuary.

Since the currently available diagnostic tests for detecting tuberculosis in elephants are still less than ideal for identifying early infection, it is only after an infected elephant is shedding the organisms and presents a risk to other animals and people that it is typically diagnosed. By this time, the likelihood of contamination of the environment and exposure of animals and people has already occurred.

In other cases, tuberculosis has occurred in facilities in which there has been no direct contact between animals. Currently there is an epidemiological investigation underway at the Taronga Zoo in Australia in which tuberculosis in elephants has spread to the chimpanzee troop (L. Vogelnest, pers. comm.). Other documented cases have also included outbreaks at the Los Angeles Zoo in which mountain goats, black rhinoceros and elephants were infected with *M. tuberculosis* without having any direct contact (Oh et al., 2002) and in elephants, tapir, giraffe, and rhinoceros in a Swedish zoo (Lewerin et al., 2005).

These examples demonstrate that the risk of transmission of tuberculosis from an infected animal at a facility to other animals, even those not in direct contact, is a documented risk. The duration of contact is probably associated with risk of transmission although those studies have not been done in elephants. As the examples above demonstrate, the time from diagnosis in an infected animal to identification of infection in a secondary case can be as short as 2 years but could be decades.

Therefore, based on this information there is a risk of transmission of tuberculosis from an infected elephant whether there or not there is direct contact with other elephants including potentially your elephants that may be relocated to a facility with a history of TB. At this time, it is difficult to provide a quantifiable risk since many factors will impact this. However, it is obvious that relocation to a facility where there is no history of tuberculosis presents a better option when considering risk for disease transmission.

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Palm Beach Zoo
Director of Conservation Medicine
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West Palm Beach, FL 33405
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mmiller@palmbeachzoo.org