

## **MYCOBACTERIUM TUBERCULOSIS INFECTION IN ASIAN ELEPHANTS (ELEPHAS MAXIMUS) IN SWEDEN**

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### **Extended abstract**

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Tuberculosis caused by *Mycobacterium tuberculosis* is an important zoonotic disease of captive Asian elephants. Elephant tuberculosis has acquired renewed attention following the outbreaks in USA in the past years. It is estimated that 3% of the captive elephant population in North America is infected (1). Although tuberculosis was recognised in captive elephants in Europe as early as in the 18<sup>th</sup> century, only limited information, mostly isolated reports, is available about the tuberculous status in captive elephants in Europe.

Recently two infected Asian elephants were detected in a Swedish zoo during a routine control based on mycobacterial culture of trunk lavage. The elephants were a 30-years-old female born in Burma, and a 26-years-old female. Both had arrived to the zoo in the late 1980-s, after having spent 12 and 10 years respectively at European circuses. The two elephants had shown occasional weak bovine reaction to the comparative tuberculin skin test, the 30-years old in 1993 and the 26-years-old in 1997. Thereafter their skin test was negative or inconclusive four times and twice respectively. Both animals seroconverted between 1995 and 1997 and developed a weak positive antibody titre at the ELISA (ELIB and MB70- antigen, at ID-Lelystad, The Netherlands). Culture of trunk lavage has been made in all the elephants of the zoo since 1998.

In late summer 2001 the 30-years-old female became tired, developed polydipsia but retained normal appetite and body weight. A significant increase in beta- and gamma globulins, and a drop in albumin/globulin-quota was noted, starting in early 2001. The trunk lavage cultured positive for *M. tuberculosis* and she was euthanised. The 26-year-old elephant showed positive culture of all three trunk washes in December 2001, while the cultures from lavage obtained in October and November had been negative. This animal is to the date (end of January 2002) in excellent physical condition but will be euthanised in February 2002.

The post mortem examination of the 30-years-old elephant revealed lesions consistent with pulmonary tuberculosis. Solid granulomatous pneumonia involved approximately one fourth of the left lung. Two large (20 x10 x10 cm diameter) granulomas were present in the right lung. The rest of both lungs' parenchyma had widespread numerous small foci. Lesions were also found in bronchomediastinal lymph nodes and in an axillary lymph node. Multiple granulomas of up to 10 mm, were observed along the mucosa of the trachea and the epiglottis.

Histopathology showed diffuse granulomatous consolidation, formed by whirls of epithelioid cells surrounded by macrophages, eosinophils and lymphocytes. There were multiple small foci of central caseous necrosis and several microabscesses within the consolidation. Large organised epithelioid cell granulomas were present in the lungs, lymph nodes and spleen. These lesions had irregular encapsulation, cellular outer layers and large necrotic centres. Calcification was mild. Some of the lesions were extending into the lumen of the smaller airways in the lungs. Large necrotic granulomas with abundant acid fast bacilli were present in the mucosa of the trachea, opening through the epithelium into the lumen. A few acid fast bacilli were found in the lung lesions. Multinucleated giant cells were not observed. *Mycobacterium tuberculosis* was isolated from the lesions on Löwenstein-Jensen medium.

Tuberculosis in elephants is most frequently of pulmonary forms (2). The lesions observed in this case were indicative of shedding via aerosol and respiratory secretions. It is generally recognised that the diagnosis of pre-clinical tuberculosis in elephants is difficult. The present diagnostic tests can detect exposure to mycobacteria and immunological response, but do not provide information on the progression of the infection. The definitive diagnosis can be made by culture of clinical samples first when shedding is in place, which appears to occur at later stages, when well established and productive lesions have developed in natural passages, such as respiratory tract. Tuberculosis acquired by humans from elephants is considered to result most often from close and repeated contact, such as that with elephant handlers. There is also a potential risk for the transmission of *M. tuberculosis* from elephants to other exotic species. It is important that monitoring and control programs for the detection of tuberculous elephants in captivity is implemented in order to prevent infection in humans and animals.

## References

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