

Dying for a Myth

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A report on the danger of transference of
TB from lions to humans

Written by

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Dying for a Myth



In September 2016, Linda Park, Director, Voice4 Lions highlighted the health issue of TB in lion bones in her blog "SA Exporting TB in lion bones?" when Director of the International Campaign Against Canned Hunting <http://www.cannedlion.org/blog/archives/09-2016>. The blog includes further opinion from Professor Paul van Helden, Stellenbosch University stating that "It should be noted that the organism that most commonly causes lion

TB is *Mycobacterium bovis* (which causes bovine TB). This differs very slightly from that species most often causing human TB. Unfortunately, this organism has the propensity to cause TB in humans often in organs other than the lung, making it very difficult to diagnose. Furthermore, it is inherently resistant to one of the four most important drugs (antibiotics) used to treat primary human TB. Treatment of humans with this form of TB is therefore compromised. This therefore poses a potential risk to humans which is arguably greater than the most common form of TB in humans.

I am therefore of the opinion that uncontrolled exposure of humans to bones from animals, in particular lion bones, poses a risk for development of the form of TB known as bovine TB in particular, although not necessarily being limited to this form of TB only." (In July 2009, Professor Paul van Helden was featured in an article on Thompson Reuters' Sciencewatch - <http://archive.sciencewatch.com/ana/st/tub/09julSTTubvanHel/> - citing him as the 4th highest ranked scientist in the World in the field of tuberculosis)

At the beginning of this year the South African Government announced plans to permit the annual export of 800 lion skeletons from captive bred lions. <http://www.traveller24.com/Explore/Green/sas-export-of-800-lion-skeletons-misguided-and-shameful-20170123>. The majority of these would most likely be sent to manufacturers of fake tiger wine. Lion bones have been used as a substitute for tiger bones since around 2008.

<https://www.theguardian.com/environment/2013/apr/16/south-africa-lion-bones-trade>. Further highlighted in the paper Williams VL, Loveridge AJ, Newton DJ, Macdonald DW (2015) 'Skullduggery': Lions Align and Their Mandibles Rock! PLoS ONE 10(11): e0135144.

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0135144> and the report Bones of Contention report by Oxford University's Wildlife Conservation Research Unit (WildCru), TRAFFIC and the University of Witwatersrand <https://www.wildcru.org/news/bones-of-contention-lion-bone-trade-report-released/>

We are deeply concerned that there could be substantial health risks to people when handling/consuming lion parts from a lion infected with TB.

<http://www.health24.com/Medical/Tuberculosis/TB-in-south-africa/Can-you-get-TB-from-animals-20150324>. <http://edition.cnn.com/2016/10/31/health/veterinarian-contracts-tuberculosis-from-wildebeest/> The OIE – World Organisation for Animal Health list diseases transmissible to humans in their October 2016 press release <http://www.oie.int/for-the-media/press-releases/detail/article/update-on-wildlife-diseases/>. Zoonotic infection including *M. tuberculosis* is highlighted by Bruno B. Chomel et al in "Wildlife, Exotic Pets, and Emerging Zoonoses" https://wwwnc.cdc.gov/eid/article/13/1/06-0480_article

We believe there is an urgent need for further research from all parties to prevent a major health issue. The most significant health risk applies to those that handle lion

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carcasses and bones in the first instance i.e. farm labourers who prepare a carcass immediately after it has been hunted, euthanised or died and prepared for the lion bone trade. It may also affect other participants in the industry (i.e. taxidermists <http://www.dailymail.co.uk/news/article-3178868/Inside-Namibian-taxidermy-factory-stuffs-6-000-animals-year-trophy-hunters.html>, customs officers, muti users <http://www.penton.co.za/strong-muti-harm-ye-none-two-worlds-apart/> and the TCM end-users <http://www.bloodlions.org/tiger-bone-wine/> , to a degree, depending upon how long the infection remains viable within the bones/organs. It should also be noted that South Africa has a burgeoning TCM industry of its own <http://globalriskinsights.com/2017/04/radar-traditional-chinese-medicine-became-one-africas-fastest-growing-industries/>

Possibility of infection becomes a major risk factor for anyone who is on medication that is immunosuppressant or has an inherited or acquired immunodeficiency disorder e.g. HIV infection or other factors (but not limited to) those with low socioeconomic status, crowded living conditions etc. There is also the issue that once a person catches TB it can lie latent for a number of years whilst it multiplies in the body. Once the disease is activated during this time they are likely to infect other members of their whole family as well as friends or anyone they may be in contact with since the disease is normally passed from human to human via the respiratory systems.

Immunodeficiency disorders

<https://medlineplus.gov/ency/article/000818.htm>

Tuberculosis overview

http://www.emedicinehealth.com/tuberculosis/article_em.htm

HIV Infection Disrupts the Sympatric Host–Pathogen Relationship in Human Tuberculosis

<http://journals.plos.org/plosgenetics/article?id=10.1371/journal.pgen.1003318>

Humans can get deadly TB from animals

<http://bhekisisa.org/article/2016-03-11-00-humans-can-get-deadly-tb-from-animals>



Workers prepare animal skins in front of animal trophies at the taxidermy studio in Pretoria, February 12, 2015. Photo by Sipiwe Sibeko/Reuters. Taken from <http://www.pbs.org/newshour/rundown/trophy-hunting-explained/>

TB in lions

TB affects humans and many animal species including wild and captive-bred lions. Both the human and animal form of TB may be the causative agent. The Wildlife Disease Association Africa & Middle East April 2017 Quarterly Newsletter (page 5) contains an article entitled Tuberculosis as an Emerging (Re-Emerging) Disease in South African Wildlife by Professor Michelle A Miller, DVM, MS, MPH, PhD NRF South African Research Chair in Animal TB, Stellenbosch University and highlights the fact that “although a Bovine TB Eradication Scheme was introduced in 1969 to address the issue in cattle, changes in national and provincial veterinary structures, lack of funding and trained personnel, and disease prioritization have resulted in failure to control the disease in South Africa.”

<http://wildlidedisease.org/wda/Portals/0/Sections/AME/WDA%20AME%20April%202017%20Newsletter.pdf>

In 2009, South African National Parks, Endangered Wildlife Trust and the Conservation Breeding Specialist Group Southern Africa convened a workshop entitled “Lion (Panthera Leo) Bovine Tuberculosis Disease Risk Assessment”. A large group of specialists met to evaluate the then status of lions in the Kruger National Park and the issue of TB. The final report can be found here https://www.wcs-ahead.org/gltfca/grants/pdfs/lion_tb_risk_report_final.pdf

At this workshop, Dewald Keet the Chief State Veterinarian KNP stated the clinical signs and pathology of TB. “Clinical signs are typically non-specific and consist of varying
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degrees of emaciation with deterioration of skin quality. Focal areas of partial alopecia of varying size are seen in most cases. Visible, palpable and marked enlargement of superficial lymph nodes as seen in various other species does not occur. Hygromas of the elbow are found to be a reliable indicator of *M. bovis* infection. They are more frequently seen in females than in males. Undetermined or non-specific lameness due to swollen, inflexible stifle and hock joints associated with muscular atrophy of affected appendices occur in older lions. Dermal wounding with an apparent inability to heal is seen in a number of cases. Older males often develop large swellings above or below the hip joint. Large ulcers subsequently develop on the surface of these swellings. This is often bilateral but varying in size. Varying degrees of mane loss and deterioration are seen in most males necropsied. Testis atrophy is consistently present in these cases. None of 86 females were pregnant at the time of necropsy. Tachypnoea and dyspnoea was seen in cases with advanced pulmonary lesions. Ocular lesions are seen in a small number of cases and central nervous system impairment in only one. Hair covering the ventral aspects of the neck, thorax and abdomen appears to be longer and white in inactive females.

Gross lesions in the carcass of a lion are not typically caseous-necrotic. They are rather fibrous and proliferative and seldom associated with abscess formation. The sarcomatous appearance of mycobacterial lesions in domestic cats frequently leads to misdiagnosis in cats and lesions in lions have a similar sarcomatous appearance. Lymph nodes are only slightly enlarged but mostly rather severely atrophied. These lymph nodes reveal sinus ectasia associated with cortical and paracortical lymphoid hyperplasia. Pulmonary lesions are the only category identifiable with a certain degree of accuracy. However, they also appear distinctly different from lung lesions seen in ruminant, primate, rodent, swine and lagomorph species.

Microscopic lesion patterns observed in various organs were of a granulomatous nature consisting of macrophages, epithelioid cells, lymphoplasmic cells and numerous neutrophils, suggestive of mycobacterial infection. Severe generalized lymphoid atrophy was sometimes seen in association with granulomatous lesions. Pulmonary lesions comprised of granulomatous interstitial pneumonitis or granulomatous bronchopneumonia often associated with bronchiectasis. Intestinal lesions showed mononuclear macrophage predominance suggestive of mycobacterial mural enteritis. Granulomatous osteitis, periosteitis and osteosis were found in most of the well-developed cases frequently associated with myositis."



Lioness at Hluhluwe-iMfolozi Park
with TB and sarcoptic mange



Hygroma in Kruger lion with TB



Kruger lion with TB

<https://www.journeyman.tv/film/1271> In 2002 reporter Sally Sara and Journeyman.tv made a report on TB in lions in the Kruger Park highlighting the issues, clinical signs and prognosis going forward with the spread of TB and the knee jerk reaction of bringing in hunters to kill neighbouring reserve lions that had been infected. If all lions that become infected with TB are culled like this there will certainly be one place that their bones could potentially end up and that will be in the lion bone trade!

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TB & Captive-bred lions



With the numbers of lions held together in a breeding farm, the likelihood of disease spread is raised to a high level. Plus the issues of inbreeding that occur in captive lion breeding cause major immune issues and therefore another high-level risk for disease spread. A recent study by the Animal TB Research Group of Stellenbosch University also suggests that lions may be able to transmit bacteria between themselves through respiratory secretions (droplets transmitted through sneezing or coughing).

<http://www.bioone.org/doi/full/10.7589/2014-07-170>

As noted above by Dr Dewald Keet and Professor Nick Kriek of Onderstepoort Veterinary Academic Faculty (in our first blog on this issue) - hygromas of the elbow have been found to be a reliable indicator for TB in lions. Kirberger RM, Keet DF and Wagner WM (2006) highlight “Radiologic abnormalities of the appendicular skeleton of the lion (*Panthera leo*): incidental finds and *Mycobacterium bovis*-induced changes”.

<https://www.ncbi.nlm.nih.gov/pubmed/16553146>



Hygroma in captive-bred lion (circled) - classic clinical sign of TB

In Viljoen et al (2015) *Mycobacterium bovis* infection in the lion (*Panthera leo*): Current knowledge, conundrums and research challenges it was also shown that the first cases of lions contracting TB came from two zoos. The onset of the disease was relatively sudden after the felids experienced high stress situations such as after repeated periods of pregnancy and lactation.



This situation is replicated within lion breeding farms and it is well known that lion breeding farms keep their lionesses in a tight circle of pregnancy (by removing cubs as early as possible to bring them back into estrus) to maximise the number of cubs that are born each year.

Keel et al (2010) also highlight the fact that progress of TB in lions is apparently slow, with the majority of infected lions appearing healthy while being sub-clinically infected.

Conclusion

We believe that there is a substantial risk to humans from TB carried in lion bones/organs and that this requires immediate attention and further research. Our request for immediate attention and further research is supported by the attached letter following a discussion with a colleague on our report with Irvin M Modlin MD PhD DSc MA FRCS(Eng) FRCES(Ed) FCS(SA), Emeritus Professor, Yale University School of Medicine (See Appendix 1). An industry that puts the health of its workers/end-users at risk is an industry that is likely to find lawsuits against them in the future. They have now been warned about this issue and need to act on it immediately.

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Appendix 1



Yale University

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July 5, 2017

Dear [REDACTED]

I am writing to you in respect of our discussion about the issue of tuberculosis in African wild animals in the consideration of dissemination of the disease by the export of their carcasses to other countries.

My comments are based upon an in-depth study of the history of medicine with a special interest in the spread of disease and the evolution of therapy.

As I understand it bovine tuberculosis has been introduced into the African lion population by feeding them with the carcasses of animals that have tuberculosis. Furthermore the African lion population is not decimated by disease as a consequence of eating cattle contaminated with tuberculosis. An additional fact that you provided points to the development of not only pulmonary and gastrointestinal tuberculosis in the Lions but a widespread involvement of their bones and joints. As a consequence of the TB these animals are unable to acquire their natural food by killing and become extremely ill both from the tuberculosis and the starvation consequent upon their inability to hunt effectively. These tuberculosis-ridden animals thus die prematurely. A further issue that was raised is the observation that with the abolition of the ivory trade the current most desirable material that is used for medication in the Orient has become lion bones. From our conversation, I understood that the lion bones are sold intact to a variety of vendors in the Far East. The bones are then rendered into powder and developed into a medication which is believed to have positive healthcare benefits or improve the recipient's quality-of-life. The statements are scientifically dubious but nevertheless represent a well-established and extremely popular form of homeopathy in the Far East.

The area that has initiated my concern and which I write to you about is the question of disease transmission. The tubercular bacillus has throughout history proved notoriously difficult to manage. The species has developed very effective means of conservation that is untouched by standard forms of antibacterial activity and procedures. Furthermore the bacillus is extremely difficult to eradicate and can survive extremes of temperature as well as moisture. In the past the way in which the backs of this was most commonly passed from person to person was by the ingestion of contaminated milk. Thereafter human sputum and coughing as well as inadequate environmental standards were responsible for the widespread nature of the disease and the inability to eradicate it effectively.

The situation that you describe is a re-creation of problems that were encountered in the last century or two. In principle it involves a vector to transmit the infection to a susceptible population. When the lion bones are converted to medication the first steps would involve sawing the bones and converting them to powder. The inhaled bone powder would contain tuberculosis bacteria and would be widely disseminated in any factory or room where the individuals were working with this material. It is indubitable that many such individuals would inhale the



tuberculosis bacillus and become infected. Given the fact that such medication factories generally do not involve sophisticated resources that would protect the workers the likelihood of exposure is extremely high. A secondary form of contamination in the environments in which such medications are produced would likely be the contamination of the workers hands and the transmission from their hands to other objects in particularly ingested food. In a population which has not been widely vaccinated for tuberculosis or does not have an immune system that has previously explained exposed to the strain of tuberculosis the risk of disease acquisition would probably be very high.

A further issue relates to the fact of treating infected individuals. The disease is difficult to identify in its early stages and by the time an obvious diagnosis is made the individual would certainly have had the opportunity to contaminate many other individuals that he/she would be in contact with. Under the best circumstances the treatment of tuberculosis involves a long, arduous and highly expensive therapeutic strategy which requires considerable medical management and a high level of patient compliance. These two requirements often not present in some of the areas where powdered bone medications are considered to represent an important component of healthcare.

I would be extremely constant based upon the information you relayed to me that the export of infected lion carcasses would represent the potential for inducing a tuberculosis epidemic in a group of individuals working with the material. Such individuals would become the unwitting vectors for the distribution of tuberculosis imported from one country and then distributed in another. Sadly, the disease would not be selective for only those individuals ingesting the powdered bone but all those healthy persons that they were inadvertently in contact with in the normal course of their daily in family life.

I would urgently suggest that this issue be explored at the highest level by individuals with the appropriate expertise to recognize and prevent the dissemination of a disease that has been regarded as one of the great scourges of mankind. Indeed until quite recently tuberculosis was regarded as one of the most major of all health threats to the public.

Yours sincerely

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