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When human diseases trample on animal health

Realising that all life is intertwined is crucial to the well-being of man and other species

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THIS year World Wildlife Day (March 3) is cele brated under the theme "Sustaining all life on Earth" and reminds us of

Is cereorated under the theme sustain-ing all life on Earth" and reminds us of the urgent need to intensify the fight against wildlife crime and human-induced reduction of species. As South Africans, we are familiar with the threats against our wildlife by poachers; however, very few of us real-ise that there is a silent killer claiming many more lives, namely tuberculosis. The Kruger National Park (KNP) and Hluhluwe-Midolozi Park (HiP) are home to some of the largest free-roam-ing wildlife populations in the world, but here an invisible killer, bovine tuberculosis (DTB) caused by Mycobac-terium bovis (M. bovis), is endemic. Numerous studies have reported on M. bovis in more than 27 wildlife species in South Africa, including African ele in South Africa, including African ele-phants, lions, black and white rhinos

hostin fines black and white rhinos and wild dogs. In a 2019 article in Frontiers in Vet-erinary Science, our colleague Michelle Miller and her co-researchers indicated that in 2016 the emaciated carcass of a wild elephant bull had been found near a rest camp in KNP. Post-mortem examinations revealed that the severely diseased animal had died as a result of tuberculosis-related suffocation, with 80% of the left lung completely diseased. Shockingly, the bacteria identi-fied to be the cause of the infection

fied to be the cause of the infection was Mycobacterium tuberculosis (M. tuberculosis), more com-

(M. tuberculosis), more com monly associated with human tuberculosis (TB). According to the World Health Organisation's 2019 Global Tuberculosis Report, TB is one of the leading causes of death in peo-ple worldwide and it is believed that one third of the data to the third believed that one third of the world's popula-tion is infected with M. tuberculosis, with an estimated 10 million new cases in 2018. There is however

There is, however, There is, however, a neglect towards the potential impact of human TB on other spe-cies, especially livestock and wildlife. Despite the emerging field of One Health – a collaborative, multisectoral, and an inter-disciplinan

and an inter-disciplinary approach to achieve optimal health recognising the interconnections between people, animals, plants and their shared environment (One Health Commission, 2020), – few studies have assessed the impact of human diseases on animal health and biodiversity.

More current research has dis-More current research has dis-proven the previous dogma that human TB only affects animals in prolonged contact with infected indi-viduals, such as in the case of com-panion and zoo animals; confirming that infection can occur following a single brief exposure with limited or infection exposure with limited or indirect contact.

indirect contact. This finding should significantly influence the way we think about the transmission of TB from animals to humans (zoonotic) and from humans to animals (anthroponotic), especially as it relates to wildlife and endangered species specie

Although chronic M. tuberculosis Although chronic M. tuberculosis infection has been extensively doc-umented in captive Asian elephants over the past decade, this case of anthroponosis in a free-roaming environment shows us that human diseases may have a greater impact on wildlife populations in Africa than we previously thought. Interestingly, the strain (type) of M.tuberculosis obtained from the African elephant bull in KNP

the African elephant bull in KNP is commonly found in human TB

patients in South Africa, and it is thought that transmission may have taken

place during indirect con-tact through contaminated

food or infectious biological food or infectious biological discharge, such as urine. Researchers from Fin-land have have shown that pathogenic mycobacteria in fresh human urine from TB patiente could survive for

patients could survive for up to two weeks at 30°C and up to six

This highlights the impor-

weeks at 15°C

tance of access to clean water sources and sanitation facilities for all commu-nities, eliminating the risk of potential freshwater contamination by human waste. In South Africa, indirect inter-spe-

In South Africa, indirect inter-spe-cies transmission of M. bovis through contaminated environments is wfre-quently observed and documented, as in the case with common warthogs. In a 2018 study in BMC Veterinary Research, colleague Eduard Roos and his co-researchers highlighted that species like warthogs, much like honey badgers in the UK and wild boars in the Brain Mediterrappear are honey the Iberian Mediterranean, are known to become infected with M. bovis, and capable of crossing fences and other man-made barriers all while transmit-ting directory

ting diseases. Large knowledge gaps exist Large knowledge gaps exist regarding human pathogens in wildlife species, empha-sising the dire need for One Health approaches to address zoonotic and anthroponotic diseases at the human-live-stock-wildlife interface. This is exercially urerent

This is especially urgent for communities living in rural towns bordering bTB endemic wildlife parks. TB and bTB are a threat to humans, livestock, captive and free-ranging

wildlife, and are a global health concern. To bridge these

continued disease surveillance in domestic animals and wildlife is required to deter-mine the pres-ence and extent of infection with

of infection with both TB and bTB.

To this extent

research research gaps, continued disease Stellenbosch University (SU)'s Animal TB Research Group implemented a multi-pronged approach to improve knowledge of the epidemiology, pathogenesis and immunology of TB, particularly bTB, in both domestic and

particularly b1B, in both domestic and wildlife species in southern Africa. This includes investigating the role of host genetics and immunology in susceptibility to TB; the genetic diver-sity of mycobacterial pathogens and their impact on wildlife and livestock; and the development of diagnostic tests for numerous host socies. tests for numerous host species

texts for numerous host species. The group has a long-standing relationship with both KNP and HiP and continuously conducts TB and bTB surveillance research in all their infected wildlife species. Additionally, with state veteri-narians the group

narians the group also assists in all livestock sur

livestock sur-veillance pro-grammes and supports the community with disease management strategies strategies.

The research done by the SU Animal TB Research Animal TB Research Group advances both molecular diagnostics and our understanding of the epidemiology of TB in South African animals

This research contributes to informing policy, strengthens conservation efforts and guides public health decisions regard-ing the human-animal ing the human-animal interface. With the increasing interac-

tion between humans and ani-mals, a renewed global commit-ment to the One Health approach is equired in order to manage zoonotic

required in order to manage zoonotic and anthroponotic diseases. The realisation that all life on earth is intertwined, that the lines between the health and well-being of all species is blurred, is crucial to a libel bench and even antime the coluglobal health and preventing the col-lapse of delicate biodiverse ec systems.

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