Bovine Tuberculosis

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EPIDEMIOLOGY

Bovine tuberculosis is widespread in cattle throughout the world. According to information on the worldwide animal health information database of the OIE (WAHID Interface), 128 out of 155 countries reported the presence of *M. bovis* infection and/or clinical disease in their cattle population during the period between 2005 and 2008. In wildlife, cases of *M. bovis* infection have been reported in more than 40 free-ranging wild animal species to date.

While bovine tuberculosis has been successfully controlled in most of the developed world through the implementation of test-and-slaughter schemes, abattoir monitoring and pasteurisation of milk, the presence and extent of bovine tuberculosis in the developing world has been poorly investigated in the past. A number of recent studies have revealed new data confirming the presence of *M. bovis* in cattle and moreover providing insights into the specific risk factors associated with tuberculosis in cattle in different countries and regions. In Africa, high prevalence rates of bovine tuberculosis (up to 50% at herd level) were reported in areas of Zambia where cattle and Kafue lechwe shared grazing and water as well as in areas where the traditional management of livestock in transhumant herds (herds which are moved to floodplains for grazing during the dry season) prevailed. Under these often nomadic conditions, the risk of exposure to *M. bovis* was increased significantly by creating multiple herd contacts and increasing the total herd size. The latter has also been suggested as a driver of the disease prevalence in Ethiopia and Ecuador. On the other hand, in countries with a rapidly increasing livestock production and intensification of production systems such as Iran, the propagation and insufficient detection of circulating *M. bovis* strains may be the most important contributor to increasing economic losses from bovine tuberculosis, rather than the importation of infected cattle, as previously suggested.

Transmission of the disease occurs most commonly during direct, close contact between uninfected and infected animals, especially those in advanced stages of the disease as shedding increases with the development of gross lesions. In cattle, other bovids and some social wildlife species bovine tuberculosis affects primarily the lungs and hence transmission occurs mainly via contaminated aerosols. Under extensive farming conditions the disease spreads as a result of cattle congregating in communal kraals (pens) at night or at watering points under dusty conditions. Ingestion of infected milk is a significant route of infection from infected dams to calves and a risk factor in humans consuming unpasteurised milk from infected cows. In carnivores and scavenging wildlife species infection *per os* is an important route of infection, whereby secondary involvement of the lungs as a result of haematogenous spread of the organisms allows excretion of high doses of infectious organisms via the respiratory route. Excretion of *M.*
bovis from discharging skin wounds, draining lymph nodes and in urine is of importance in the epidemiology of M. bovis infection in meerkat (suricate), greater kudu and the European badger, respectively. Congenital infection is possible and can affected 1 - 5 per cent of calves in cattle herds with a high prevalence of tuberculosis.

The environment generally plays a minor role in the epidemiology of bovine tuberculosis due to the fact that Mycobacterium bovis is an intracellular pathogen and cannot survive outside the host for prolonged periods of time. Under environmental conditions of high temperature, low moisture content and UV radiation, the survival time is measured in days with a maximum of 2 weeks. Despite this, circumstantial evidence has indicated the spillover of M. bovis from cattle to greater kudu and from kudu to buffalo, which is less likely to occur via direct contact but is probably facilitated by contaminated environmental sources such as soil, vegetation or water.

African buffalo, which had originally contracted the disease by close contact with infected cattle, have introduced bovine tuberculosis into several wildlife populations. They can serve as direct source of infection to predators (alimentary route) and other herbivores sharing the same habitat (e.g. by aerosol during close contact). Scavengers and omnivores in southern Africa and elsewhere can contract M. bovis from contaminated carcasses or other environmental sources in a high prevalence area. Mycobacterium bovis infection has also been diagnosed in a wide variety of free-living wildlife species in some game parks in South Africa including African buffalo (Syncerus caffer), greater kudu (Tragelaphus strepsiceros), lion (Panthera leo), cheetah (Acinonyx jubulatus), baboon (Papio ursinus), grey duiker (Sylvicapra grimmia), spotted hyena (Crocuta crocuta), leopard (Panthera pardus), honey badger (Mellivora capensis), warthog (Phacochoerus aethiopicus), bushpig (Potamochoerus porcus), impala (Aepyceros melampus), bushbuck (Tragelaphus sylvaticus), eland (Taurotragus oryx), spotted genet (Genetta tigrina). It has been isolated from wildebeest (Conochaetes taurinus), topi (Damaliscus lunatus) and lesser kudu (Tragelaphus imberbis) in Tanzania and from lechwe (Kobus leche) in Zambia and wild boar in Spain. With the exception of buffalo, kudu, lechwe and wild boar these species are considered to be spill-over species of M. bovis.