CURRENT CHALLENGES IN DIAGNOSIS OF ANIMAL TUBERCULOSIS: NEW TESTS AND THEIR APPLICATIONS IN CONTROL STRATEGIES IN WILDLIFE

Christian Gortázar – SaBio, National Wildlife Research Institute IREC (Universidad de Castilla – La Mancha & CSIC), Ciudad Real, Spain.

Animal tuberculosis (TB) is caused by infection with *Mycobacterium bovis* and closely related members of the *Mycobacterium tuberculosis* complex (MTC). It is a typical multi-host infection which in Europe involves several domestic hosts including cattle, goats, sheep and pigs, as well as several wild hosts, mainly the European badger (*Meles meles*), the Eurasian wild boar (*Sus scrofa*), and cervids such as red deer (*Cervus elaphus*) and fallow deer (*Dama dama*). The host range varies among geographical regions and new hosts are steadily added to the list of animal species contributing to MTC maintenance. Moreover, *M. bovis* is able to survive for some time in the environment, including water and mud or even salt stones. This creates remarkable challenges for TB eradication, particularly in multi-host systems with a strong environmental component of MTC transmission.

In cattle, TB testing is traditionally based on measuring the cell-mediated immune response to more or less MTC-specific antigens, most often to *M. bovis* (bovine) purified protein derivative (bPPD). Additional diagnosis takes place at slaughter, based on the detection of TB-compatible lesions and on MTC-culture. Similar tests are applied to other domestic MTC hosts, too, mainly goats. In wildlife and in the context of TB control at the wildlife-livestock interface, three main needs exist: (1) in-vivo tests for use in farmed or captive wildlife (deer farms, zoos), during wildlife translocations, or for capture-test-targeted culling schemes; (2) post mortem tests used for disease surveillance, epidemiology and intervention assessment purposes; and (3) environmental DNA detection, which is increasingly used in studies on transmission routes, biosafety assessment and herd-level risk certification. New tests are increasingly developing, generating opportunities for innovation in TB control.

In situations where wildlife and the environment contribute significantly to MTC circulation, TB-control schemes addressing only cattle, or only cattle and goats, are not enough: all suitable MTC maintenance hosts need to be taken into account. The first step is performing a proper epidemiological diagnosis, i.e. a comprehensive assessment of the role of each and every host and of the environment, as well as of their interconnections, in MTC maintenance. From a diagnostic point of view, this requires combining traditional diagnostic tools (applied to livestock) with post-mortem diagnosis (for instance for game species), serology (for wildlife and pigs, if present) and environmental DNA detection. Once the main players are identified, their populations and their TB prevelance need to be monitored through time. Inexpensive diagnostic tools are needed for this so-called integrated monitoring. Only after such an integrated monitoring scheme is running does it make sense to consider intervention. Again, combined, integrated disease control schemes are more likely to succeed. Such schemes will likely make use of biosafety and prevention, population control, and vaccination. An example of such a strategy is available (in Spanish) at https://www.mapama.gob.es/es/ganaderia/temas/sanidad-animal-higiene-ganadera/patubes2017_3_tcm30-378321.pdf.