A One Health approach for controlling tuberculosis in animals and humans

El enfoque “Una Salud” para el control de la tuberculosis en animals y humanos

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Tuberculosis (TB) is a reemerging disease and a significant health problem in both humans and animals. The traditional picture of human tuberculosis is disease caused by *Mycobacterium tuberculosis* (MTB), which often presents as a chronic pulmonary infection that, without treatment, can progress to systemic infection and result in death. Mycobacterial infections outside the respiratory system, or extra pulmonary TB, are documented but often under-reported. In addition to MTB, *M. bovis* (BTB) is the agent most commonly associated with non-pulmonary TB. It is a recognized public health problem in many non-industrialized countries, where direct contact with livestock reservoir hosts of BTB and consumption of unpasteurized dairy foods and improperly cooked meat are important routes for the zoonotic transmission of BTB from animals to humans. The primary reservoir host for BTB is domestic cattle; however BTB has been reported in most mammalian species. It is important to emphasize that other domestic and wild animals have been recognized as potential reservoirs of *M. bovis* for cattle and human infection. The economic costs of BTB, from losses in livestock productivity (e.g., milk, meat, animal mortality) to losses in human productivity due to illness are greater in non-industrialized countries where BTB control programs are absent or ineffective.

The World Health Organization (WHO) lists BTB as one of seven neglected zoonoses that pose serious threats to public health and the World Organization for Animal Health (Organization International for Epizootics, OIE) has called for the control and eradication of BTB. Global awareness of the importance of BTB infection in humans has increased with the spread of HIV-AIDS: rates of BTB infection in HIV-AIDS patients are higher than those in the general population and BTB/HIV-AIDS co-infections now constitute the majority of BTB cases in various countries

Bovine tuberculosis continues to cause disease in food producing animals as well as free-ranging and captive wild and farmed in industrialized and non-industrialized countries around the globe. In the United States BTB has been reported in a few beef and dairy cattle in widespread areas. The current national bovine TB surveillance program utilizes animal identification (back tags and ear tags) of adult slaughter cattle. Animals with tuberculous lesions are traced to the source origin and follow-up PPD (Tb) skin tests are conducted on the animals in the herd of origin and in cattle in contact herds. When *M. bovis* infection is confirmed in the herd, the entire herd is quarantined. Responders on the Tb test are removed and send to slaughter within 15 days. Disinfection of the premises is conducted using tuberculocidal agents (http://www.cdfa.ca.gov/ahfss/Animal\_Health/pdfs/biosecurity\_surface\_disinfect\_b4.pdf). Follow-up tb tests are conducted at two month intervals until negative tests are reported on animals in the entire herd at two and six months. In some states in vitro assays may be used in place of the tb skin test or as a supplemental test.

 *Mycobacterium bovis* BCG vaccine has been widely used in humans in high burden countries. Although it does not protect against the adult form of TB, BCG vaccination can provide protection against primary TB in children (disseminated TB and TB meningitis). For this reason, it is included in vaccination programs for newborns and infants in diverse countries. BCG vaccines are not utilized in animals since they fail to protect against infection and their ability to prevent progression of disease is uncertain. It is important to note that symptomatic TB patients, usually consult for treatment, and the effective TB treatment can cut the chain of infection; however, animals with clinical disease that are contagious remain in the population and are reservoirs of infection for other animals. Therefore, vaccines for animals must be highly efficacious to be of practical value in control of bovine tuberculosis.

In order to address challenges associated with BTB in the global strategy to control TB, both human and animal health professionals must work together for effective prevention and control of zoonotic TB. The term One Health has been adopted to describe the unified human medical and veterinary medical approach to zoonoses, and will be critical for future endeavors in the control of the global TB epidemic. This unified paradigm is ideally suited for control of BTB. Increased interaction and sharing resources and increased interaction between public health and veterinary medical scientists can raise awareness of ‘shared risk’ of BTB between humans and animals, and in resource-limited situations, can maximize use of existing infrastructure and reduce unnecessary duplication of effort in disease control programs.

Shared research in human and animal health can speed the development of new diagnostic tests for humans and livestock, and improved TB surveillance, control, and eradication programs. Utilization of One Health principles for interdisciplinary/multidisciplinary collaborations offers a valuable approach for all global regions. This modernized informational approach is and will be of significant value to public health officials, research workers, allied health scientists, state and federal regulatory veterinarians, medical (physicians) and veterinary medical practitioners, and professionals interested in the health care of domestic and wild animals.