

## The Economic Burden of Leptospirosis

### Introduction

Leptospira infection is a global zoonosis caused by spirochetes of the genus *Leptospira*. It causes endemic disease among agricultural workers and others regularly exposed to flooded fields and livestock, or other sources of animal urine. Outbreaks of leptospirosis also occur among immune-naïve individuals who may be exposed because of changing environmental conditions, travel, or occupational or recreational activities. Although the global burden of leptospirosis is unknown, more than 500,000 human cases of leptospirosis are reported worldwide each year, with a fatality rate of up to 25% in some regions. Leptospirosis affects numerous animal species including livestock, pets, and wildlife.

Leptospirosis is indicated in some of the scientific literature as being both a neglected tropical disease and a neglected zoonotic disease (Evangelista and Coburn 2010; Hotez 2010). The neglected tropical diseases (NTDs), which are primarily parasitic and bacterial infections, represent the most common infections in the poorest billion people in the world (Hotez 2010, 2011). Because NTDs occur in the poorest people in the world, who often lack adequate access to hospitals and diagnostic centers, it can be difficult to estimate the total disease burden for the NTDs, despite concentrated efforts to do so (Perry and Randolph 1999; Vanderelst et al. 2012; Victoriano et al. 2009).

Several methods were used in an attempt to review the prominence and economic burden of leptospirosis, including review of NTDs lists by various world health organizations, and literature searches to estimate human and animal disease burdens.

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Internet searches were conducted for worldwide health organizations concerned with human disease, animal disease, and vaccination. Within those organizations, searches were conducted for *Leptospira*, leptospirosis, neglected tropical diseases, tropical diseases, neglected zoonotic diseases, and zoonoses.

Leptospirosis, as a zoonotic disease, imposes two major burdens to humans; the direct burden of illness and medical costs (where available), and an indirect burden due to livestock illness.

Three organizations indicated that leptospirosis was a disease of concern, the WHO (WHO 2010), the International Livestock Research Institute (ILRI) (Grace and Jones 2011; Perry et al. 2002), and the Cochrane Library. The WHO classifies leptospirosis as a neglected zoonotic disease. ILRI discusses leptospirosis as one of the top twenty diseases with major economic and zoonotic impacts. The Cochrane Library lists leptospirosis as one of the top 22 neglected tropical diseases.

According to the WHO, “Very little is known about the true incidence of leptospirosis. The disease is underreported for many reasons, including difficulty in distinguishing clinical signs from those of other endemic diseases and a lack of appropriate diagnostic laboratory services. Leptospirosis presents with a wide variety of clinical manifestations and can be fatal, but if detected early, the disease can be successfully treated with antibiotics.” In the Philippines, where incidence of Leptospirosis is high, the University of the Philippines has started a 5-year program on the Prevention and Control of Leptospirosis called LepCon. Preliminary LepCon findings indicate “More than a third of Metro Manila residents aged 10 - 65 years had either been exposed or infected with leptospirosis in the past. Incidence is likewise very high. The source of infection is apparently poor environmental conditions around their homes that favor the breeding of rodents. The incidence is grossly under-reported as evidenced by the sero-conversion rate that was more than 500-fold higher than the reported incidence during the worst epidemic experienced in the Philippines. Because the disease has serious complications, it could also prove fatal to approximately 7.7% of cases. Further, the cost per patient of leptospirosis (473 US\$) is beyond the reach of many Metro Manilans because the minimum wage per month is only 217 US\$.”

With regard to the indirect burden due to livestock illness, Dr. Angela Walter at the USDA was contacted for more information. She indicated that she had not been able to locate any concrete information on the economic impact of leptospirosis on agriculture in the US, and added that the major cost will be through reproductive losses in cattle and pigs. “Globally, there seems to be agreement from several sources that no one has good data on the economic importance of leptospirosis, largely because there is no good data on the disease prevalence.” In addition to our own literature searches, Dr. Walker provided several articles that discuss the economic burden of leptospirosis, from which several quotations are provided below.

- “ The reported prevalence values of animal infection across the world are between 2% and 46% depending on the animal species. Given this wide variation in reported prevalence values and the contributions to it of factors such as climatic, animal species, time of the year, method of investigation (serovar inclusion in testing), there is not a safe way to calculate the economic impact of the infection among animals. However, it appears that the disease is of major economic concern when it is involved in the reproductive failure of food producing animals. Infection of the reproductive system could result in a "storm of abortions" causing considerable economic losses from meat and milk reductions. Furthermore, these losses appear as more significant among cattle and pigs, because these animal species are considered less resistant than small ruminants.”(Burriel 2010). "There is little research on the economic impact of leptospirosis, and information is lacking about the societal costs of the disease, including the costs of health care, lost productivity caused by sequelae, and death of livestock."(WHO 2011) "It emerged from the discussions that to date a cohesive global estimate for the burden of leptospirosis is lacking and discussions therefore focused on how this global estimate could be obtained. It was agreed that a strategic plan for a GBD study on leptospirosis should be developed and initiated without delay." (WHO 2006). The U.K. National Animal Disease Information Service mentions leptospirosis as a disease of concern in several livestock species, and indicates "economic losses result from infertility, abortion, poor milk yield"

The lack of data regarding the burden of Leptospirosis has been acknowledged by the WHO, which established the Leptospirosis Burden Epidemiology Reference Group (LERG). LERG held their first meeting in 2009, with the recommendation that a transmission model and risk map for leptospirosis be developed as the preliminary steps towards estimating the worldwide leptospirosis burden.

### **Conclusion**

Neglected tropical diseases are associated with poverty and are generally not well studied. Recently world health organizations have made tropical diseases a high priority for study. Leptospirosis is a zoonotic disease with considerable global human and animal incidence. Despite this, there has not been a great deal of research into the economic burdens caused by leptospirosis in humans, livestock, and domestic pets, nor has it been declared to be a high priority by many world health organizations. Regardless, human illness resulting in the loss of productivity and treatment costs (where available) and the agricultural burden due to impacts on fertility, pregnancy, and milk yields all have a significant if currently unmeasured economic impact. As human-animal interfaces intensify and accelerate due to the increase in populations of people, domestic animals, wildlife, and animal products (Abela-Ridder et al. 2010; King 2011; Tomley and Shirley 2009), the significance of neglected zoonoses is expanding, and their health and socioeconomic impacts are increasingly being experienced by many countries, particularly in the developing world (King 2011).

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