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Review on Brucellosis Sero-prevalence and Ecology in Livestock and Human Population of Ethiopia☆

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ABSTRACT

The economic and public health impact of brucellosis remains of concern in developing countries. The disease can generally cause significant loss of productivity through abortion, still birth, low herd fertility and comparatively low milk production. In Ethiopia brucellosis prevalence studies have been conducted in different agro-ecology of the country. But, in general there was information gap on disease dynamics, identification of strain circulating in the region. The paper reviewed the distribution of brucellosis in different regions of Ethiopia and its prevalence among different livestock hosts. Risk factors for the occurrence of brucellosis and finally, different strategies for the control and prevention of brucellosis under Ethiopian conditions are discussed.

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Introduction

Under the name “Malta fever”, the disease now called brucellosis first came to the attention of British medical officers in the 1850s in Malta during the Crimean War. Jeffery Allen Marston described his own case of the disease in 1861. The causal relationship between organism and disease was first established in 1887 by David Bruce. In 1897, Danish veterinarian Bernhard Bang isolated *Brucella abortus* as the agent; and the additional name “Bang's disease” was assigned. Maltese doctor and archeologist Sir

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Themistocles Zammit earned a knighthood for identifying unpasteurized milk as the major source of the pathogen in 1905, and it has since become known as "Malta fever". In cattle, this disease, usually caused by *B. abortus*, is also known as "contagious abortion" and "infectious abortion"(Radostits et al., 2000).

Brucellosis is a zoonotic disease that leads to considerable morbidity (Smits and Kadri, 2005). Also it was characterized by abortion in females and epididymitis and orchitis in males (Debassa et al., 2013). The economic and public health impact of brucellosis remains of concern in developing countries (Roth et al., 2003). Tariku (1994) reports that brucellosis contributed significant economic loss in dairy farm. In general brucellosis can cause significant loss of productivity through abortion, still birth, low herd fertility and comparatively low milk production (Gessese et al., 2014). In addition, it poses a barrier to export and import of animals constraining livestock trade and is an impediment to free animal movement (Zinsstag et al., 2011).

Sources of infection include aborted fetuses, fetal membranes, vaginal discharges and milk from infected cows (Adugna et al., 2013). Primary clinical manifestations of brucellosis among livestock are related to the reproductive tract. In highly susceptible pregnant cattle, abortion after the five month of pregnancy is cardinal feature of the disease (Radostits et al., 2000). In humans, the disease is characterized by fever, sweating, anorexia, malaise, weight loss, depression, headache and joint pains and is confused with malaria and influenza (WHO, 1997).

Brucellosis is transmitted to humans mainly by direct contact with infected livestock and the consumption of unpasteurized contaminated milk and dairy products (Musa et al., 2008). The incubation period varies between 14 and 120 days (Seifert, 1996). The disease presents as an acute or persistent febrile illness with a diversity of clinical manifestations in humans (Bechtol et al., 2011).

Brucellosis occurs worldwide and remains endemic among Mediterranean countries of Europe, Northern and Eastern Africa, Near East countries, India, Central Asia, Mexico and Central and South America (FAO, 2003). Also it is considered as a re-emerging problem in many countries such as Israel, Kuwait, Saudi Arabia, Brazil and Colombia, where there is an increasing incidence of *Brucella melitensis* or *Brucella suis* biovar$_1$ infection in cattle (Cutler et al., 2005). According to WHO (1997) *B. melitensis* is considered to have the highest zoonotic potential, followed by *B. abortus*, and *B. suis* on those endemic regions.

In Ethiopia the first published cases of the disease date back to 1970s (Domenech and Lefevre, 1974). Since then brucellosis prevalence studies have been conducted in different localities of the country based on seroprevalence studies. But, there is information gap on the causative agents' identification and specific transmission of disease dynamics within species and agro-ecological zones of the country up to date one report by Asfaw (2014) have tried to found isolate from dairy caws in and round Bishoftu and Asela town.

Currently ten *Brucella* species are recognized including the better known six classical species comprised of *B. abortus* (cattle, biovars 1–6, and 9), *B. melitensis* (goats, sheep, biovars 1–3), *B. suis* (pigs, reindeer and hares, biovars 1–5), *Brucella ovis* (sheep), *Brucella canis* (dogs) and *Brucella neotomae* (desert wood rats). More recently, new members to the genus include *Brucella ceti* and *Brucella pinnipedialis* (dolphins/porpoises and seals respectively), *Brucella microti* (voles) and *Brucella inopinata* (reservoir undetermined) was identified (Godfroid et al., 2011).

Of these species, *B. melitensis* has the greatest risk for human infection followed by *B. suis* and *B. abortus*, however several of the other species have been shown to be virulent for humans (Godfroid et al., 2011). Bovine brucellosis is usually caused by *B. abortus*, less frequently by *B. melitensis*, and rarely by *B. suis*. Although *B. abortus* is mainly associated with cattle, occasionally other species of animals such as sheep, swine, dogs and horses may be infected. In horses, *B. abortus* together with *Actinomyces bovis* may be present in poll evil and fistulous withers (Gul and Khan, 2007).

In Ethiopia, brucellosis in animals and humans has been reported from different localities of the country, particularly associated with cattle in different agro-ecology and production systems (Debassa et al., 2013). These prevalence studies in animals and human were largely confined to serological surveys and commonly targeted bovine brucellosis, occasionally sheep and goats and rarely camels. So far, attempts to identify *Brucella* species in the country were unsuccessful; the distribution and proportion of their natural hosts was also not studied exhaustively (Yohannes et al., 2013). This is largely attributed to the degree of laboratory development and lack of consumables for laboratory tests (Gumi et al., 2013).

Epidemiology of Brucellosis in Ethiopia

Both husbandry systems as well as environmental conditions greatly influence the spread of *Brucella* infection (WHO, 1997). Ethiopia owns immense but largely untapped livestock resources scattered over diverse agro-ecologies (Solomon et al., 2003). Ethiopia's agro-ecologies can be broadly divided into highlands (1500 m above sea level) 39% and lowlands (1500 m below sea level) 61% (Tegegne et al., 2009). The lowlands, which are commonly referred to as "pastoral areas," are found in the Eastern, South-Eastern and Southern parts of the country (Tegegne et al., 2009). In Ethiopia 40% of livestock population was kept under the pastoral lowland (CSA, 2000).We have systematically reviewed prevalence report at herd and individual animal level within livestock species across the agro-ecology of Ethiopia.

Most brucellosis study report for highland agro-ecology was concentrated at urban and preurban dairy farms. According to different authors herd level seroprevalence ranged between 2.9% and 45.9%. The report was reviewed from 8.2% in Arsi area (Molla, 1989), 22% in Dairy Farm in Northeastern Ethiopia (Tariku, 1994), 8.1% in dairy farms in and around Addis Ababa (Asfaw, 1998), 11%, 15% in dairy farms and ranches in Southeastern Ethiopia (Bekele et al., 2000), 2.9% in Jimma Zone (Tolosa et al., 2008), 12% in Arsi–Negele District of Southern Ethiopia (Amenu et al., 2010), 7.7% in North West, Tigray region (Haileselassie et al., 2010), 4.9% in Dibate and Wembera districts of the Metekele zone, Benishangul Gumuz region of north western Ethiopia (Adugna et al., 2013), 42.31% in Tigray region based on CFT (Berhe et al., 2007). In another study, Ibrahim et al. (2010) reported overall