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Review Article

Sheep Brucellosis in Delta Region

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ABSTRACT

Brucellosis is the generic name for animal and human infections owing to different species of the genus Brucella mainly *B. abortus* and *B. melitensis*. *B. melitensis* was the prevalent serotype among sheep in Delta region, like bovine brucellosis. This paper tailors the epidemiology of brucellosis in small ruminants in Delta region pointing to the evaluation of the ordinarily used diagnostic bacteriological, molecular, and serological procedures. Herein, a broad review to shed light on the complexity of brucellosis plus discussing that the test and slaughter strategy should be applicable to free the herd out of quarantine, withal application of biosecurity practices and fair compensation policy for owners for good protection.

INTRODUCTION

Brucellosis is designed as a re-emerging granulomatous zoonotic disease that is engaging health policymakers. Brucella is a Gram-negative facultative intracellular pathogen that causes infection in sheep and goats(B. melitensis), rams (B. ovis), bovines (*B. abortus*), canines (*B. canis*), and pigs (B. suis) (**Shome et al. 2018).** Sheep are familiar livestock species in Egypt plus sheep holders increase yearlong due to sheep's ability to graze and less requirement of concentrate (**FAOSTAT, 2018).** Until 2019 the sheep number in the Egyptian field is 5.69 million head as well as the mass of this number reared in an open system like a mobile grazing flock among villages and towns **(Elshazly and Youngs, 2019).** So B. melitensis biovar 3 is the predominant serotype among sheep in Egypt **(Wareth et al. 2020).** This destructive disease threats the Egyptian dairy industry as it is not causing production losses due to abortion, stillbirth, sterility, a longer calving interval, and lower milk yields only, but it builds a fence to trade (**Akakpo et al. 2010).** Brucellosis influences human health via causing severely devastating and disabling sickness (**Godfroid, 2017).** The incidence of brucellosis in the Nile Delta region is 12.26% in sheep and 36.84% in goats (**Mahboub et al. 2013).** Brucella is excreted in huge quantities at parturition and could be cultured from a broad spectrum of materials such as vaginal discharges, placenta, fetal stomach contents plus milk applying suitable selective culture media (**Ebrahimi et al. 2014).** Human brucellosis occurs through close contact with contaminated fetal membranes or commonly through the

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consumption of infected non-pasteurized milk and dairy products (van den Brom et al., 2020). Here comes the necessity of this paper to shed light on elaboration of brucellosis talking about etiology, prevalence, transmission, clinical signs, diagnosis and control.

ETIOLOGY

Bacteria of the genus Brucella spp. are coccobacilli, Gram-negative, aerobic, non-spore-forming, non-motile, and non-capsulated **(von Bargen et al. 2012**). Of 10 known species of Brucella, infections with *B. abortus, B. melitensis, and B. suis* are the grand pathogenic to animals and humans which threat the Egyptian dairy industry (**Rahman, 2015).** These species are cataloged as category B priority pathogens by the US Center for Disease Control (CDC) as brucella is highly infectious, can be aerosolized, and outbreaks plus it is noticed due to non-specific symptoms of infection **(D Doganay and Doganay, 2013).** Small ruminant brucellosis mainly occurs due to Brucella melitensis **(Al-Ani et al. 2004).** It has been proved that *B. melitensis* infection is mostly widespread in Egypt, Sudan, Syria, Morocco, Turkey, Greece, Spain, and Italy, and in some Latin American countries **(Şahin et al. 2008).**

STABILITY OF BRUCELLA

Brucella can live in the environment for a period of time. Mostly, the activity of Brucella spp. outside the mammalian host is heightened by cool temperatures and moisture as well as lowered by high temperatures, dryness, and direct exposure to sunlight. For example, B. abortus survives for two hours under direct sunlight but up to 185 days in the cold and shade. Brucella abortus still lives in aborted fetuses, manure, and water for periods of 150 to 240 days **(Godfroid et al. 2010)** So, it is obvious that Brucella has no boundary due to infecting humans, domestic and wild animals, freshwater fish, and even marine mammals.

Transmission

In Animals, Brucellosis can affect sheep, goats, cattle, pigs, horses, and dogs, besides affecting rats and wild animals including deer, bison, elk, moose, camels, water buffalo as well as marine mammals. *B. suis, abortus,* and *melitensis* are not host-specific and can transmit across species under applicable conditions as brucellosis is highly contagious **(Sabra et al. 2021).** Because of different rearing systems like indoors or in mobile herds, there was a great spread of B. melitensis across different Egyptian governorates **(Hegazy et al., 2022).** Transmission among hosts occurs through ingestion of Brucella-contaminated feed and water, licking an infected placenta or fetus or genitalia of an aborted infected animal (**Yao et al. 2020).** On the contrary, Individuals' transmission of brucellosis occurs through connection with contaminated aborted materials or mostly during feeding on infected non-pasteurized dairy products or milk (**El-Diasty et al. 2021).**

HOST RANGE

The genus Brucella consists of different serotypes called species. Brucellosis in sheep and goats mostly goes from Brucella melitensis which is the most important zoonotic agent among Brucella spp. Brucellosis firstly affects sexually mature animals along with Dogs which are kept on farms and may become infected through ingestion of infected placenta **(Islam et al. 2013).** Among the domestic ruminants, the overall seroprevalence of brucellosis is higher in sheep than in goats and cattle

PREVALENCE

Seroprevalence of brucellosis in sheep and goat farms stands on many parameters like husbandry as well as management approaches (**Madzingira, 2013).** The Incidences of Brucella are 17.8%, 8.9%, and 12% in Dakahlia, Damietta, and Alexandria Governorates correspondingly by using RBT, BAPAT, and TAT plus 20 specimens of human brucellosis are identified **(Shalaby et al. 2013).** The seroprevalence of Brucella melitensis in local sheep and goat flocks living in Nile Delta regions of Egypt is 12.26% in sheep as well as 36.84% in goats **(Mahboub et al. 2013).** The incidence rate of brucellosis in Kafr El-Sheikh Governorate was highest in sheep (12%), then cattle (8%) and goats (6%), while the lowest incidence rate was in buffaloes (6%) **(Hosein, 2015).** The total incidence of brucellosis in Damietta and Dakahlia Governorates was

8.75% in cows and 6.98% in ewes (**Hashem et al. 2020).** The seroprevalence of brucellosis in sheep herds reared in Bilqase, one of the biggest cities at Dakahlia governorate in Egypt's Delta region were 7.8% by (BAPAT), 7.2 %by (RBPT) and 6.7% by (MRT) (**El-Diasty et al. 2021).** Finally, we have to point out the seroprevalence of brucellosis at Fayoum governorate based on RBT and BAPAT which were 9.5%, 35%, and 50% in cattle, sheep, and camels, respectively, (**El-Diasty et al. 2022).**

CLINICAL SIGNS AND LESIONS

Brucellosis is a systemic infection with a broad clinical spectrum beginning from asymptomatic disease to severe or fatal illness **(Lalsiamthara and Lee, 2017).** As in cattle, brucellosis in goats is determined by late abortion, stillbirths, reduced fertility, and depressed milk production. The mammary gland is mostly infected in sheep and goats. Mastitis is primarily noticed feature of caprine brucellosis compared with bovine brucellosis. The infected mammary gland has multinodular firmness and watery clotted milk **(Cutler et al. 2005).** There was a mass excretion of organisms in the milk of goats than sheep. Brucellosis can be divided into classical brucellosis and ram epididymitis. Ram epididymitis goes from non-zoonotic agent B. ovis but classical brucellosis is due to B. melitensis and stays a major public health threat equal to goat brucellosis **(Rahman, 2015).**

ECONOMIC IMPORTANCE

Brucellosis comes to increase economic losses between countries where the rural compensation stands on livestock breeding and dairy products **(Maadi et al. 2011).** Different losses like reproductive losses due to abortions and increased infertility, production losses, mortality losses in aborted animals as well as draught power losses. The disease has been eradicated in most industrialized regions, its occurrence raises in developing countries, especially in some Mediterranean and Middle Eastern countries **(Şahin et al. 2008).**

DIAGNOSIS OF BRUCELLOSIS

Diagnostic tests are applied for the following purposes: confirmatory diagnosis, screening or prevalence studies, certification as well as surveillance to bypass the reintroduction of brucellosis in countries (**Godfroid et al. 2010).** Different serological tests diagnose the positive cases and all researchers affirmed that we should not depend on a single serological test to determine the positive animals. Some serological tests detect antibodies against S-LPS, like the Rose Bengal plate test (RBT) which is a rapid screening test, but the results should always be confirmed. The diagnostic methods include direct tests, besides isolation of organisms or DNA detection by polymerase chain reaction (PCR)-based methods plus indirect tests, which are applied in vitro (milk or blood) or in vivo (allergic test).

AMOS-PCR was a dynamic method for rapid, sensitive, and accurate Brucella identification at the species level. PCR is used to affirm analyzed blood samples from confirmed infected sheep and goats **(Ebid et al. 2020**).

PREVENTION AND CONTROL

In order to eradicate brucellosis, the combined test and slaughter program is usually implemented firstly by compulsory vaccination, then vaccination is gradually restricted and prohibited through the removal of seropositive animals. For a wise eradication program, we have to point out a sufficient financial compensation scheme **(Godfroid et al. 2013),** good record keeping, infrastructure, cooperation between all stakeholders, and epidemiologic surveillance. The vaccination primarily prohibits clinical effects of the disease that lead to transmission. *B. melitensis* Rev1 is broadly used for sheep and goats which results in good protection but may cause abortion if administered during pregnancy **(Rahman, 2015).**

CONCLUSION:

There is therefore the need to enforce fundamental steps for the management of future outbreaks of similar zoonotic diseases as well as longstanding of people's livelihoods and well-being and therefore falls back with positive reflection on human health, animal production, and environmental management.

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