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SITUATION OF BOVINE TUBERCULOSIS IN SUB-SAHARAN AFRICA

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ABSTRACT

Although bovine tuberculosis is a notifiable disease in many countries, it is often underestimated, particularly in sub-Saharan Africa, which does not have an effective monitoring and reporting system. This major zoonosis, whose epidemiological importance and economic consequences within the different production systems are also largely despised because of the low diagnostic capacity in breedings. This is a serious threat to human health due to inadequate hygiene measures such as pasteurization of milk, close contact between man and animal reservoir. Data from the literature show that the disease is widely distributed in animal populations in sub-Saharan Africa, but with a very variable prevalence rate.

Key words: tuberculosis, zoonoses, epidemiology, animal

Introduction

Tuberculosis is a very old, chronic, insidious and widespread disease at the global level (Boukary*and al.,* 2011; Thoen*and al.,* 2009). It is characterized by the gradual development of granulomatous lesions or specific tubers in the lung tissue, lymph nodes or other organs (Thoen*and al.,* 1992). In industrialized countries, programs for the control and eradication of bovine tuberculosis, as well as pasteurization of milk, have significantly reduced the incidence of disease caused by Mycobacterium bovis in cattle and in humans (Vekemans*and al.,* 1999). Almost all Western European countries report prevalence rates of bovine tuberculosis below 0.1% (Acha and Szyfres, 2005). In Africa, however, 85% of the herds and 82% of the human population live in areas where M. Bovis Tuberculosis is reported (Cosivi*and al.,* 1998). It also represents one of the major threats to wildlife where it rapidly spreads by affecting a wide variety of animal species (Michel *and al.,* 2006; 2008) thus creating a permanent reservoir of infection and a serious threat to Programs to control and eliminate this disease. This article is a contribution to present a state of the art knowledge on tuberculosis to M. Bovis in sub-Saharan Africa in relation to the geographical areas of interest and the different production systems, highlighting the Observed prevalence, the means of diagnosis and constraints, the manifestations of tuberculosis and its interaction with the immune system.

Prevalence of bovine tuberculosis, diagnostic means.

Information on the prevalence of bovine tuberculosis in sub-Saharan Africa is relatively small and diversified (Benkirane, 1997). Several studies on the determination of the rate of individual apparent prevalence of bovine tuberculosis show that the Intradermal-tuberculin test (WHO, 2004; Ameni*and al.,* 2007) is by far the most used (70% of cases) followed by visual examination of carcasses at the slaughterhouse level (28%) and finally the polymerase chain reaction (2%). These diagnostic tests with different levels of sensitivity and specificity, the results obtained by the different authors are made difficult to compare. Indeed, the performance of the tuberculin skin test depends on the epidemiological status of the animal (infected/uninfected, sick/Not sick), its physiological state, genetics, environmental factors but also the nature of the tuberculin and its storage conditions (Humbletand al., 2010). The performance of the Intradermal test can also be altered in pre-allergic subjects of latent tuberculosis infection or in a state of tuberculin energy characterized by the disappearance of the faculty of the body to defend itself. The estimation of the prevalence rate of bovine tuberculosis on the basis of visual examination of carcasses at the slaughterhouse level significantly underestimates the actual prevalence rate of the disease. According to Assagedand al. (2004), meat inspection at the slaughterhouse only detects 55% of cases of bovine tuberculosis in infected animals with visible lesions. In addition to failures related to diagnostic techniques, it is also important to note the great diversity of the protocols used by different researchers. A recent study conducted in Benin by Vikouand al. (2018) showed an overall prevalence of 36.8% bovine tuberculosis using the Ziehl-Neelsen staining test. But these authors also suggest using simple intradermal tuberculin testing (IDS), a most widely used, reliable universal method (70% of cases) for testing for tuberculosis in cattle (WHO, 2004; Ameni*and al.*, 2007).

Constraints related to the determination of prevalence.

The difficulties in determining the actual prevalence of bovine tuberculosis in Africa is attributable not only to the lack of material and human resources provided, but also to the fact that the technical tools currently in use are in most cases, adapted to the specific context of African regions (Marcotty*and al.,*2009). In general, the authors agree that in sedentary or intensive farms, the prevalence rates of bovine tuberculosis at animal and herd levels are much higher than in extensive farms. According to many authors (Sidibé*and al.,* 2003; Mfinanga*and al.,* 2003; Cleaveland*and al.*, 2007), the difference in prevalence rates would be related to confining conditions that make it easier to transmit infection by intensifying contacts in urban and peri farms. In fact, feeders for dietary supplements or concentrates are favourable places for direct contact (Ayele*and al.,* 2004). Similarly, prevalence rates are higher in herds where animals are parked overnight in an enclosed area (Morris and al., 1994; O'Reilly and Daborn, 1995). Apart from farms, the work carried out at slaughterhouses in large African cities has also allowed to calculate prevalence rates of bovine tuberculosis but also to characterize the different strains of circulating Mycobacterium bovis. The determination of the prevalence rate in slaughterhouses is based exclusively on post-mortem visual examination (EVP) of carcasses during routine inspections, a visual examination whose sensitivity limits have been reported above (Assaged*and al.*, 2004). On the other hand, it is difficult to determine the traceability of animals slaughtered at slaughterhouses because of their various origins (Diguimbayeand al., 2006). The injury prevalence rates at this level are therefore generally quite low. The insidious nature of the disease, which does not cause the emergence of stormy outbreaks with high mortality, is likely to weaken the recognition and reporting processes, and therefore the implementation of control measures Insufficient.The resurgence of milk productionnear cities, the unregulated movement of animals, the lack of identification of animals, the lack of surveillance in slaughterhouses, and the weakness of veterinary services contribute significative to poor control of animal tuberculosis in sub-Saharan Africa. The limited diagnostic capacity of laboratories is one of the main obstacles to programs to combat bovine tuberculosis in sub-Saharan Africa. The diagnosis of tuberculosis is generally limited to microscopic observation of microorganisms on smears, and does not allow Confirmer to easily isolate infected cases and identifier the strains of Mycobacterium involved. Post-mortem inspection at the slaughterhouse is a cost-effective method for passive surveillance of bovine tuberculosis. However, the quality of the detection of TB lesions in slaughterhouses may vary within the same country, thus reducing the effectiveness of surveillance. In addition, routine post-mortem surveillance is not feasible if the number of slaughterhouses is limited. For example, in many African countries, there are only a few slaughterhouses, and more than 50 per cent of slaughtering take place informally, without meat inspection (Michel *and al.*, 2004). When surveillance data exist in slaughterhouses, they are not always integrated into the country's official notification system, and are therefore not used effectively. The results vary according to the conditions under which the tests are carried out, the reagents used, the choice of the inclusion limit for the stage of development of the infection, the immune status of the animal, etc. Insufficient cooperation at the regional level, the absence of quarantine and border security, and illegal movement across borders between neighboring countries have also been identified as contributing factors to the persistence of bovine tuberculosis and undermining the efforts to determine the prevalence rate in sub-Saharan Africa.

Manifestations of tuberculosis to Mycobacterium tuberculosis and its interaction with the immune system.

Cattle can contract TB through several pathways. The most common are the airways and the digestive pathway. When the infection is respiratory, the primary infection outbreak develops in the lungs and lymph nodes of the thorax. In bovines infected with the digestive tract, the primary infection outbreak is developed at the lymph nodes of the gut (Thoen, 1992). Following its respiratory penetration, Mycobacterium Bovis arrives at the small airways where it is captured by phagocytes. Then, the phagocytes cross the membrane of the bronchioles, enter the circulation and are transported to the lymph nodes, the pulmonary parenchyma or other sites (Thorel 1997; Thoen and Bloom, 1995). After ingestion of TB bacteria, mononuclear macrophages attempt to kill it. Some virulent tuberculosis bacilli are able to withstand all the bactericidal actions of phagocytosis, multiply inside the phagocytes and cause them to burst. Other phagocytes arrive on site and ingest the growing numbers of TB bacilli. A small cluster of these cells is developing. This phenomenon represents an attempt by the host to restrict the disease process to a specific location and to allow inflammatory and immune mechanisms to destroy the bacilli. Some lesions may appear to regress and be surrounded by well-organized connective tissues. Lesions of this type may contain viable bacilli. Cellular responses that seek to control the disease result in the accumulation of a large number of phagocytes and the formation of a macroscopic lesion called tuber (Thorel1997).After 10 to 14 days, cell-mediated immune responses develop and the ability of macrophages to kill intracellular bacilli increases. Cellular hypersensitivity settles and leads to cell death and tissue destruction (Thoen and Bloom, 1995; Thoen, 1997). Several defense mechanisms of the host determine the susceptibility and development of tuberculosis in animals exposed to virulent TB bacilli. Although Humoral immunity is the first that step in the response of the immune system to TB infection, cell immunity is considered to be much more important in the protection of the host against Mycobacterium Bovis (Grange1995).

Conclusion

The synthesis of data available in the literature shows the impact of tuberculosis on animal health and the endemic nature of concern in sub-Saharan Africa. The economic and health consequences of this zoonosis are little or not evaluated despite the efforts made in recent decades in scientific research, particularly through the characterization of pathogens at the level of certain countries Africans, the epidemiological aspects of this disease are still very little investigated to date. There is enough evidence to indicate that the prevalence of the disease is higher. Isolation of infected animals and vaccination of herds could reduce bovine tuberculosis in Africa. In addition, the reorganization of the livestock sector in sub-Saharan Africa and the development of a specific strategy for farming systems and modes in sub-Saharan Africa is necessary to facilitate the determination of the real prevalence rate. Therefore, better surveillance of bovine tuberculosis is vital in many African countries, thanks to the improvement of post-mortem inspection, the effective tracing of infected animals to their herds of origin, the regular implementation of intradermal-tuberculin tests, and the effective support of laboratory diagnostics.

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