

Brucellosis: some epidemiological aspects

M. Sousa Carvalho*, M. R. Barroso*, F. Pinhal*, F. Mota Tavares**

Abstract

The authors describe some epidemiological aspects of Brucellosis, highlighting the transmission to men.

Keywords: epidemiological aspects, Brucellosis, transmission

Introduction

In 1886, David Bruce a British military doctor in Malta has isolated the agent responsible for the Mediterranean fever, undulating fever or Malta fever, establishing it definitely as the cause of infection. The name *Brucella* is a tribute to Bruce being denominated as *Micrococcus melitensis*.

In 1905, Zammit a bacteriologist in Malta has demonstrated the excretion of bacteria through goat milk, apparently in good health, establishing the association of this fact to the agent isolated by Bruce. Meanwhile, Lawrence and Skelett have pointed out the cows abortion contagiousness although the demonstration of such contagious is due to Frank, Lehnert and Breuer. In 1896, Bang and Stribolt have shown the cows epizootic abortion was caused by a bacillus and, in 1918 Evans has demonstrated the relation among the agents isolated by Bruce and Bang. Thus, in 1920 it was made the grouping in one genus - genus *Brucella* – and the designation of species in *melitensis* and *abortus*. In 1928, Huddleson isolated a new species, *Brucella suis*¹ (Table 1).

After Bruce's discovery, it was set up the Mediterranean Fever Committee, which has recommended the non-intake of goat milk and its products, leading to a deep drop in the number of cases existing among the British military personnel based in Malta.

In Portugal in 1983, Carlos Tavares, has described for the first time the disease in humans, although it has been known for a long time called in popular terms according to region as “fever of Marinha Grande”, Leiria fevers” or “Santarem fevers”.² The first study documented by Portuguese Veterinarians emerges in 1930 (Viana Conde and Mario Rosa). In 1938, the official sanitation in both bovine and caprine cattle was started and only in 1980 the Department for Rural Affairs started the sanitation of ovine cattle, although there is not until this day an effective swine sanitation. In spite of official campaigns some areas in our country are not yet screened.

Brucellosis is a disease with a very big impact at economic and social level with commercial relevance in public health. Reason why not only the clinical diagnosis but therapy are very important as well as the knowledge of its epidemiology, mainly the screening of reservoirs, because only with a deep knowledge on such subject the disease can be reduced or eradicated.

Knowing that Brucellosis, in the Human species, has as only source of the infection the animal reservoir (according to data available in June 1993, there were 602 notified cases in that semester, in men).³ Brucellosis remains in first position in Portugal among infectious diseases transmitted from animal to men. The disease is kept and disseminated due to risk factors favouring it with a chain of responsibility starting in major producers and ending up in organizations deciding the technical and financial management, being subject to the technical performance, policies and interests which are alien to sanitation programmes and inherent targets.

The economic and social repercussion is high, through direct costs – hospitals, medical appointments, outpatient clinics – and indirect – stopping work and compensation, professional disease and partial or permanent disability.

*Resident to the Internal Medicine Internship

**Internal Medicine Senior Assistant

Leiria Hospital Medicine II Service

TABLE I

Brucella genus classification

	Pathogenic power to humans	Animal species reservoir
<i>B. melitensis</i>	+	Small Ruminants
<i>B. abortus</i>	+	Bovine
<i>B. suis</i>	+	Swine
<i>B. ovis</i>	–	Ovine
<i>B. canis</i>	+	Dog
<i>B. neotomae</i>	–	Rodents

The economic cost is also huge for cattle breeding, considering as direct cost the abortion (the loss of the future animal and reducing or annihilation of the lactation period), infertility, less viable offspring, drop in milk production and indirect costs as the ones limiting the expansion of the cheese industry and genetic improvement.

Brucellosis is an endemic disease in Portugal, the epidemiology surveillance is based upon the number of notified cases. Failure on non-declaring the disease and not recognizing all deformed shapes, lead to a great difficulty on assessing the actual incidence of brucellosis. It is estimated values to be five times higher than notified, according to the recommendations of the World Health Organisation for Mediterranean countries. Epidemiology also shows the close relation between the animal location and the level of human contamination. The higher incidence rates are located in the Central Coast and on the south of the Tagus River, with maximum rates on the North and the Centre countryside.^{4,5} Such rates show an overlapping geographic distribution for animal species.

Through several studies made, it was seen a monthly distribution, with a higher incidence between March and June,⁶ coinciding with an increase on the number of births (in special of small ruminants) conditioning the number of veterinary handling and intervention and also the amount of raw milk available for consumption and transformation. Most patients are from 20 to 50 years old, in risk due to jobs exposed to the disease (shepherds, rural technical assistant, butchers, milkers, inseminators, cattle traders, slaughterhouses workers, sausage factories workers, meat preserves, cheese factories, laboratories) being

these the reasons why brucellosis is considered an occupational disease in our country.

The contamination, in most cases, is through direct contact (60%) with infected animals reaching high impact in individuals with risk jobs (births, abortion). Contamination through digestive tract (25%), is due to the intake of raw milk and non-pasteurised fresh cheese where *Brucella* permanence can go from 2 weeks to 3 months.⁷ For temperatures below 5° Celsius, the growth and multiplication of bacteria is inhibited, conditioning its viability, kept even at a freezing temperature. Therefore in refrigerated milk the resilience capacity can reach 15 days. Another conditioning factor is the viability of *Brucella* is acidity, being limited to a pH <4.⁸ *Brucella* is destroyed in fifteen seconds at a temperature of 72°C and in 3 min at 62/63°C (pasteurization). However in endemic areas it can be necessary to reach temperatures of 85° C, to ensure innocuousness, as the time elapsing from the moment the milk is collected to the final processing can wide with a poor or inexistent refrigeration.

If it is a confirmed fact that raw milk and fresh cheese are important factors of infection for men, in mature cheeses, the capacity of bacterial survival remains unknown. There are studies in several kinds of cheese, observing the bacteria viability in some cases up to 100 days.⁷ The difference in the process of producing cheeses – curdled milk temperature, water activity, acidity and maturation condition – can explain the variable results regarding the viability, making its consumption potentially dangerous. There is however unanimity regarding considering 60 days of cure as a reasonable amount of time to ensure *Brucella* is no longer viable in cheese.⁷

In the particular case of curd cheeses, made from milk serum, doesn't seem to be a transmission vector as bacteria tend to fix themselves in fat cells. However a small amount can be found in the serum, and this can be a means of transmission. In curd cheeses made from milk acidification, such bacteria do not survive but in the curd cheese made from curdled milk, with clot, can survive up to 30 days.⁷

Therefore the heat treatment of milk and the time to mature cheeses, are the safest ways to avoid risks for consumers.

The case of Brucellosis due to meat ingestion or its derivatives are difficult to bring to evidence. Bacteremia stage has a variable duration according to the animal species, but it is limited to a small number of

bacteria per gram in the muscle. However *Brucella* can persist in the reticulo-endothelial system cells, in uterine secretions, in the mammal gland and in the bone marrow and therefore meat contamination can occur when the slaughter and carcass evisceration, mainly in the sanitary slaughterhouse. The place of slaughter and bleeding of animals is where there is the highest risks of infection to men, mainly through the inhaling of infected particles.⁹ In the meat, *Brucella* can keep its viability for months, without being affected by the muscle acidification, mainly when the meat is preserved in refrigeration or freezing conditions.

In meat products, *Brucella* survival depends on the technological process used and on the degree of meat contamination at the beginning of the procedure. As in milk, to subject meat to a heat treatment is crucial, as well as adopt strict hygiene procedures during the slaughter and carcass evisceration.

In Portugal, it is unknown the sanitary condition of sylvatic species regarding brucellosis therefore this can be a source of infectious propagation for consumers and also the source of contamination for the flocks effective in areas of pasture considered uninfected.

There are other forms of human transmission but there are very unlikely in our country. Therefore, Brucellosis due to *Brucella canis* is important as it has growing importance in certain African countries in which meat consumption for dogs has been expanded,¹⁰ as well as in some Asian countries in which dog meat is a part of traditional food. In Nordic countries, reindeer meat consumption leads to the emergence of Brucellosis due to *Brucella suis biovar*.^{4,11}

It should also be highlighted still the contamination of vegetables through the faeces and urine of infected animals, making reference to a case of human brucellosis by the ingestion of vegetables in the region of Castelo Branco in 1991.⁷

“Mediterranean fever is progressing with a tendency to become a big repercussion disease and it will be an infirmity for the future. (Ch. Nicolle, 1905). ■

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