

## SOME EPIDEMIOLOGICAL ASPECTS OF TUBERCULOSIS IN WATER BUFFALOES IN THE AMAZON BASIN OF BRAZIL

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### ABSTRACT

A survey of tuberculosis infection in slaughtered buffaloes, coming mainly from Marajo Island farms, Para state, Brazil, allowed observations of characteristics and epidemic aspects of the disease in the Amazon basin. The prevalence rate of the disease was 7.7%, 72.1% of the lesions were localized, 27.9% generalized and more than 50% of infected animals were males. The greatest number of infected animals, which had the highest disease infection, came from Chaves County in the micro region of "Campos de Marajo". Hot and humid climate, high rainfall index, pastures flooded with low support capacity and nutritional quality and long animal permanency in the breeding (higher than 300 days breastfeeding) seemed to favor the infection, maintenance and spread of the disease among animals.

### INTRODUCTION

Bovine tuberculosis is one of the most important diseases which infect animal herds with economic damage to agricultural production (O'Reilly and Daborn, 1995). Direct contact between animals is one of the most important factors in increasing the rate of infection and spread of the disease to the animal herds (Pritchard, 1988).

In the Amazon basin, large bovine and buffalo herds are raised in extensive areas of native pastures where the climate is hot and humid, with an average annual rainfall 3,000 mm, and with long

rainy and dry seasons. In localized places of the region, tuberculosis prevalence rates goes up to 8% (Lau, 1990; Freitas *et al.*, 1997).

Despite the potential risk for tuberculosis and the high incidence of the disease in buffalo herds of the region, little is known of the factors that affect infection in the Amazon basin (Freitas, 1984, 1999).

The objective of this work was to determine some epidemiological aspects of water buffalo tuberculosis in infected animals from regional breeding places.

### MATERIAL AND METHODS

Tuberculosis-like lesions were observed during routine slaughtering of 1,735 water buffaloes in the city of Belem, Para, Brazil. The animals were slaughtered and examined according to official techniques and procedures recommended by the Federal Inspection Bureau (Brasi, 1971, 1997). The diagnosis of the disease was made on the basis of lesion histopathology, isolation of the probable infection agent and identification of mycobacterium by recommended biochemical assays (CENTRO PANAMERICANO DE ZOONOSIS, 1986).

Data of sex and age of the animals, disease characteristics such as damaged organs, distribution of lesions and spread of the infectious process as

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well as information regarding animal origin (county and farm) were surveyed during slaughtering and in the slaughterhouse registration offices. Rain index, rainy and dry seasons, temperature, economic micro regions, herd management, grass and type of grazing were obtained from the local specialized literature.

## RESULTS

Table 1 shows data related to general prevalence rate of tuberculosis, prevalence rate by sex and forms of lesions in slaughtered animal for consumption in Belem. The general prevalence rate was 7.7% distributed between males (4.2%) and females (3.5%). The disease lesions were localized in organs or lymph nodes in 72.1% of the cases and were generalized in the remaining 27.9% of the cases.

Figure 1 shows the places of origin of infected animals. Only two out of the eight counties from which the buffaloes originated were not in the Marajo Island; one from the county of Marapanim in the state of Para and the other from the neighboring state of Amapa.

The prevalence rate by animal origin is summarized in Table 2 and the number of buffaloes and farms in each county of origin of infected animal are shown in Table 3. Chaves County had the highest number of farms with the disease, eight out of sixteen, and also the highest number of infected animals, 55 out of 133, or 41.4%; Marapanim County had the lowest rate, 0.75%, or just one female with lesions suggesting tuberculosis infection.

## DISCUSSION

The general prevalence rate of the order of 7.7% reported in this survey was inferior to the rates of 16.4% and 19.55% determined by Letts (1964)

and Moraes (1990) for buffaloes slaughtered in Australia or submitted to tuberculin ten fold test in Brasil, respectively, and close to the prevalence rate of 8.04% determined in slaughtered animals of Australia by Mc Cool and Newton-Tabret (1979). However, it was superior to the rate of 3.99% obtained by Alfinito *et al.* (1986) in a tuberculin test campaign in Marajo Island, to the 4.68% rate determined by the Official Sanitary Animal Defense Service (Brasil, 1996), and to the 3.5% prevalence rate reported by Freitas *et al.* (1997) on the slaughtering of animals in the state of Para, Brazil.

Contrary to the statement of Rajaram *et al.* (1996), the male disease prevalence rates of this survey were up to 50% (Table 1). In the meat producing systems used in the Amazon basin, discard of females is made at the end of 15 years of productive life and of reproducer males at eight years of age. Animals for the slaughterhouse should weigh 350 to 370 kg by the age of 4 to 5.5 years. (EMBRAPA/EMATER, EMBRAPA/CPATU, 1980).

On the other hand, the 72.1% localized and 27.9% generalized forms of lesions determined in this survey were in accordance with tuberculosis infection characteristics at slaughtering level described by Hathaway *et al.* (1991). The spread of the infectious process and the lesion characteristics allowed the conclusion that buffaloes tuberculosis is frequently a lung disease with progressive infection and that breathing is the primary way of infection in slaughtered animals.

In the economic region of "Compos de Marajo", the origin of the highest number of infected animals (Table 2, 3), a hot and humid climate with high temperatures prevails throughout the year. Rajaram *et al.* (1996) reported identical climatic factors in five Indian farms, including the farm where most of the animals showed positive results to the tuberculin test. Edaphoclimatic factors such as high rainfall index, long rainy and dry seasons observed in the "Campos de Marajo" affected the availability of native pastures, especially on the swampy areas during the rainy and flooding periods (EMBRAPA/EMATER-Para, EMBRAPA/CPATU, 1980).

Table 1. General prevalence rates of tuberculosis, rates by sex and forms of lesions in slaughtered buffaloes for consumption. Belem, 2002.

Sex	Total Animals	Total lesions		Localized Lesions		Generalized Lesions	
		Number	%	Number	%	Number	%
Male	1,186	72	4.2	60	45.1	12	9.0
Female	549	61	3.5	36	27.0	25	18.9
Total	1,735	133	7.7	96	72.1	37	27.9

Table 2. Tuberculosis in slaughtered buffaloes for consumption as a function of origin and number of animals by sex with symptoms of the disease. Belem, 2002.

State/County of origin	Animals with disease symptoms			
	Male	Female	Total	%
<b>1. Para State</b>	<b>60</b>	<b>54</b>	<b>114</b>	<b>85.71</b>
Chaves	33	22	55	41.35
Santa Cruz do Arari	6	12	18	13.53
Cachoeira do Arari	6	1	7	5.26
Ponta de Pedras	2	1	3	2.25
Soure	2	8	10	7.52
Marapanim	0	1	1	0.75
Others <sup>1</sup>	11	9	20	15.0
<b>2. Amapa State</b>	<b>12</b>	<b>7</b>	<b>19</b>	<b>14.28</b>
Total	62	61	133	100.0

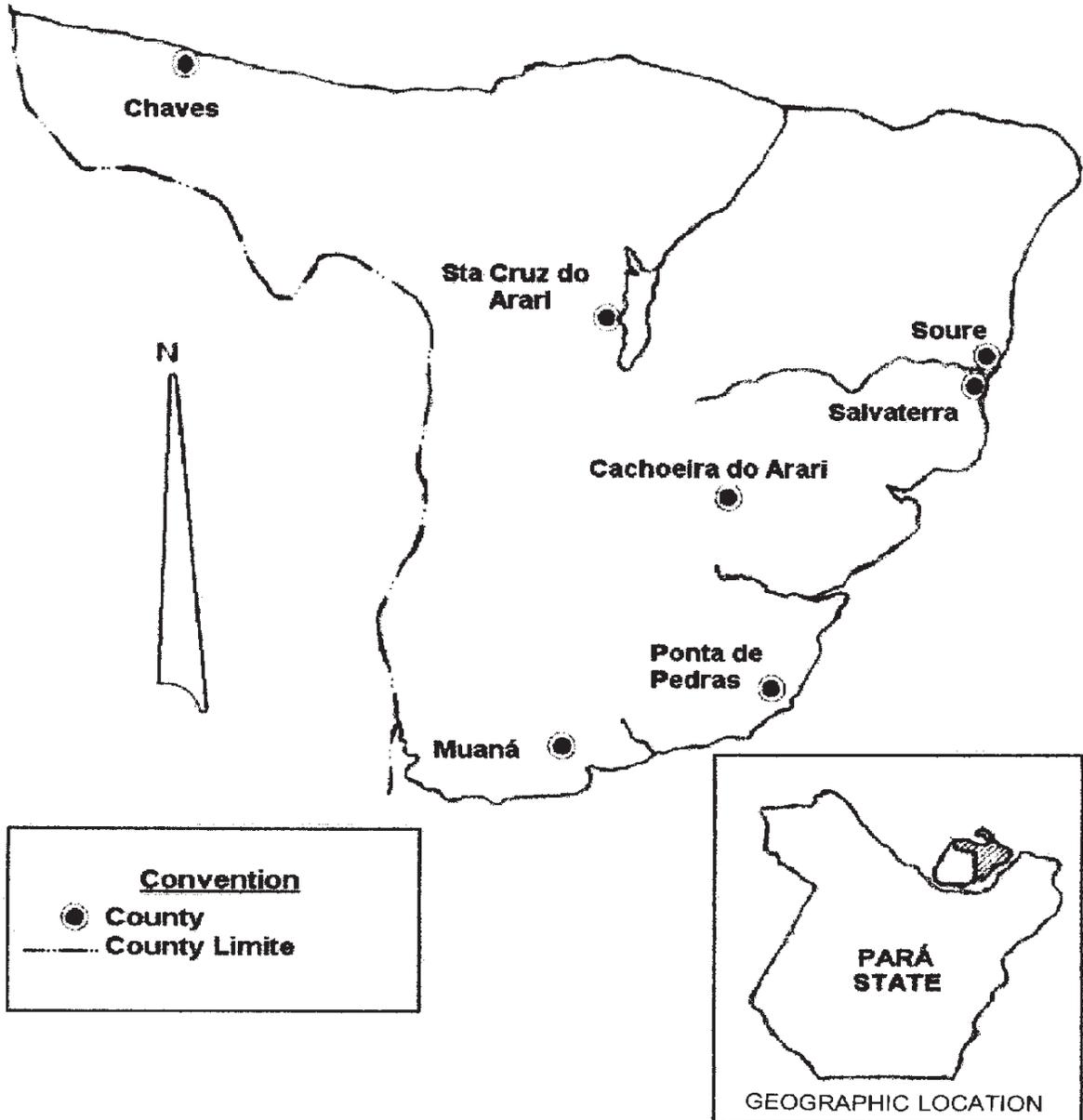
<sup>1</sup> Origin not defined

Table 3. Tracing back of animals with tuberculosis infection as a function of county and farm origin. Belem, 2002.

State/County of Origin	Number Total of Animals	Farms	Number of Infected Animals
Chaves	55	A	27
		B	4
		C	2
		D	1
		E	7
		F	12
		G	1
		H	1
Cachoeira do Arari	7	O	3
		P	4
Santa Cruz do Arari	18	M	1
		N	1
Soure	10	H	16
		J	2
		K	2
Pontas de Pedra	3	L	6
		Q	
Marapanim	1	ND	1
Others <sup>1</sup>	20	ND	20
<b>Amapa State</b>	<b>19</b>	<b>I</b>	<b>19</b>
Total	133	16	133

ND-Not determined

Figure 1. Geographic location of counties and farms in the economic region of “Campos de Marajo”.  
Adapted from EMBRATER/EMATER-Para, EMBRAPA/CPATU (1980).



The low productivity of buffalo herds of “Campos de Marajo” is the result of low nutritional quality of the pastures planted on soils of low native fertility without proper management, conditions closely associated to climate variability throughout the year and heavy rains in the wet season (Teixeira and Serrao, 1984).

The edaphoclimatic characteristics indicated and those predominant in the producing systems related to grazing and nutrition seemed to be of fundamental importance during flooding of the swampy areas, when the animals stay isolated on high elevations of pastures called “tesos”. According to Alfinito *et al.* (1986), these conditions and long stays in pastures, with breastfeeding periods longer than 300 days keep focuses and spread the tuberculosis in the regional breeding places.

The conditions described could lead to overcrowding, grazing deficiency and confinement, making easier the spread of the disease among animals, a problem also observed in India (Rajaram *et al.*, 1996). Neil *et al.* (1989, 1991) found that animal contact and grazing density were important factors for the transmission of tuberculosis under experimental conditions. *Mycobacterium bovis* excretion has been frequently observed in tuberculosis infection, and in natural transmission conditions, this excretion is observed around 87 days after infection.

The tuberculosis in depressed bovines and buffaloes has been shown to be an infection process with characteristics of endemic disease (personal reports). Alfinito *et al.* (1986) stated that this disease was introduced in Marajo Island from imported Dutch black and white infected bovines discarded from the Belem milk basin or infected buffaloes from farms of southern Brazil. Rajaram *et al.* (1996) reported that the introduction of bovine tuberculosis in India was in a similar way. Moreover, according to Andrews and Johnston (1988), bovine tuberculosis became an endemic disease in north Australia with the introduction of infected bovine cattle and as a result of low support capacity of the pastures, high rainfall index in the coastal area or semiarid conditions in the interior, grazing in open

flat areas and inadequate management of herds, factors which are present on Marajo Island.

The very low support capacity of pastures, one AU/ha/year, and the low nutritional quality, which characterize the producing system of “campos de Marajo”, are responsible for the nutritional status of the animals in the breeding places. Griffin *et al.* (1993) also indicated the nutritional factor as responsible for the outbreak of bovine tuberculosis in Ireland.

It is also considered that the high rate of tuberculosis infection in buffaloes is the result of their associative habits (Alfinito *et al.*, 1986). Tullock (1967) cited by Mc Cool and Newton-Tabret (1979), revealed that buffaloes have the common habit of defecating and urinating in streams that may contain large mycobacterium populations and from which they drink water in drought periods. According to Wray (1975), cited by Mc Cool and Newton-Tabret (1979), wild pigs frequently share these sources of water in which the mycobacterium persists for long periods as potential sources for transmission of agents of that disease.

## CONCLUSIONS

1. Tuberculosis prevalency rates in buffaloes of Marajo Island were higher in male than in female animals;
2. The proportion of generalized cases of the disease was high;
3. More than 40% of the infected animals came from farms (eight out of sixteen) of Chaves county on Marajo Island;
4. Factors of the physical environment such as hot and humid climate, long rainy and dry periods, as well as low support capacity and nutritional quality of the pastures, overcrowding and confinement for long periods of time in the breeding places during floods seem to be of fundamental importance to the infection and maintenance of the disease in the region.

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