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# Texas Preventable Disease

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# NEWS

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The Changing Epidemiology of Human  
Brucellosis in Texas, 1977-1986

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## THE CHANGING EPIDEMIOLOGY OF HUMAN BRUCELLOSIS IN TEXAS, 1977-1986\*

Human brucellosis is a zoonosis caused by species of the genus *Brucella*. In the US, human infections are commonly caused by *Brucella abortus*, *Brucella melitensis*, and *Brucella suis*.<sup>1,2</sup> Infections with *Brucella canis* have also been reported in the US.<sup>2</sup> The primary hosts for these *Brucella* species are cattle, goats, swine, and dogs, respectively. During infections in animals, the blood, spleen, liver, and kidneys carry the pathogen. *Brucella* also localizes in the pregnant uterus, causing abortion, and in the mammary glands where organisms are shed in the milk.<sup>3</sup> Transmission to humans usually occurs by direct contact with infected animals, their carcasses, or by ingestion of unpasteurized milk or dairy products from infected animals.<sup>3</sup> Airborne transmission is thought to occur by contaminated aerosols in meat packing plants and laboratories.<sup>4,5</sup> The clinical manifestations of human brucellosis vary from acute systemic or localized infections to chronic infections.<sup>1</sup> In the US, human brucellosis has been typically described as a disease of males who have occupational exposure primarily at packing houses.<sup>6,7</sup> This paper describes the recognition of changes in the epidemiologic features of human brucellosis in Texas from 1977-1986.

### MATERIALS AND METHODS

Reports of possible human brucellosis cases were obtained through the morbidity reporting system of the Epidemiology Division, Texas Department of Health, Austin, Texas, or through requests by private physicians for brucellosis agglutination testing and bacteriologic culture identification performed by the Bureau of Laboratories, Texas Department of Health. Clinical and epidemiologic information were obtained from interviews with the patients and their physicians.

The following information was requested for each patient: age, sex, race, county of residence, symptoms experienced, date of onset and duration of illness, type of antibiotic therapy, results of bacteriological cultures and serologic tests, current occupation, history of exposure to animals, consumption of unpasteurized milk products, and outcome of illness.

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References available from PDN editor, Texas Department of Health.

A confirmed case of brucellosis was defined as a patient with a febrile illness or one who experienced headaches and myalgias with: 1) a fourfold rise in titer between acute and convalescent serum specimens to *Brucella* antigen by agglutination testing; 2) a single titer of  $\geq 1:160$  by agglutination testing; or 3) isolation of a *Brucella* species from a clinical specimen. All incidence determinations were based on population data from 1980 census data.<sup>8</sup> The average annual age-, sex-, and race-adjusted incidence rates were calculated by the direct method using the state population as the standard. Characteristics of cases in 1977-1981 were compared with those of cases in 1982-1986 by means of the uncorrected chi-square test. A *p* value less than 0.05 was considered significant.

### RESULTS

A total of 359 cases of brucellosis were reported in Texas in 1977-1986. Of the 359 patients, 331 (92.2%) met the definition for a confirmed case and are the basis of this report. The annual number of confirmed cases ranged from 13 in 1977 to 84 in 1983. Two brucellosis outbreaks were recognized in Texas. In 1983, 29 cases in Houston (Harris County) and in 1985 nine cases in Laredo (Webb County) were associated with unpasteurized goat milk cheese. *Brucella* were isolated from a clinical specimen in 154 patients. *B. melitensis* was cultured from 102 patients, *B. abortus* from 26 patients, *B. suis* from 14 patients, and *B. canis* from 4 patients. The *Brucella* species was not identified from eight patients. Brucellae were isolated from the blood in 86.4% of the patients who were culture positive, while other tissues from which brucellae were isolated included bone marrow, joint fluid, liver tissue, and the testicles. A total of 40 patients had the diagnosis confirmed by a fourfold rise in agglutination titer, and 137 patients were confirmed by a single agglutination titer of  $\geq 1:160$ .

The ages of the patients ranged from 1 to 92 years, with 57% between the ages of 20 and 49 years. A total of 218 cases were males. A majority (58%) of the 331 cases were Hispanic, and 36% were white. Differences in sex and race distribution were noted when comparing *Brucella* species infections. Whereas 85% of the 26 patients with a *B. abortus* infection were males, only 50% of the 102 patients with a *B. melitensis* infection

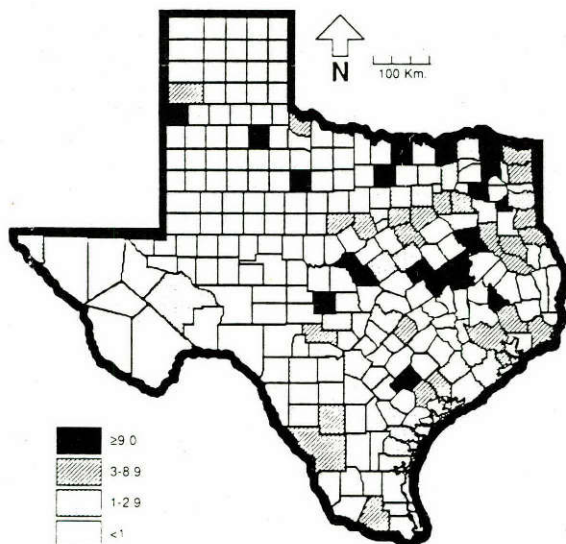
were males. A majority (77%) of the patients with a *B. abortus* infection were white. Over 90% of the patients with a *B. melitensis* infection were Hispanic. The average annual incidence rates by age, sex, and racial groups are presented in Table 1. Annual incidence rates were higher in Hispanics within each age group. In males, incidence rates were highest in almost all older age groups for each race group. Incidence rates for Hispanic females were also higher in older age groups compared with younger age groups.

**Table 1.**  
Average annual incidence rates per one million population by age, race, and sex groups, human brucellosis, Texas 1977-1986

Age (years)	Hispanic		White		Black	
	Male	Female	Male	Female	Male	Female
<10	2.86	1.98	0.14	0.00	0.62	0.00
10-19	4.91	5.08	0.25	0.26	0.56	0.09
20-29	9.45	6.67	1.79	0.87	3.59	0.00
30-39	11.49	8.48	3.30	0.56	4.07	0.09
40-49	12.11	12.31	3.49	0.57	1.49	0.00
50-59	8.30	6.33	2.85	0.76	6.79	0.00
60-69	14.09	17.91	3.53	0.46	0.00	0.00
≥70	24.56	11.07	1.84	0.22	0.00	0.00
Total	7.85	6.57	1.96	0.48	2.09	0.00

The average annual incidence rate for Texas was 2.3 cases per one million population. Incidence rates greater than 16 cases per one million population occurred in eight counties. The highest average annual incidence rates were noted in Motley, Mason, and Mills counties with rates of 102.6, 27.1, and 22.3 cases per one million population, respectively. Figure 1 shows the age-, sex-, and race-adjusted average annual incidence rate for each county in the state. Counties with high incidence rates are observed in northeastern and east-central Texas. Patients with a *B. melitensis* infection primarily resided in the cities of Dallas, El Paso, Houston, McAllen, and San Antonio.

**Figure 1.**  
Age-, sex-, and race-adjusted average annual incidence rates of human brucellosis per million population, Texas, 1977-1986



The frequency distribution of signs and symptoms is presented in Table 2. A majority of patients experienced fever, chills, malaise, backaches, sweats, weight loss, headache, and anorexia. Meningitis was reported for five patients. One of these patients had a *B. suis* infection, a second had a *B. melitensis* infection, and the other three patients had serologic evidence of infection. *Brucella* infections were reported in seven women who were pregnant, six of whom had *B. melitensis* infections. The outcome of pregnancy was unaltered in three of five, while abortion occurred in two of those for whom follow-up information was available.

**Table 2.**  
Frequency of signs and symptoms in 331 human brucellosis cases, Texas, 1977-1986

Sign or symptom	%
Fever	94.6
Chills	70.4
Malaise	64.5
Backaches	63.7
Sweats	61.6
Weight loss	56.9
Headache	55.8
Anorexia	55.4

Only three patients died, for an overall case-fatality ratio of 0.9%. The ages of the three patients were 51, 82, and 92 years, and two were female. *B. melitensis* infections were reported in two of these patients, and one patient had a *B. suis* infection.

Patients had onset of symptoms in all months, with more than half occurring during March through July. The number of cases each year peaked in these five months in nine of the ten years. The seasonal distributions of cases with exposure to cattle or swine compared with cases with a history of consumption of unpasteurized goat milk cheese and of cases with *B. melitensis* infections compared with *B. abortus* infections were similar.

A source of infection was reported in 276 of the 331 cases. A high proportion of cases (48.2%) had exposure to unpasteurized goat milk cheese produced in Mexico. Exposure to cattle and/or swine was reported for 43.5% of the cases. Of the 120 cases who reported exposure to cattle and/or swine, 34 were employed in a meat packing industry, 15 were veterinarians, and the remainder were farmers or ranchers. Five patients acquired *Brucella* infections while working in a laboratory. All four patients with a *B. canis* infection owned dogs, and female dogs of two of these four patients aborted puppies before the onset of symptoms in the patient. *B. canis* was isolated from blood specimens of one of these dogs. A needle stick while vaccinating a calf with *B. abortus* strain 19 vaccine was the source of infection for one patient, a veterinarian. A majority (80%) of patients with a *B. melitensis*

infection had exposure to unpasteurized goat milk cheese. Exposure to cattle or swine was reported for 81% of the patients with a *B. abortus* infection and for 64% of the patients with a *B. suis* infection.

Differences in the age, sex, and race distributions of cases were noted when surveillance data were compared for the periods 1977-1981 and 1982-1986. During the first five years, 129 cases were reported. A total of 202 cases were reported in the second five years. Table 3 presents the number of brucellosis cases by age, sex, and race groups in the two time periods. In 1977-1981, 54.3% of the cases were white compared with 23.4% in 1982-1986 ( $p < 0.001$ ). During this second time period, Hispanic patients (71.8%) were the predominate ethnic group. In 1977-1981, a majority of cases were males (82.2%) in 1977-1981 compared with 55.4% in 1982-1986 ( $p < 0.001$ ). Only 7.0% of the cases in 1977-1981 were 19 years of age or younger compared with 21.3% in 1982-1986 ( $p < 0.001$ ). Differences were also noted between these two five-year intervals for types of exposure. Of the cases reported in 1977-1981, 72% were exposed to cattle or swine. Between 1982 and 1986, only 26% were exposed to cattle or swine ( $p < 0.001$ ). Unpasteurized goat milk and its products were the source of infection for 17% of the cases in 1977-1981 and for 67% of the cases in 1982-1986 ( $p < 0.001$ ).

**Table 3.**  
Number of brucellosis cases by age, sex, and race groups for 1977-1981 and 1982-1986, Texas

	1977-1981		1982-1986	
	n	%	n	%
<b>Race/ethnic group*</b>				
Hispanic	48	37.2	145	71.8
White	70	54.3	49	24.3
Black	10	7.8	7	3.5
<b>Sex</b>				
Male	106	82.2	112	55.4
Female	23	17.8	90	44.6
<b>Age group (years)†</b>				
<10	2	1.6	15	7.4
10-19	7	5.4	28	13.9
20-29	35	27.1	38	18.8
30-39	28	21.7	39	19.3
40-49	20	15.5	30	14.9
50-59	18	14.0	18	8.9
60-69	13	10.1	19	9.4
≥70	5	3.9	15	7.4

\* Race/ethnic group not reported for two cases.

† Age not reported for one case.

## DISCUSSION

Human brucellosis is often characterized as a disease of adult males who have occupational exposure to livestock.<sup>6,7</sup> Of 425 cases reported in Florida from 1946-1975 and 1,085 cases reported in the US from 1965-1969, 65% and 86%, respectively, were males.<sup>8,9</sup> During 1982

through 1986, however, only 55.4% of brucellosis cases in Texas were males. Differences were also noted when comparing age distributions between cases in Texas and in Florida or the US. Of 72 cases reported in Florida from 1961-1975, 59.7% were between the ages of 25 and 44 years. A similar distribution was seen in cases in the US from 1965-1969; 51.4% were age 20-39 years. Only 38.1% of Texas cases from 1982 through 1986 were age 20 through 39 years.

The livestock and meat packing industries were the most probable source of infection for 65% of 51 cases in Florida in 1963-1975.<sup>9</sup> From 1965-1969, 69% of the cases reported in the US worked in these two industries.<sup>10</sup> Outbreaks of human brucellosis have also been recognized in meat packing plant workers.<sup>11,12</sup> Surveillance data from Texas show a different pattern. During 1982-1986, only 22% of cases in Texas were employed in the livestock and meat packing industries. Only 8% of the cases in Texas were specifically employed in the meat packing industry. Consumption of unpasteurized goat milk cheese from Mexico was reported for 67% of Texas cases during 1982-1986. The high percentage of cases with exposure to unpasteurized goat milk cheese is probably related to the proximity of Texas to Mexico. Northern Mexico is an enzootic area for caprine brucellosis.<sup>13</sup> Exposure to unpasteurized goat milk cheese has been recognized as a source of infection for some brucellosis cases in the US.<sup>14-16</sup>

From 1965-1974, 51% of the 425 culture proven cases in the US were *B. suis* infections.<sup>2</sup> Only 9.1% of the culture confirmed cases in Texas were *B. suis* infections. A majority of Texas cases (66%), were *B. melitensis* infections. This difference in type of *Brucella* infection between cases in Texas and in the US could presumably be due to differences in exposure. *B. melitensis* infections are usually associated with exposure to unpasteurized goat milk products or goats.<sup>3</sup> Human infection caused by *B. canis* occurred in four patients in Texas in 1977-1986. All four of our cases were exposed to dogs and were non-laboratory associated cases. Human infection with *B. canis* has been reported after exposure to *B. canis*-infected dogs.<sup>17-19</sup> Annual incidence rates for human brucellosis in the US have ranged from 0.4 to 0.9 cases per million population in 1983 to 1986.<sup>19</sup> The average annual incidence rate for Texas is higher (2.3 cases per million population). Hispanic males had annual incidence rates four times higher than white males. Hispanic females had annual incidence rates more than thirteen times higher than those of white females.

The signs and symptoms of our cases were similar to those previously reported.<sup>2,11,12</sup> Case-fatality ratios between zero and 1% have occurred in the US and are similar to ratios in Texas cases.<sup>2,16,20</sup> Abortion is the usual outcome of infection in pregnant animals.<sup>3</sup> Abortion during infection occurred in two of five women in Texas. Abortion in humans with a *Brucella* infection has been previously reported.<sup>14,21</sup> No convincing evidence

to suggest an association between *Brucella* infections and recurrent abortions in humans has been demonstrated, however.<sup>22</sup>

Human brucellosis occurs predominantly in the late spring and the summer. In Florida, the highest incidence occurred between May and August (44.8%), with a peak in May.<sup>9</sup> About one third of the cases in the US had onset in April, May, and June.<sup>2</sup> A majority of brucellosis cases in Texas also occurred during March through July.

Human brucellosis continues to be an important public health problem in Texas. From 1977-1986, a total of 359 cases of brucellosis were reported in Texas, representing 20% of the 1,757 cases reported in the US.<sup>20</sup> The diagnosis of human brucellosis is usually suggested by

epidemiologic features, particularly exposure to livestock and working in the meat packing industry. Human brucellosis is usually associated with males aged 20 to 59 years. These typical epidemiologic features are not characteristic of human brucellosis in Texas. Typical epidemiologic features of cases in Texas are exposure to unpasteurized goat milk cheese in the Hispanic population involving any age and sex groups. Recognition of this change in epidemiologic features could assist in the diagnosis of acute cases. A majority of human brucellosis cases in Texas could be prevented by prohibiting the importation of unpasteurized goat milk cheese.

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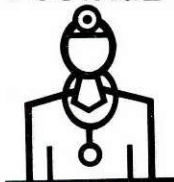
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