

Epidemiology of Brucellosis

21--23-11-2023

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INTRODUCTION

Brucellosis is a **zoonotic** infection.
(ANTROPOZOONOSES)

Other Name

- ❖ Undulant fever
- ❖ Malta fever
- ❖ Gibraltar fever
- ❖ Mediterranean fever.

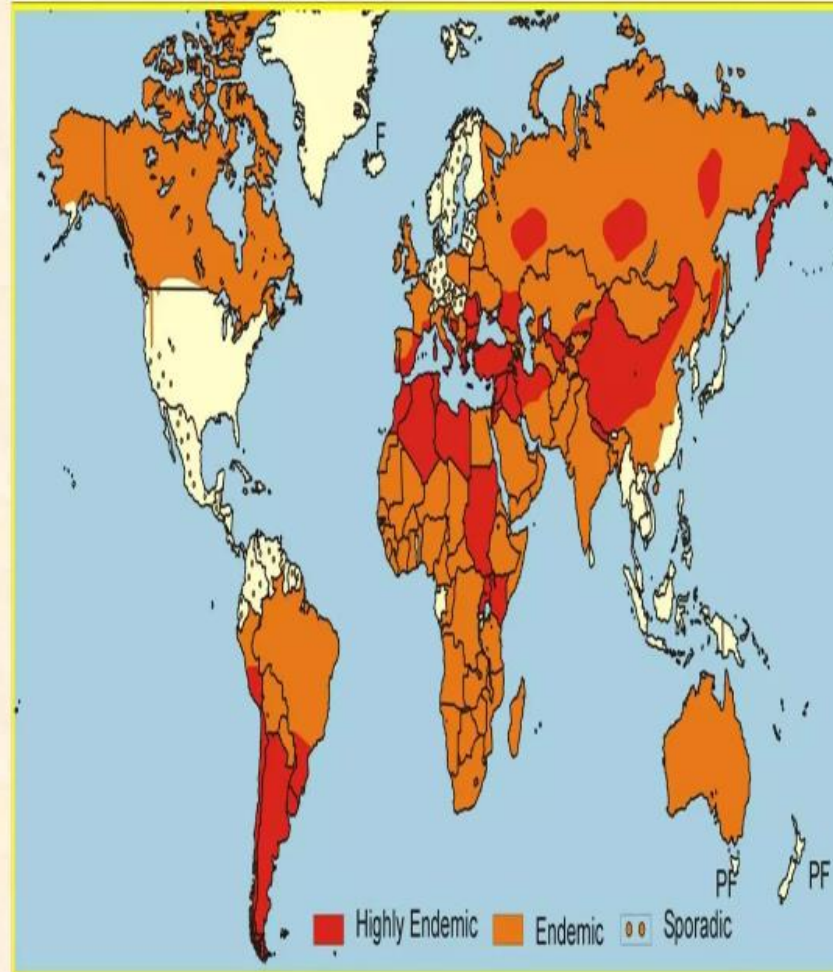


Introduction

1. Brucellosis is considered as one of the most **wide spread zoonosis** in the world.
2. The importance of this contagious disease is the **economic impact** on livestock industry.
3. Causes **severe hazard to human health**, through either direct contact with infected animals or the consumption of contaminated milk and dairy products.

DISTRIBUTION

- Brucellosis occurs worldwide; major endemic areas include
- Countries of the Mediterranean basin,
- Arabian Gulf,
- The Indian subcontinent,
- Parts of Mexico,
- Central and South America.



HISTORY

- 450 BC: Described by Hippocrates
- 1905: Introduced to the U.S.
- 1920: **Alice Evans**, American bacteriologist credited with linking the organisms.
- Brucellosis Nomenclature today credited to **Sir David Bruce**.



AGENT

BRUCELLA are

- Rod shaped, Gram negative coccobacilli.
- Facultative, intracellular organism,
- Nonmotile, Nonsporing,

Brucella Species:

- Abortus(Cattle),
- **Melitensis (Sheep,Goat)**
- Suis(Swine),
- Canis(Dog).
- Blood or Chocolate agar.

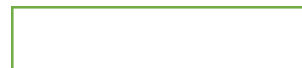


Marine brucellosis

- *Brucella ceti* sp.
- Recently discovered in marine mammal species 1994
- Few human cases diagnosed with neurobrucellosis

Brucella melitensis*

- Principal hosts - goats and sheep
- Most pathogenic in humans
- **B. Canis: Least common cause of human disease.**



Epidemiology

- The average yearly global incidence over 500,000.
- prevalence of more than 10/100,000 population in some endemic countries.

EPIDEMIOLOGY(CONT.)

- **Brucellosis, Ch. Infection, persisting for life.**
- **Brucellae localization in reproductive organs, accounts for major manifestations – abortion and sterility.**
- **Brucellae shed in large numbers in: Milk, urine, gestational products of infected animals**

Aborted cow fetus due to brucellosis, with edema, opaque and bleeding of placenta



EPIDEMIOLOGY OF BRUCELLOSIS IN IRAQ

- Brucellosis (Malta fever) is one of the zoonotic diseases that endemic in all the world, this disease has a history from 1937 in Iraq when the microorganism was first isolated via an Iraqi clinician.

Epidemiology of Brucellosis in Iraq

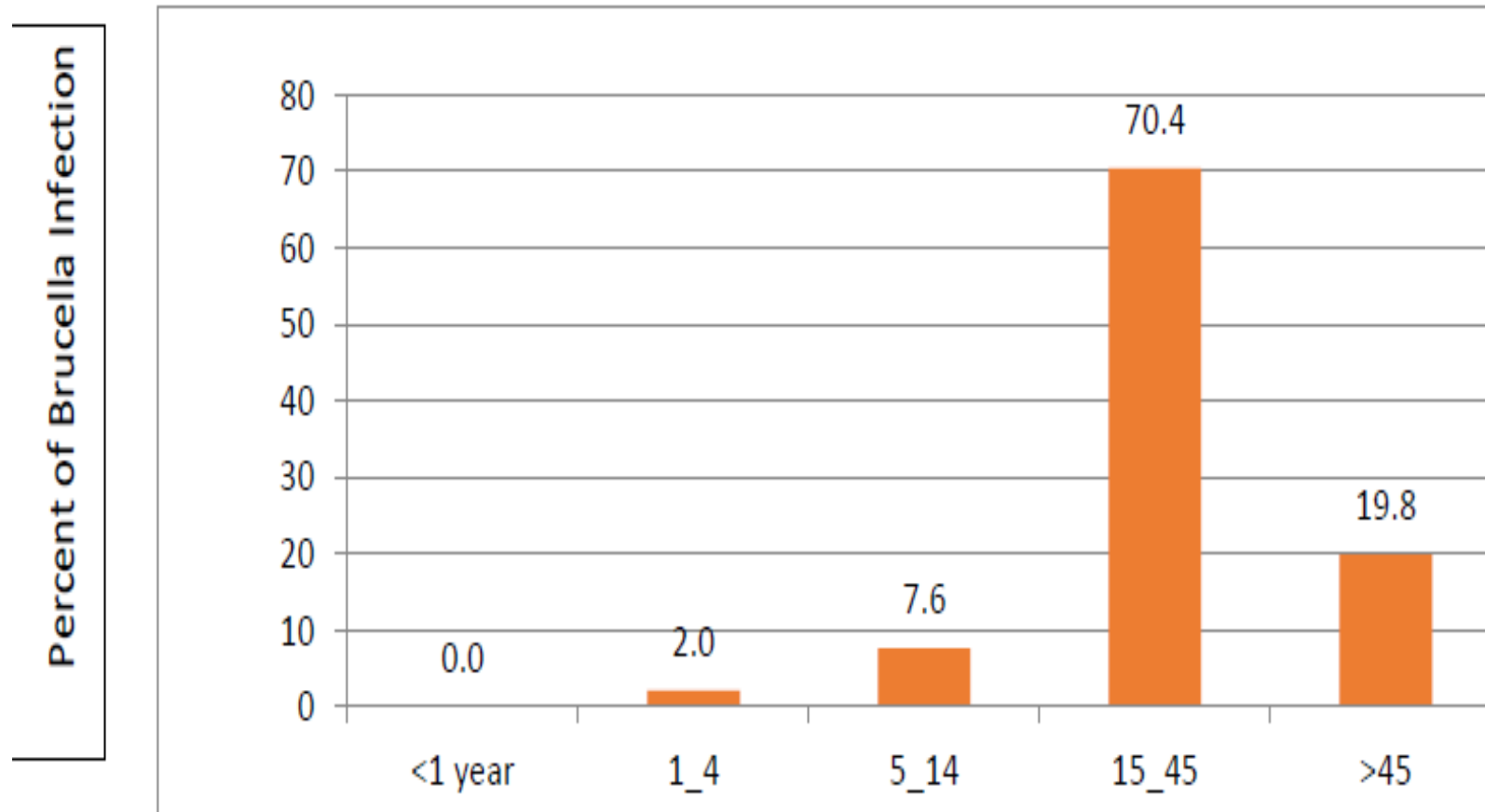


Fig-1: Distribution of the Age-groups with Brucella Patients

Epidemiology of Brucellosis in Iraq

Table-1: The Distribution of Patients with Brucellosis Among Gender.

| Gender | Patient number | % |
|--------|----------------|------|
| female | 1126 | 61.7 |
| male | 699 | 38.3 |
| Total | 1825 | 100% |

Epidemiology of Brucellosis in Iraq

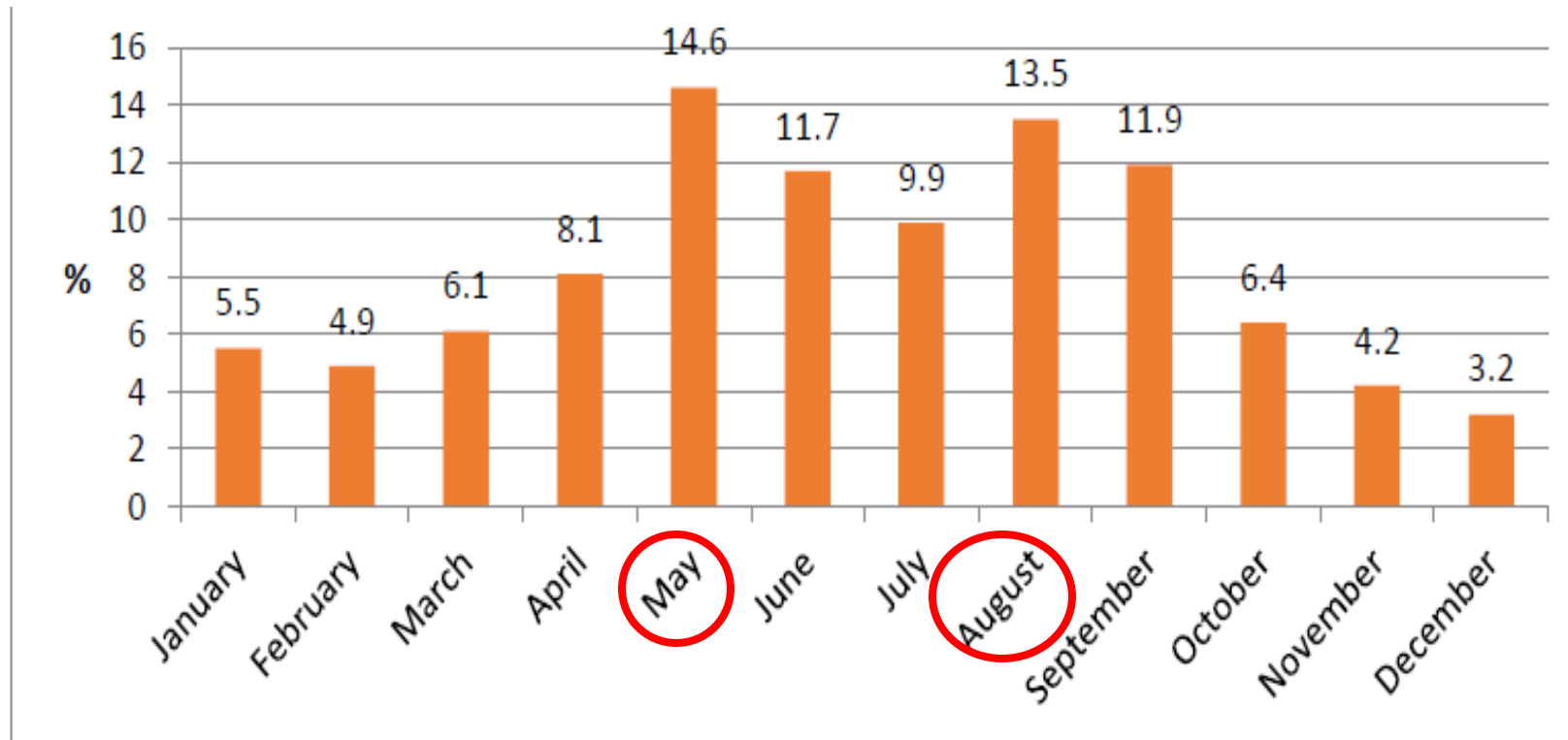
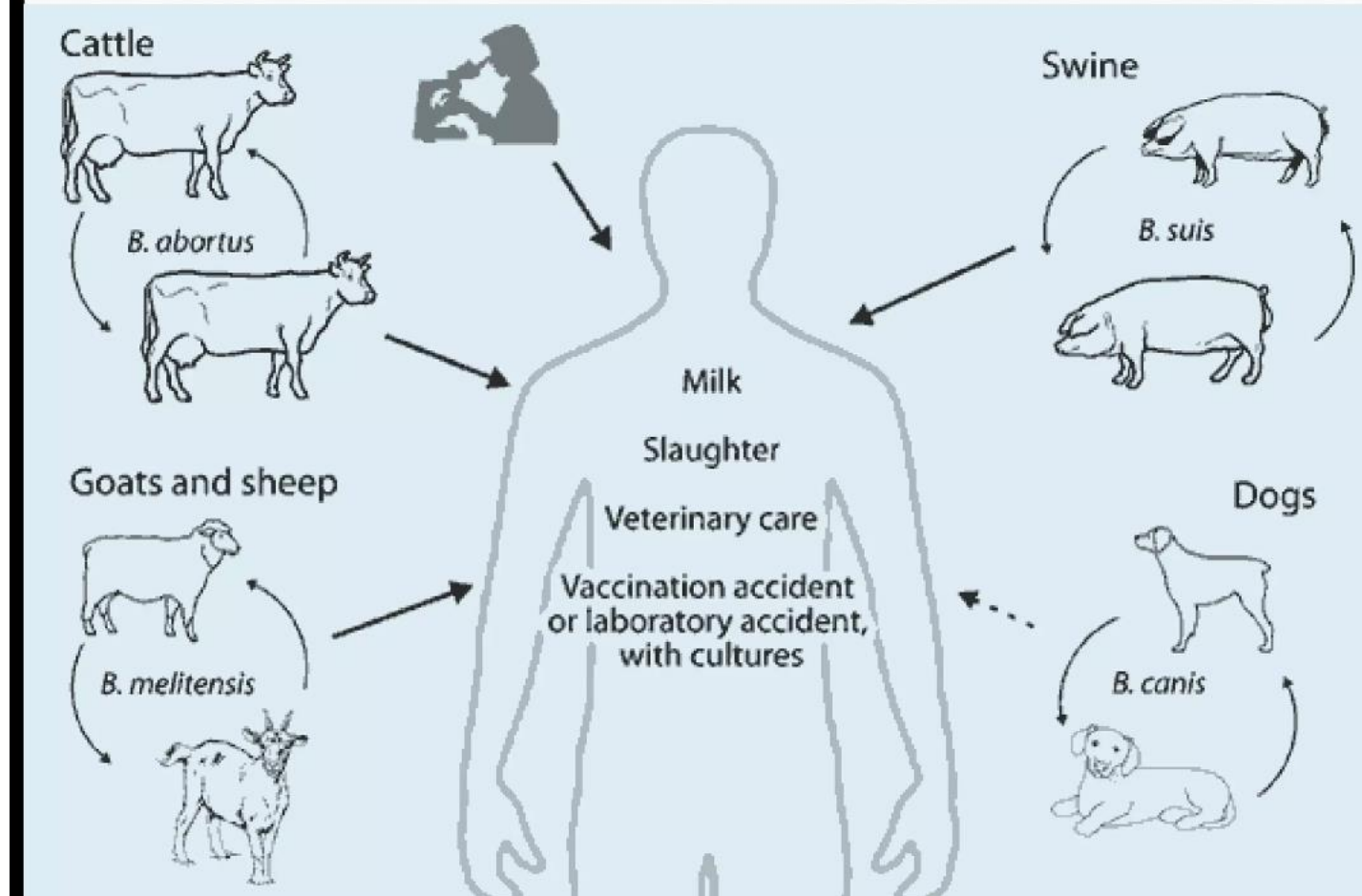


Fig-2: The Distribution of Number of Cases According to Month's Variation

Table-2: The Relationship of Cases with the Residence of Patients.

| Residence | No. | % |
|-----------|------|------|
| Rural | 1046 | 57.3 |
| Urban | 779 | 42.7 |
| total | 1825 | 100 |

RESOIRVOIR OF INFECTION



HOST FACTOR

- ❑ Predominantly in Adult Males.
 - ❑ Occupational Disease
 - Farmers, Shepherds,
 - Abattoir Workers,
 - Veterinarians, Lab Workers,
 - ❑ Hunters
-
- ❑ Consumers
 - Unpasteurized dairy products



ENVIRONMENTAL FACTORS

- Overcrowding of herds
- High rainfall
- Lack of exposure to sunlight
- Unhygienic practices in Milk & Meat production
- Brucella can survive for weeks, or months in favourable conditions of water, urine, faeces, damp soil & manure.



MODE OF TRANSMISSION

1. CONTACT INFECTION

- ❑ Direct inoculation into skin by contact with infected
 - Tissues,
 - Blood,
 - Urine,
 - Vaginal discharge & placentas.
- ❑ Direct conjunctival inoculation.



2. FOOD-BORNE INFECTION

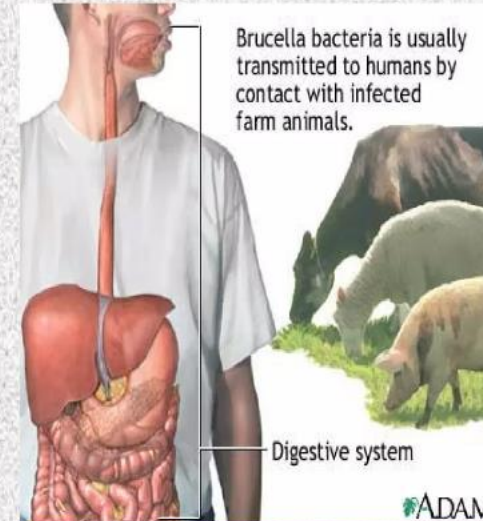
- Ingestion of contaminated raw milk,
- Cheese (unpasteurized milk),
- Raw meat,
- Raw vegetable .

3. AIR-BORNE INFECTION

- Inhalation of infectious aerosols

INCUBATION PERIOD

Usually 1-3 weeks



TRANSMISSION

- Brucellosis normally doesn't spread from person to person, but in a few cases, women have passed the disease to their children during birth or through their breast milk.
- Rarely, brucellosis may spread through sexual activity or through contaminated blood or bone marrow transfusions.

Pathogenesis

Brucella organisms



Entry via lesions or cuts, ingestion or inhalation



Phagocytosed by macrophages



Survive and replicates with phagocytes and monocytes (much of the pathogenesis of brucellosis is associated with intracellular survival)



Infected macrophages localize in reticuloendothelial system namely lymph nodes, liver, spleen and bone marrow



Results to formation of granuloma with lymphocytes and epitheloid gaints cells, which can progress to form focal abscesses and caseation

Pathogenesis

- Disease determined by:-
- Host nutritional and immune status.
- - Size of infectious inoculum
- .- Route of transmission. Ex: -Low gastric juice PH, more effective in preventing *B. abortus* than *B. melitensis* infection when administered by oral route.
- -Therefore, drugs that decrease gastric acidity were implicated in food borne brucellosis.

Clinical manifestation

- **Incubation period** - 1-3 weeks (up to several months)
- **Target population** - All age groups (occupational exposure)

- **Acute brucellosis (influenza like syndrome) :**
 - Undulant fever (usually peaks in the evening and slowly returns to normal by morning)
 - Headache
 - Limb and back pains are unusually severe, night sweating and fatigue are marked
 - Anorexia, weakness, loss of weight, depression

- **Chronic brucellosis:**
 - It is usually non-bacteremic.
 - There is lassitude sweating and joint pain.
 - Symptoms last for 3-6 months and occasionally for a year or more.

Clinical features:

- Headache
- Fever
- Lymphadenopathy
- Night sweats
- Hepatosplenomegaly
- Weight loss
- Malaise & myalgia
- Arthralgia

Dry cough



Complications:

- Orchitis
- Meningoencephalitis
- Endocarditis
- Osteomyelitis
- Arthritis

Congenital Brucellosis

- Variable symptoms
 - Premature delivery
 - Low birth weight
 - Fever
 - Failure to thrive
 - Jaundice
 - Hepatomegaly
 - Splenomegaly
- Abortion risk unclear



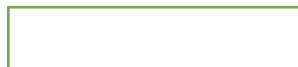
Differential Diagnosis

- Tuberculosis
- Toxoplasmosis
- CMV
- HIV infection



Chronic Brucellosis

- Patients with undiagnosed and untreated brucellosis can be symptomatic for months. In addition, previously treated patients may present with relapsed infection.



Relapse

- About 10 percent of patients relapse after therapy.

DIAGNOSIS

CULTURE AND ISOLATION

- Sensitivity of blood cultures ranges from 30 to 50% depending on the Brucella species isolated.
- **Br. melitensis and Br. suis are readily cultured than Br. abortus.**
- **Bone marrow cultures are more sensitive than blood culture.**
- They typically are positive in the negative blood culture and serological results.
- Synovial fluid culture is positive in 50% of patients.

ROSE BENGAL TEST

- Brucella are intracellular and the difficult in cultivation of this bacteria, and also most patients were taken antibiotic therapy before bacterial culture.
- So the Rose Bengal test appears to have its main value in epidemiological surveys to detect the risk of infection in different population groups .
- Sometimes the Rose Bengal test show false-positive results with typhoid fever and Yersinia enterocolitica because of cross-reactions with antigens from other organisms; so the diagnosis is incorrect in some cases,

SEROLOGY

- Specific brucella antibodies, both IgG and IgM antibodies appear in the serum 7-10 days after infection.
- IgM antibodies persist for up to 3 months after which these antibodies decline.
- Then IgG and IgA antibodies appear after 3 weeks of infection and persist for longer time.
- In acute stage or subclinical brucellosis both IgG and IgM can be demonstrated.

SEROLOGY

- In chronic brucellosis only IgG can be demonstrated, as IgM are absent.
- As IgG antibodies persist for many months or years, demonstration of significant rise in the antibody titer is the definitive serological evidence of brucellosis.
- **Antibody titer of 1: 160 is the presumptive evidence of Brucella infection.**

- which level is diagnostic ??

1 : 160 - non endemic area

1 : 320 - endemic area

PCR an Emerging Tool

- Polymerase chain reaction (PCR) shows promise for rapid diagnosis of *Brucella* spp in human blood specimens
- Positive PCR at the completion of treatment is not predictive of subsequent relapse
- PCR testing for fluid and tissue samples other than blood has also been described

Imaging

- Patients with spine symptoms → MRI examination to rule out spinal cord compromise.
- Plain radiographs, radionuclide bone scintigraphy, CT scanning, and joint sonography.

Management

- The World Health Organization recommends the following for adults and children older than 8 years:
 - Doxycycline 100 mg PO bid and rifampin 600-900 mg/d PO: Both drugs are to be given for 6 weeks (more convenient but probably increases the risk of relapse).
 - Doxycycline 100 mg PO bid for 6 weeks and streptomycin 1 g/d IM daily for 2-3 weeks: This regimen is believed to be more effective, mainly in preventing relapse.

Treatment of brucellosis in children younger than 8 years

- administration of rifampin and TMP-SMZ for 6 weeks is the therapy of choice.
- The relapse rate appears to be approximately 5% or lower.

Pregnancy and Brucellosis

- Premature labor and fetal wastage
- Rifampin — 900 mg once daily for six weeks
- Rifampin — 900 mg once daily plus trimethoprim-Sulphmethoxazole(TMP-SMX; 5 mg/kg of the trimethoprim component twice daily) for four weeks

Prevention :

- **Pasteurization.**
- Inspection of domestic animals.
- PPE when working with animals or animal carcass.
- Attenuated vaccine controls disease in domestic animals.

| Temperature | Time | Pasteurization Type |
|--------------------|-------------|---|
| 63°C (145°F)* | 30 minutes | Vat Pasteurization |
| 72°C (161°F)* | 15 seconds | High temperature short time Pasteurization (HTST) |
| 89°C (191°F) | 1.0 second | Higher-Heat Shorter Time (HHST) |
| 90°C (194°F) | 0.5 seconds | Higher-Heat Shorter Time (HHST) |
| 94°C (201°F) | 0.1 seconds | Higher-Heat Shorter Time (HHST) |
| 96°C (204°F) | 0.05seconds | Higher-Heat Shorter Time (HHST) |
| 100°C (212°F) | 0.01seconds | Higher-Heat Shorter Time (HHST) |
| 138°C (280°F) | 2.0 seconds | Ultra Pasteurization (UP) |

Prevention



- Four vaccination campaigns were implemented in 2006, 2007, 2008, and 2009, with a total number of vaccinated animals each year at 10,099972, 4,698482, 753,153, and
- 1,833482 head, respectively.

- The primary satisfactory outcome of the program was the apparent decline in livestock abortions leading to obvious increases in productivity.

Prevention

- Regarding the incidence of brucellosis among the human population, the apparent decline in the middle and south of Iraq began with the vaccination phase of the control program in 2006.
- The results represented a significant decrease in human cases after only four vaccination campaigns of a program that was intended to continue for 15 years.

Vaccinate domestic animals.

- In the United States, an aggressive vaccination program has nearly eliminated brucellosis in livestock herds.
- Live-attenuated vaccines such as *B. abortus* strains S19 and *B. melitensis* strain Rev1 as the two most common anti-brucellosis vaccines have been widely used in the world for the immunization of animals.
- Because the brucellosis vaccine is live, it can cause disease in people. Anyone who has an accidental needle stick while vaccinating an animal should be treated.

**REFERENCE:MANUAL OF COMMUNICABLE
DISEASES**