Brucellosis







Presented by: Shaymaa H. Al-Kubaisy B.Sc. M. & Ph. D. Med. Microbiology **<u>The Many Names of Brucellosis</u>** Undulant Fever, Malta Fever, Mediterranean Fever, Enzootic Abortion, Epizootic Abortion, Contagious Abortion, Bang's Disease



BRUCELLOSIS

Brucellosis, a bacterial disease caused by members of the genus Brucella, remains one of the most common zoonotic diseases worldwide, also cause abortion which is common and rate varies from 30%-80%. So this disease is very dangerous as it can affect man and also cause large economic losses by decreasing milk yield and aborted fetus.



interest

Define
Causative agent
Route of infection
Pathogenesis
Microscopic examination
Macroscopic examination



Define

Brucellosis

It is a chronic bacterial infection affect domestic animals and man. it is characterized by abortion.

Cause

Brucella species, which is gram -ve bacilli and intracellular. B.melitensis B.abortus B.suis B.ovis Goat cattle sheep

pig



ROUTE OF INFECT

Ingestion of raw milk
Through conjunctiva
Intact or broken skin





Humans are generally infected in <u>one</u> of <u>three</u> ways: eating or drinking something that is contaminated with the bacteria, breathing in the presence of organisms (inhalation), or having the bacteria enter the body through skin abrasions. <u>Inhalation of Brucella</u> organisms is not the

common route of infection, **but** it can cause significant hazard for people in certain occupations.

THE ORGANISM

Brucella spp.

 Gram negative coccobacillus - Facultative, intracellular organism Multiple species - Associated with certain hosts Environmental persistence - Withstands drying – Temperature, pH, humidity - Frozen and aborted materials, dust, soil



- It affects people of all age groups and of both sexes.
- The genus *Brucella* consist of eight classical species,

Human Brucellosis & Associated Species

Species	Animal Reservoir	Clinical Disease
Brucella melitensis	Goats, sheep	Severe acute disease with compli- cations (common)
Brucella abortus	Cattle	Mild disease with suppurative complications (uncommon)
Brucella suis	Swine Sever	e Chronic, suppurative, destructive
Brucella canis	Dogs	Mild disease with suppurative complications (uncommon)



Brucellosis in humans is predominantly caused by four different species of Brucella: Brucella melitensis, Brucella suis, Brucella abortus and Brucella canis. Though all of these species can cause human brucellosis, Brucella melitensis is the most prevalent worldwide, and is known as main causative agent of human brucellosis.

HISTORY

History of Brucellosis



Professor FEG Cox. The Wellcome Trust, Illustrated History of Tropical Diseases

 Sir David Bruce (1855-1931)

> British Army physician and microbiologist

- Discovered *Micrococcus melitensis*

The mode of infection is:

on contact *Brucellae* penetrate the skin or mucosal membranes and enter the lymph nodes, which become hemorrhagic, resulting in bacteremia, which facilitates dissemination throughout the body. During the early phase of infection, *Brucellae* invade macrophages, adapt to the acidic enviornment, and multiply in the vacuolar compartments; it prevents phagosome/lysosome fusion. Brucellosis is a systemic infection that can involve any organ or organ system of the body.





<u>Symptoms:</u>

are non specific, which may include fever, chills, headache, pain, fatigue, dementia, and arthritis, generally occurring within 2-3 weeks of inoculation.

The <u>complication</u> involves osteoarticular complication, gastro intestinal complications, genitourinary complications, neurological complications, cardiovascular complications.

Brucellosis in Humans

- Human brucellosis = Bang's disease, named for Bernhard Bang & Sir David Bruce who discovered Brucella
- Facultative intracellular pathogens of mononuclearphagocyte system (formerly reticuloendothelial system which is involved in immune defense against microbial infection and removal of worn-out blood cells)
 - Bacteria are phagocytosed by macrophage or polymorphonuclear leukocyte
 - Survive intracellularly by inhibiting killing
 - Carried to spleen, liver, bone marrow, lymph nodes, kidneys

Form granulomas (mass of granulation tissue produced in response to chronic infections, inflammation, or foreign bodies) and cause destructive tissue damage

Clinical Presentation of Human Brucellosis

- Acute disease often develops with initial nonspecific symptoms of malaise, chills, fatigue, weakness, myalgias (muscles), weight loss, arthralgias (joint), and nonproductive cough
- Mild disease with rare suppurative complications
- Chronic disease and recurrence are common because it can survive in phagocytic cells and multiply to high concentrations
- May also take the form of destructive lesions

DIAGNOSTIC TOOLS FOR BRUCELLOSIS

1. **Culture**: Blood culture provides definite proof of brucellosis but may not provide a positive result for all patients.

2. Antigen detection: Antigen detection methods by enzyme linked immunosorbent assay (ELISA) are potentially useful and recently several antigen detection systems are under development. 3. Genome detection: Polymerase chain reaction (PCR) has been explored for the rapid detection and confirmation of *Brucella*. Molecular characterization techniques are very useful tools for differentiating Brucella spp., 4. Antibody detection: The limitations of above mentioned tools make serology, directed against antibody detection, the most useful tool. Antibodies usually begin to appear in the blood at the end of the first week of the infection, IgM appearing first followed by IgG.

(A) Agglutination tests

Rose Bengal Plate Test (RBPT) is one of a group of tests known as the buffered Brucella antigen tests which rely on the principle that the ability of IgM antibodies to bind to antigen is markedly reduced at a low pH. It is performed on glass slide with coloured bacterial antigen, and this test is of value as a screening test especially in high risk rural areas where it is not possible to perform SAT. Whenever possible, a serum that gives a positive result should be confirmed by a more specific test. RBPT also plays a great role in the rapid confirmation of neurobrucellosis, arthritis, epididymo-orchitis, and hydrocele due to Brucella. The test is an excellent screening test

Serum Agglutination Test (SAT) remains the most popular and worldwide used diagnostic tool. SAT measures the total quantity of agglutinating antibodies (IgM and IgG) and the quantity of specific IgG is determined by 2-mercaptoethanol (2ME). The type of antibody is important, as IgG antibodies are considered a better indicator of active infection and the rapid fall in the level of IgG antibodies is said to be prognostic of successful therapy. This test is simple and cheap to perform but its lack of sensitivity and specificity mean that it should only be used in the absence of alternative techniques.

Coombs test

Complement fixation test (CFT) has good sensitivity and specificity

(B) ELISA

The ELISA tests offer excellent sensitivity and specificity whilst being robust, fairly simple to perform with a minimum of equipment and readily available from a number of commercial sources in kit form.,

EPIDEMIOLOGY

Populations at Risk

 Occupational disease - Cattle ranchers/dairy farmers - Veterinarians – Abattoir workers Meat inspectors – Lab workers Hunters Travelers Consumers

Unpasteurized dairy products



Brucellosis: Reported cases, by year United States, 1979 – 2009



DISEASE IN HUMANS

Disease in Humans

 Incubation period – Variable; 5 days to three months Multisystemic - Any organ or organ system - Cyclical fever • Flu-like illness - Chronic illness possible

Complications of Brucellosis

- Most common
 - Arthritis, spondylitis, epididymo-orchitis, chronic fatigue
- Neurological
 - 5% of cases
- Other

 Ocular, cardiovascular, additional organs and tissues

Congenital Brucellosis

- Variable symptoms
 - Premature delivery
 - Low birth weight
 - Fever
 - Jaundice
 - HepatomegalySplenomegaly
- Abortion risk unclear



Vaccination

- Vaccines against *Brucellae* have varying degrees of success in controlling the disease in animals; however, human vaccines are **not currently available** and the animal vaccines currently in use are pathogenic to humans.
- Both humoral and cell-mediated immune responses develop in brucellosis patients, but the cellular immunity is the essential component.

PREVENTION AND CONTROL

PREVENTION

The prevention of human brucellosis is based on Education to avoid consuming unpasteurized milk and milk derivatives. Barrier precautions for hunters and professionals at risk (butchers, farmers, slaughterers, veterinarians). Careful handling and disposal of afterbirths, especially in cases of abortion. Serological or other testing of animals; immunization of herds/flocks may be envisaged; eliminate infected herds/flocks. Occupational hygiene and food hygiene; Vaccination is not generally recommended. All dairy products should be prepared from heat-treated milk; Consumption of raw milk or products made from raw milk should be avoided. Meat should be adequately cooked. Special precautions should be taken by laboratory workers; Physicians and health workers should be aware of the possibility of brucellosis. Public health education should emphasize food hygiene and occupational hygiene.

TREATMENT

 Treatment for brucellosis aims to relieve symptoms, prevent a relapse of the disease and avoid complications. You'll need to take antibiotics for at least six weeks, and your symptoms may not go away completely for several months.

The disease can also return and may become chronic

- Rifampicin is active in vitro against Brucella species, is remarkably lipid soluble, and it accumulates within eukaryotic cells. In order to provide a completely oral regimen with which to treat brucellosis, the combination of doxycycline plus rifampicin, with both drugs administered for six weeks, was recommended by the WHO in 1986.
- Tetracycline administered for at least six weeks has long been the standard treatment of human brucellosis
- For infants, tetracycline is toxic, so children are treated with trimethoprim-sulfamethoxazole

CONCLUSION

Brucellosis has been eradicated from various developed countries but still it remains an important veterinary public health problem in most of the developing world as abortions and infertility in herds result in severe economic loss. Human brucellosis is commonly reported among laboratory workers, slaughter house employees, farmers and veterinarians who may be exposed to infected animals. Due to its heterogeneity and poorly specific clinical symptoms, the diagnosis of brucellosis always required laboratory conformation either by isolation of pathogen or by demonstration of specific antibody. The serological test available for diagnosis of brucellosis remains most useful test for preliminary identification of the disease besides its limitation of low sensitivity. Therefore, there is a need to develop rapid, reliable and user friendly system for disease diagnosis and alternative vaccines approaches. Because of inherent problems with bacterial isolation, inefficiency, cost, danger and other factors,

most laboratories prefer to use other, more cost effective methods. Molecular biology as a diagnostic tool is advancing and will soon be at the point of replacing actual bacterial isolation. It is rapid, safe and cost effective, the only real problems being some uncertainties regarding specificity.