

Bacterial Infections

Dr. Mohammed Abdulla Mehdi
MBChB; FIBMS (general medicine); FIBMS (G&H)

Systemic bacterial infections:

- Brucellosis
- Typhoid and paratyphoid (enteric) fevers
- Leptospirosis
- Listeriosis
- Actinomycete infections

Brucellosis (undulant fever, Malta fever)

- Brucellosis is an enzootic infection (i.e. endemic in animals).
- Four species are important to humans:
 - *B. melitensis* (goats, sheep and camels in the Mediterranean basin, the Middle East, Africa, India, Central Asia and South America)
 - *B. abortus* (cattle, mainly in Africa, Asia and South America),
 - *B. suis* (pigs in South Asia)
 - *B. canis* (dogs).

Transmission

- Infected animals may excrete *Brucella spp.* in their milk for prolonged periods, and human infection is usually acquired by ingesting contaminated dairy products (especially unpasteurized milk).

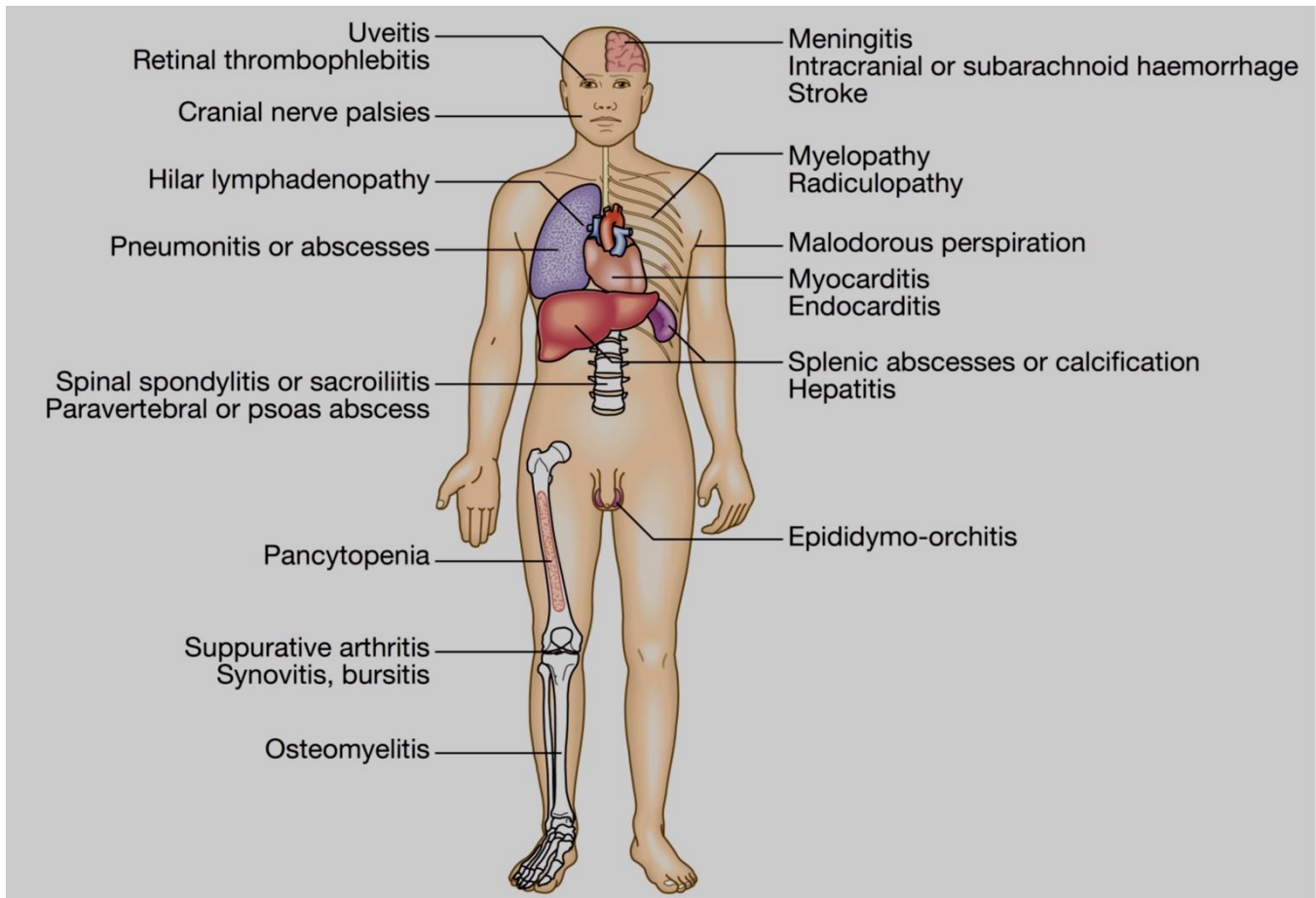
- Animal urine, feces, vaginal discharge and uterine products may act as sources of infection through abraded skin or via splashes and aerosols to the respiratory tract and conjunctiva; therefore brucellosis can occur through occupational exposure of laboratory workers, veterinarians, and slaughterhouse workers.
- Human to human transmission has been documented but is rare (methods include breast milk, sexual transmission, and congenital disease).

Pathogenesis

- After ingestion (or entry via skin abrasions or inhaling infected dust), the bacteria live in the regional lymph nodes during the incubation period (usually 2– 8 weeks). They then enter the circulation and subsequently localize in different parts of the reticulo- endothelial system, forming granulomatous lesions that may result in complications in many organs.
- *Brucella* is an intracellular organism, which can survive within granulomas causing relapses of acute disease or resulting in chronic brucellosis.

Clinical features of Brucellosis

- Acute illness is characterized by a high swinging temperature, rigors, lethargy, headache, joint and muscle pains, and scrotal pain. Occasionally, there is delirium, abdominal pain and constipation.
- Physical signs are non-specific, e.g. enlarged lymph nodes. Splenomegaly may lead to hypersplenism and thrombocytopenia.
- Localised infection is commonly osteoarticular (occurs in about 30% of patients), is more likely if diagnosis and treatment are delayed.



Diagnosis of Brucellosis

- Definitive diagnosis depends on the isolation of the organism.
- Culture: Blood cultures are positive in 50–80% of cases.
Bone marrow culture can be useful if antibiotics have been given before specimens are collected.
CSF culture in neurobrucellosis is positive in about 30% of cases.
- Serology: Rose Bengal test (cheap rapid slide-type agglutination assay performed with a stained *B. abortus* suspension).

Others (standard tube agglutination, mercaptoethanol test, ELISA.)

- Single high antibody titre of more than 1/320 or fourfold rise in antibody titre is diagnostic. Serology usually takes several weeks to become positive but eventually detects 95% of acute infections.

Treatment of Brucellosis

- Doxycycline 100 mg twice daily orally for 6 wks plus gentamicin 5 mg/kg IV once daily for the first 7 days.

OR

- Doxycycline 100 mg twice daily orally for 6 wks plus rifampicin 600–900 mg orally once daily for the same period.

Prevention and Control of Brucellosis

- This involves careful attention to hygiene when handling potentially-infected animals, vaccination and eradication of infection in animals (by slaughtering infected animals) and pasteurization of milk.
- No vaccine is available for use in humans.

Typhoid (Enteric fever)

- Over 17 million new cases of enteric fever occur annually worldwide, mainly in India and Africa, causing around 600 000 deaths per year.
- Enteric fever is an acute systemic illness characterized by fever, headache and abdominal discomfort.
- *Typhoid*, the typical form of enteric fever, is caused by *Salmonella typhi*. A similar but generally less severe illness known as paratyphoid is due to infection with *S. paratyphi*.
- Man is the only natural host for *S. typhi*, which is transmitted in stool-contaminated food or water. The incubation period is 10–14 days.

Clinical features of Typhoid fever

- After ingestion, the bacteria invade the small bowel wall via Peyer's patches, from where they spread to the regional lymph nodes and then to the blood.
- The onset may be insidious. The temperature rises in a stepladder fashion for 4 or 5 days with malaise, increasing headache, drowsiness and aching in the limbs.
- Constipation may occur in adults although in children diarrhoea and vomiting may be prominent early in the illness.
- The pulse is often slower than would be expected from the height of the temperature, i.e. a relative bradycardia.
- At the end of the first week, a rash may appear on the upper abdomen and on the back as sparse, slightly raised, rose-red spots, which fade on pressure. Cough and epistaxis may occur.

- Around the 7th–10th day, the spleen becomes palpable. Constipation is then followed by diarrhea and abdominal distension with tenderness. Bronchitis and delirium may develop.
- Complications occur in the third or fourth week of illness and may involve almost any viscus or system because of the septicaemia present during the first week.
- Bone and joint infection is common in children with sickle-cell disease.



13.46 Clinical features of typhoid fever

First week

- | | |
|------------------------|--------------------------------------|
| • Fever | • Constipation |
| • Headache | • Diarrhoea and vomiting in children |
| • Myalgia | |
| • Relative bradycardia | |

End of first week

- | | |
|-----------------------|------------------------|
| • Rose spots on trunk | • Abdominal distension |
| • Splenomegaly | • Diarrhoea |
| • Cough | |

End of second week

- Delirium, complications, then coma and death (if untreated)



13.47 Complications of typhoid fever

Bowel

- Perforation
- Haemorrhage

Septicaemic foci

- Bone and joint infection
- Cholecystitis
- Meningitis

Toxic phenomena

- Myocarditis
- Nephritis

Chronic carriage

- Persistent gallbladder carriage

Diagnosis of enteric fever

- The definitive diagnosis of enteric fever requires the culture of *S. typhi* or *S. paratyphi* from the patient.
- Blood culture is positive in most cases in the 1st & 2nd weeks of illness whereas stool culture is useful in the 2nd & 3rd weeks of illness.
- Bone marrow culture is more sensitive than blood culture, but is often reserved for patients who have already received antibiotics.
- Leucopenia is common but is a nonspecific finding.
- Serological tests such as the Widal antigen test are of little practical value, are easily misinterpreted and should not be used.

Treatment of enteric fever

- Chloramphenicol, cotrimoxazole, ampicillin or amoxicillin used to be effective in the past but resistance is now common.
- Quinolones (e.g. ciprofloxacin 500 mg twice daily) are now the treatment of choice, although increased resistance to these agents is being seen: in such cases azithromycin (500 mg daily) or ceftriaxone (2-3 g daily iv) may be effective. Treatment should be continued for 14 days.
- The patient's temperature may remain elevated for several days after starting antibiotics and this alone is not a sign of treatment failure.
- Even with effective therapy, there is still a risk of complications, relapse of symptoms, and the development of a chronic carrier state.

Prevention of enteric fever

- Improved sanitation and living conditions can reduce the incidence of typhoid.
- Travellers to countries where enteric infections are endemic should be inoculated with one of the three available typhoid vaccines (two inactivated injectable and one oral live attenuated).