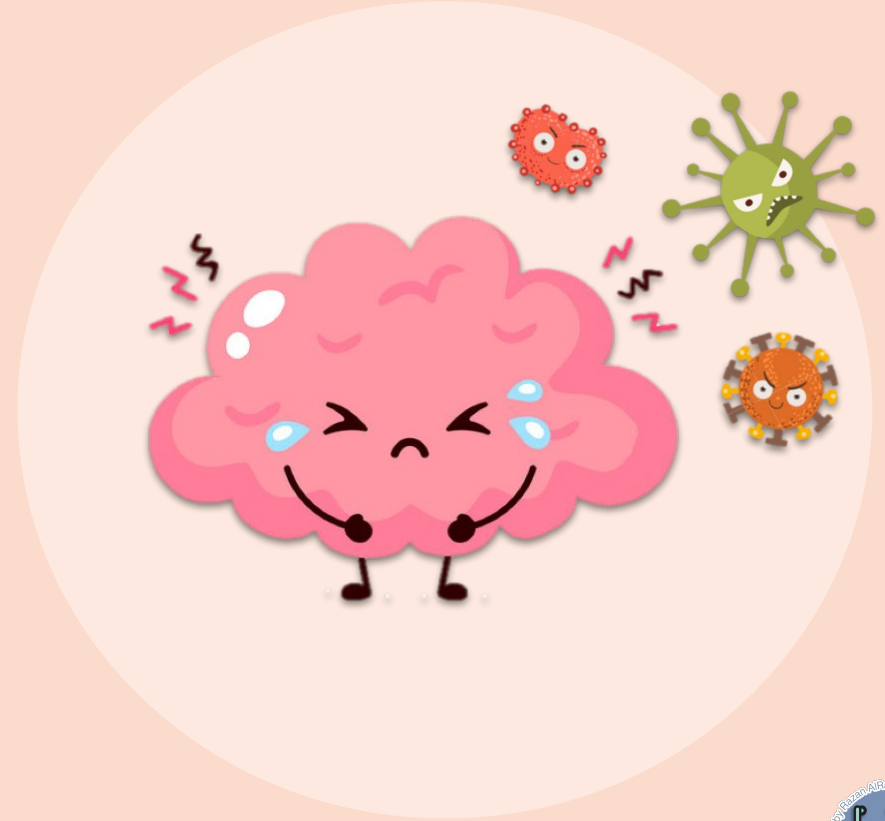


# Chronic cerebral bacterial infections



## Objectives

- ★ Identify the epidemiology and risk factors for chronic meningitis.
- ★ Define chronic meningitis and the various causes of chronic meningitis.
- ★ Determine microbiological etiology of chronic meningitis.
- ★ Differentiate the clinical presentation of chronic meningitis from other clinical syndromes.
- ★ Interpret the laboratory investigations used for the diagnosis of chronic meningitis.
- ★ Explain the management approach for a patients suspected to have chronic meningitis.
- ★ Define the prevention measures of these infection in the community.

**Color index:**

- Important
- Doctors note
- Extra

# Chronic meningitis

## Causes

### 1. infectious:

Defined as meningeal inflammation that persists for **more than 4 weeks**

- Bacterial including TB
- Viral
- Fungal
- Parasitic

2. Neoplastic

3. Parameningeal

4. Autoimmune

5. Chemical

6. Idiopathic

## Risk factors

- Age and Gender (listeria, brucella and SLE)
- Regional preponderance.
- Occupation and recreational activities.
- Immune status.
- **Animals** or ticks contact.

## Can produce:

- Neurological disability. **it depend on representation late or early.**
- Maybe fatal if not treated.

## They usually have :

- Slow insidious onset.
- Progression of signs and symptoms over a period of weeks.

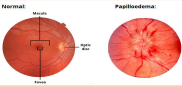
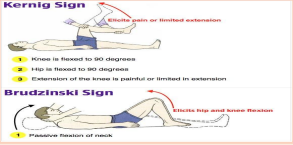
## They differ from those of acute infection which have :

- rapid onset of symptoms and signs.

- **Should differentiated from recurrent aseptic meningitis , aseptic meningitis symptoms are less than 4 weeks**
- Chronic meningitis affects about 10% of patients diagnosed with meningitis
- **They are usually diagnosed, if the neurological syndrome exists for > 4 weeks.**

# Clinical Presentation of chronic cerebral & meningitic infection

over long period or can be recurrent.

Symptoms	Signs
Chronic headache	<b>+/-Papilloedema</b> optic disc swelling that is secondary to elevated intracranial pressure. 
Neck or back pain	Brudzinski or Kernig positive sign of meningeal irritation 
Change in personality	Altered mental status, memory loss, etc
Facial weakness	Seventh nerve (facial) palsy
Double vision ,visual loss	3,4,6th Nerve palsy
Arm and leg weakness	<b>Ataxia</b>
Clumsiness	<b>Hydrocephalus</b> mainly caused by TB.

# Microbiological Causes

## Bacterial Most imp.

- **Tuberculosis** <sup>1</sup>
- **Brucellosis** <sup>1</sup>
- Partially treated acute meningitis.
- **Syphilis** caused by **Treponema Pallidum**.  
*Sexual contact.*
- **Leptospirosis** caused by *L. Icter haemorrhagia*. *Rare and it comes from rat urine in the sewerage. Common for who works there.*
- **Lyme disease** caused by *Borrelia burgdorferi*. *Common in North America & Europe, not in Saudi Arabia.*
- Nocardiosis caused by *Nocardia* species e.g *N. Asteroids*.
- Actinomycosis caused by *Actinomyces*.

→ These organisms can also causes Cerebral abscesses.

*1-Most imp causes in Saudi Arabia.*

## Fungal

- **Cryptococcus neoformans**  
*2nd common cause of CM and usually seen in HIV patients.*
- *Candida* species in Saudi Arabia species mainly *Candida albicans* in immunocompromised patients
- *Aspergillus* species
- *Histoplasma capsulatum*

## Parasitic

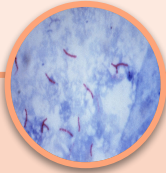
- **Toxoplasma gondii** (most common). *in HIV*
- Trypanosomiasis caused by *T.gambiense*.
- Rare causes: *Acanthamoeba* spp.

## Viruses *they mostly cause encephalitis*

- Some virus can some present as chronic meningitis these include:
  - Mumps
  - Herpes simplex
  - HIV

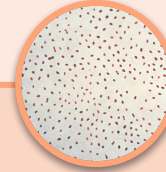
## EXTRA

### M.tuberculosis.



- Acid fast rods
- cell wall contains high concentration of lipids (mycolic acid)
- intracellular pathogen <sup>1</sup>
- Auramine-rhodamine staining bacilli
- Grows on lowenstein-jensen medium
- Reservoir: human lungs
- Transmission: respiratory droplets
- High risk patients: HIV , IV drug users

### Br.melitensis



- Gram -ve coccobacilli
- intracellular pathogen <sup>1</sup>
- Reservoir: goats
- Transmission: Direct contact with animals or unpasteurized dairy

They should be differentiated on the basis of:

1

Clinical History

3

Clinical symptoms

2

Occupation

4

CSF findings

5

Clinical signs in other organism

<sup>1</sup>- that's why they are chronic and can recur (avoid fusion of the phagosome with lysosomes)

Disease	Tuberculosis	Brucellosis
Etiology	caused by <b>Mycobacterium tuberculosis</b> .	in KSA caused by <b>Br.melitensis</b> .
Epidemiology	<ul style="list-style-type: none"> <li>● It infect one third of human race.</li> </ul>	<ul style="list-style-type: none"> <li>● It is common disease in Saudi Arabia.</li> </ul>
Transmission	<ul style="list-style-type: none"> <li>● Airborne disease, the bacteria is very small and can stay in air for a long time and spread to a long distance.</li> </ul>	<p>It affect people who:</p> <ul style="list-style-type: none"> <li>● Are in contact with <b>domestic animals</b>.</li> <li>● Consume <b>raw milk and milk products</b>.</li> <li>● <b>And through inhalation</b>.</li> </ul>
Clinical presentation	<ul style="list-style-type: none"> <li>● The patient usually presents with <b>fever of long duration</b>.</li> <li>● Symptoms of cough and coughing of blood (Haemoptysis) <b>when the chest is affected</b>.</li> <li>● In some cases present as meningitis and cerebral infection presenting chronic neurological symptoms and signs. (<b>Headache</b>, vomiting, meningeal signs, focal deficits, vision loss, <b>cranial nerve palsies</b>, and <b>raised ICP</b>)</li> <li>● It affects the <b>base of the brain</b> in the subarachnoid space where they cause arachnoid fibrosis which result in increased ICP and hydrocephalus</li> </ul>	<ul style="list-style-type: none"> <li>● It usually presents with Pyrexia (fever) of unknown organism of <b>intermittent nature</b> (rising and falling)</li> <li>● The fever is accompanied by <b>night sweating</b>, in between the attacks of fever the patient is not very ill.</li> <li>● Influenza-like symptoms.</li> </ul>

<p>Can cause</p>	<ul style="list-style-type: none"> <li>● Parenchymal CNS involvement can occur in the form of tuberculoma or more rarely abscess.</li> <li>● also can cause: spinal meningitis, radiculomyelitis, spondylitis, or spinal cord infarction (Pott's spine, Pott's paraplegia).</li> </ul>	<ul style="list-style-type: none"> <li>● It can cause chronic cerebral infections &amp; meningitis.</li> </ul>
<p>Prevention</p>	<p>Immunization with Bacille Calmette-Guerin (BCG) to newborns.</p>	<ul style="list-style-type: none"> <li>● <b>Prevention in animal:</b> Vaccination.</li> <li>● Eradication: can only be achieved by test-and slaughter combined with effective prevention measures and control of animal movements</li> <li>● cook the meat ,avoid contact with animals when they are giving birth and drink pasteurized milk</li> </ul>
<p>only in girls slides</p> <p>Classification of CNS TB</p>	<p>Intracranial</p>	<ul style="list-style-type: none"> <li>● tuberculous meningitis (TBM).</li> <li>● TBM with miliary tuberculosis.</li> <li>● tuberculous encephalopathy.</li> <li>● tuberculous vasculopathy.</li> <li>● space-occupying lesions: tuberculoma.</li> <li>● (single or multiple); multiple small.</li> <li>● tuberculoma with miliary tuberculosis.</li> <li>● tuberculous abscess.</li> </ul>
<p>Spinal</p>	<ul style="list-style-type: none"> <li>● <b>Pott's spine and Pott's paraplegia.</b></li> <li>● tuberculous arachnoiditis (myeloradiculopathy).</li> <li>● non-osseous spinal tuberculoma.</li> <li>● spinal meningitis.</li> </ul>	



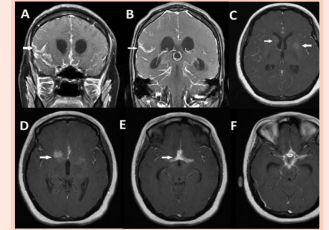
# Diagnosis of chronic cerebral & meningeal infections

History for brucellosis & TB

Clinical examination

Laboratory findings

Imaging  
X-ray, MRI or Ultrasound



study break:



We tried..

Diagnosis	Tuberculosis	Brucellosis	other organisms
Clinical diagnosis	<ul style="list-style-type: none"> <li>● Fever and headache (for more than 14 days).</li> <li>● Vomiting.</li> <li>● Altered sensorium or focal.</li> <li>● neurological deficit.</li> </ul>	<p>anorexia, asthenia, fatigue, weakness, and malaise, and weight loss, Bone and joint symptoms include arthralgias, low back pain, spine and joint pain, and, rarely, joint swelling.</p>	-
CSF and Laboratory Findings	<ul style="list-style-type: none"> <li>● Collect of <b>2-5 ml</b> of CSF and check for the pressure →↑ CSF pressure indicating increased intracranial pressure common with TB. (other infections 1ml but TB you will take more because it has mycolic acid )</li> <li>● <b>Biochemical investigation for:</b> <ul style="list-style-type: none"> <li>○ Total protein→↑ protein level due to presence of inflammatory substance, dead organism, protein and WBC.</li> <li>○ Glucose level in comparison to the serum glucose level→↓ glucose level ( Normally is 2/3 of serum glucose level).</li> </ul> </li> <li>● <b>Microscopy:</b> <ul style="list-style-type: none"> <li>○ Presence of organism.</li> <li>○ Total white cell count →↑ local white cell count but in chronic infection the differential shows <b>lymphocytosis</b> while in acute infections there is ↑ of polymorph.</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>● India ink for Cryptococcus neoforman.</li> <li>● modified Z-N stain can show Nocardia.</li> </ul>

- Differential count mainly for:
  - Polymorphic
  - Lymphocytes → Neutrophil
- **Culture for CSF :**
  - for Brucella, T.B Mycobacterium tuberculosis, Leptospira other Bacteria:
  - TB:
    - media :CSF culture a solid medium L.J or fluid medium.
    - stain: **Z-N Stain** can show AFB of T.B
  - Gram stain can same time rarely shows causative organism.
- **PCR :**
  - or other molecular biopsy test for presence of bacterial element.
- **Serology :**
  - for Brucella.
- Mantoux test, Tuberculin skin test(TST).
- Chest x-ray for primary focus.
- Combination of these finding with clinical history and examination finding

- **VDRL and other serological causes for syphilis.**
- Wet preparation of CSF for fungal and parasite.

## Imaging

- Exudates in basal cisterns or in sylvian fissure hydrocephalus
- Infarcts (basal ganglionic)
- Gyral enhancement
- Tuberculoma formation

-

-

## Treatment

- For the first 2 months:
  - **Rifampicin**
  - Isoniazid (INH)
  - Ethambutol
  - Pyrazinamide
- For the next 4-6 months:
  - Rifampicin
  - INH

(In severe cases of chronic meningitis, we use Anti-mycobacterial as empirical therapy).

- Two of the following 3 drugs:
  - Tetracycline
  - **Rifampicin**
  - Cotrimoxazole
- Usually Rifampicin and Cotrimoxazole are preferred as they have good penetration power in the Blood-Brain-Barrier

-

## CSF findings in different cases:

CSF	Viral meningitis	TB meningitis	Fungal meningitis	Bacterial meningitis
Cell count	Lymphocytosis (<2000 cells/mcL)	100-500 cells/mcL predominately monocytes & lymph	100-500 cells/mcL predominantly lymphocytes	Neutrophilia
Protein	Normal / slightly high	High (100-500 mg/dl)	Normal / high	High (>250 mg/dl)
Glucose	Normal	Decreased	Normal / low	Decreased

Disease	Etiology	RF	Presentation	Diagnosis	Treatment	Prognosis
Syphilis (Neurosyphilis)	Treponema pallidum	Only from Human Secondary Syphilis HIV/AIDS	headache and confusion cranial nerves VII and VIII	lymphocytosis ↑ protein normal glucose -serum & CSF-VDRL	IV Penicillin G 10-14 days	Depend on the stage of the disease
Lyme Disease (Neuroborreliosis)	Borrelia burgdorferi	Exposure to an ixodes scapularis or tick. Endemic area	Peripheral and cranial neuropathies	lymphocytosis ↑ protein normal glucose -Serology	IV ceftriaxona ,Penicillin G or Doxycycline	resolve slowly over weeks to months
Leptospirosis	Leptospira interrogans	Exposure to Rat urine	Intense throbbing Headache and delirium Anicteric second stage 50%	lymphocytosis ↑ protein normal glucose -Serology -PCR	ceftriaxone ,Penicillin G or Doxycycline	Meningoence phalitis /hemiplegia

# Quiz :

Q1/ Both MTB and Brucella are:

- A. Gram -ve.
- B. coccobacilli.
- C. Intracellular pathogen .
- D. Rods.

Q2/ Treponema Pallidum causes:

- A. Neuroborreliosis
- B. Neurosyphilis
- C. AIDS
- D. A & B.

Q3/ What is the best treatment of brucellosis?

- A. Rifampicin
- B. Tetracycline
- C. Cotrimoxazole
- D. A & C.

Q4/ A 59 years old female, came to the ER complaining of neck stiffness, severe headache, & fever for the last 2 weeks, Which of the following organisms is not a cause in this case?

- A. Rabies virus
- B. MTB
- C. West Nile virus
- D. A & C.

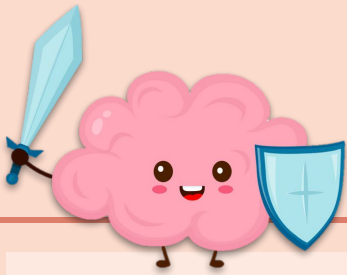
SAQ/ A 68 years old female farmer came to the hospital complaining of intermittent fever , weight loss , back pain and fatigue in the last 4 months. the doctor took a CSF sample that showed predominate monocytes & lymphocytes , high protein and slightly decreased glucose . The culture showed a gram -ve coccobacilli .

- 1- what is your diagnosis, and what is the most likely causative organism?
- 2- what further investigation method would you do to confirm your diagnosis?
- 3- what is the treatment in this case?
- 4- how can we prevent this infection ?

Q1/C  
Q2/B  
Q3/D  
Q4/B

SAQ:

1. chronic meningitis , Br.melitensis
2. serology
3. Two of the following 3 drugs:  
Tetracycline, Rifampicin, Cotrimoxazole
4. slide 8



# THANK YOU

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Editing file



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