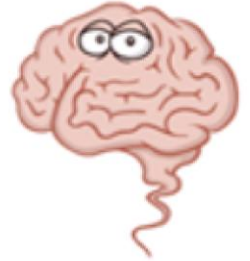


MICROBIOLOGY  
TEAM 432



Lecture ( 2 )

# Acute Pyogenic Meningitis



Color  
guide:

- Very important
- Additional information
- Male doctor's notes
- Female doctor's notes

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Lecture ( 2 )

# Acute Pyogenic Meningitis

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## Objectives:

1. Epidemiology of meningitis
2. Pathophysiology and pathogenesis
3. Clinical presentation
4. Laboratory diagnosis
5. Management and prevention

Pyogenic Meningitis	Inflammation of the meninges affecting Pia, Arachnoid and subarachnoid space.
<b>Bacterial Organisms:</b> Capsulated, and common	<b>Capsulated</b> “ Polysaccharide “: Doesn’t get phagocytized 1- <i>Neisseria meningitidis</i> . 2- <i>Sterptococcus pneumoniae</i> . 3- <i>Hemophilus influenzae</i> .
<b>Antibiotic</b>	<b>Ceftriaxone:</b> It perfuse in CSF very effectively in large amount.
<b>How is it caused?</b>	Thru the blood, Sinusitis, Trauma, lung Infection, Inhalation.
<b>Pathogenesis:</b> Thru: - Direct Invasion. - Thru the blood. - Thru Inhalation. - By the mother.	-Direct Invasion: Fracture in skull can lead to Meningitis - Colonization in Pharynx < Invasion < Bacteremia < Blood Brain Barrier < Meningitis. - Infection in an organ “ Lung “ < Bacteremia < Blood Brain Barrier < Meningitis. - In Neonates: From birth canal, or thru the blood by placenta < Bacteremia < Blood Brain Barrier < Meningitis. - When Meningitis happen, Severe Inflammatory process can lead to edema < Intracranial pressure or/and thrombosis < Can lead to CVA < Can lead to death.
<b>Symptoms</b>	<b>Most Common:</b> Pain, itchy nick “ Stiffness “, <b>Photo Sensitivity</b> , <b>Headache</b> , <b>Fever</b> , and <b>Vomiting</b> . <b>In Infants:</b> Irritability, <b>Vomiting</b> , <b>Fever</b> , lethargy ,drowsy, <b>Inactivity</b> , and <b>Poor feeding</b> . We do LP to know! Advanced Cases: Bruises under skin & spread rapidly. Advanced Disease: Brain damage, Coma, and Death.

<b>Special circumstances</b>	1- S.Aureus: Patients with history of fracture ( head trauma). 2- S.Epidermidis: Patients with history of shunt from the brain. 3- S.Pneumoniae: Immunocompromised Patients or patient with otitis media. 4- Anaerobes: Patients with abscess or truma . 5- P.aeruginosa.		
<b>Neonates: inter by: ( Birth Canal or Blood )</b>	<b>Children</b>	<b>Adults</b>	<b>Old Age</b>
Group B streptococcus. E.Coli Listeria monocytogenes	N. Meningitidis. S. Pneumoniae. H. Influenzae.	Same as Children	Same as Children + Listeria Monocytogenes
<b>Antibiotics</b>			
Amplicillin + Gentamicin	Ceftriaxone(or Cefotaxime ) ± Vancomycin	Same as Children	Same as Neonates

### Management

Parenteral administration of the antibiotics

Duration : 10-14 days ( or more ) according to the medical condition

Prevention: **vaccination , prophylaxis of contacts (Hib& N.meningitidis)**

**In the upcoming 2 slides you MUST know the GRAM STAINS for all the organisms.**

### 1- *N. Meningitidis*

<b>Gram Stain</b>	<b>Gram negative diplococci</b> present in the Nasopharynx of 10 % of people.
<b>Infection method</b>	Transmitted by inhalation of aerosolized droplets, close contact.
<b>Serotypes</b>	<b>B,C,Y,W135</b> cause isolated ,sporadic small epidemics in close population. Serotype <b>A</b> "most serious "has an epidemic potential in sub-Saharan Africa (meningitis belt).
<b>Pathogenesis</b>	<ul style="list-style-type: none"> <li>- Carriers stimulate antibody production,</li> <li>- In some pili attach to microvilli of Nasopharynx &lt; invasion &lt; bacteremia, <b>endotoxin</b></li> <li>- Lipopolysaccharide (<b>LPS</b>) produced &lt; meninges.</li> <li>- <b>Capsule resists phagocytosis.</b></li> <li>- 11-20 % of recovered patients suffer permanent hearing loss, mental retardation.</li> <li>- 10-14% of cases are fatal.</li> </ul>

### 2- *S.pneumoniae*

<b>Gram Stain</b>	<b>Gram positive diplococci</b> ,meningitis may follow pneumococcal pneumonia ,or other site. present in the Nasopharynx of 10 % of people, but they are not affected, why? Because they carry N.meningitidis as colonized normal flora in the Nasopharynx, so they have antibody against it < no disease. However, those people can transmit the organism to other people if they are Immunocompromised.
<b>More Info</b>	<ul style="list-style-type: none"> <li>- <b>May develop after trauma to the skull.</b></li> <li>- High mortality rate &gt; 30% due to invasive disease.</li> <li>- Capsule is polysaccharide polymer.</li> <li>- Pneumolysin decreases inflammatory immune response &lt; severe infection.</li> </ul>
<b>More ☺</b>	<ul style="list-style-type: none"> <li>- Infection rate decreases due to vaccination.</li> <li>- Recovered cases develop sustain learning disabilities.</li> </ul>

**3- *H.influenzae***

<b>Gram Stain</b>	<b>Small Gram negative coccobacilli.</b>
<b>Stop.. and SMILE😊</b>	<p>Found in the Nasopharynx normal flora.                  Major cause of lower RTI, occasionally invade deeper tissues and cause bacteremia.                  Bacteremia &lt; CNS ,bones or other organs.                  Need blood for optimal growth, Hematin (factor X) and NAD ( factor V)                  H.Influenzae type b cause acute life threatening invasive infections .</p>

**4- Group B Streptococcus**

<b>Gram Stain</b>	<b>Gram positive cocci in chains.</b>
	<p>Resident in GIT &amp; vagina ( 10-30%)                  Gain access to amniotic fluid during delivery or colonize newborn as it passes birth canal.</p>

**5- *E.coli***

<b>Gram Stain</b>	<b>Gram negative bacilli.</b>
	<p>Most common cause of neonatal meningitis                  Many features similar to GBS.</p>

**6- *Listeria monocytogenes***

<b>Gram Stain</b>	<b>Gram positive rods/Bacilli</b>
	<p>Human intestinal colonization (2-12%)</p>
😊😊	<p>Spread to fetus following hematogenous dissemination in mother or from birth canal                  Has tropism to CNS.</p>

**Diagnosis of Meningitis**

CSF acquired through Lumbar Puncture and blood for: Analysis of cells, protein, glucose, culture and antimicrobial susceptibility testing. In meningitis we will find **↑WBC,PMN,↓Glucose,↑Protein,↓Chloride**

## Summary

- Pyogenic Meningitis is Inflammation of the meninges affecting Pia, Arachnoid and subarachnoid space.
- Common capsulated bacterial organisms are: *N. meningitidis*, *S. pneumoniae*, and *H. influenzae*.
- Symptoms are **Fever, vomiting, stiffness, and photo sensitivity.**
- Symptoms for Infants are **vomiting, fever, poor feeding, inactivity.** We do **LP** to diagnose Meningitis.
- Common organism are found in ( Children ), ( adults ), and ( old age + **Listeria monocytogenes** )
- In Neonates there are other bacterial organism: **GBS, E.Coli, and Listeria Monocytogenes**
- Antibiotics for children and adults are **Ceftriaxone ± Vancomycin**
- Neonates and old age antibiotics are **Ampicillin + Gentamicin.**
- Organisms affect Neonates by birth canal, thru blood, or by colonization.
- Antibiotic for **Listeria monocytogenes** is **Ampicillin.**
- The inflamed CSF would show high protein level, low glucose level.



## Questions ..

An example question by doctor 😊:

Q: 14 days old baby presented with fever. Treated physician suspect meningitis. Took LP, it showed high WBC, high protein level, low glucose, and gram stain showed gram positive bacilli. What is the organism? What is the drug of choice?

A: ***Listeria Monocytogenes*. Ampicillin.**





For any problems and suggestions please contact:

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Thank you