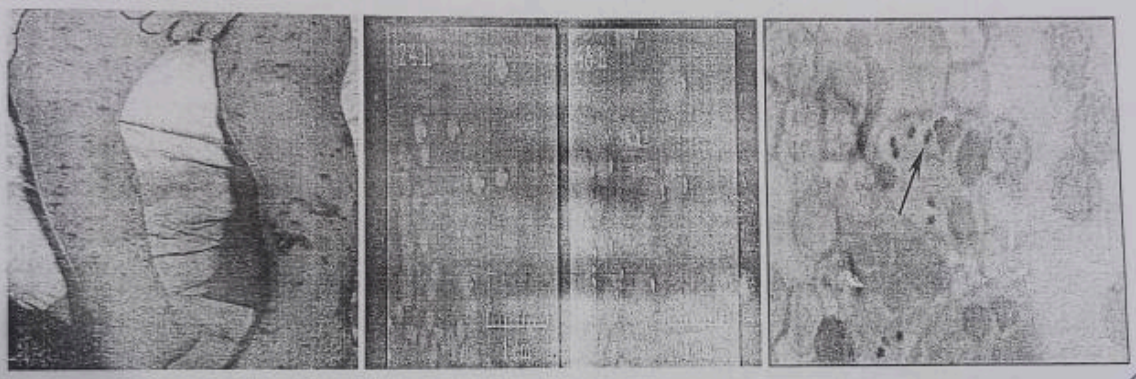
Ahmed Mustafa
F17-011

SGT)
Dr Sadia
3rd Year MBBS

Neisseria meningitidis

A 8-year-old child is brought to the emergency department by his parents. He has been irritable and not eating well for the past 12 hours. He now has a temperature of 103°F, neck stiffness and has a petechial rash on his legs. The physician collects blood and CSF samples for analysis. When Gram stained, the CSF sample appears as shown. Both CSF and blood samples were plated on chocolate agar, resulting in white, mucoid colonies. Cells from the colony growth were Gram negative and oxidase positive. What is the most likely etiology and infection?



1. Name the disease and the causative agent. Neisseria Meningitidis
2. What is the morphology of the bacterium on Gram stain?
3. What virulence factor is variable between strains and allows the microorganism to evade phagocytosis and survive desiccation?
4. Enumerate the virulence factors.
5. What is Waterhouse-Friedrichson syndrome?
6. Name the culture media and the biochemical tests.
7. What is the treatment & Prevention of disease?
8. Enlist the causes of meningitis in adult age group. St pneumonia H. influenza, N. meningitidis
9. Name the site where this organism is present as flora. normal flora of nasopharynx.
10. What is the route of transmission & pathogenesis?

(2) Gram -ve intracellular diplococci show with in the neutrophils.
(3) Polyscharride Capsule.

KEY:

1. The patient most likely has **meningitis** caused by ***Neisseria meningitidis***.
2. Gram-negative intracellular diplococci shown within Neutrophils.
3. The **polysaccharide capsule** is virulence factor that is variable between strains and allows the microorganism to both evade phagocytosis and survive desiccation.
4. Capsular polysaccharide, Outer membrane proteins, Pili, IgA protease, Lipopolysaccharide or endotoxin.
5. **Waterhouse-Friderichson syndrome:** Most severe form of meningococcemia. Life-threatening : High fever, shock. widespread purpura, disseminated. Intravascular coagulation, thrombocytopenia, Adrenal insufficiency.
6. Culture: Chocolate agar: incubated at 37°C in 5 % CO2. Modified thayer martin medium: Colonies are convex, mucoid, transparent, and glistening.
   Biochemical tests: Glucose & maltose fermenter, Oxidase positive, Dnase negative
7. Penicillin G, Chloramphenicol, Cephalosporin. Cefotaxime, Ceftriaxone
   Conjugated Vaccine: four polysaccharides with a carrier protein „ diphtheria toxoid. Conjugated in children (11- 12)which prevents meningitis in teens and young adults.
   Unconjugated Vaccine: four polysaccharides without a carrier protein. Unconjugated vaccine recommended in military personel and travellers.
8. ***Streptococcus pneumoniae, N. meningitidis, H.influenzae***
9. **Normal flora of nasopharynx.**
10.

Lipopolyscharrides
Outer membrane

Pathogenesis of N meningitidis

- **Mode of transmission-** By airborne droplet

N meningitidis
↓
Enter into nasopharynx & attach to epithelial cell of nasopharynx.
Invade mucous membrane
↓
Colonize
↓
Enters to the blood stream
↓
CNS
↓
Through pili, they attach to the meninges--> Meningitis

Ceftriaxone

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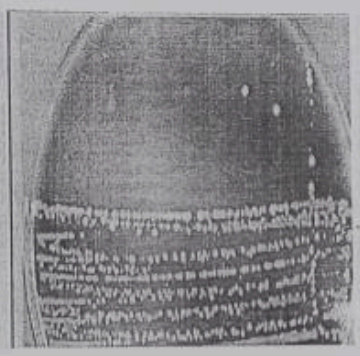
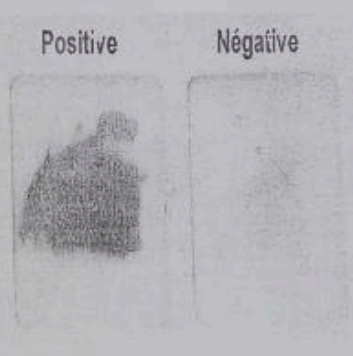
Neisseria gonorrhoeae

A 19-year-old male presents at his doctor's office with a urethral discharge and pain upon urination. The patient is sexually active and admits to having unprotected sex with several different partners over the last 6 months. The urethral discharge was examined directly by Gram stain and microscopy. The Gram-stained sample and culture appeared as shown. The following biochemical test was also positive.





1. What is the most likely bacterium and the disease? Neisseria gonorrhoeae.
2. What is the morphology of the Gram-stained bacterium shown? Gram +ve diplococci inside the neutrophil
3. Name this biochemical test and give its principle. (Oxidase test)
4. What is the mode of transmission of this disease? transmitted sexually.
5. What are the virulence factors?
6. What is the pathogenesis of the disease? ✓
7. What are the disease caused by this organism in newborns and women? (clinical findings)
8. Discuss the laboratory diagnosis of this organism.
9. Enlist the antibiotics used for its treatment.
10. Enumerate the differences between two neisseria species.

KEY:

1. The patient most likely has gonorrhea caused by *Neisseria gonorrhoeae*.
2. Gram-negative diplococci inside the neutrophils.
3. Oxidase test.

Oxidase Test

Principle:

Determines the presence of bacterial enzyme cytochrome oxidase.

Cytochromes are iron containing hemoproteins and in aerobic respiration they transfer electrons(H) to oxygen to form water.

cytochrome oxidase test :-

The cytochrome oxidase test uses certain reagent dyes such as p- phenylenediamine dihydrochloride,that substitute for oxygen as artificial electron acceptors.

In the reduced state the dye is colourless; however in the presence of cytochrome oxidase and atmospheric oxygen,p- phenylenediamine dihydrochloride is oxidized forming indophenol blue.

4. Sexual route
5. Pilli (fimbriae), POR Proteins, Rmp Proteins, Lipooligosaccharide, Ferric binding Proteins, IgA Protease
6. **Transmitted sexually.** Attacks mucous membranes of genito-urinary tract, eyes, rectum & throat. Produce acute suppuration (pus)……Tissue invasion……chronic inflammation…..fibrosis
   Newborns catch infection during birth from birth canal.
7. Endocervicitis, salpingitis, fibrosis, obliteration of fallopian tubes, infertility. Bacteremia occurs & may cause skin lesions, tenosynovitis, arthritis, endocarditis, meningitis, eye infections. If untreated: cause Pelvic inflammatory disease (PID) DGI.

Pelvic inflammatory Disease

Ophthalmia neonatorum: Infections of newborns eye, acquired during passage through birth canal. Marked purulent discharge from both eyes, Pain, Tenderness, Swollen eye lids. If untreated ----------(blindness).

Blindness

8. **Microscopy:** Gram Staining: Gram positive diplococci in the neutrophils. Cultured on Chocolate agar & Modified Thayer martin medium. Incubated in 5% CO_2 at 37°C. (Medium has vancomycin, amphotericin B, Colistin, Trimethoprim to prevent overgrowth of flora & contaminants).
   Biochemicals: Dnase Negative, Glucose fermenter, Oxidase Positive.

is the result of gonococal infection from the mother during the passage through the birth canal.

Serological Tests: Slide agglutination test positive

9. Resistance developed for: Penicillin, Tetracyclines, Flouroquinolones. Uncomplicated genital or rectal infections treated by: Ceftriaxone, Cefixime, Azithromycin.

10.

Differences Between

Neisseria meningitidis (Polyscharrides)	*Neisseria gonorrheae* (No polyscharrides)
• Capsulated	• Non-capsulated
• Have plasmids	• Rarely contain plasmids
• Present in upper respiratory tract, cause meningitis	• Cause genital infections i.e. gonorrhea
• Found in association within or inside neutrophils	• Found extracellularly
• Rarely contain bacteriophage	• Commonly contain bacteriophage
• Maltose fermenter	• Maltose non-fermenter
• Enter through respiratory tract or airborne droplets	• Enter through genital tract by sexual contact
• Vaccines available	• No vaccines

characteristics.

- Both diplococci, Kidney bean shaped.
- Oxidase positive
- Glucose fermenter
- Non motile