Sharq Elneil College
School of Medical Laboratory Sciences
Department of Microbiology
Medical Bacteriology course

NEISSERIA

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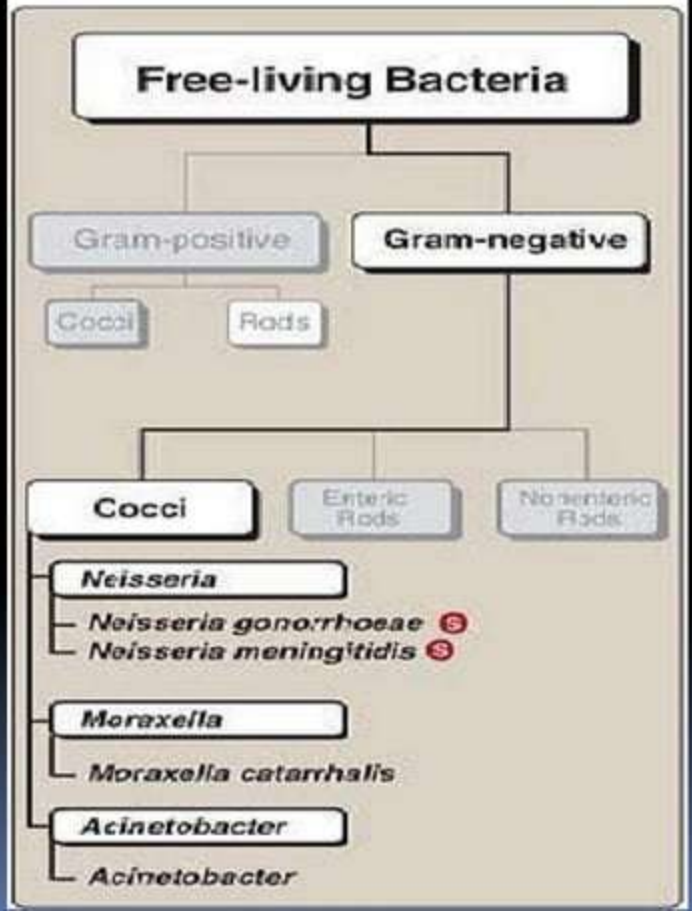
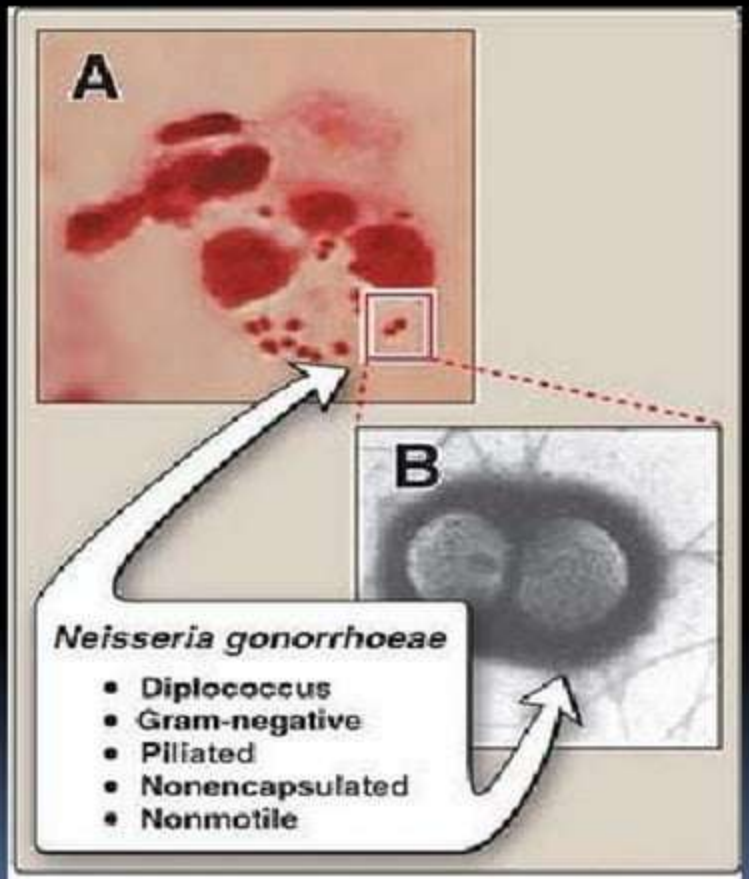

Free-living Bacteria
Gram-positive
Gram-negative
Cocci
Rods
Cocci
Enteric Rods
Nonenteric Rods
Neisseria
Neisseria gonorrhoeae S
Neisseria meningitidis S
Moraxella
Moraxella catarrhalis
Acinetobacter
Acinetobacter

Classification

- Family *Neisseriaceae*
- genera *Neisseria, Kingella, Eikenella, Simonsiella, Alysiella,* and several unnamed species

General properties

- It's aerobic G -ve kidney shape diplococci found intracellular (inside pus cells) and extracellular, non motile and non spore forming.
- Catalase and Oxidase +ve.
- Can't grow on ordinary culture media need chocolate agar with 5% CO_2 (capnophilic).
- Not found as normal flora or comensals (primary human pathogens).
- Produce γ-glutamyl aminopeptidase


A
B
Neisseria gonorrhoeae
Diplococcus
Gram-negative
Piliated
Nonencapsulated
Nonmotile

Species of medical importance

- Neisseria gonorrhoeae ----- Gonorrhoea.
- Neisseria menigitidis ----- Meningitis.
- Branhamella catarrhalis ---- Opportunistic infection.

Neisseria meningitidis

- Found in nasopharynex in 3-30% of carrier individuals.
- Cause meningitis (spread through inhalation and characterized by frontal head ache high grade fever and stiff neck.

SEROGROUP CLASSIFICATION	COMMENT
A	Usually responsible for massive epidemics in developing countries.
B	Does not elicit an effective immune response.
B, C	Responsible for most endemic meningitis in the United States.
A, C, W-135, Y	Effective capsular vaccine is available.

- Septicemia.
- Rarely cause pneumonia, endophthalmitis and arthritis.
- Complication of the disease includes DIC, septic shock, and adrenal haemorrhage.

Virulence Factor

- Polysaccharide capsule (13 serogroup the most pathogenic is A,B,C,Y, and W-135).
- Pili.
- IgA protease.
- Endotoxins.

Pathogenicity of *N. meningitidis*

- Pyogenic (purulent) meningitis

(a sudden onset with intense headache, vomiting and a stiff neck)

- Meningococcal septicaemia.
- Chronic meningococcal arthritis.

Laboratory diagnosis

- Specimens:
  - Neisseria meningitidis:
    - C.S.F.
    - Blood.
    - Nasopharyngeal swab.
  - Transport media is Aimies or Stuart transport media.

- **Direct Gram stain:**
  - G ram Negative kidney shape diplococci intra and extracellular.

Culture:

- Chocolate agar with a 5-10% CO_2.
- Blood Agar.

Blood cultures

Meningococci grow well in

- **Columbia diphasic** medium Because sodium polyanethol sulphonate (SPS) may be inhibitory to meningococci.
- add sterile gelatin (1% final concentration) to neutralize the effect of SPS.
- Subculture a positive blood culture onto chocolate agar and incubate in a carbon-dioxide enriched atmosphere

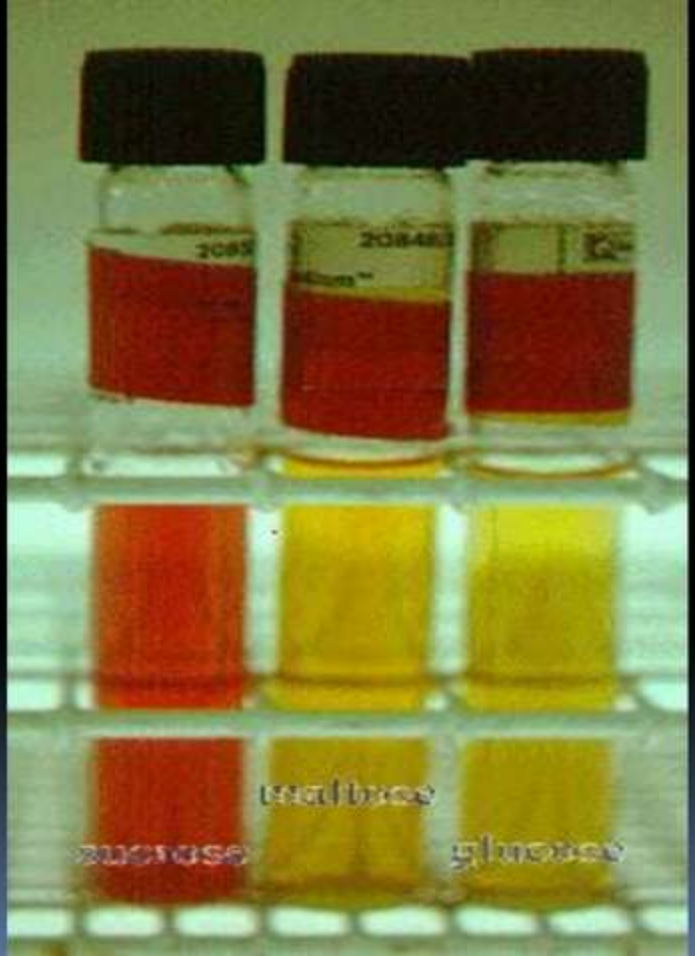
Incubation:

- At 37ºC in candle jar for 24-48 hrs.

- Colonial morphology:
  - small, gray, translucent and raised.
- Biochemical reaction:
  - Oxidase +ve.
  - Catalse +ve.

Rabid Carbohydrate Utilization test:

	Glucose	Maltose
Neisseria meningitidis	+ (Acid)	+ (Acid)


maltose
sucrose
glucose

Serology

- Neisseria meningitidis are capsulate
  - Direct from C.S.F.
  - From culture incase of gonococci.
- Molecular technique:
  - Using Nucleic acid probe for detection of gonococcal DNA by using PCR.

Antimicrobial susceptibility testing

- Ceftriaxone
- Penicillin
- Chloramphenicol
- Ampicillin
- Trimethoprimsulphonate

Control and prevention

- Diagnosis:
- Vaccines: A conjugate meningococcal vaccine
- quadrivalent polysaccharide vaccine. MCV4 is a tetravalent vaccine that contains capsular polysaccharides from serogroups A, C, W-135, and Y conjugated to diphtheria toxoid.
- Prophylaxis: Rifampin is usually used to treat family members of an infected individual; the drug is effective in eliminating the carrier state. Other drugs used for prophylaxis include oral ciprofloxacin and intramuscular ceftriaxon

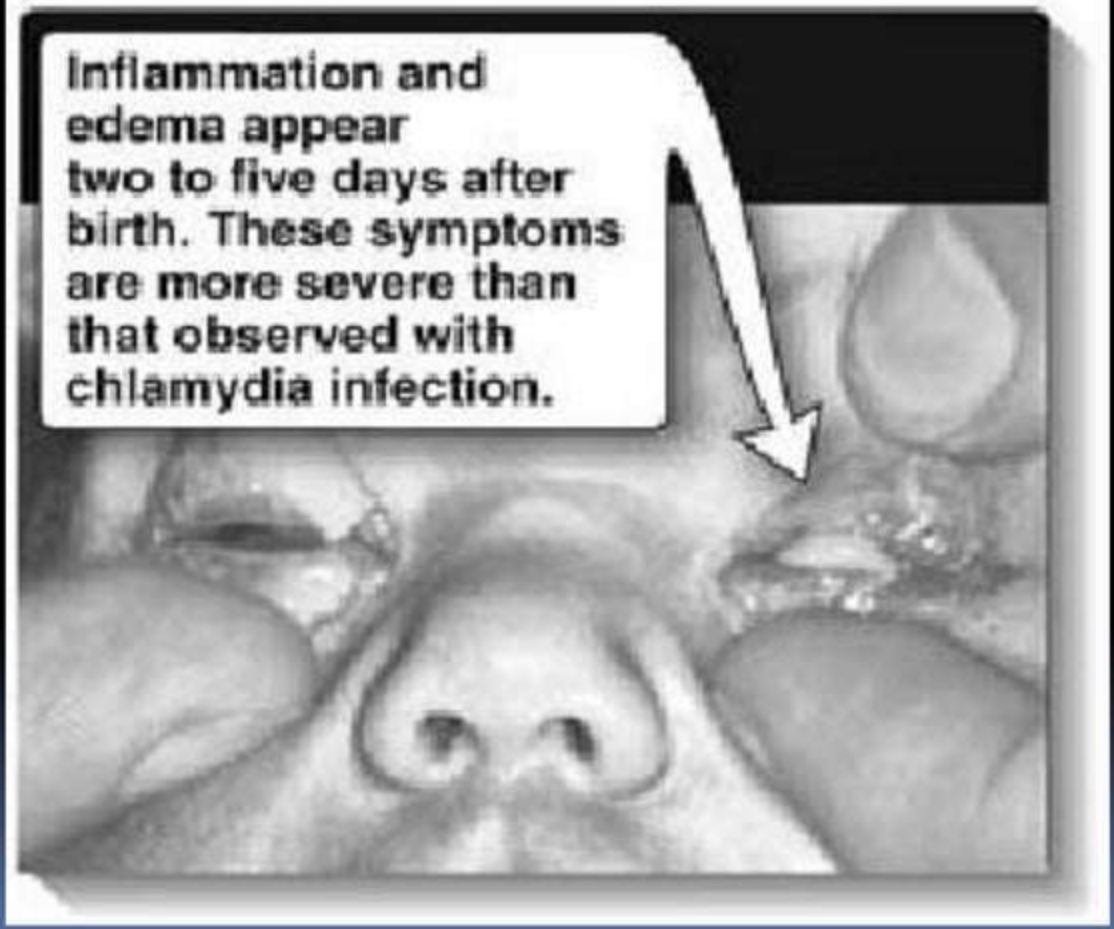
Virulence factor

- **Pili** --- most important virulence factors helping the gonococci to stick on the epithelial cells.
- **IgA** protease that cleave IgA on mucosal surface.
- **Lipopolysaccharide** damage tissue and prevent phagocytosis.

Neisseria gonorrhoeae

- Cause a sexually transmitted disease (gonorrhoea).
- In male appears as acute urethritis with purulent discharge.
- In female infect the endocervic resulting in vaginal discharge and dysuria. 50% of females are a symptomatic carrier. Could lead to pelvic inflammatory disease and sterility.

- Disseminated gonococcal infection appears as arthritis and septcemia.
- gonococci occasionally isolated from mouth and anus from homosexual and unusual sexual activities.
- Opthalmia neonatorum is an eye infection to a neonate during delivery

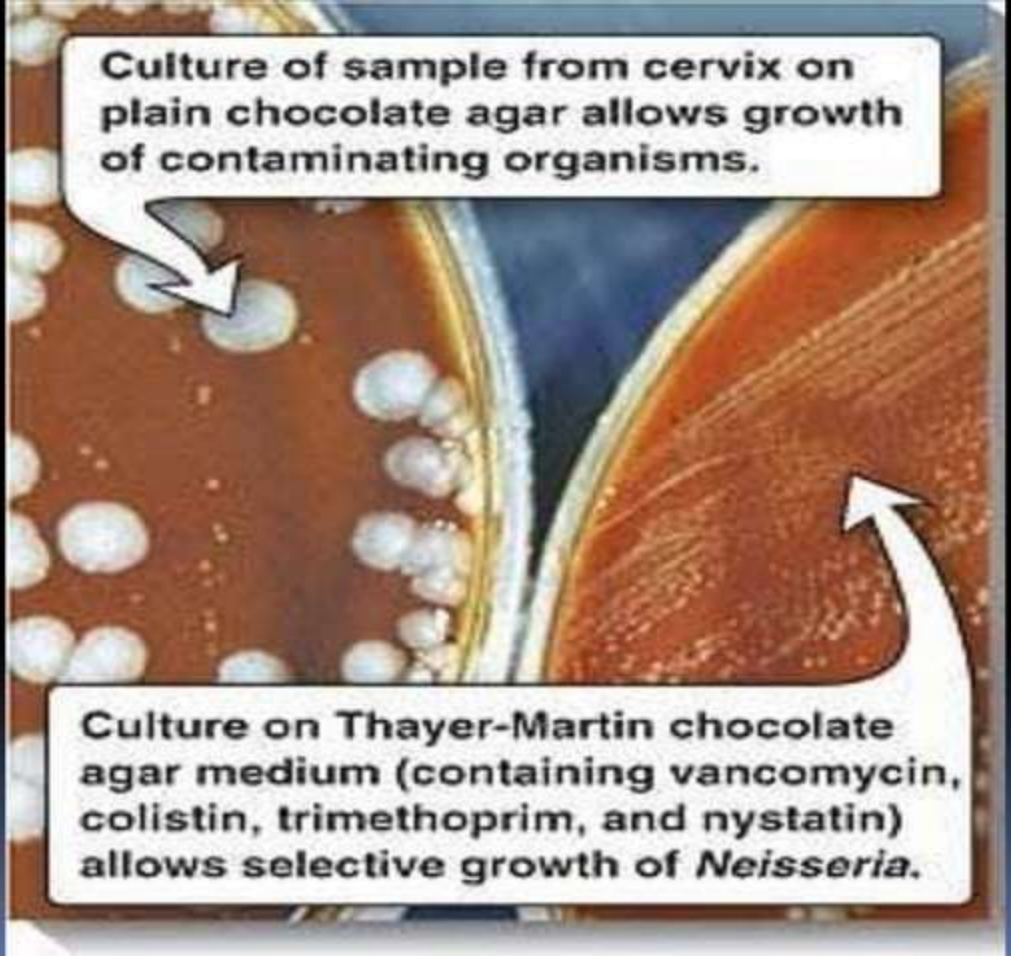

Inflammation and edema appear two to five days after birth. These symptoms are more severe than that observed with chlamydia infection.

Laboratory diagnosis

- Specimens:
  - N.gonorrhoeae: (avoid using cotton or calcium alignament swab use Rayon or Dacron swab)
    - Urethral swab.
    - Endocervical swab.
    - Eye swab.
    - Throat swab and Rectal swab.

Culture:

- Chocolate agar with a 5-10% CO_2.
- Selective media for gonococci:
  - Thayer-Martin media chocolate agar contain:
    - Vancomycin for G+ve
    - Colistin for G-ve.
    - Nystatin for fungi and Yeast.
  - Modified Thayer-Martin media:
    - Addition of Trimethoprim which kill swarming proteus species.


Culture of sample from cervix on plain chocolate agar allows growth of contaminating organisms.
Culture on Thayer-Martin chocolate agar medium (containing vancomycin, colistin, trimethoprim, and nystatin) allows selective growth of *Neisseria*.

- Martin-Lewis:
  - Contain Anisomycin instead of Nystatin
- Modified New York City media contain:
  - Vancomycin.
  - Colistin.
  - Amphotericin B
  - Trimethoprim

Incubation:

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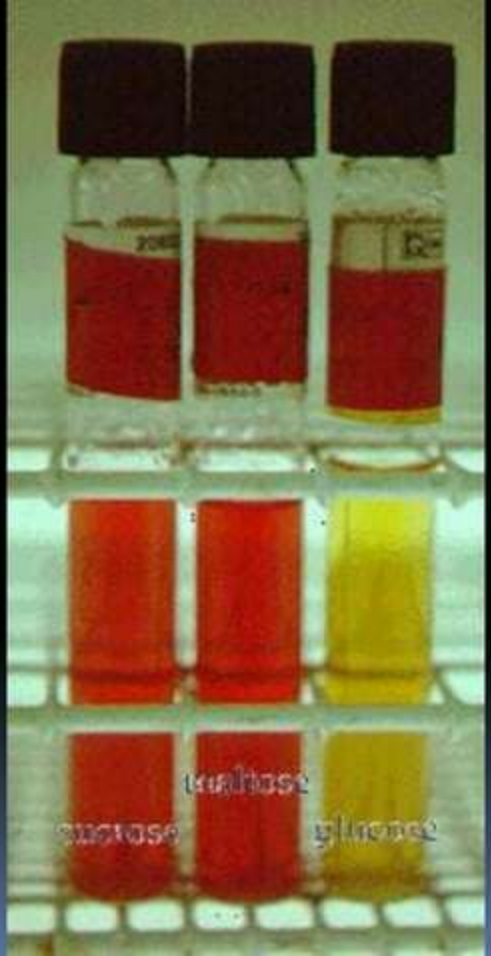
Rabid Carbohydrate Utilization test:

	Glucose	Maltose
Neisseria gonorrhoeae	+ (Acid)	-
Neisseria meningitidis	+ (Acid)	+ (Acid)
Branhamella catarrhalis	-	-


maltose
glucose

	GLUCOSE FERMENTATION	MALTOSE FERMENTATION	PLASMIDS	VACCINE AVAILABLE	POLY-SACCHARIDE CAPSULE	β-LACTAMASE PRODUCTION	OXIDASE
Neisseria gonorrhoeae	+	−	Common	−	−	Common	+
Neisseria meningitidis	+	+	Rare	Serogroups A, C, W-135, Y	+	None	+

Antimicrobial susceptibility testing

- **Penicillin**
- **Tetracycline**
- **Cefoxitin, and/or spectinomycin**
- Penicillin-resistant organisms due to penicillinase-producing N.gonorrhoeae
- third-generation cephalosporins

Moraxella

- nonmotile
- gram-negative coccobacilli that are generally found in pairs.
- Moraxella are aerobic, oxidase-positive
- fastidious organisms that do not ferment carbohydrates.

- The most important pathogen in the genus is Moraxella (formerly, Branhamella) catarrhalis.
- This organism can cause infections of the respiratory system, middle ear, eye, CNS, and joints.

Acinetobacter

Members of the genus Acinetobacter

- are nonmotile coccobacilli
- are frequently confused with neisseriae in gram-stained samples.
- Generally encapsulated

- oxidase-negative
- obligately aerobic
- do not ferment carbohydrates. They are important nosocomial (hospital-acquired) pathogens.