Al-Mustaqbal University
Dept. Medical Lab. Techniques
Diagnostic Microbiology 25-2026
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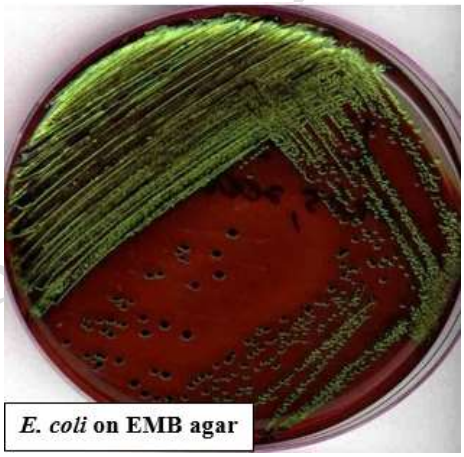
Lecture-15: Family of *Enterobacterceae*

Gram-negative rods related to the enteric tract include a large number of genera.

Diseases Caused by Members of the Enterobacteriaceae

Escherichia: It causes **urinary tract infection, traveler's diarrhea, neonatal meningitis. Produces green metallic sheen colonies on Eosin Methylene blue (EMB).**



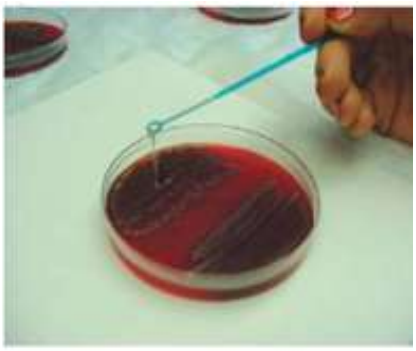
E. coli **on EMB agar**

Shigella: The causative agent of **Dysentery**, non-motile. Lactose (-) on MacConkey.

Slmonella: The causative agent of **typhoid fever** and **enterocolitis**.

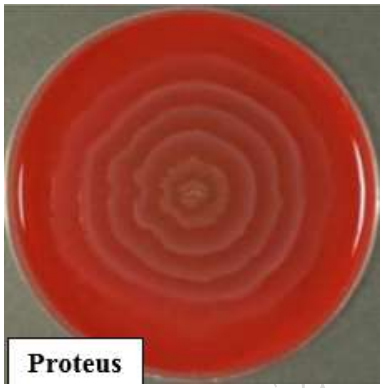
Klebsiella: Causes Pneumonia, urinary tract infection. **It produces heavy mucoid colonies.**

Klebsiella pneumoniae

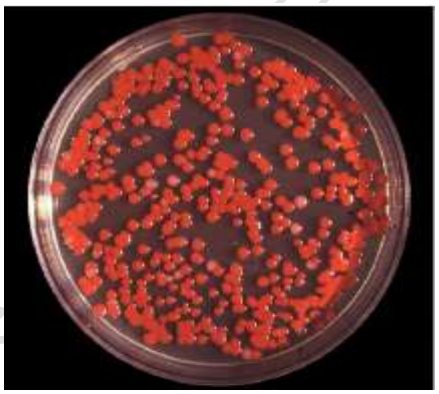


Proteus: commonly causes urinary tract infection. **Forms Swarming growth on culture media.**

Blood agar: Swarming effect over plate as Proteus is active in motility as shown in this figure …….



Serratia – **causes pneumonia and urinary tract infection, forms red colonies on solid media*:***



Yersinia: The causative agent of **Plague**, **enterocolitis**, **mesenteric adenitis**.

Diagnosis:

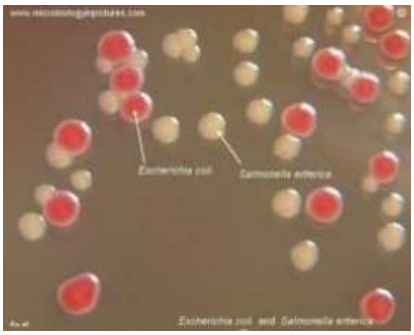
Culture Media

Specimens have suspended in broth and cultured on ordinary as well as differential media (**MacConkey agar**, EMB agar) to permit separation of non-lactose fermenting gram-negative rods from other enteric bacteria. If salmonella infection has suspected, the specimen has also placed in an enrichment medium (**selenite broth**) for 18 hours before has plated on differential media (**Hektoen enteric or Shigella- Salmonella agar, S-S agar**).

Identificatio

MacConkey agar is inoculated with tested organism using streak plate technique. Incubate the plate in incubator at 37 C for 24 hrs., then read the results as the following:

- Lactose fermenting (LF) organism appears as **pink colonies** (e.g. ***E. coli*** and ***Klebsiella***)
- Non lactose fermenting (NLF) organism appears as **colorless colonies** (***Salmonella*** *and* ***Shigella***).



Key Characteristics to differentiate some group of *Enterobacteriaceae*

Test \ Bacteria	*E. coli*	*Shigella sonnei*	*Salmonella typhi*	*Klebsiella pneumoniae*	*Klebsiella oxytoca*	*Proteus vulgaris*	*Proteus mirabilis*	*Morganella morganii*
Indole	+	-	-	-	-	+	-	+
Methyl Red (MR)	+	+	+	v	-(v)	+	+	+
VogesProskauer (VP)	-	-	-	+	+	-	V	-
Simmons' Citrate	-	-	-	+	+	-(v)	+(v)	-
Hydrogen Sulfide (H_2S)	-	-	+w	-	-	+	+	-
Urea	-	-	-	+	+	+	+	+
Motility	v	-	+	-	-	+	+	v
Gas from D- glucose	+	-	-	+	+	+	+	+
Lactose	+	-	-	+	+	-	-	-

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Neisseria meningitides: Family: *Neisseriaceae*: Genus: *Neisseria.*

N. meningitides is aerobic, gram-negative cocci typically arranged in **pairs** (**diplococci**) with adjacent sides flattened together (**resembling coffee beans**).

Specimens collection

- Nasopharyngeal swabs; body fluids (**joint** fluid or **CSF**) should be stored at 37°C because it was sensitive to cold.

- Any volume (greater than 1 ml) of clear body fluid should be centrifuged at room temperature at 1500xg for 15 min. the sediment should be vortexed and inoculated onto appropriate media.

Diagnosis:

a) Direct detection methods

1- By Gram stain

As indicated above, *N. meningitides* is **Gram negative diplococci** with adjacent sides flattened. They are often referred to as **(Kidney bean)** shaped diplococci.

N. meningitides by electron microscope

2- Antigen detection

The detection of *Neisseria meningitids* **capsular polysaccharides antigen** in body fluids is no longer recommended.

b) Cultivation

The culture media used for Neisseria **5% sheep blood** agar and **chocolate agars**. Colonies of *N. meningitidis* are grey and unpigmented on a blood agar and appear round, smooth, moist, shiny, and convex, with a clearly defined edge. *N. meningitidis* appear as large, colorless-to-grey, opaque colonies on a chocolate agar.

N. gonorrhoeae, *N. meningitidis*, and *M. catarrhalis* grow best under conditions of increased CO2 (3% to 7%).

Colonial appearance (morphology)

N. meningitides colonies are **medium**, **smooth**, **round**, **moist**, **gray to white**; **encapsulated strains are mucoid**; may be greenish cast in agar underneath colonies.

Biochemical identification

Test / Organism	Growth on			Rapid fermentation sugars				Gas from Nitrate reduction
	Modifed Thayer-Martin	Nutrient Agar at 35°C	Blood or Chocolate Agar at 25°C	Glucose	Maltose	Lactose	Nitrate reductions	
N. gonorrhoeae	+	-	-	+	-	-	-	-
N. meningitides	+	-	-	+	+	-	-	-
