Lec. 3 micro summary , by Ghada Alzoubi

Enterobacteriaceae

→Gram **negative bacilli** , habitat is the intestinal tract of humans and animals.

→**all motile** with peritrichous flagella EXCEPT for Shigellae, Yersinia and Klebsiella

→**facultative** anaerobes →oxidase negative ,catalase positive, reduce nitrate to nitrite

→**LPS**: component of the G-ve bacterial cell wall and is an endotoxin

→**Antigenic Structure of Enterobacteriaceae**:

O antigens " heat-stable" , [with capsule]**K (capsular) antigens** " heat- labile" , **H (flagellar) antigens**"motile"

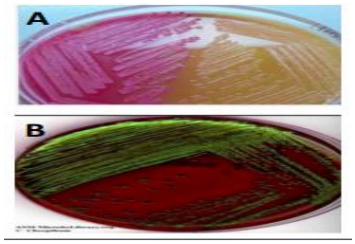
→**Salmonella** serotype Typhi is called Vi antigen because it's not only resistant to serum killing but is also a virulence antigen

→produce Colicins "bacteriocins produced by E. coli."

1) E.Coli : cause disease by 3 ways : **gain** virulence factors "plasmids/phages" +**opportunistic** infection +**introduced** into a sterile site " urine +blood"

-Main cause of UTI -oxidase negative and lactose fermenters

	Lactose fermenters	Non-lactose fermenters
MacConkey (pic A)	Pink	Colorless
EMB (pic B)	Black dots on colony (nucleated) (E. coli specifically forms green sheen colonies)	Colorless



E coli-associated diarrheal diseases (cause gastroenteritis):

A) **Enteropathogenic E coli (EPEC)** : infantile diarrhea, outbreaks of explosive diarrhea in nurseries.
-**Pathognesis**: requires two important factors for attachment and effacement "EPEC adherence factor (EAF) +effacement (LEE) "
-feco-oral as kids are unhygienic , watery diarrhea "contain mucus"
-self limiting , but can prolonged or chronic "may need hospitalization"
- can be cured by antibiotic treatment

B) **Enterotoxigenic E coli (ETEC)** : **traveler's diarrhea**

-**pathognesis**: : ETEC colonization factors [CFAs]+produces toxins[ST: cGMP + LT: cAMP]

-Both toxins result in hypersecretion of fluids and electrolytes and poor absorption of sodium→ watery diarrhea.

-PREVENTION: ingestion of bismuth subsalicylate suspension

C) **Shiga toxin-producing E coli (STEC/EHEC) /VTEC/EHEC**:
-Most common E. coli strain that causes gastroenteritis
-The most common of all the E coli serotypes that produce Shiga toxin is O157:H7
-Toxins: Shiga-like toxin 1 and toxin 2 -STEC is NOT INVASIVE -develop HUS
-**clinically** : Colonic edema and an initial non-bloody then may developed into bloody diarrhea "contains RBCs, WBCs, some mucous"
-**self limited** , not invasive= no fever
-Dx: test for shiga toxin " EIAs" , Sorbitol MacConkey agar plate "EHEC is the only E. coli that doesn't ferment sorbitol"→ it won't grow on the plate
-**Treatment** : Antibiotics are contraindicated because they increase the risk for HUS , Anti-motility drugs (reduce motility of colon) and opioids are also contraindicated

D) **Enteroinvasive E coli (EIEC)** : INVASIVE (so it causes bloody diarrhea and fever) , most commonly **in children** in developing countries and in travelers to these countries , E. coli are lactose fermenters EXCEPT EIEC.
Similar to Shigella, EIEC strains are non-lactose or late lactose fermenters and are nonmotile.

E) **Enteroaggregative E coli (EAEC)** : chronic diarrhea , persistent diarrhea in patients with HIV.

-Some strains of EAEC produce ST (Shiga toxin)-like toxin (EAST). {Others produce a plasmid-encoded enterotoxin that produces cellular damage (hemolysin and enterotoxin)}

-They are characterized by their specific patterns of adherence to human cells. The organisms exhibit a diffuse or "stacked-brick" pattern of adherence to small intestine epithelial cells

- **ETEC, EPEC, and EAEC** cause non-inflammatory diarrhea.
- **EIEC, STEC** cause inflammatory diarrhea

TREATMENT: cotrimoxazole +No single specific therapy is available. The sulfonamides, ampicillin, cephalosporins, fluoroquinolones, and aminoglycosides

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2) **Shigellae**: facultative anaerobes but grow best aerobically , gram-negative rods , produce shigellosis , humans are the only reservoir
-**ferment glucose. They do not ferment lactose, but Shigella sonnei can**
-non-motile" no H-antigen" -do NOT produce H2S "differentiates them from salmonella"
-developed countries, the most common serotype is S. sonnei " group D"
-developing countries, the most common serotype is S. flexneri " group B"
-**transmission**: Food, Feces, Flies, Fingers
-Group A Shigella Dysenteriae→produces type 1 shiga toxin"most severity,but not common"
-**pathogenesis**: essential pathologic process is invasion of the mucosal epithelial cells→resulting in later dysentery with blood and pus in stools
-**toxins** →Endotoxin (LPS) , Shigella Dysenteriae Exotoxin" heat-labile[neurotoxic, cytotoxic and enterotoxic]" -**Opioids** should be avoided in Shigella dysentery

-**Dx**: culture "MacConkey or EMB :appear colorless , selective agar : Hektoen enteric agar or Salmonella –Shigella agar) , Serology is NOT used , rectal swab / stool culture"

-**treatment** : Ciprofloxacin, ampicillin, doxycycline, and trimethoprim–sulfamethoxazole