Gram-negative Bacteria
Enterobacteriaceae and Coliform Bacteria

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Medical Microbiology MA 323

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Outline

- Gram Negative Bactera
- ***Enterobacteriaceae***
- Coliform Bacteria
- Infections by coliform bacteria

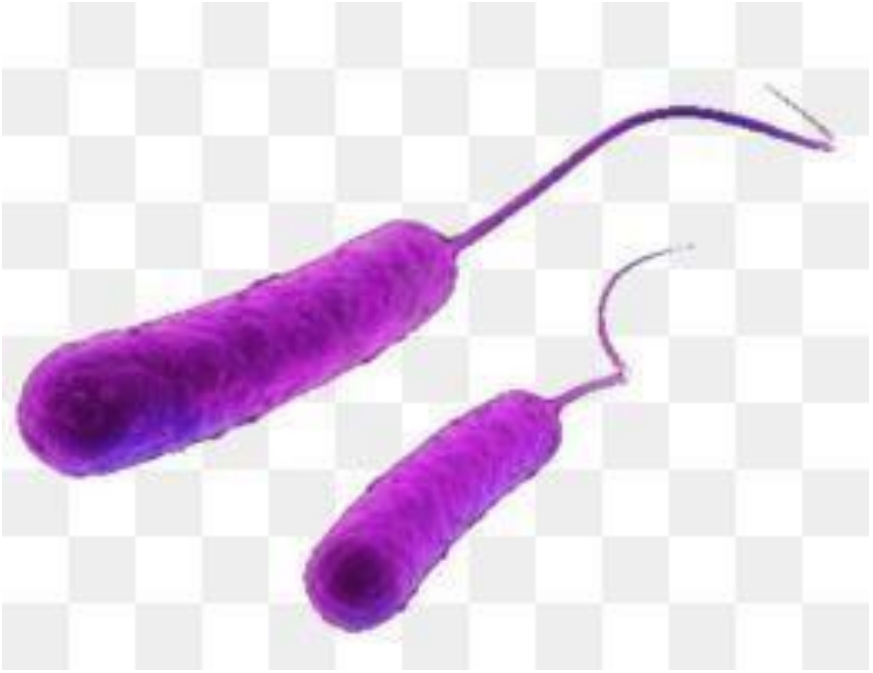
Enterobacteriaceae

- Commonly present in large intestine
- Some are non-pathogenic
- A few are highly Pathogenic,
- Some commensals turn out to be pathogenic. as in UTI after catheterization.
- Include: *Escherichia coli*, *Salmonella*, *Shigella*, *Enterobacter*, *Klebsiella*, *Proteus* and *Serratia*

Characters of *Enterobacteriaceae*

- Gram-negative rod shape
- Ferment **glucose** with **acid** production
- Reduce nitrates into nitrites
- Generally Oxidase negative
- Catalase positive (except *Shigella dysenteries*)
- Facultative anaerobic
- Motile **except** *Shigella* and *Klebsiella*
- Non-capsulated except *Klebsiella*

- Examples: Include: *Escherichia coli, Salmonella, Shigella, Enterobacter, Klebsiella, Proteus and Serratia*



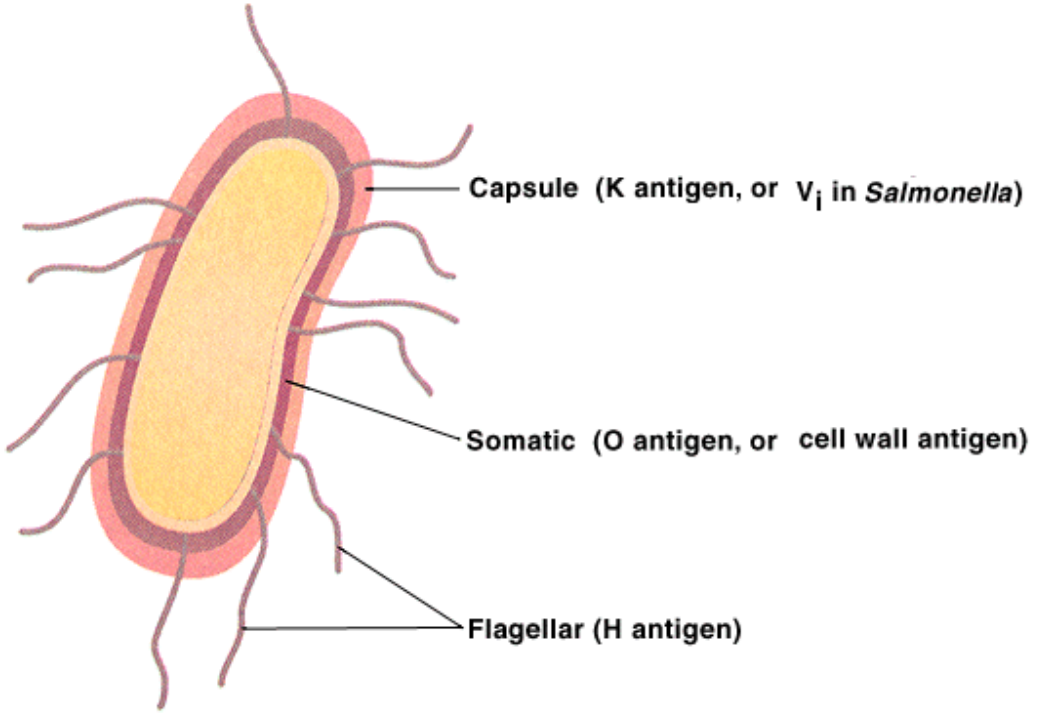
Classification:

1- Serological classification upon antigens:

*Somatic antigen (O-Ag)

*Flagellar antigen (H-Ag)

*Capsular antigen (K-Ag)



2- Biochemical reactions and sugar fermentation.

➢ Infections

Enterobacteriaceae can cause a wide range of illnesses, which include

- wound infections
- Gastroenteritis
- Urinary Tract Infection
- Pneumonia
- Meningitis
- Septicemia
- Hemolytic Uremic Syndrome

➢ Hemolytic uremic syndrome (HUS) leads to erythrocyte destruction, subsequently resulting in renal failure.

➢ Coliforms

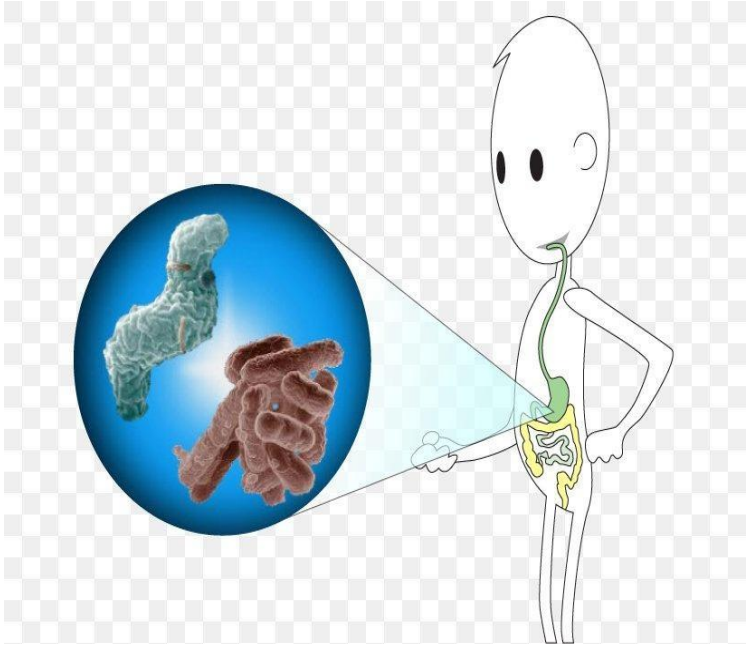
- Coliforms is a general term that refers to a **group of grams negative**, **rod-shaped**, **non-spore forming**, **motile** or **non-motile** and **lactose fermenting bacteria**.

- When coliforms ferment lactose producing **gas** and **acids**. Therefore, the production of gas and acids are the results used **to evaluate their presence in laboratory testing.**

- The most important and well-known example of coliform bacteria is ***Escherichia coli*** **(E. coli)**.

Escherichia coli (E. coli).

- Among the Coliforms, **fecal coliforms** and *E. coli* are the most specific indicator organisms tested in the assurance of food and water quality. Their presence **indicates the potential presence of pathogens in food and water.**



- Coliforms belong to Enterobacteriaceae. Hence, all coliforms are members of Enterobacteriaceae. But not all Enterobacteriaceae are coliforms.

- Coliforms ferment lactose and produce acids and gas. Enterobacteriaceae ferment glucose and some ferment lactose

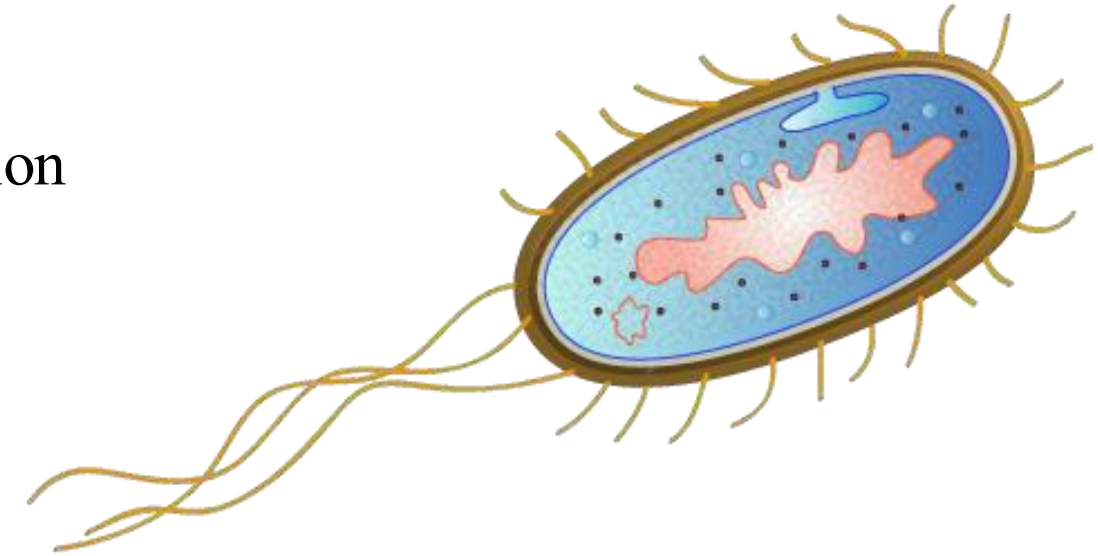
- Coliform bacteria generally belong to four genera of the Enterobacteriaceae: *Citrobacter, Enterobacter, E. coli, and Klebsiella pneumoniae.*

➢ Characteristics of E. coli

- Gram Negative rod
- Facultative anaerobe
- Normal flora of the intestine
- There are more than 700 different serotypes of E. coli
- Colonizes newborns GI tract within hours after birth

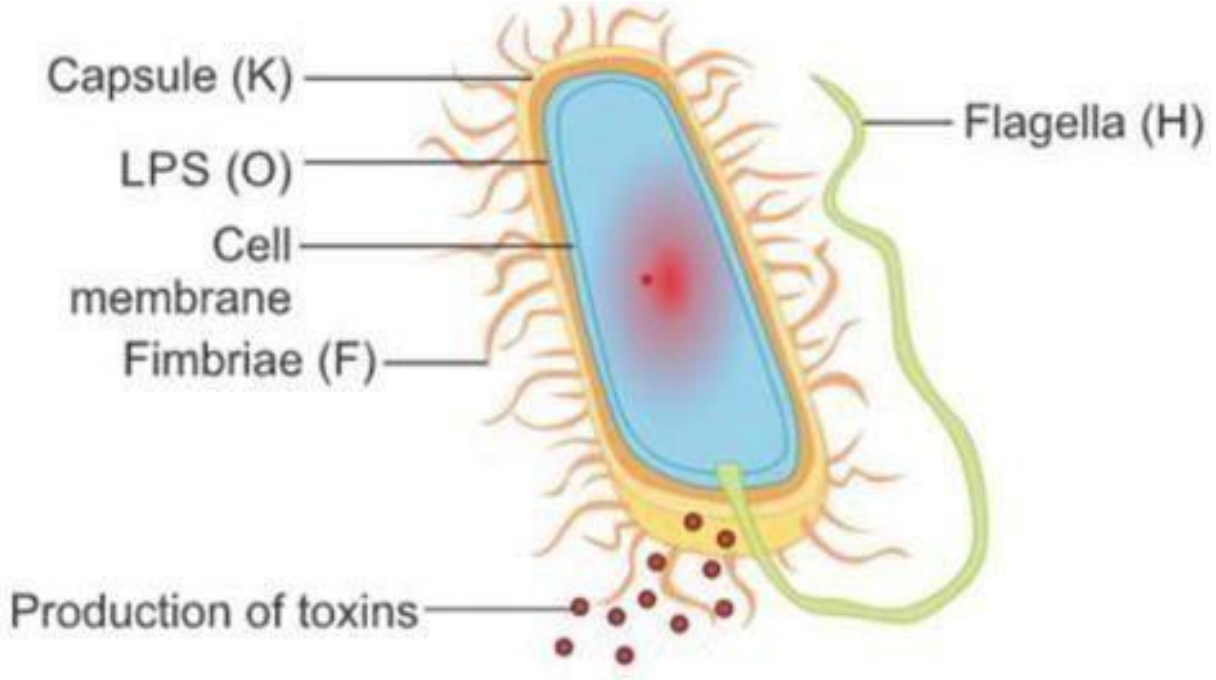
Benefits for body

- Protects the intestinal tract from bacterial infection
- Assists in digestion
- Produces small amounts of vitamins B12 and K



Antigenic structure

- O somatic
- H flagellar
- K capsular



➢ Virulence Factors

Following are some of the virulence factors

- Endotoxin
- Capsule
- Antigenic variation
- Exotoxin- Hemolysins, **Enterotoxins**

- Adhesins, fimbriae

Infections

- **Urinary tract infection**
- **Diarrhea**
- **Pyogenic/wound infection-post surgical**
- **Septicemia:** an infection in the bloodstream that is caused by bacteria, viruses, or fungi.
- **Neonatal meningitis**

➢ Urinary tract infections

- Are common infections that happen when bacteria, often from the **skin** or **rectum**, enter the **urethra**, and infect the urinary tract.

- The infections can affect several parts of the urinary tract, but the most common type is a **bladder infection (cystitis).**

- What is cystitis: is a **bladder infection.**

- Biofilm-forming Enterobacteriaceae are a common cause of recurrent and severe urinary tract infections.

➢ Diarrhea

- The following are types of **diarrheagenic** E.coli

1. **Enterotoxigenic E. coli (ETEC) cause watery diarrhea**
2. Enteropathogenic E. coli **bloody diarrhea**
3. Enteroinvasive E. coli (EIEC) watery diarrhea
4. Enterohemorrhagic E. coli (EHEC) watery diarrhea