Escherichia

Introduction

- Predominant aerobic bacterial flora of large intestine of human beings.
- Gram negative, non sporing, non acid fast.
- Aerobic & facultative anaerobic
- Grow on ordinary culture media
- Intestinal pathogens: Non LF, e.g. Salmonella, Shigella

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- Oxidase negative.
- Catalase positive except dysenteriae type 1
- Reduces nitrates to nitrites except some strain of Erwinia & Yersinia.
- Ferment glucose (A + / G +)
- Found in soil & water, on plants & in intestinal tracts of man & animals.
- May be capsulated or noncapsulated
- Motile by peritrichate flagella or non motile

Classification

Groups	Lactose fermentation	Colonies on MacConkey agar	Examples
Lactose fermenters (LF)-all are coliform bacilli	Ferment lactose producing acid	Produce pink colored colonies, (acid changes the color of neutral red indicator to pink)	Escherichia, Klebsiella Citrobacter
Non lactose fermenters (NLF)	Do not ferment lactose	Produce pale or colorless colonies	Salmonella, Shigella Proteus, Morganella, Providencia and Yersinia

Groups	Lactose fermentation	Colonies on MacConkey agar	Examples
Late lactose fermenters (LLF or previously called as paracolon bacilli)	Ferment lactose after 2-8 days of incubation	At 24 hrs incubation- produce pale or colorless colonies, After 2 days- produce pink color colonies	Shigella sonnei

Ewing's Classification

Tribe	Genus
Tribe I-Escherichieae	Escherichia Shigella
Tribe II-Edwardsielleae	Edwardsiella
Tribe III-Salmonelleae	Salmonella
Tribe IV-Citrobactereae	Citrobacter

Tribe	Genus
Tribe V-Klebsielleae	Klebsiella Enterobacter, Hafnia Serratia Pantoea
Tribe VI-Proteeae	Proteus Morganella Providencia
Tribe VII-Yersinieae	Yersinia
Tribe VIII-Erwinieae	Erwinia

E.Coli - Pathogenicity

- Urinary tract infections(UTI)
- Wound infections
- Septicemia
- Diarrhoeal diseases

Five types of diarrheagenic E.coli recognized as causing diarrhoeal disease:

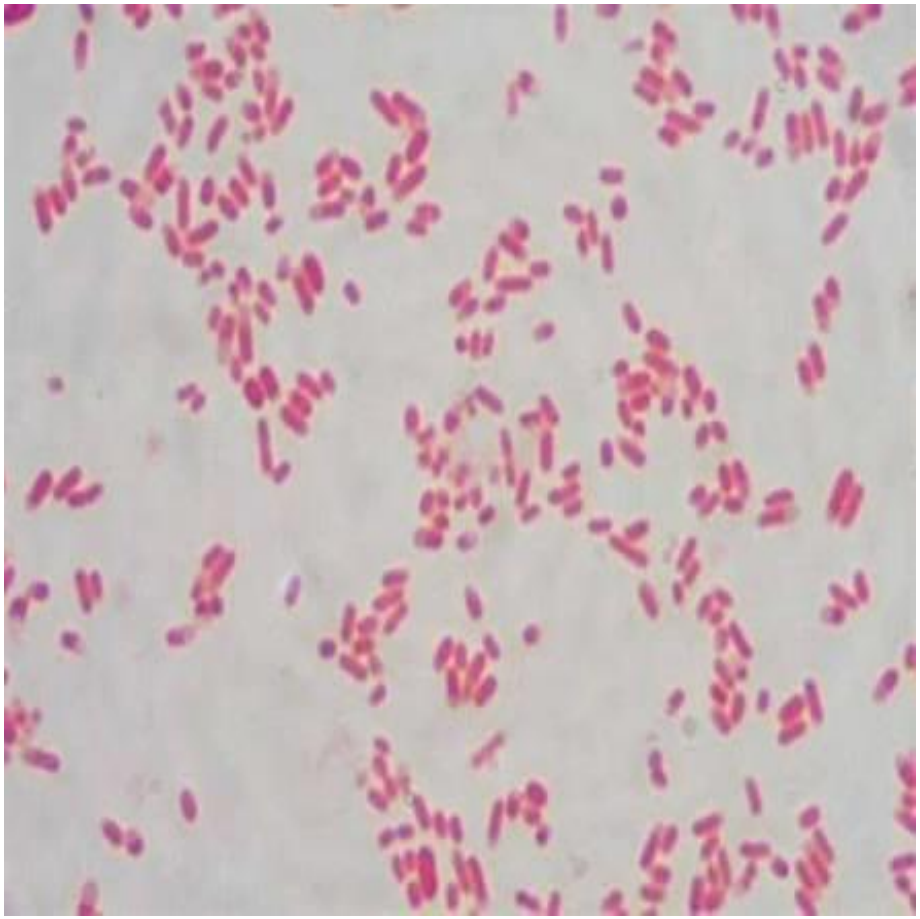
1. Enterotoxigenic E. coli (E**T**EC) (**Traveller's diarrhea**)
2. Enteroinvasive E. coli (E**I**EC) (**Dysentery** like diarrhea)
3. Enteropathogenic E. coli (E**P**EC) (**Infant** diarrhea)
4. Enterohaemorrhagic E. coli (E**H**EC) (**Hemolytic uremic syndrome**)
5. Enteroaggregative E. coli (E**A**EC) (**Infant** diarrhea)

Type	Pathogenesis	Clinical picture
ETEC	Secretory toxins (LT, ST) that do not damage mucosal epi. – enterotoxin	'Traveller's dia.' Profuse watery dia. Abd. Cramps- cholera infantum
EPEC	Adhere & damage to epi. cells	Infant dia., low grade fever, malaise, vomiting, dia. With mucus,no gross blood loss
EIEC	Invade epi cells & destruction , ST & LT not produced	Dysentry (shigellosis) fever, colitis, urgency, tenesmus, blood-mucus with many pus cells

EHEC VTEC STEC	**Elaboration of cytotoxin ST & LT disrupt protein synthesis O157:H7 phage mediated**	**Bloody diarrhoea without pus cells, often fever, abd.pain -HUS**
EAggEC	**Adhere to epi. cells**	**diarrhoea, vomiting, dehydration,less commonly abd. pain**

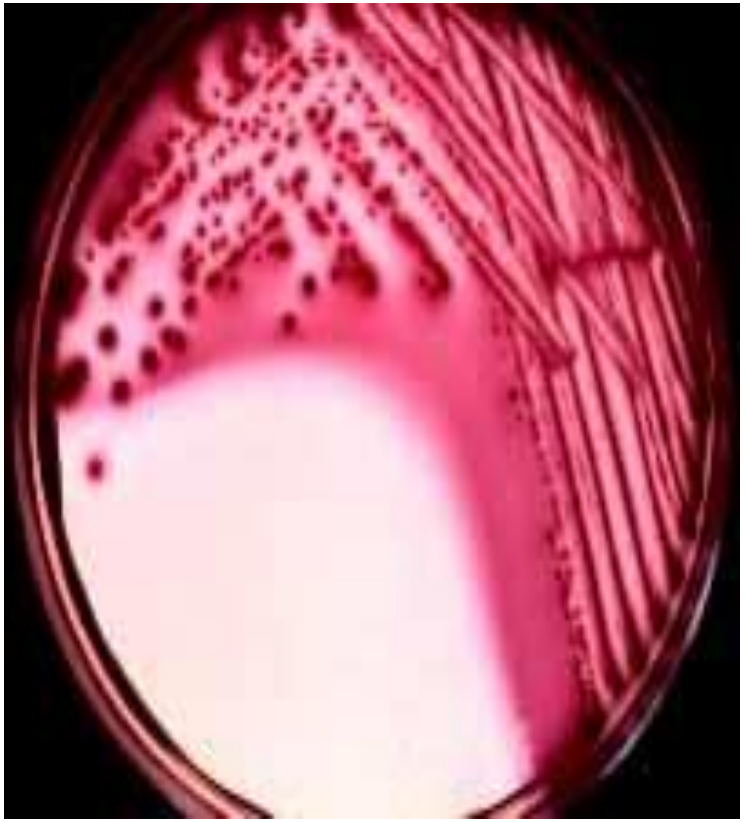
Laboratory diagnosis

- **Sample Collection**: Faeces ,Urine,Pus & Blood
- **Morphology** :
- Gram negative, straight rod, arranged singly or in pairs, size 1-3 ×0.4-0.7 µm
- Motile by peritrichate flagella & may be non motile.
- Non sporing
- Some strains produce capsule



Culture characters

- Aerobic & facultative anaerobes
- N. agar: Large, thick, greyish white, moist, smooth, opaque, partially translucent.
- Mac- Conkey: Lactose fermenter
- Nutrient broth: Generalized turbidity & heavy deposit, which disperse completely on shaking.



Biochemical reactions

- Sugar fermentation: Acid & Gas in Glucose, Maltose, Lactose, Mannitol
- IMViC : + + - -
- Gelatin liquefaction: Negative
- H_2S is not formed
- Urease test: Negative
- Reduce nitrates to nitrites