ENTEROBACTERIACEAE

Enterobacteriaceae

- Large family of gram Negative rods
- Free living in nature, part of indigenous flora of humans and animals.
- All are
  - Facultative anarobes
  - Ferment glucose
  - Oxidase Negative
- Grow rapidly
- Many are motile (except *Klebsiella, Shigella*) w/ (peritrichous flagella)

Enterobacteriaceae (Continued)

- They are the most common leading cause of Urinary tract infection and acute diarrhea.
- Some are encapsulated (Klebsiella)

Antigenic Structure: (Imp. in identification)

- Cell wall LPS → O antigen
- Capsule → K antigen
- Flagellar → H antigen

Enterobacteriaceae (Continued)

Habitat: (Normal Colonic flora)

1- Lower gastrointestinal tract (GIT)
(Colon) of human al animals.
E.g. *E.coli, Klebsilla, Proteus, Enterobacter*

2- Female genital tract

3- Transient colonization of skin

4- URT of hospitalized patients.

NB: Salmonella, Shigella, Yersinia are intestinal pathogens (not normal flora).

Enterobacteriaceae (Continued)

Classification:

- Cultural, Biochemical

  E.g. Indole production (*E.coli*) H_2S (*Salmonella*)
- Lactose fermentation (pink colories on MacConky agar)
- Most spp. produce pink colories except. (*Salmonella Shigella Yersinea*)

  (Non lactose fermenters) LF

E.coli

- Most common colonic flora
- Lactose fermenter
- Produce indole
- Many serotypes (O,K,H antigens) (>150)
- Hemolysins, capsule, pilli (P attachment) to EPC

E.coli (Continued)

1- UTI Infections:

- >90% of UTI, Cystitis (bladder) Pydonephritin (Renal *pelvis* .
- Women
- Children
- Elderly

Risk Factors:

- Trauma
- Catheter
- Obstruction to outflow (prostate)

E.coli (Continued)

2- Intestinal Infection (GIT)

4 main groups

1-Enteropathogenic (EPEC)

- Important cause of infantile diarrhea (<1 year) (bottle fed) in developing countries.

2- Enterotoxigenic (ETEC)

- Cause of Traveler's diarrhea (and childhood) produces 2 toxin – LT, ST enterotoxins in small intestine.

  ➡ self limiting watery diarrhea.

  Source: contaminated food and water (fecal oral route)

E.coli (Continued)

3- Enterotoxigenic (ETEC)

- Transmitted through Cattle under cooked beef
- E.coli O_{157}:H7
- Bloody diarrhea (Childhood) 10 days after

➡ Hemolytic uremic syndrome (HUS)

- hemolytic anemia
- thrombocytopenia
- Renal failure (life threatening)

E.coli (Continued)

4- Enteroinvasive (ETIEC)

Treatment & Prevention:

- Proper waste disposal
- Clean water supply
- Avoid ice. salads. raw vegetables for travellers
- Hand washing

Treatment

Diarrhea

- Most are self limiting
- Rehydration
  - Oral
  - Parenteral (IV)

E.coli (Continued)

2- UTI.

i) fluid intak

ii) Antibiotics

e.g. - ampicillin (R ↑)

- Cotrimoxazol. (Septrin)
- Cephradin
- Ciprofloxacin

Other infections caused by *E.coli*

E.coli (Continued)

3- Meningitis

- Most common cause of Neonatal among E.coli K1

Klebsiella:

- Non motile – LF
- Capsule (mucoid)
- Cause UTI pneumonia

  species

  - K. aerogens
  - K. pneumoniae
- Most resistant to antimicrobial agents (MDR) intrensic R to ampicillin.

Enterobacter:

- Lactose fermenter
- Motile
- R to common agents except 2nd and 3rd Ceph.

Proteus, Morganella, Providensia

- NLF – Swarming – urease +ve
- Produces UTI + Stone formation

Serratia

Citrobacter

Shigella

- (Cause of bacillary dysentry)
  (acute inflammatory colitis) + bloody diarrhea
- NLF
- No gas production
- Non motile

4 Main Species

A- S.dysenteriae
B- S. flexneri
C- S. bodyii
D- S. sonrei

Epidemiology:

- Pediatric disease (<5 Yrs)
- Over crowding conditions + poor hygine.

  E.g. *day care center*
- Communicable (high infectivity) low ID.
  (100 organisms) water, food, flies, feaces (4 F).
- Fecal-oral route.

Pathogenesis:

- Invasion of the colon → local infection (ulceration inflammation abscess formation)

Clinical:

- Range watery diarrhea: → fever, dysentry. Severity depends on spp.
- Most severe → S.dysenteria type-1.
- Least → S.sonnie
- Dysentry: cramps. painful passing of stool (± blood)

Treatment:

- Usually self limiting
- Indicated to shorten illness and decrease excretion of organism → decrease spread of infection.

Antibiotics:

- Qunelons (Cipro)
- Cephtriaxon – ampicillin (R ↑)
- Septrin

Prevention:

- Avoid contaminated water, food
- Hand washing
- Insects control

Salmonella (Intracellular, Organism):

- NLF
- Produce gas and H_2S
- Motile
- >1500 Spp. in human and animals

Infections:

1- Gastroenteritis (food poisoning)
2- Typhoid fever

1) Gastroenteritis:

- Zoonotic disease (animal born) through
  - Poultry (Chicken)
  - Eggs
- Mainly due to improper handling of food and water
- Main species
  - S.typhimurium
  - S.enteritides
- Children & elderly patients with achlorhydria (acids) are most susceptible.

Clinical

- Nausea,vomiting diarrhea (bloody) + fever within (IP) 24–44 h
- Self limiting
- No systemic involvement OR blood stream infection.
- No prolonged carriage.

2) Typhoid fever (enteric Fever)

- Restricted human disease (no animal source)
- Water born
- Systemic blood stream infection involving RES
  - Liver
  - lymph nodes-spleen
  - Kidney
- Associated with carrier state chronic carrier (source of infection) + contamination of water with human waste.
- Communicable (fecal oral routes) infection + person - person

Etiology

- Salmonella typhi → typhoid fever (most fever)
- S.paratyphi A, B, C → Paratyphoid fever (less fever)

Clinical

- Fever (most important) + chills. Headache, bradicardia.
- Rash (rose spots) - constipation
- IP. (2 Wks.) (14 days)
  - Performation
  - Hemorrhagic
  - Chronic carriage in gall bladder & urinary tract.

Diagnosis: Treatment

- Isolation from Stool and blood Or Urine
- Serology (Widal test) 2nd and 4th week.

I.V

- Ceftriaxone (CRO) IV
- Quanolons (Ciprofloxacin)
- Chloramphenicol
  for 14 days.