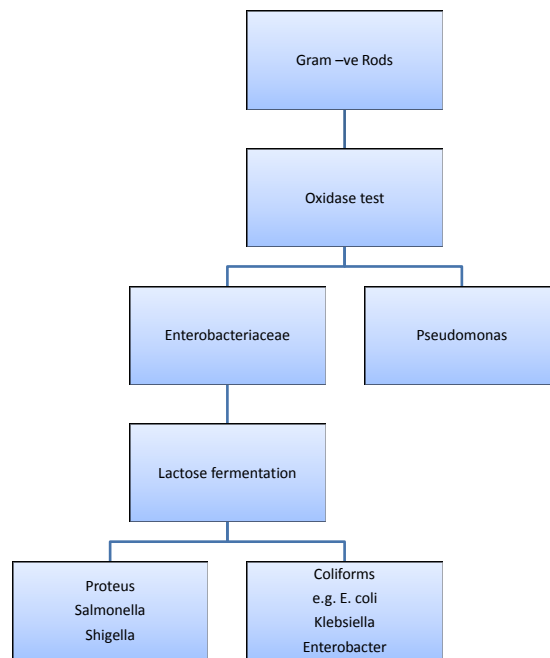


Gram Negative Rods

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Pseudomonas

- Pseudomonas are motile, oxidase positive, obligate aerobic Gram –ve bacilli that don't ferment lactose
- Pseudomonas need minimal requirements for their growth and hence they are widely distributed in the environment including human & animal intestines, plants, soil, sewage and water sources.
- They are also highly distributed in hospital environments and are resistant to many disinfectants and antiseptics
- Most important is *P. aeruginosa*, which is among the most common causes of human infections especially in immunocompromised and hospitalized patients

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Pseudomonas

- *P. aeruginosa* produces several hemolytic/ protolytic enzymes, endo- /exotoxins and fluorescent pigments (e.g. pyocyanin)
- *P. aeruginosa* causes a wide range of human infections including burn infections, post-operative wound infection, UTI, lower respiratory infections, otitis externa, eye infections, skin infections and septicemia
- Antibiotics that are effective against *P. aeruginosa* include: extended spectrum penicillins, ceftazidime, cefipime, aztreonam, carbapenems, aminoglycosides, fluoroquinolones and polymyxins
 - However several strains of *P. aeruginosa* (especially in hospitals) can be resistant to many of the abovementioned antibiotics and hence antibiotic susceptibility testing is highly recommended

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Enterobacteriaceae

- Enterobacteriaceae is a large family of bacteria that include facultative anaerobic Gram –ve bacilli that are oxidase negative
- They are common habitats of the human gut and are widely spread in the environment including food, water sources, sewage, soil, animals and plants. They are also highly present in hospitals.
- Some are true (obligate) pathogens while others are opportunistic pathogens
- Many have capsules, flagella and pili, and they produce a wide range of toxins (endo- and exotoxins)

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Coliforms

- Enterobacteriaceae that are lactose fermenters and urease negative
- Mainly include *E. coli*, *Klebsiella* and *Enterobacter*
- *E. coli*
 - The most abundant coliform in human intestines
 - Opportunistic bacteria that causes a wide range of infections including: UTI, wound infections, neonatal meningitis, septicemia, watery diarrhea (enterotoxigenic strains) and bloody diarrhea (enterohaemorrhagic strains)
 - Commonly used as indicator for fecal contamination of foods and water

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Coliforms

- *Klebsiella* and *Enterobacter* spp.
 - Opportunistic bacteria that cause many infections (mainly hospital acquired) such as UTI, wound infections, septicemia and meningitis (rare)
 - *K. pneumoniae* is also among the most common causes of hospital acquired pneumonia
- Broad/extended spectrum penicillins, cephalosporins, aminoglycosides and fluoroquinolones are commonly used with coliforms. However, many strains (especially in hospitals) have become resistant to many of these agents

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Proteus

- Enterobacteriaceae that is lactose non-fermenter and urease positive
- Usually associated with hospital acquired infections such as UTI (mainly), wound infections and septicemia

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Salmonella

- Enterobacteriaceae that is lactose non-fermenter and urease negative
- Food-poisoning salmonellosis:
 - Caused by *S. enterica*
 - Fecal-oral infection; usually from contaminated food (meat, chicken, eggs...)
 - Incubation period 8-24 hours.
 - Vomiting, diarrhea and fever (usually self-limiting, treatment with fluid replacement)
- Typhoidal salmonella (typhoid fever):
 - By *Salmonella enterica* subtype typhi (Salmonella Typhi)
 - Incubation 1-3 weeks
 - High fever, diarrhea, constipation, septicemia, meningitis, hepatosplenomegaly, intestinal perforation
 - Treatment with fluoroquinolones or 3rd generation cephalosporins (broad spectrum penicillins, chloramphenicol or TMP/SMX can also be used)

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Shigella

- Enterobacteriaceae that is lactose non-fermenter and urease negative (closely related to *Salmonella*)
- Most important species are *S. dysenteriae* and *S. sonnei*
- Causes disease in primates only. Mainly, fecal-oral transmission
- Causes shigellosis, where it invades the large intestine causing a form of colitis described as 'bacterial dysentery' (diarrhea mixed with blood and mucus)
- Most common symptoms are diarrhea, fever, nausea and vomiting
- Usually self-limiting (treatment with fluid replacement), but in severe cases antibiotics are used (broad spectrum penicillins, TMP-SMX, or fluoroquinolones)

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