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Enterobacteriaceae Continue

Klebsiella

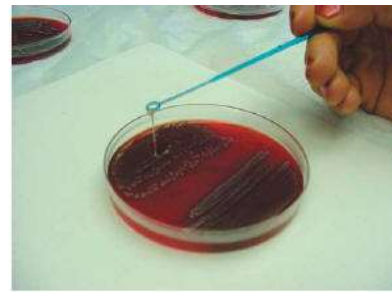
General Characteristics

- Usually found in **gastrointestinal** tract (GI).
- Four major species, (*K. pneumoniae* is mostly commonly isolated species)
- Possesses **polysaccharide capsule**, which protects against **phagocytosis and antibiotics** and makes the colonies moist and **muroid**.
- Has a distinctive “yeasty” odor
- Frequent cause of nosocomial pneumonia
- *K oxytoca* has also been demonstrated in human clinical specimens.

Diagnosis of Klebsiella:

- TSI A/A + gas
- Urease productionve+
- Citrate.....ve +
- MR-, VP.....ve+
- Motility.....ve -
- **Has both O and K antigens**
- oxidase-negative

Klebsiella prominent polysaccharide-based capsule. *Klebsiella* species are found everywhere in nature. They can be found in water, soil, plants, insects and other animals including humans. The members of the genus *Klebsiella* are a part of the human and animal's normal flora in the nose, mouth and intestines. The species of *Klebsiella* are all gram-negative and usually non-motile. The cells are rods in shape. They can be found singly, in pairs, in chains or linked end to end. *Klebsiella* can grow on ordinary lab medium and do not have special requirements. The optimum temperature is 37 °C and at pH 7.2. The species are facultative anaerobes. Members of the genus produce a prominent capsule, or slime layer, which can be used for serologic identification.



Antigenic structure:

Klebsiella express **two** types of antigens on their cell surfaces. The **O antigen**, which is a component of the lipopolysaccharide (LPS) and the K antigen, which is the capsular polysaccharide.

Klebsiella can lead to a wide range of diseases such as pneumonia, urinary tract infections, sepsis, meningitis, diarrhea and peritonitis. *Klebsiella* species have also been implicated in the pathogenesis of spondylitis.

Sigella: *Shigella* is Gram-negative, facultative anaerobic, non-spore-forming, non-motile, rod-shaped. invade the epithelial lining of the colon, causing severe inflammation and death of the cells lining the colon. This inflammation results in the diarrhea and even dysentery

The causative agent of human shigellosis, typically causes dysentery. It is one of the leading bacterial causes of diarrhea worldwide, causing an estimated 80–165 million cases. The number of deaths it causes each year is estimated at between 74,000 and 600,000. *Shigella* infection is typically by ingestion. Depending on the health of the host, fewer than 100 bacterial cells can be enough to cause an infection. It invades the epithelial lining of the colon, causing severe inflammation and death of the cells lining the colon. This inflammation results in the diarrhea and even dysentery. *S. dysenteriae* strains produce Shiga toxin, which is hemolytic similar to the verotoxin produced by enterohemorrhagic *E. coli*. Both Shiga toxin and verotoxin are associated with causing potentially fatal hemolytic-uremic syndrome.

Methods to Diagnose Shigellosis

- Shigellosis can be correctly diagnosed in most patients on the basis of fresh blood in the stool. Neutrophils in fecal smears is also a strongly suggestive sign. Nonetheless, watery, mucoid diarrhea may be the only symptom of many *S. sonnei* infections, and any clinical diagnosis should be confirmed by cultivation of the etiologic agent from stools.

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LABORATORY DIAGNOSIS

- Culture Stool
- Rectal Swabs
- Macconkey Agar
- Xld Agar
- Selenite F Broth
- Shigella Salmonella Agar
- Microscopy :: Leucocytes ,, Rbc
- Biochemical :: Tsi - No Gas,, H₂S ,, Acid
- Non Motile
- Serology Test :: Slide



Proteus

- Normal flora of the GI tract.
- All are motile, with swarming growth.
- Phenylalanine Deaminase Testis positive (**PA +ve**)
- Urea is strongly +ve
- Indole +ve except *P. mirabilis*, it is -ve
- Strongly urease positive

Proteus species

P. mirabilis and *P. vulgaris* are widely recognized as human pathogens Isolated from **urine**, **wounds**, and **ear** and rarely from bacteremia. It produces **swarming** colonies on non-selective media and have a distinctive, “burned chocolate” odor

Culture:

Blood agar: Swarming effect over blood agar plate as a consequence of the organisms active motility.



Swarming phenomenon on blood agar plate

Key Characteristics to differentiate some group of *Enterobacteriaceae*:
 (According to baily and Scotts' Diagnostic Microbiology¹)

<u>Bacteria</u>	<i>E. coli</i>	<i>Shigella sonnei</i>	<i>Salmonella typhi</i>	<i>Klebsiella pneumoniae</i>	<i>Klebsiella oxytoca</i>	<i>Proteus vulgaris</i>	<i>Proteus mirabilis</i>	<i>Morganella morganii</i>	
<u>Test</u>									
Indole	+	-	-	-	-	+	-	+	
Methyl Red (MR)	+	+	+	V	-(v)	+	+	+	
VogesProskauer (VP)	-	-	-	+	+	-	V	-	
Simmons' Citrate	-	-	-	+	+	-(v)	+(v)	-	
Hydrogen Sulfide (H₂S)	-	-	+w	-	-	+	+	-	
Ureas production	-	-	-	+	+	+	+	+	
Motility	V	-	+	-	-	+	+	V	
Gas from D- glucose	+	-	-	+	+	+	+	+	
Lactose	+	-	-	+	+	-	-	-	