

Lesson 13

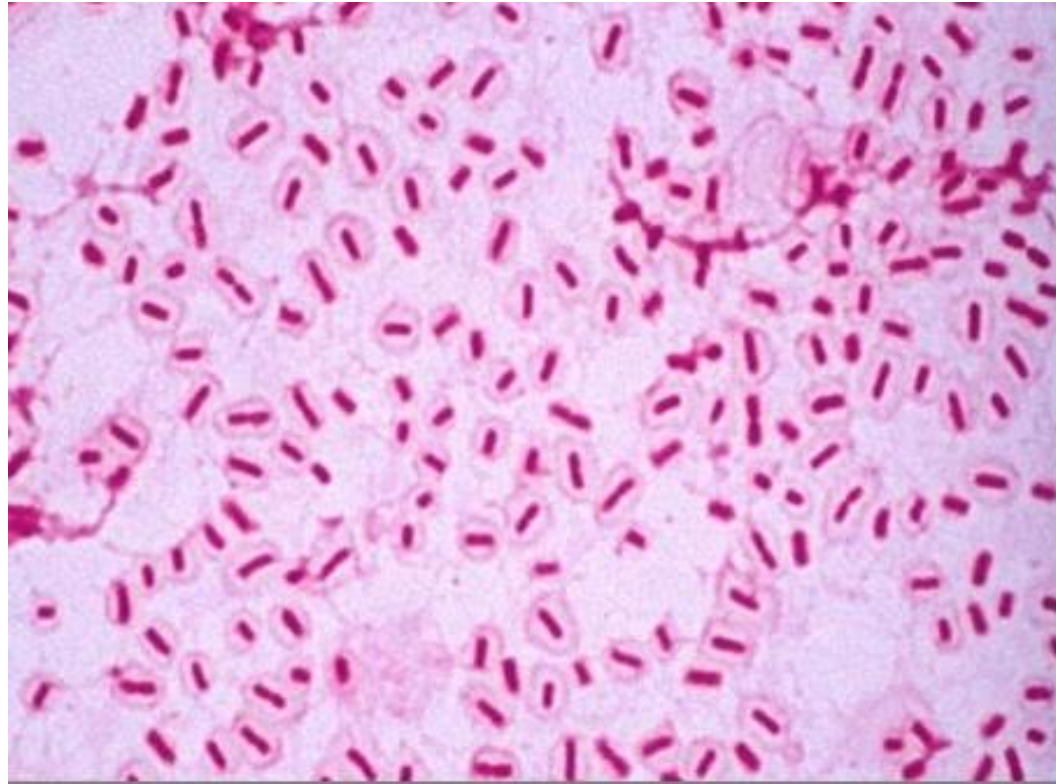
Microbiological diagnosis of gram negative rod
form of extra intestinal bacterial infections
(*Klebsiella*, *Enterobacter*, *Proteus*)

Genus Klebsiella

- In human pathology, the main role belongs to the species *K.oxytoca* and *K.pneumoniae*. *K.pneumoniae* is divided into 3 subspecies according to biochemical properties:
- *K.subsp.pneumoniae*, *K.subsp.ozaenae*, *K.subsp.rhinoscleromatis* .

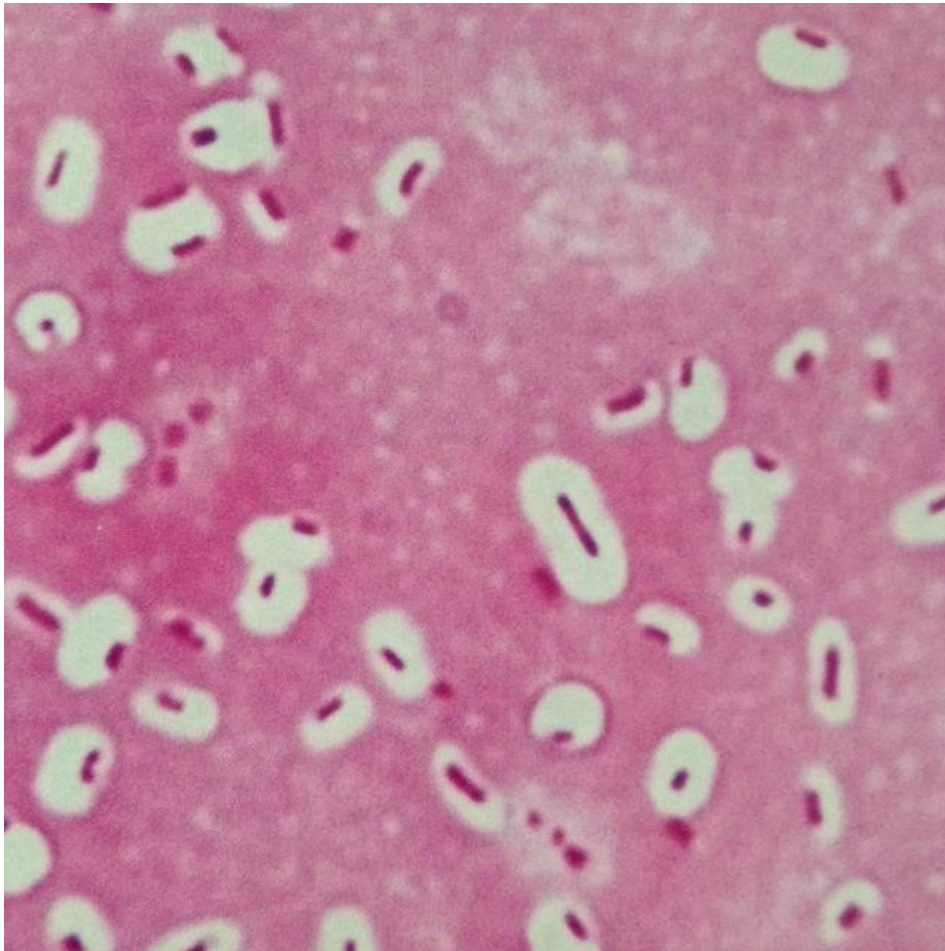
Klebsiella

pure culture smear (Gram stain)



Klebsiella

Burri-Gins stain



Klebsiella

colonies



Klebsiella

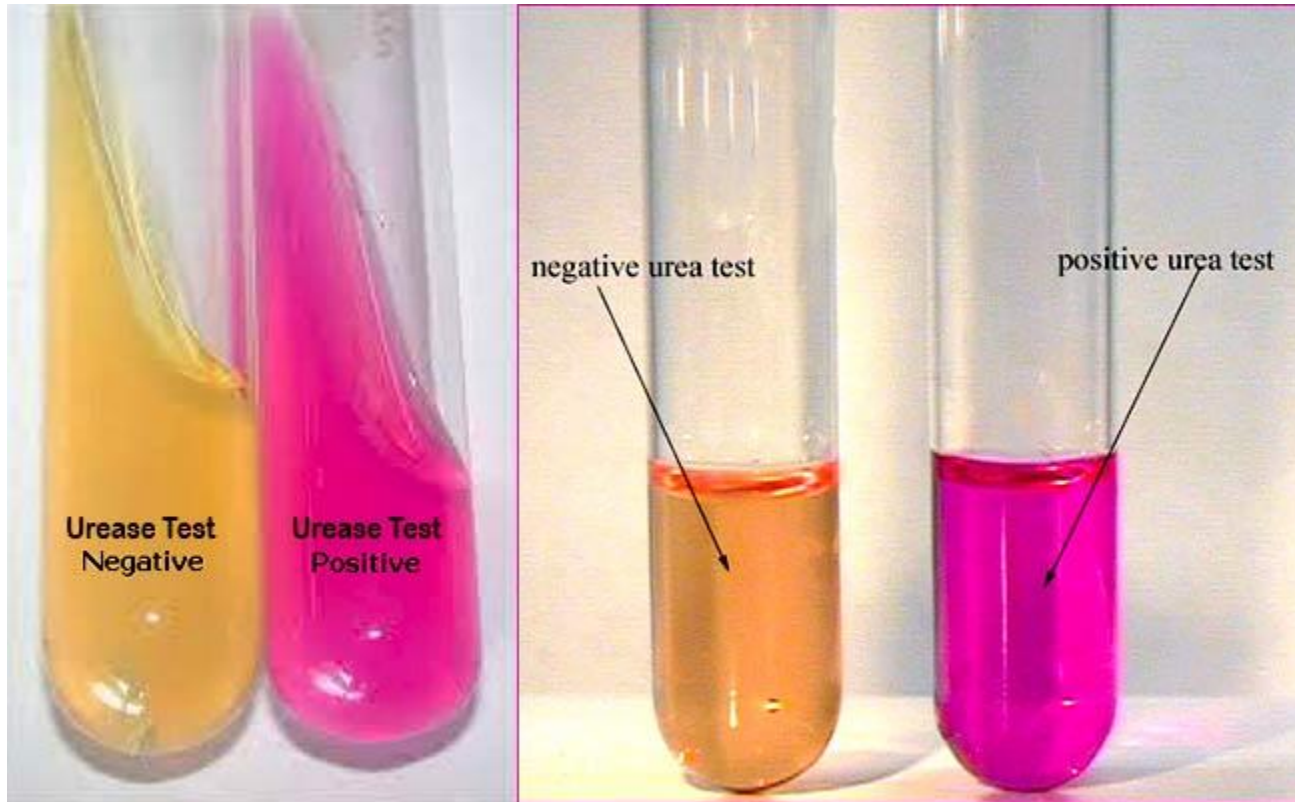
mucous colonies of Endo, Ploskirev, McConkey, Levin



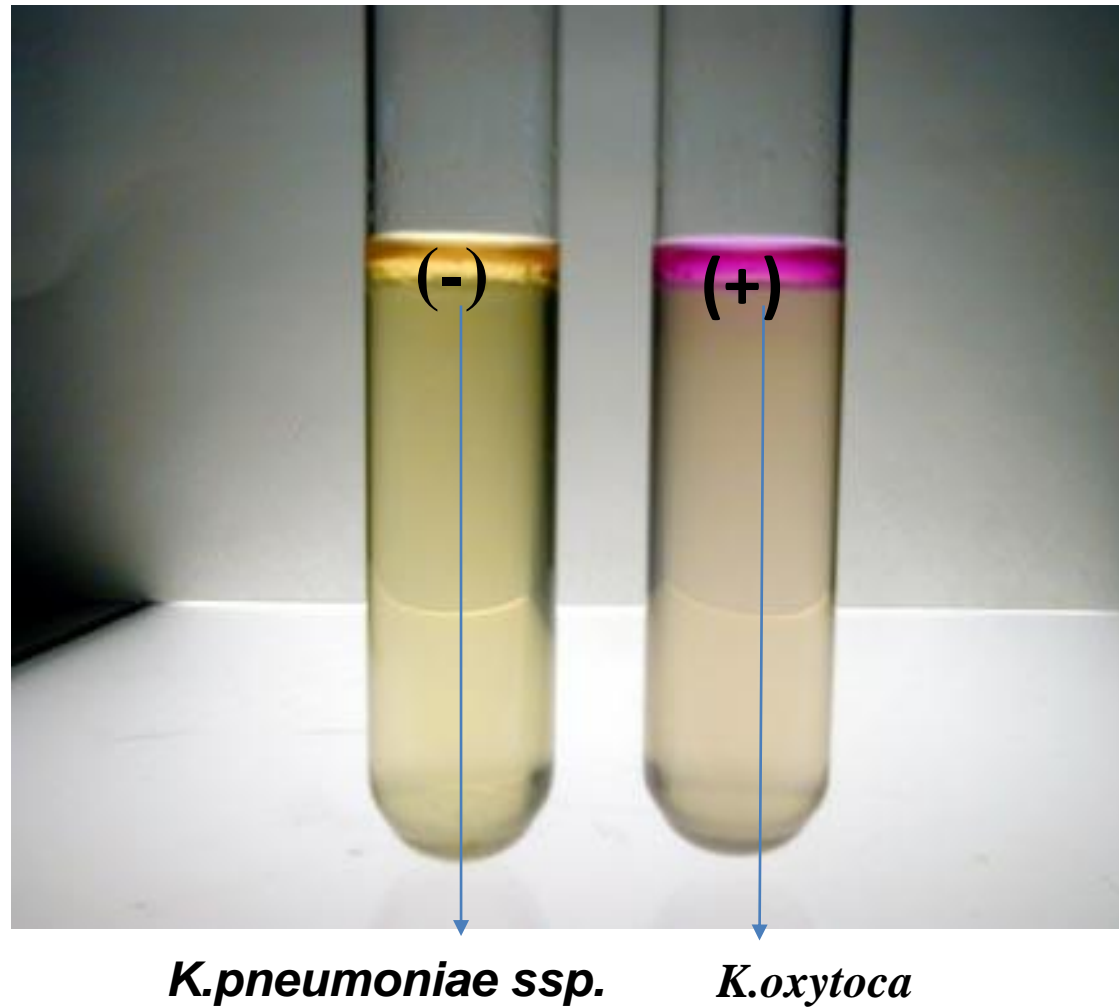
Biochemical differentiation of bacteria of the genus Klebsiella

| | K.oxytoca | K.pneumoniae spp. ozenae | K.pneumoniae spp. pneumoniae | K.Pneumoniae spp.rhinocleromati s |
|-------------------------------|-----------|-----------------------------|---------------------------------|---|
| indole formation | + | - | - | - |
| Reaction with methyl- roth | +/ - | + | - | - |
| Voges-Proskauer reaction | + | - | + | - |
| Utilization of citrate | + | +/ - | + | - |
| Utilization of malonate | + | +/ - | + | - |
| Breakdown of urea | + | +/ - | + | - |
| Lysidecarboxylase | + | +/ - | + | - |
| Breakdown of lactose | + | +/ - | + | - |

Identification of bacteria of the genus Klebsiella
(positive urease test)



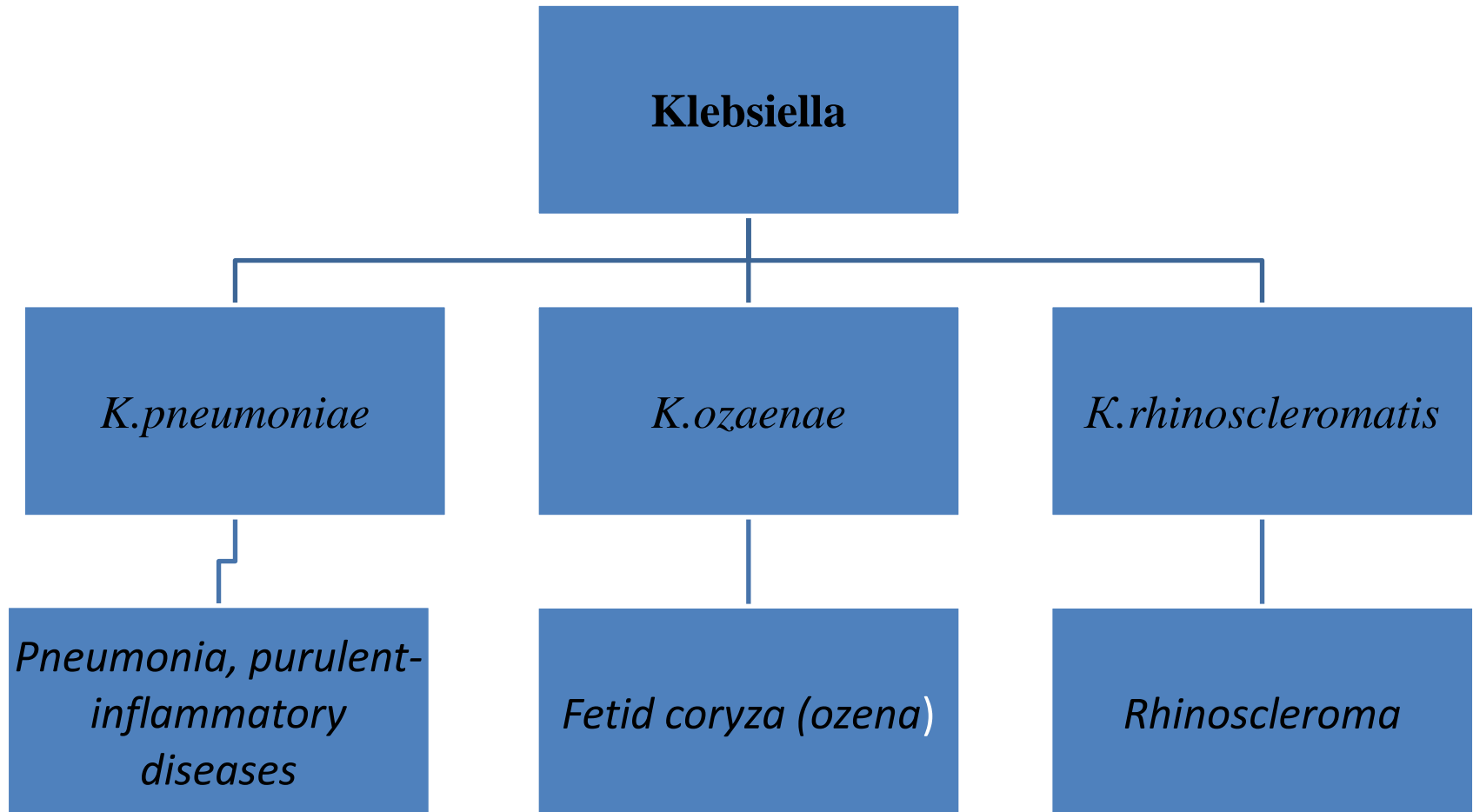
Intraspecific differentiation of bacteria of the genus Klebsiella (indole test)



Factors of pathogenicity of bacteria of the genus Klebsiella

- capsule;
- drank;
- enterotoxins,
- endotoxin (LPS),
- DNase, neuraminidase, phosphatase

K.pneumonia (diseases caused)



Microbiological diagnostics

Materials for research:

- sputum
- urine
- excreta
- blood
- pus

Microbiological diagnostics

Bacteriological (cultural)

- Inoculation of the test material on simple and lactose-containing differential nutrient media
- Incubation at 37°C for 18-24 hours
- Identification by morpho-biological properties
- Determination of sensitivity to antibiotics

➤ ***Histological***

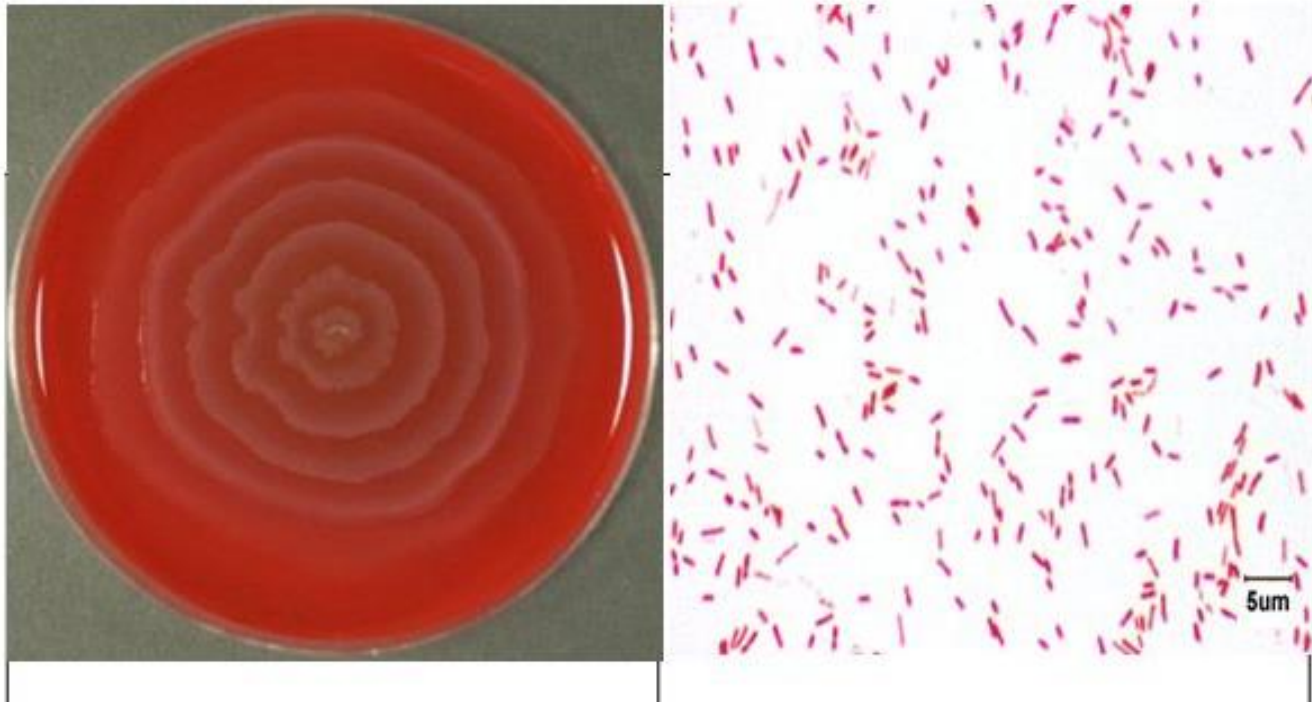
With lake and rhinoscleroma

Genus Proteus

- Representatives of the genus *Proteus* are gram-negative rods, they do not form a capsule and spores, they are mobile.
- *The genus Proteus* includes 4 species. In human pathology, two species play the greatest importance: *P.vulgaris* vø *P.mirabilis*

Genus Proteus

(blood agar culture and pure culture smear)



mobile H-colonies of P. vulgaris



Genus Proteus

(identification and differentiation on Kligler agar)



Genus Proteus - pathogenicity factors:

- drinking
- protease enzyme
- Urease enzyme
- The phenomenon of "swarming"
- Hemolysin
- Hemagglutinin

The role of bacteria of the genus Proteus in human pathology

- Proteas are opportunistic pathogens.
They cause urinary tract infections (urolithiasis) and purulent wound infection, including sepsis.
- Diseases can occur as endoinfection,
as well as be the result of a nosocomial infection.

Microbiological diagnostics

Materials for research:

- sputum
- urine
- excreta
- blood
- pus

Microbiological diagnostics

Research methods:

➤ *Bacteriological (cultural)*

Sowing on simple and lactose-containing differential nutrient media

- Incubation at 37°C for 18-24 hours
- Identification by morpho-biological properties
- Determination of sensitivity to antibiotics

Genus Enterobacter

- Gram-negative facultative anaerobic rod-shaped bacteria.
- Arranged in pairs, singly, sometimes in short chains.
Peritrichi
- They are part of the normal composition of the intestinal microbiota of certain types of animals and humans.

The genus consists of two groups:

1) having the greatest medical significance

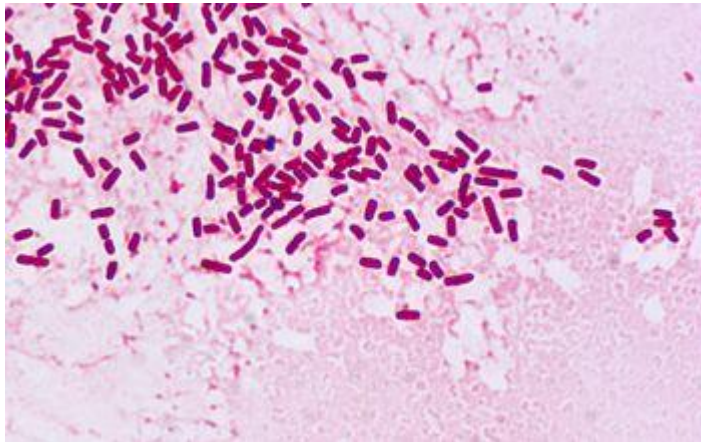
E. cloacae, *E. sakazaki*, *E. agglomerans*

2) other types



Genus *Enterobacter*

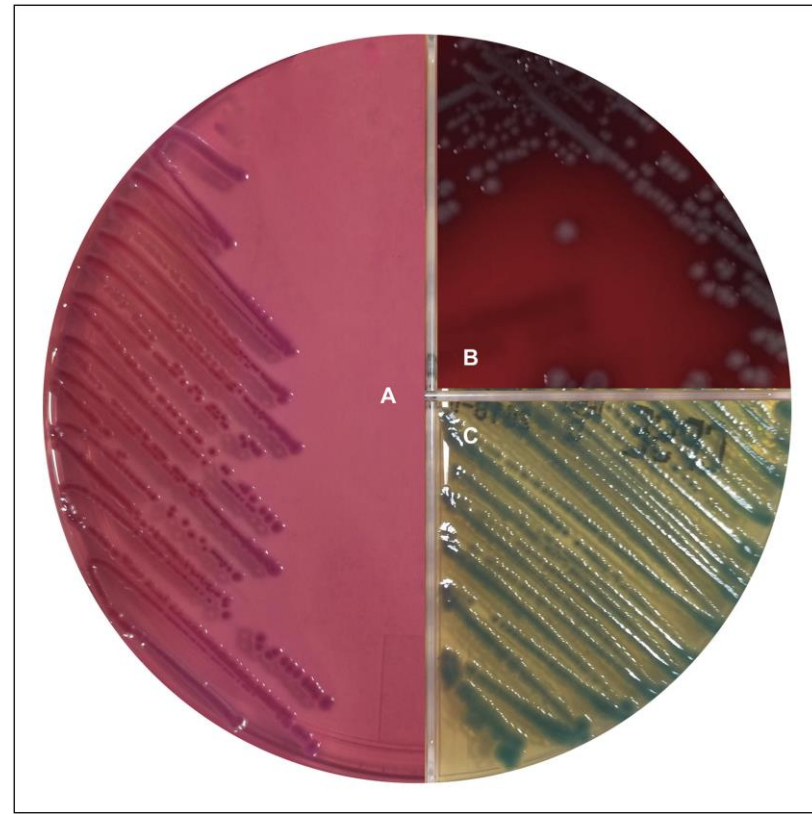
Pure culture *Enterobacter*



Enterobacter after 24 hours of incubation.

A) on MacConkey agar; B) by 5%; KA

B) C) on CPS agar



Genus Enterobacter

- Sometimes species of this genus can also be found in soil, water, milk, dairy products, wastewater, on plants and other biotopes, which are suitable for their normal existence and natural cycle of life.
- Cause intestinal, respiratory urogenital HL
- The most common symptoms of infection are abdominal pain, stool disorders, nausea, itching and burning in the genital area (more often in women), fever to subfebrile numbers. In newborns and seriously ill patients, enterobacteria can cause meningitis, pyelonephritis, and septicemia.

Genus Enterobacter

- They are multi-resistant to antibiotics.
- E.cloacae, which is resistant to penicillin and cephalosporins, is most often isolated from patients, as it produces β -lactamase