

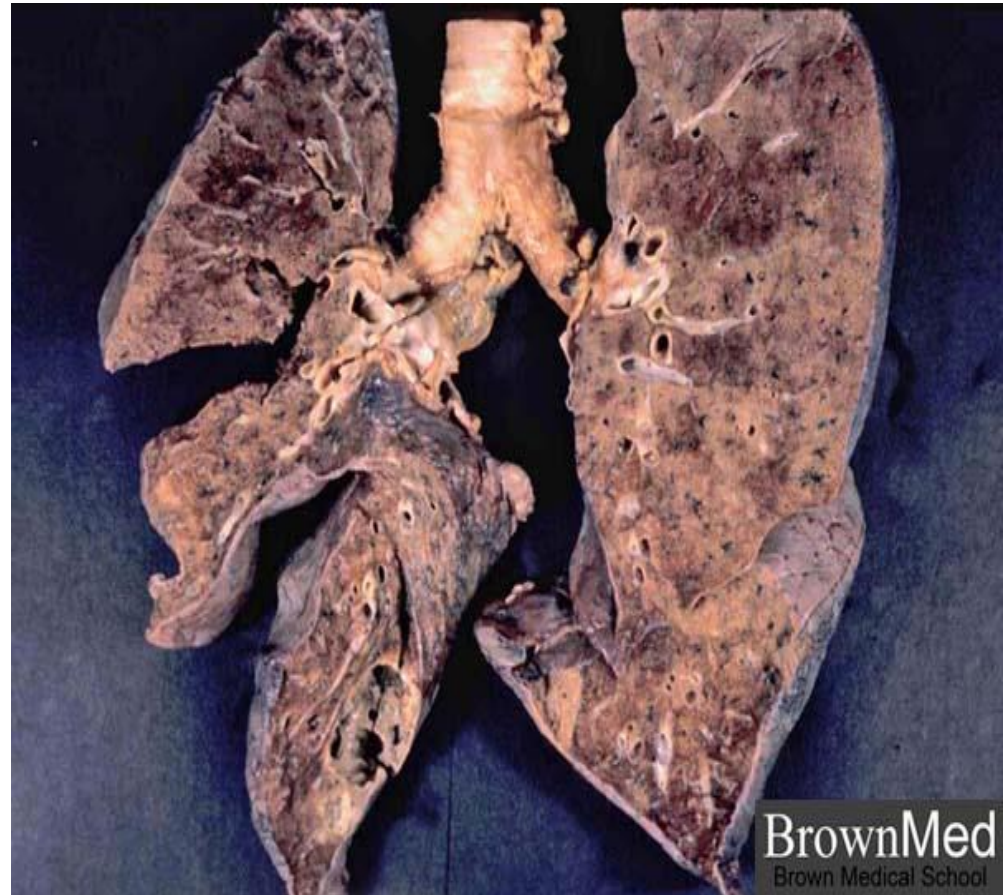
Klebsiella, Proteus & Yersinia

# Klebsiella (Friendlander's bacillus, *Bacillus mucosus capsulatus*)

- *Klebsiella pneumoniae*
- *Klebsiella rhinoscleromatis*
- *Klebsiella ozaenae*

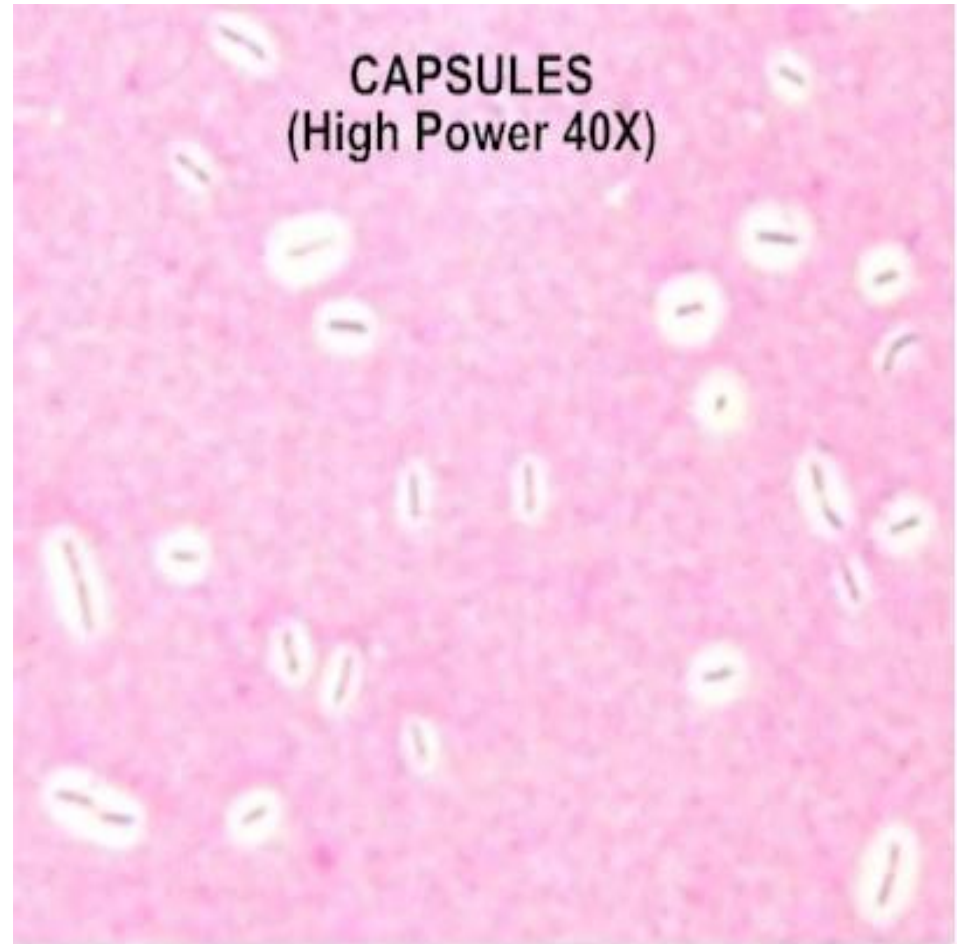
## **Pathogenicity :**

1. Pneumonia
2. Urinary infections
3. Septicemia
4. Meningitis
5. Wound infections
6. Nosocomial infections



# Laboratory diagnosis:

- Sample Collection:
- Sputum, Urine , Pus , Blood, CSF
- Morphology :
- Gram negative bacilli which are thick & short
- Non motile
- Large capsule



# Culture characters

- Aerobic, grow well on ordinary culture media
- N. agar : Large, dome shaped, mucoid
- Mac Conkey : Lactose fermenter, mucoid



# Biochemical reactions

- Sugar fermentation:  
Acid & gas in Glucose,  
Lactose, Sucrose,  
Mannitol
- IMViC test: - - + +
- Urease test : Positive

## Citrate utilization

"Reagent: Bromothymol blue  
"Media: Simmon's Citrate Agar  
+ve: Blue  
-ve: Green



*Escherichia coli*  
+ + - -

## Klebsiella

- - + +



	<b>E. coli</b>	<b>Klebsiella</b>
<b>Morphology</b>	<b>Slender &amp; Long</b>	<b>Short &amp; Thick</b>
	<b>Motile</b>	<b>Non motile</b>
	<b>Non capsulated</b>	<b>Capsulated</b>
<b>IMViC test</b>	<b>+ + - -</b>	<b>- - + +</b>
<b>Urease test</b>	<b>Negative</b>	<b>Positive</b>
<b>Colony</b>	<b>Moist</b>	<b>Mucoid</b>

# Proteus

- Normal intestinal commensals
- 'Proteus' refers to pleomorphism
- Widely distributed in nature as saprophytes
  
- Tribe : Proteeae
- Genus : Proteus, Morganella, Providencia

- **Species:** 1. Proteus mirabilis -  
2. Proteus vulgaris
- **Pathogenicity :**
  1. Urinary infections
  2. Abdominal & wound infections
  3. Septicemia
  4. Meningitis
  5. Nosocomial infection



# Laboratory diagnosis

- Specimen : Urine , pus  
Sputum & CSF
- Morphology :
- Gram negative, motile,  
non capsulated,  
pleomorphic bacilli.
- Non motile strains of  
Proteus OX2,OX19, OXK  
are used for Weil Felix  
reaction in diagnosis of  
rickettsial diseases.



- **N.agar** : Form a thin filmy layer, swarming, putrefactive odour ('fishy' or 'seminal' odour)
- **Mac Conkey agar** : Smooth, colourless, non lactose fermenter



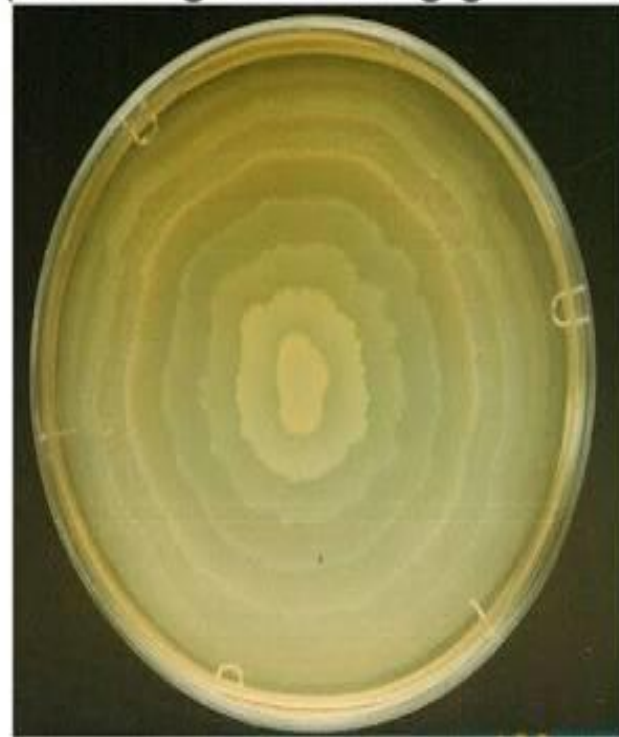
SP0920 [RM] © www.visualphotos.com

On MacConkey agar *Salmonellae* produce pale non-lactose fermenting colonies.

# Methods to inhibit swarming

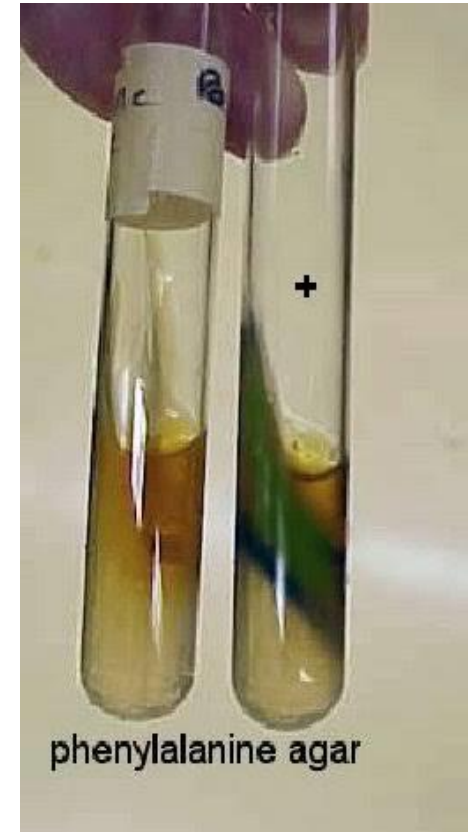
- Increase concentration of agar (6%)
- Incorporation of Chloro hydrate (1:500)
- Sodium azide (1:500)
- Alcohol (5 – 6%)
- Sulphonamide
- Surface active agents or boric acid (1:1000)

Proteus on nutrient agar  
(showing swarming growth)



# Biochemical test

- Enzyme phenyl alanine deaminase which converts phenyl alanine to phenyl pyruvic acid (PPA reaction)
- Fail to acidify lactose, dulcitol or malonate
- IMViC test : - + - -  
(Pr.mirabilis)
- Urease test : Positive



- Morganella – Mr.morganii
- Providencia – Pr.alcalifaciens
  - Pr. Stuarti
  - Pr. Rettgeri
- Morganella (Pr.morganii) : No swarming. Cause urinary tract infection & nosocomial wound infection
- Providencia (Pr.alcalifaciens) Diarrhoeal diseases.

# Yersinia -

- Species : Y.pestis  
Y.pseudotuberculosis  
Y.enterocolitica
- Plague –zoonotic disease

# Laboratory diagnosis

- Sample collection:
  1. Pus/fluid aspirated from bubo in bubonic plague
  2. Splenic tissue on post mortem
  3. Throat swab
  4. CSF in meningeal plague
  5. Blood for serological examination
  6. Bone marrow in decomposed carcasses

# Laboratory diagnosis

Morphology (giemsa &  
Wayson's Staining):

Short, plump, ovoid, Gram

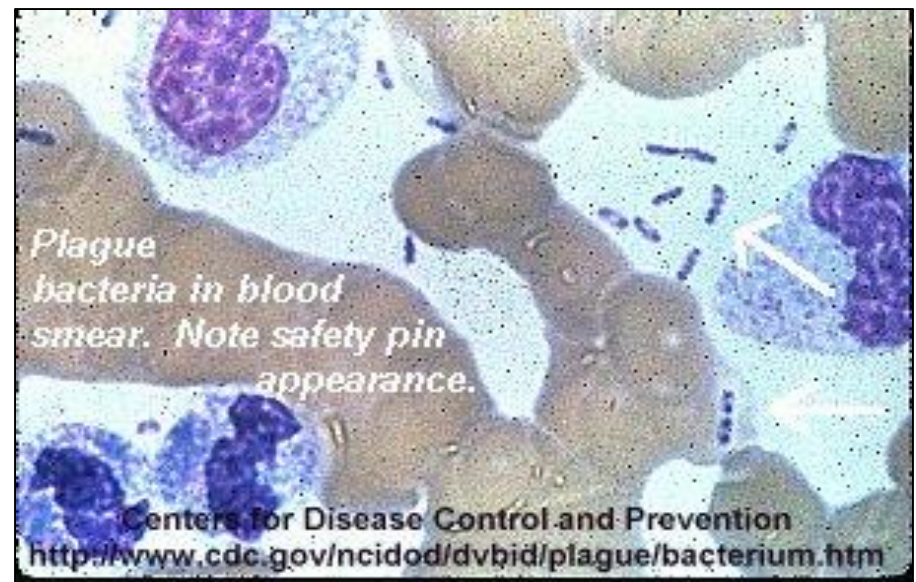
Negative bacilli

Small coccobacilli -1.5 X  
0.7 um

Non motile, nonsporing

In giemsa or methylene blue  
- Bipolar staining (safety  
pin appearance)

Wayson's stain





# *Cultural characteristics*

- Aerobic & facultative anaerobic
- pH 5- 9.6 (7.2)
- Temp. 2-45°C
- NA: small, delicate , transparent disc
- BA : dark brown
- MA : colourless
- N broth : Flocculent growth at bottom & along the sides with little or no turbidity
- Ghee broth culture: stalactite growth



- Serological methods :
- Passive haemagglutination
- Complement fixation test
- ELISA