

LAB: 7

Practical Pathogenic bacteria

Family: Enterobacteriaceae

Lactose non fermenting

Genus: *Proteus. spp*

Genus: *Shigella .spp*

Genus: *Salmonella .spp*

1- Genus: *Proteus. Spp*

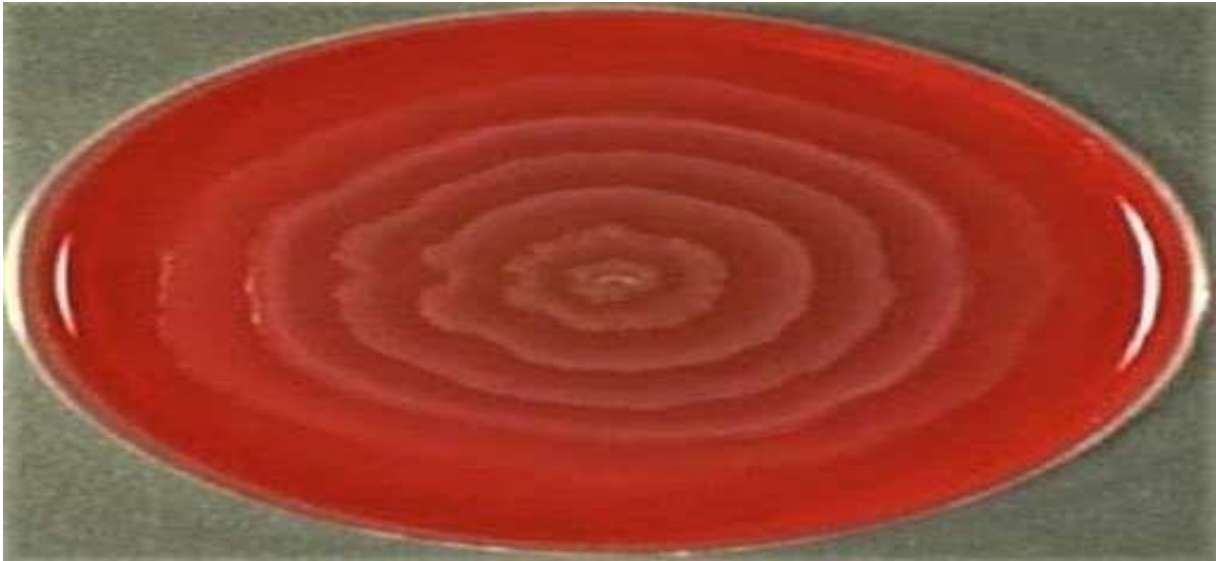
***a- Proteus vulgaris* (UTI, wound infection).**

***b- Proteus mirabilis* (UTI, wound infection , nosocomial infections).**

***c- Proteus penneri* (UTI, wound infection , nosocomial infections).**

Distinguishing Features:

Gram negative, pleomorphic (bacilli or coccobacilli), actively motile with peritrichous flagella , swarming on agar, Natural habitat: some are free living in water, sewage, soil and vegetable. Some are normal intestinal flora.



Proteus swarming on blood agar



Proteus urease test positive (pink color).

Some factors inhibit the swarming phenomena:

- 1- Adding 4% agar to media.
- 2- Presence of bile salts (MacConkey agar).
- 3- Anaerobic conditions.

Tests	<i>P.mirabilis</i>	<i>P.vulgaris</i>	<i>P. penneri</i>
IMViC	- , + , - , v	+ , + , - , v	- , + , - , -
TSI	A/K CO ₂ + ,H ₂ S +	A/KCO ₂ +,H ₂ S +	A/KCO ₂ +,H ₂ S -
Catalase	+	+	+
Oxidase	-	-	-
Urease	+	+	+
Capsule	+	-	-
Swarming	+	+	+
H ₂ S	+	+	-
Motility	+	+	+
MacConkey agar	L.N.F	L.N.F	L.N.F
Phenylalanine	+	+	+
Glucose	+ readily	+ readily	+
Maltose	-	+ readily	+
Sucrose	Ferment slowly	Ferment readily	+
Blood hemolysis	Non hemolysis	Non hemolysis	Beta
Gelatinase	+	+	+

Genera: Shigella and Salmonella

1- Shigella:

a- *Shigella dysenteriae*

b- *Shigella flexneri*

c- *Shigella boydii*

d- *Shigella sonnei*

General characteristics

Gram negative, rod, cylindrical, non-motile, non-spore former, encapsulated, non-lactose fermenter, the colonies appear pale on MacConkey agar, considered as intestinal normal flora of human (if present in small number), about 200 cells can pass to the intestine causing infection (highly virulent). The infection is caused by contaminated food with fecal materials.

Specimens :

Stool during 4-5 days after infection, mucous blood from the intestine or rectal swab for the detection of cells.



Figure: Shigella on S-S agar (pale colonies)

2- Salmonella:

Salmonella typhi , *Salmonella paratyphi A* , *Salmonella paratyphi B* , *Salmonella typhimurium* , *Salmonella enteritidis* , *Salmonella ariwna* , *Salmonella choleraesuis* , *Salmonella gallinarium* , *Salmonella schottmuelleri para A*

General characteristics:

Gram negative bacilli , non-spore forming , resistant to some chemical like brilliant green, Na-tetracholate and Na-deoxycholate, therefore it is useful to add these chemical to the medium for Salmonella isolation and can be used without sterilization.

Specimens:

For isolation: stool, urine, blood and serum for serological identification.

*** Serological diagnosis by **widal test** for somatic antigen (O- Ag) and Flagellar antigen (H-Ag) or by Phagtyping.

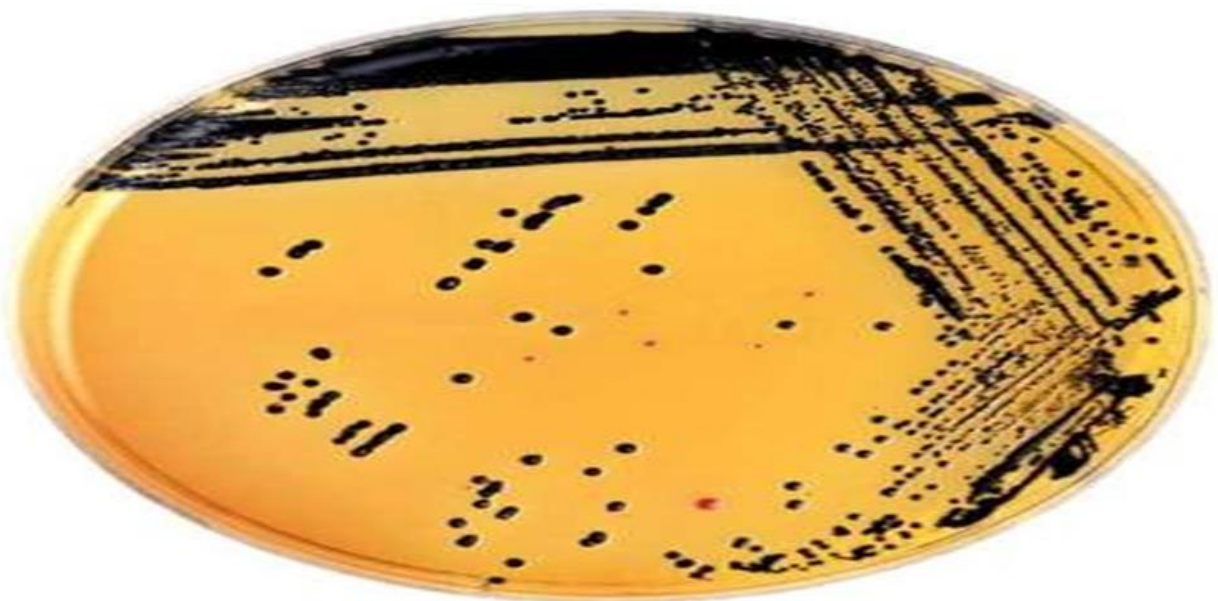
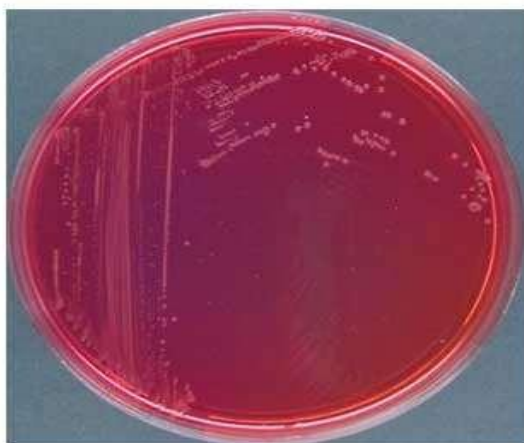
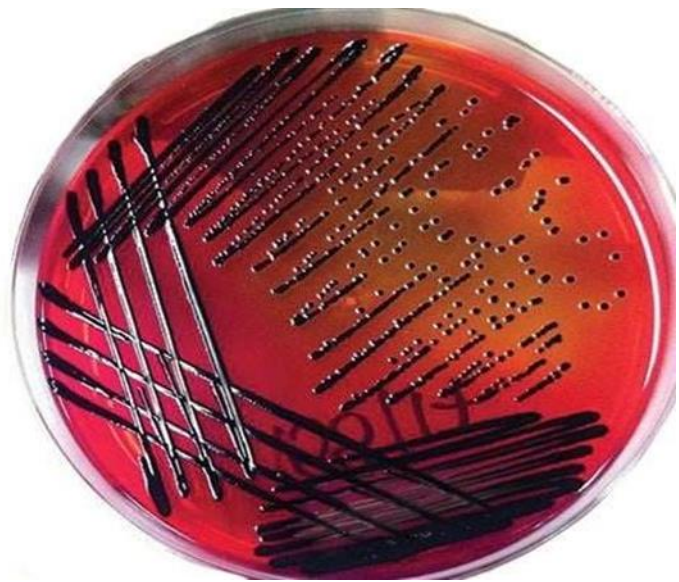


Figure : Salmonella on S-S agar (black colonies)



Figure : Salmonella on XLD agar (yellow colonies with black center)

***Salmonella*
Typhimurium
on
XLD agar.**

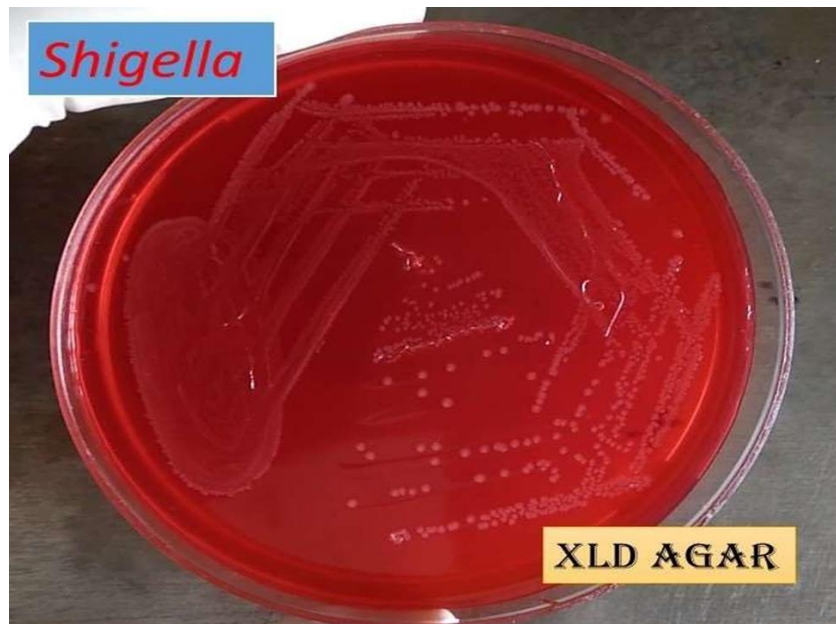


Shigella on XLD.



Salmonella on XLD.

Image Source: Faculty of Health and Medical Sciences - University of Copenhagen, Denmark



Colony characteristics on XLD agar

Organisms	Colony characteristics
<i>Salmonella</i> H ₂ S positive	Red colonies with black centers
<i>Shigella</i> spp. and <i>Salmonella</i> H ₂ S negative	Red colonies
<i>E. coli</i>	Large, flat, yellow colonies
<i>Proteus</i> spp.	Red to Yellow colonies
<i>Enterobacter</i> / <i>Klebsiella</i>	Muroid, yellow colonies

Some biochemical and culture characteristics of *Shigella* spp.

Tests	<i>Sh.dysenteriae</i>	<i>Sh.flexneri</i>	<i>Sh.boydii</i>	<i>Sh.sonnei</i>
IMViC	V , + , - , -	V , + , - , -	V , + , - , -	- , + , - , -
TSI	A/K CO ₂ - ,H ₂ S -	A/KCO ₂ -,H ₂ S-	A/KCO ₂ -,H ₂ S -	A/KCO ₂ -,H ₂ S -
Catalase	+	+	+	+
Oxidase	-	-	-	-
Urease	N	N	N	N
H ₂ S	N	N	N	N
Motility	N	N	N	N
MacConkey agar	L.N.F (Lactose Non Fermenter)	L.N.F	L.N.F	
Phenylalanine	N	N	N	N
Glucose	+ NO gas	-	+ NO gas	+ NO gas
Mannitol	N	P	P	P
Gelatinase	N	N	N	N
S-S agar	Pale colony	Pale colony	Pale colony	Pale colony

Some biochemical and culture characteristics of *Salmonella* spp.

Tests	<i>S.typhi</i>	<i>S.typhimurium</i>
IMViC	- , + , - , -	- , + , - , +
TSI	A/K CO ₂ + , H ₂ S -	A/K CO ₂ + , H ₂ S +
Catalase	+	+
Oxidase	-	-
Urease	-	-
H ₂ S	-	+
Motility	+	+
MacConkey agar	L.N.F (Lactose Non Fermenter)	L.N.F (Lactose Non Fermenter)
Phenylalanine	-	-
Glucose	+ (Fermenter)	+ (Fermenter)
Maltose	+ gas	+ gas
S-S agar	Pale colony	Pale colony with black center