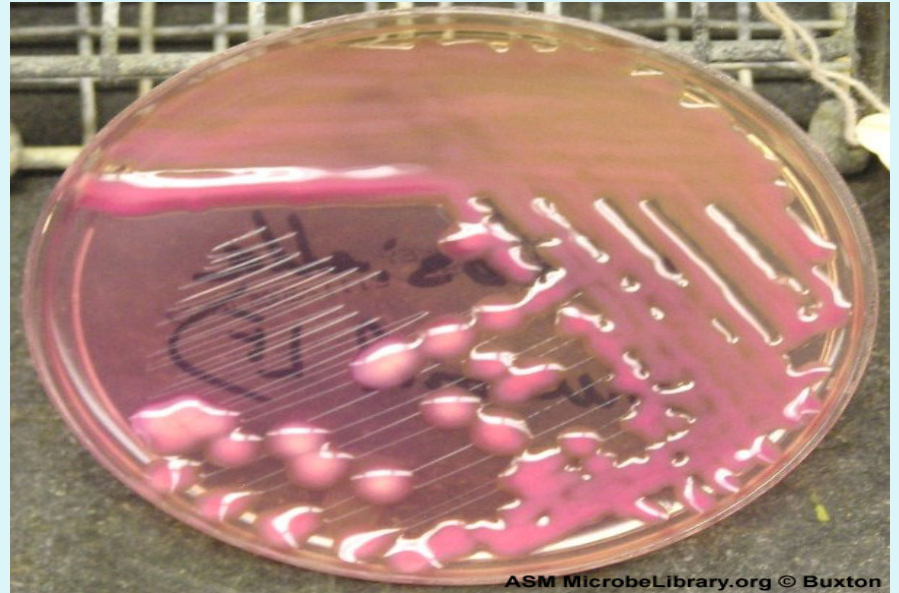
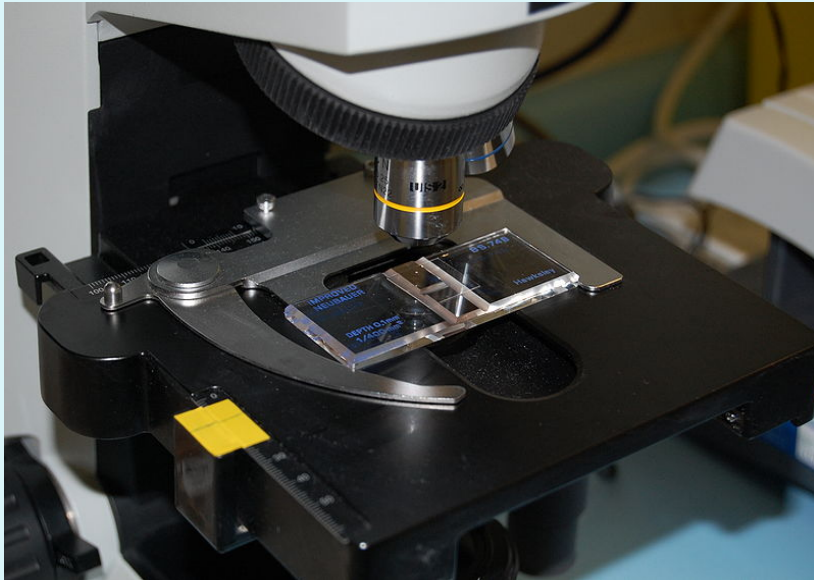


Practical of Urinary Tract Infection



Department of Microbiology

Objectives

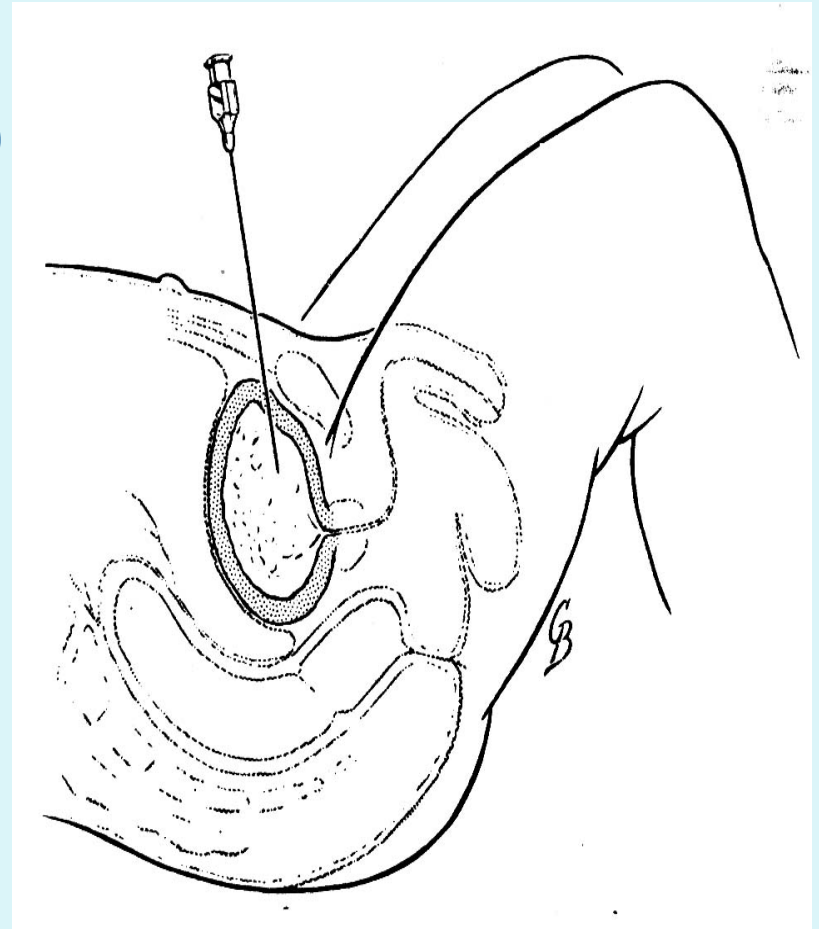
- Describe the different acceptable specimen types used for the diagnosis of cystitis
- Discuss the laboratory work up of urine specimens for analysis and culture
- Discuss important microbiological features of common causes of cystitis
- Interpret urine analysis and culture results
- List non bacterial causes of urinary tract infections

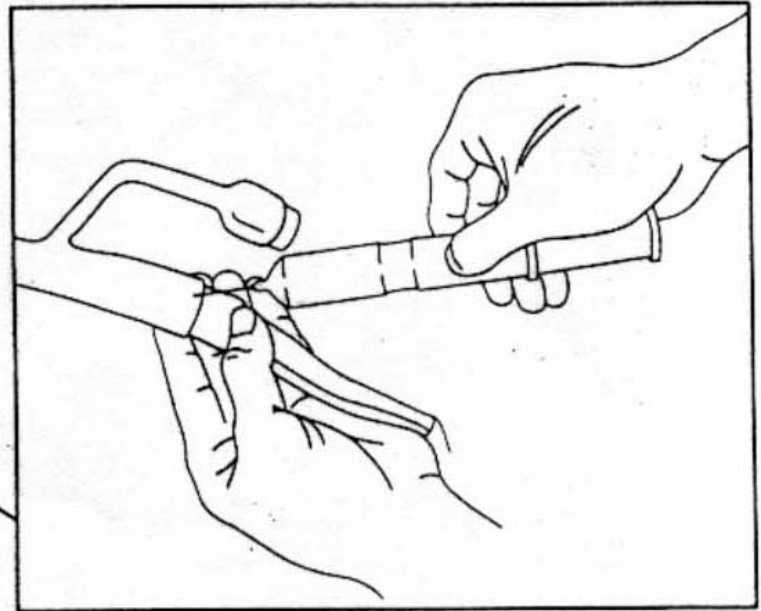
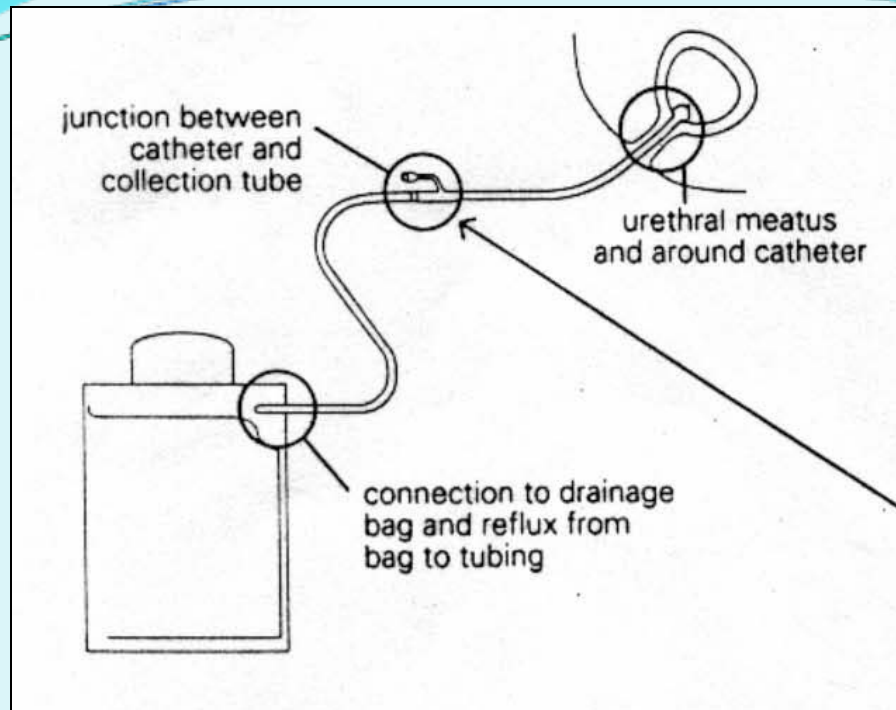
Important aspects of Microbiologic Examination of UTI:

- Urine collection
- Urine analysis
- Interpretation of microbiology laboratory result

Type of Specimens

- Midstream urine (MSU)
- Suprapubic aspiration
- Catheter sample





The urinary catheter

Urine specimens for laboratory investigations can be collected from catheterized patients as shown (left). The second port is for putting fluids into the bladder (right).

Urine from the drainage bag should not be tested because it may have been standing for several hours.

TRANSPORT MEDIA



**Sterile
Urine container**

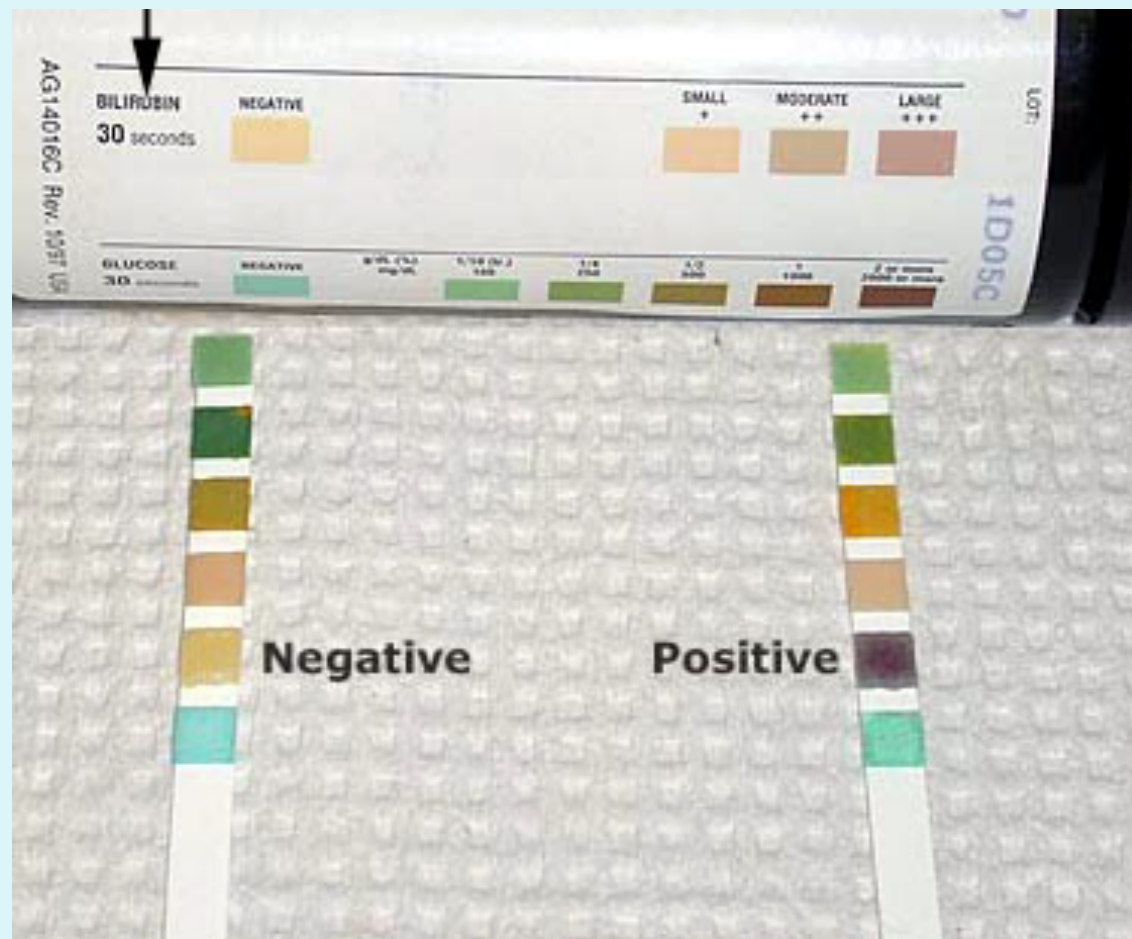


dipslides

One side is CLED media, the other can be MacConkey (MAC) agar or blood agar.

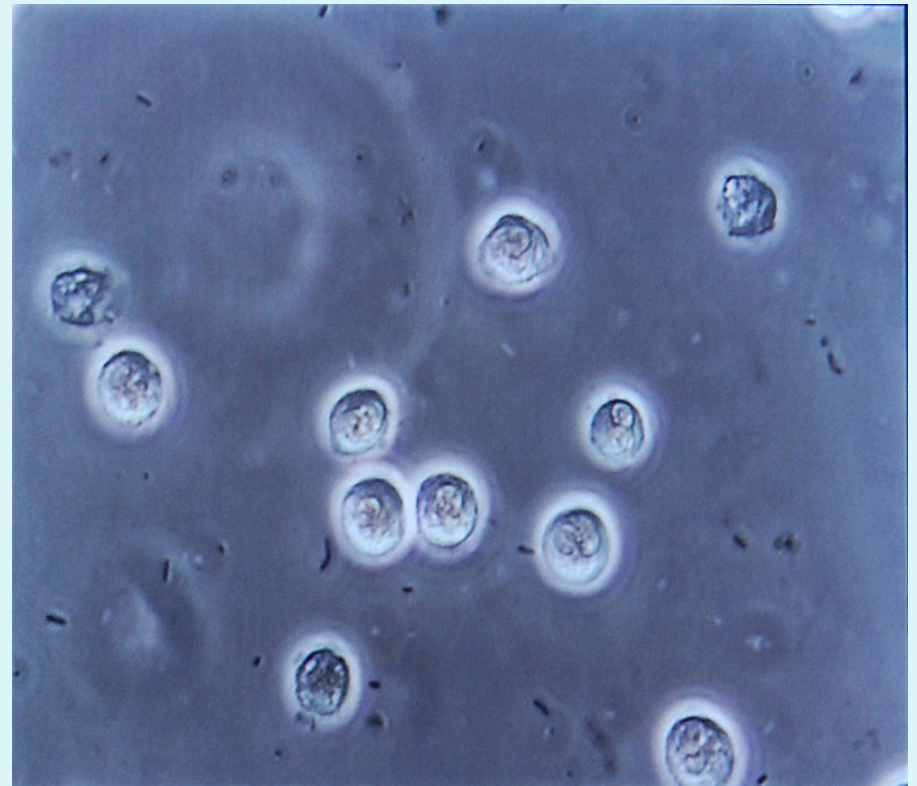
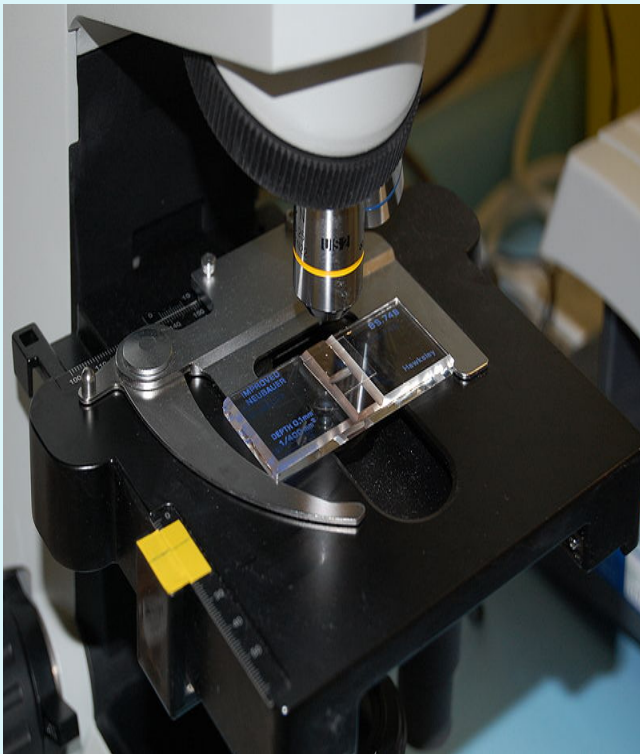
Urine analysis;

1- Dip stick (leukocyte esterase ,nitrate test)

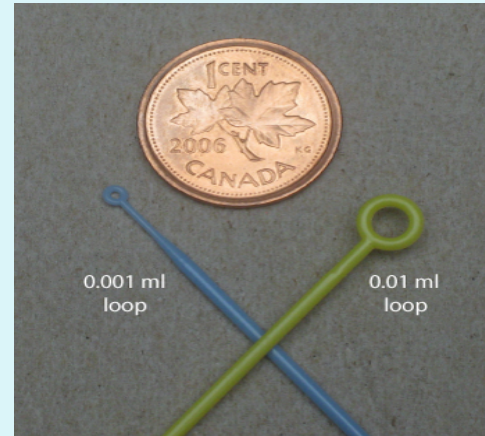
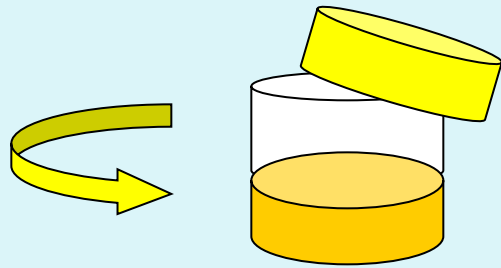


Urine analysis;

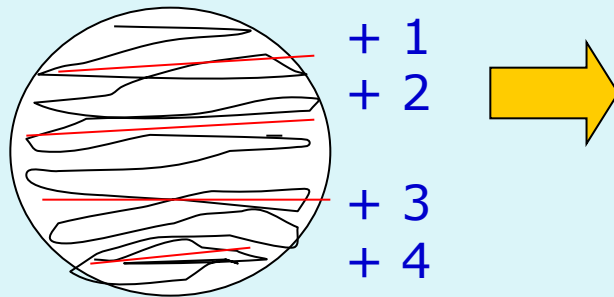
- 1- Dip stick (leukocyte esterase ,nitrate test)
- 2-microscopic ex; cell-counting chamber



Laboratory examination of urine



Quantitative (Colony counts)



a urine sample is streaked on surface of Blood Agar plate and CLED agar / McConkey agar with a special loop calibrated to deliver a known volume.

Over night incubation

Isolation of colonies, Biochemical tests, Drug susceptibility test,

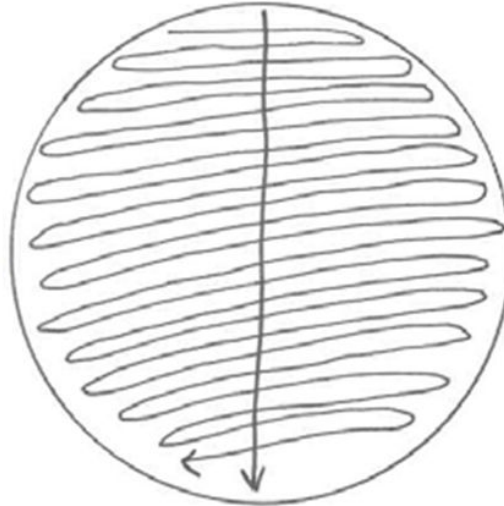
Over night incubation

RESULT

Quantitative urine culture

URINE PLATE TECHNIQUE

CALIBRATED LOOP: 0.001 uL vs. 0.01 uL



Inoculation: dip calibrated loop in urine, streak down middle of agar plate, then with the same loop go back and streak across the center inoculum to dilute

- Using 0.001/ml loop
 - 1 colony = 1000 CFU/ml
 - 100 colonies = 100,000 CFU/ml

GRAM NEGATIVE	GRAM POSITIVE
<i>Escherichia coli</i>	<i>Enterococcus</i>
<i>Klebsiella</i>	<i>Staphylococcus saprophyticus</i>
<i>Proteus</i>	<i>Streptococcus agalactiae</i> (group B)
Other <i>Enterobacteriaceae</i> (<i>Enterobacter</i> , <i>Citrobacter</i>)	<i>Staphylococcus aureus</i> ¹ (Associated with staphylococemia) ⁽
<i>Pseudomonas aeruginosa</i>	

- Other organisms ;
 - *Candida*
 - *Schistosoma haematobium*

Causes of UTI's	Outpatients (%)	Inpatients (%)
<i>Escherichia coli</i>	53-72	18-57
Coagulase negative <i>Staphylococcus</i>	2-8	2-13
<i>Klebsiella</i>	6-12	6-15
<i>Proteus</i>	4-6	4-8
<i>Morganella</i>	3-4	5-6
<i>Enterococcus</i>	2-12	7-16
<i>Staphylococcus aureus</i>	2	2-4
<i>Staphylococcus saprophyticus</i>	0-2	0.4
<i>Pseudomonas</i>	0-4	1-11
<i>Candida</i>	3-8	2-26

culture media

blood agar



an enriched medium

MacConkey agar



**Selective and
differential medium**

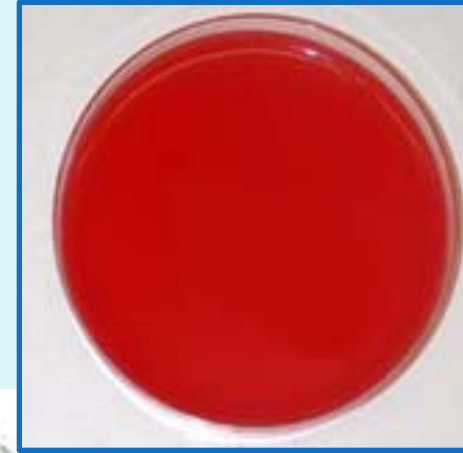
CLED agar

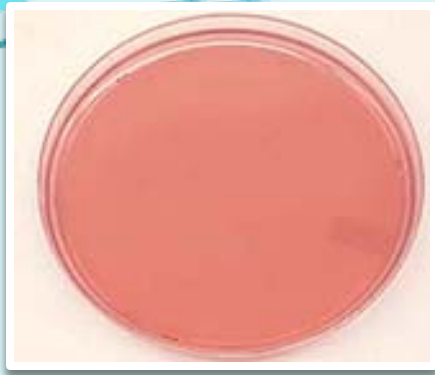


Differential medium

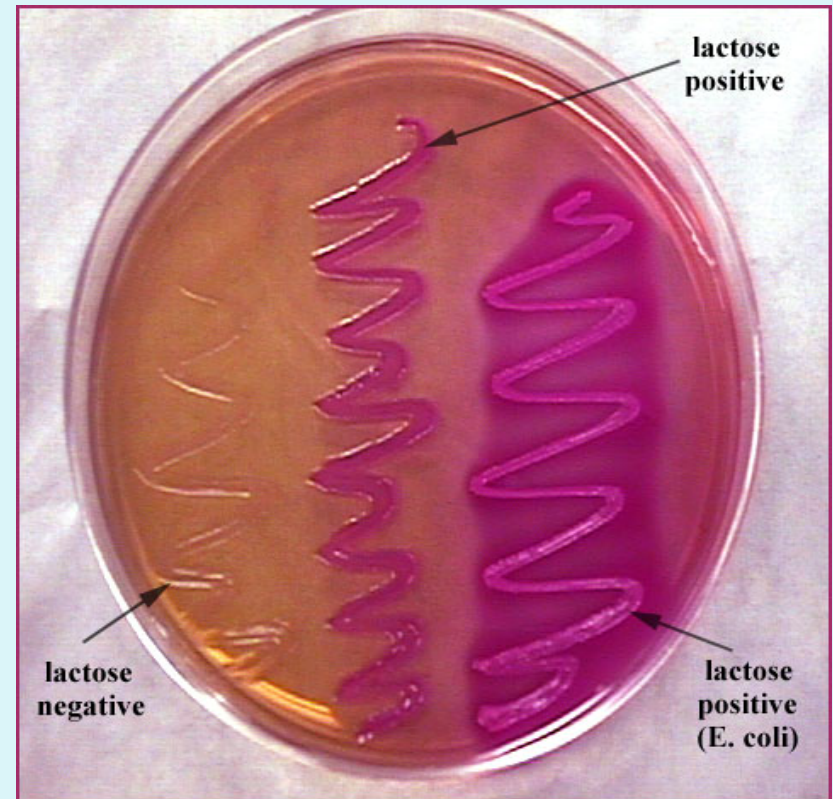
Blood agar

**An enriched medium,
especially for
culturing fastidious
microorganism and
observed the
hemolytic reaction**



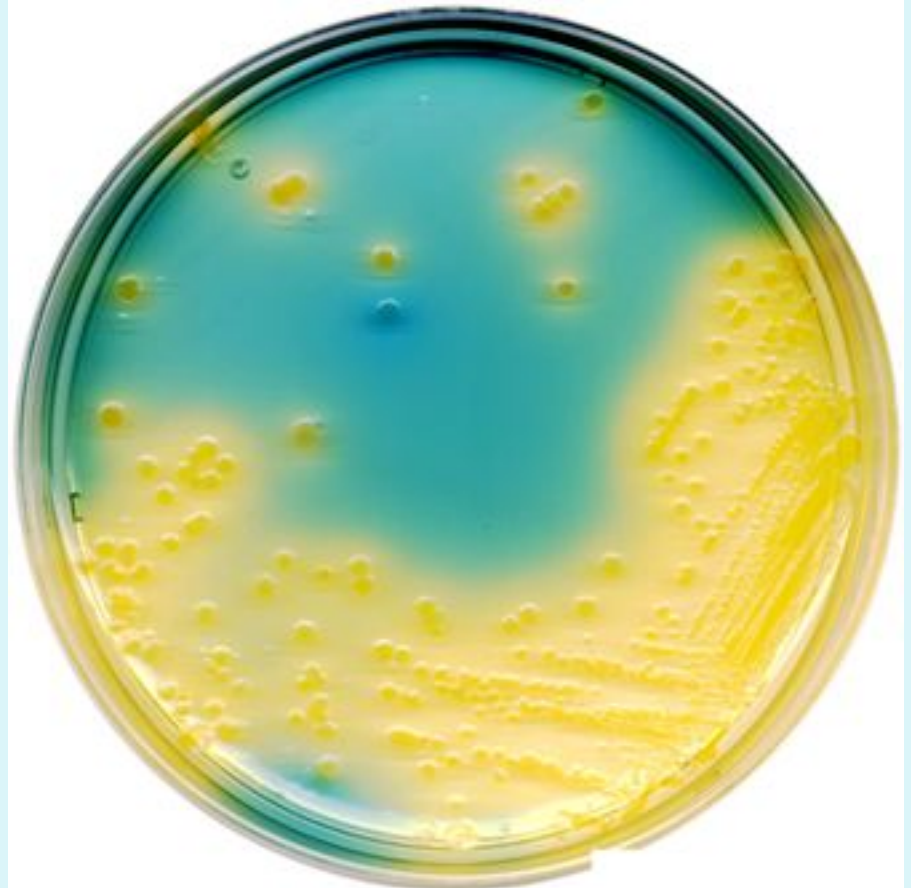


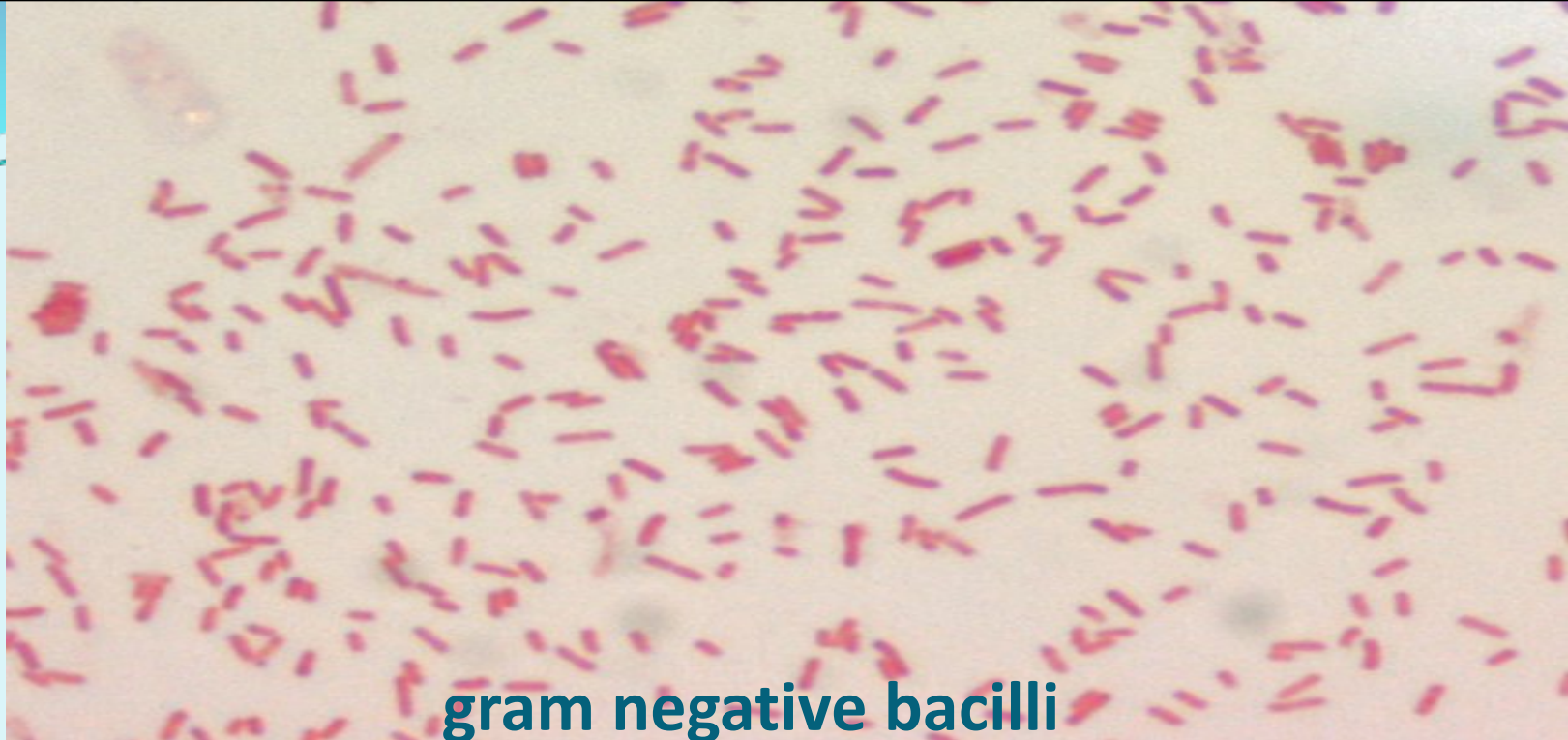
MacConkey's agar showing both lactose and non-lactose fermenting colonies. **Lactose** fermenting colonies are **pink** whereas **non-lactose** fermenting ones are **colourless** or appear same as the medium.]



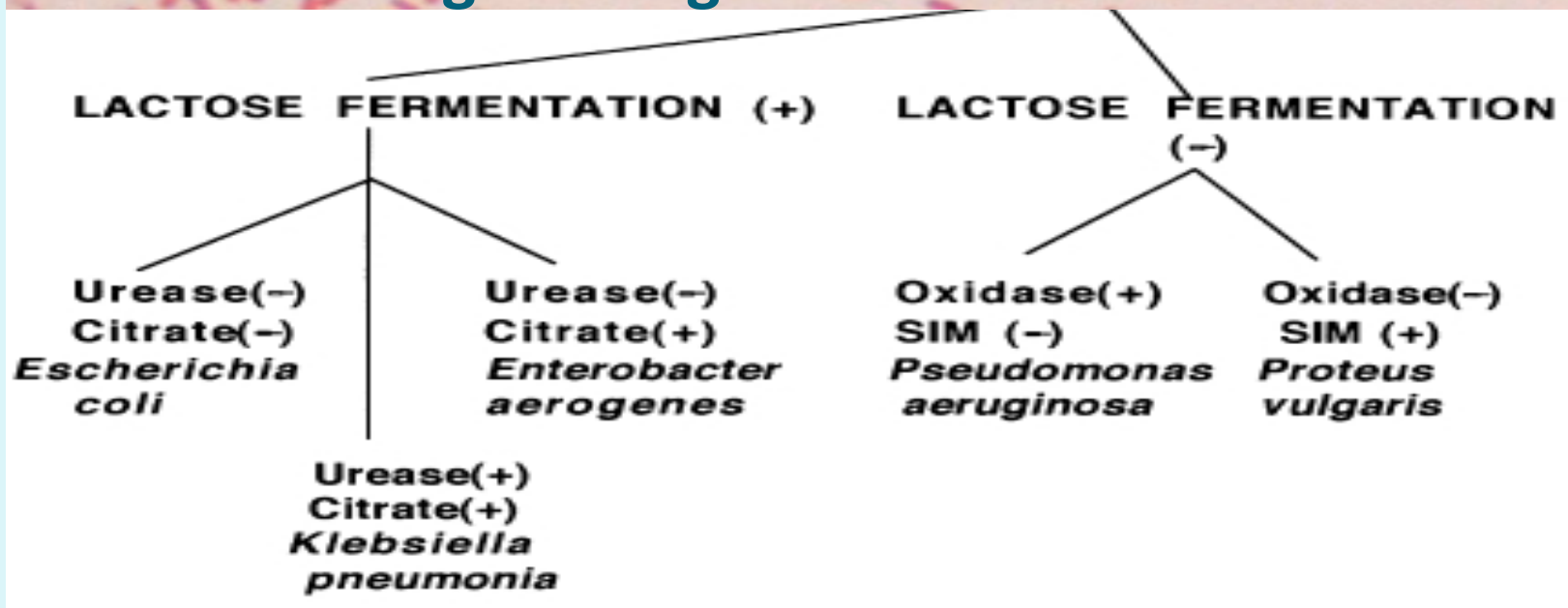
CLED agar

Differential culture medium for isolation and differentiation
Of *urinary pathogens*

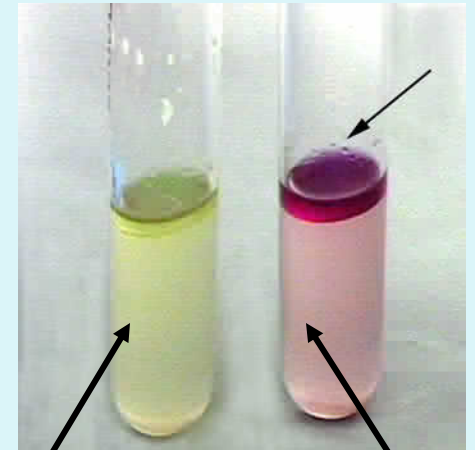
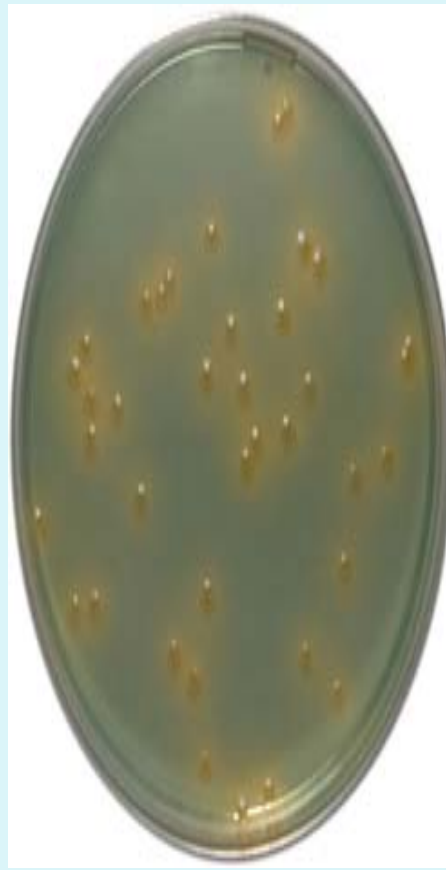
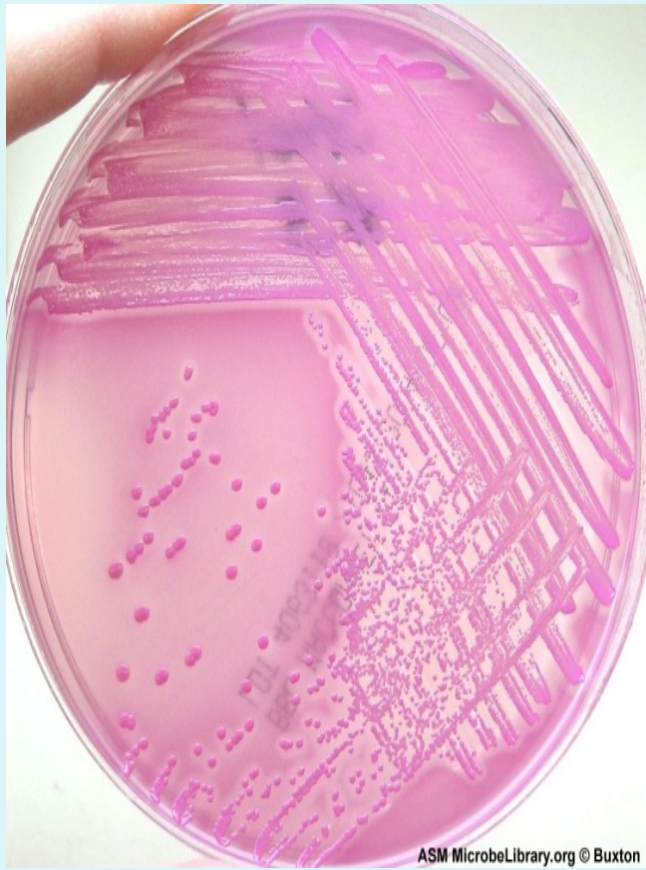




gram negative bacilli

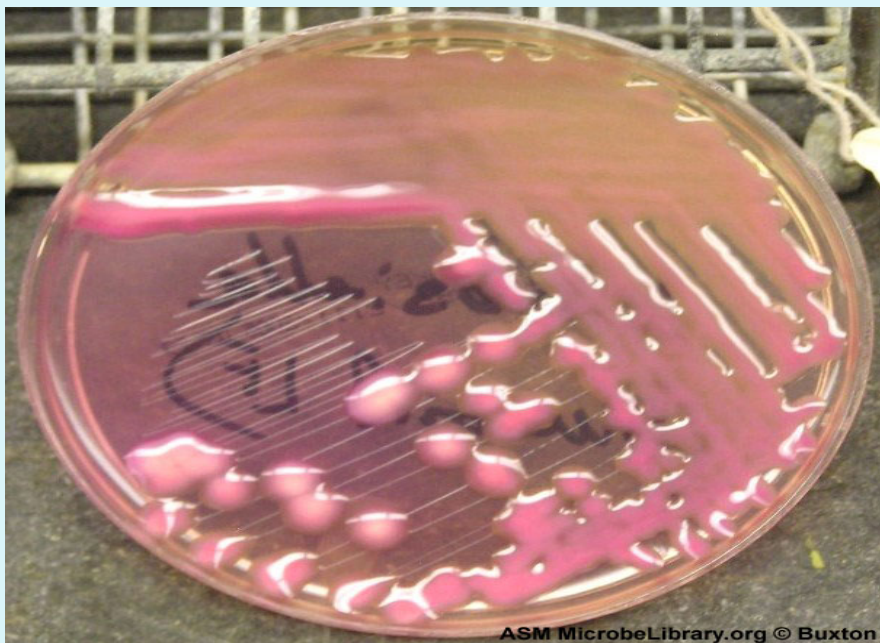


E coli



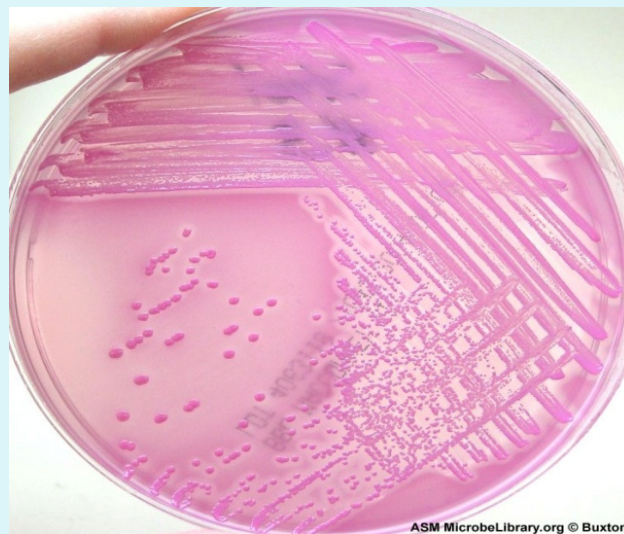
Indole Reactions
Negative **Positive**

Klebsiella pneumoniae



ASM MicrobeLibrary.org © Buxton

E coli



ASM MicrobeLibrary.org © Buxton



asmulwlab©

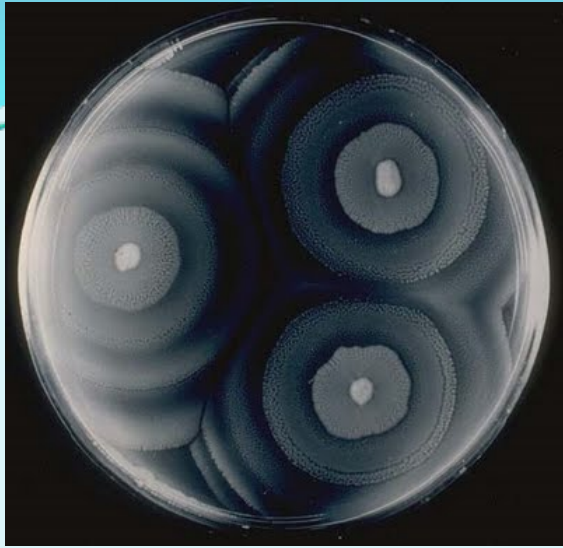
Klebsiella

Proteus growth : Swarming

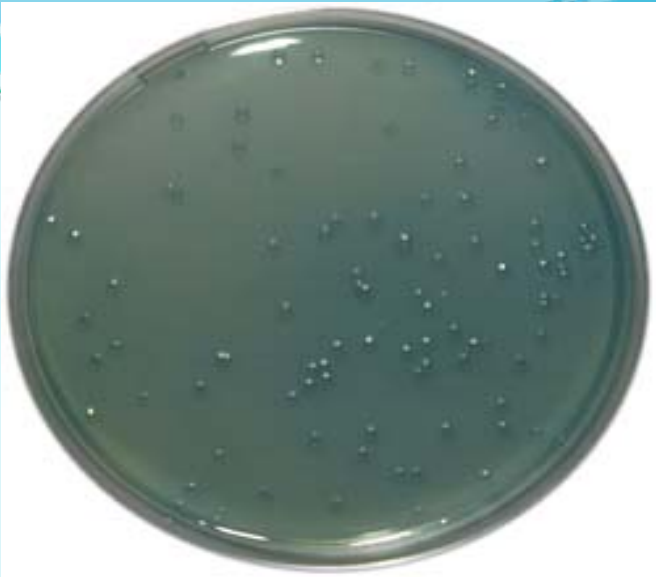


**CLED [(Cystine-Lactose-
Electrolyte-Deficient) -
inhibits the proteus swarm**

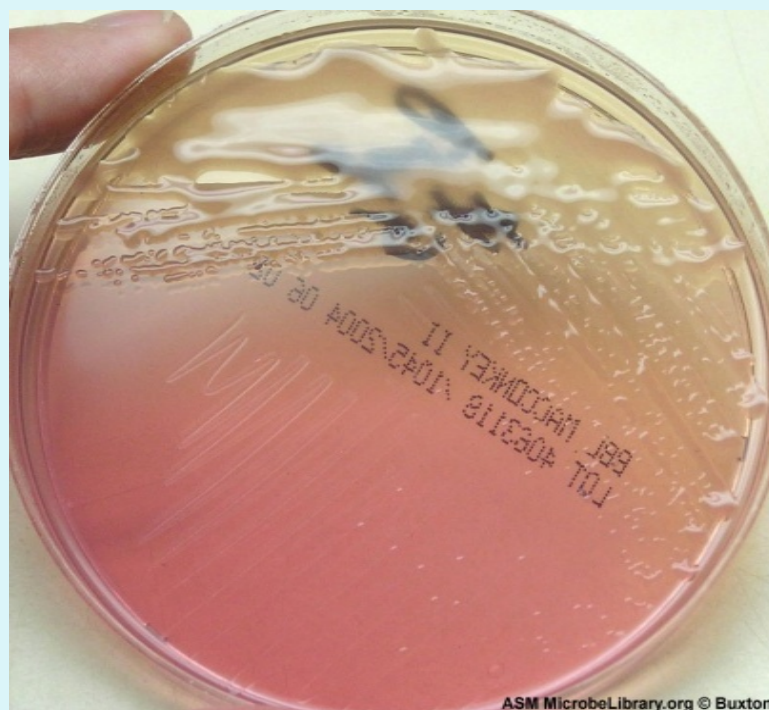
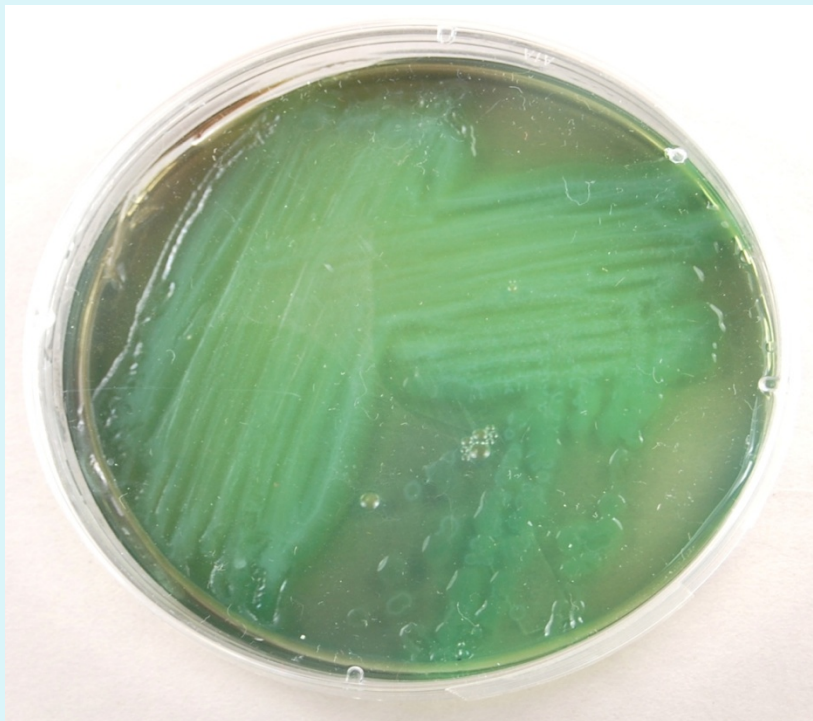
**proteus is Urease positive
Urease splits urea into
ammonia; and alkalinizes
the urine with production of
crystals**



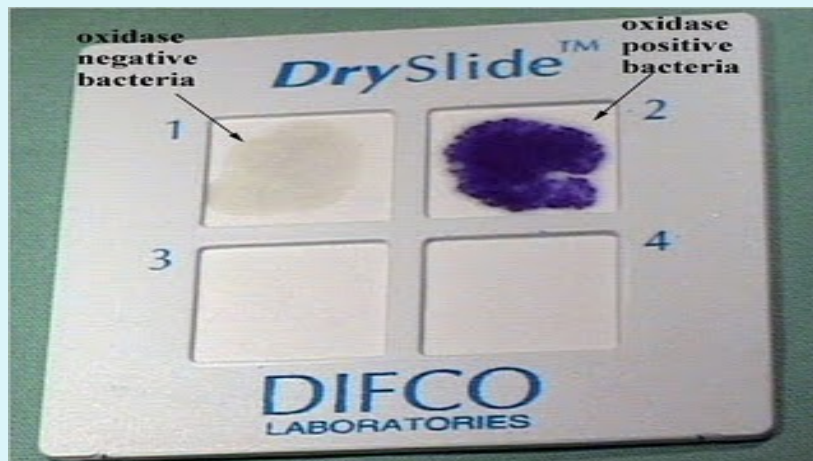
Proteus spp,



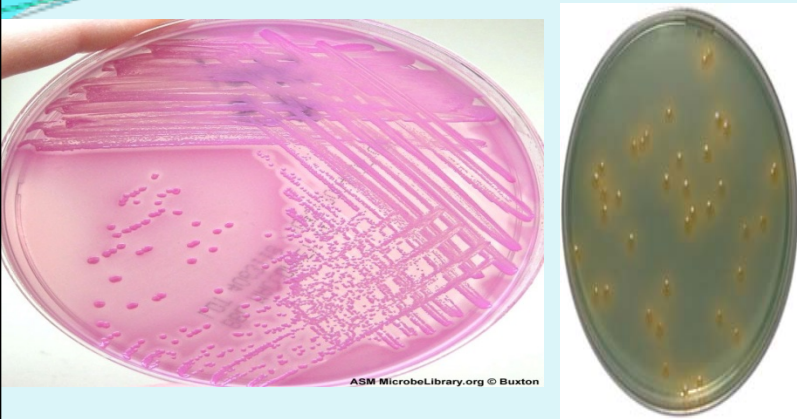
Pseudomonas aeruginosa



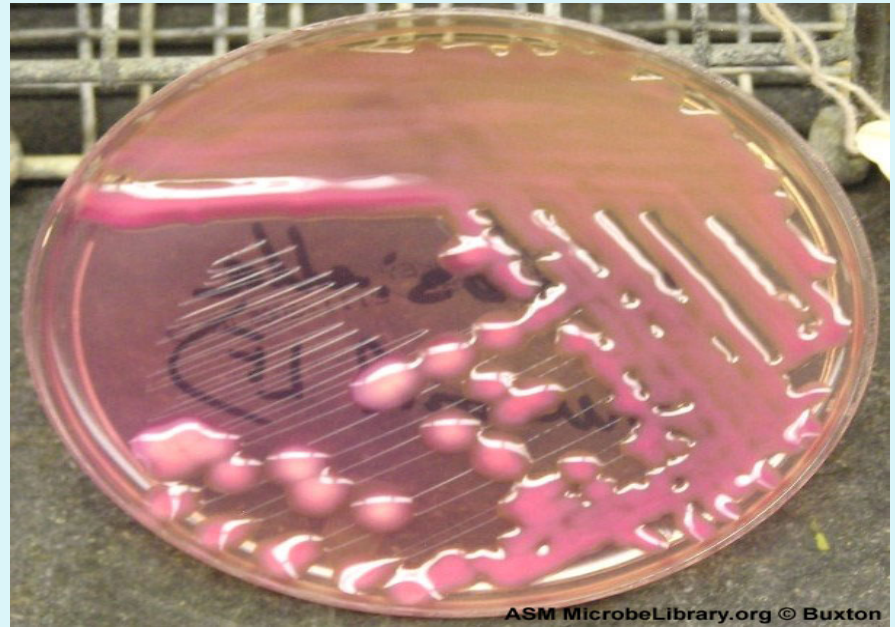
ASM MicrobeLibrary.org © Buxton



E coli



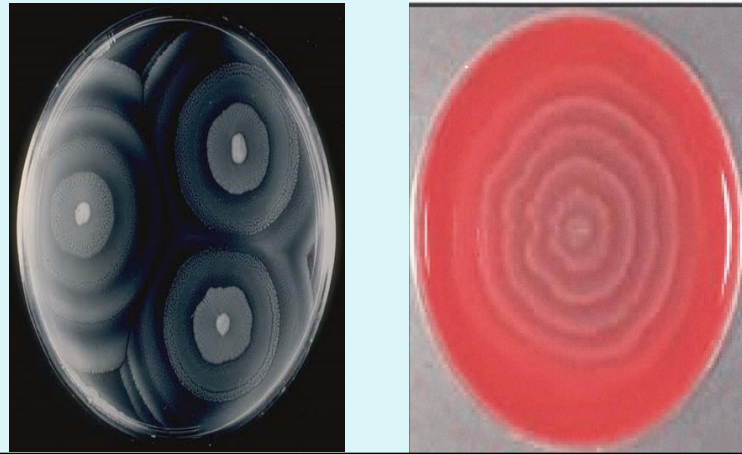
Klebsiella pneumoniae

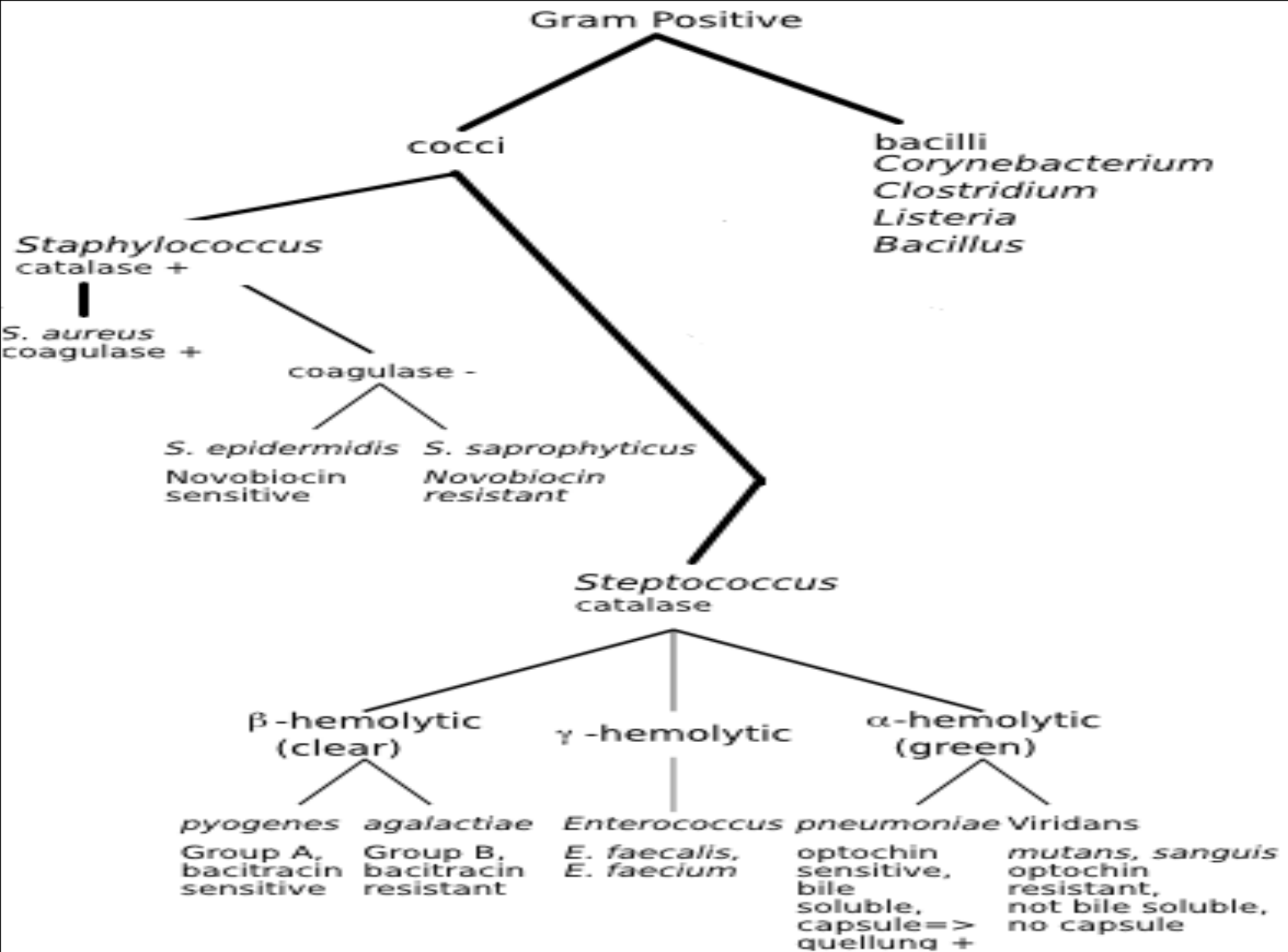


Pseudomonas aeruginosa



Proteus spp,



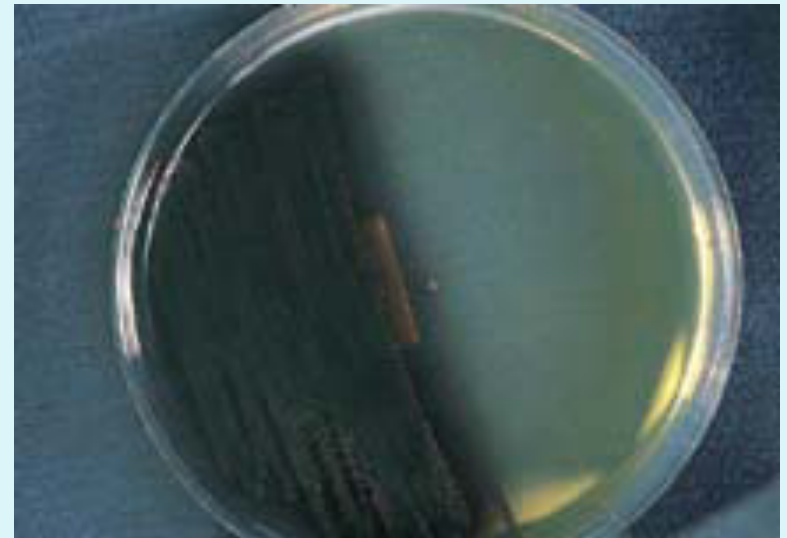


Enterococcus species



Biochemical Identification

- Bile Esculin hydrolysis



Both Group D streptococci and enterococci produce a positive (left) bile Esculin hydrolysis test.



Staphylococcus spp

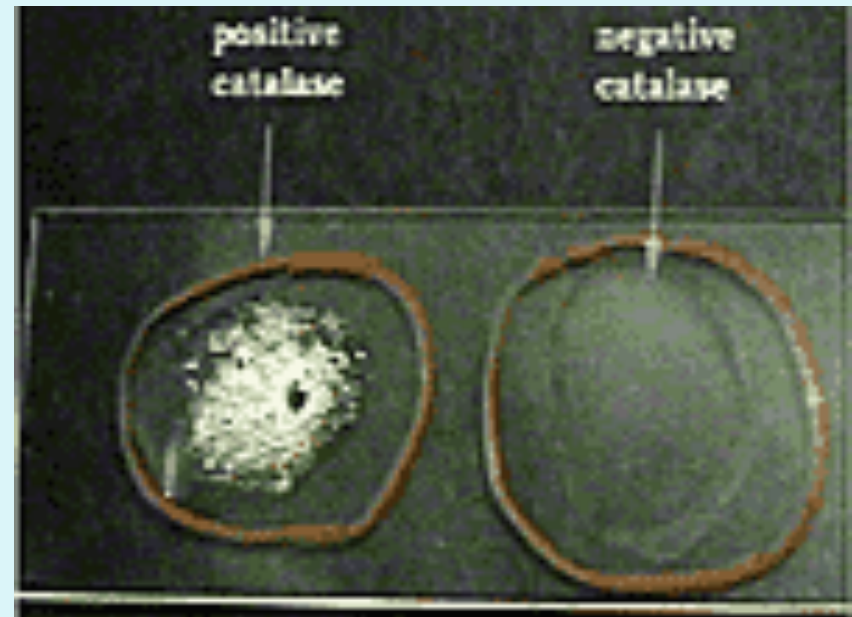


Differential Characteristics

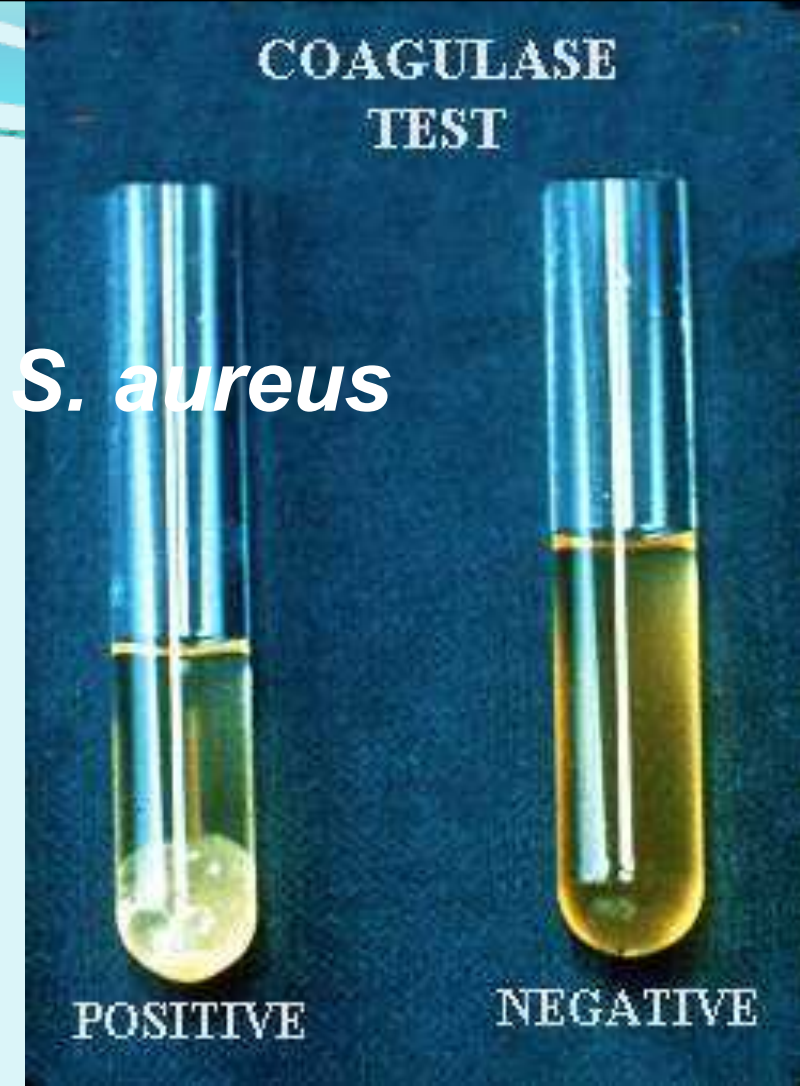
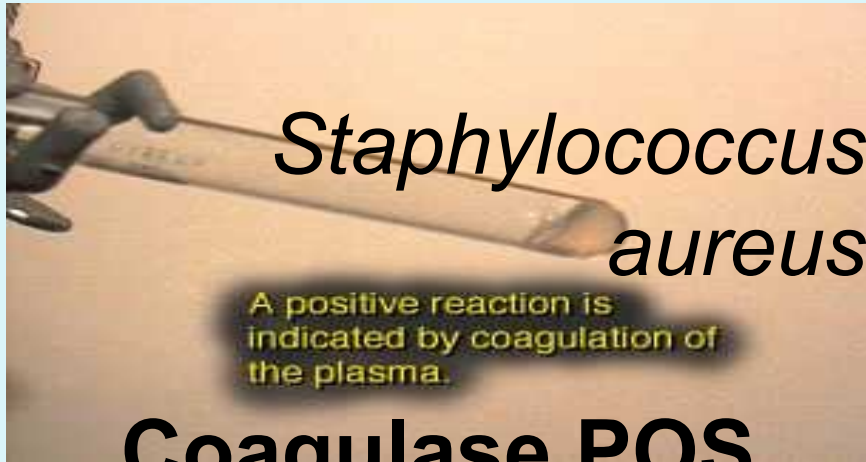
Catalase



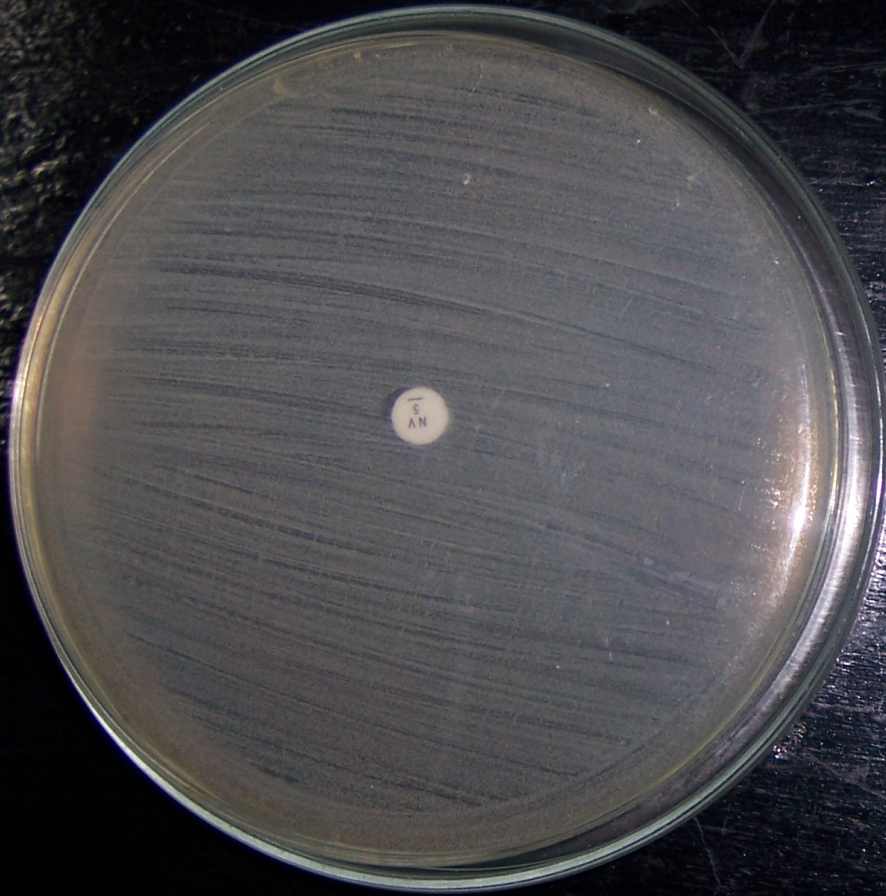
Streptococci vs. Staphylococci



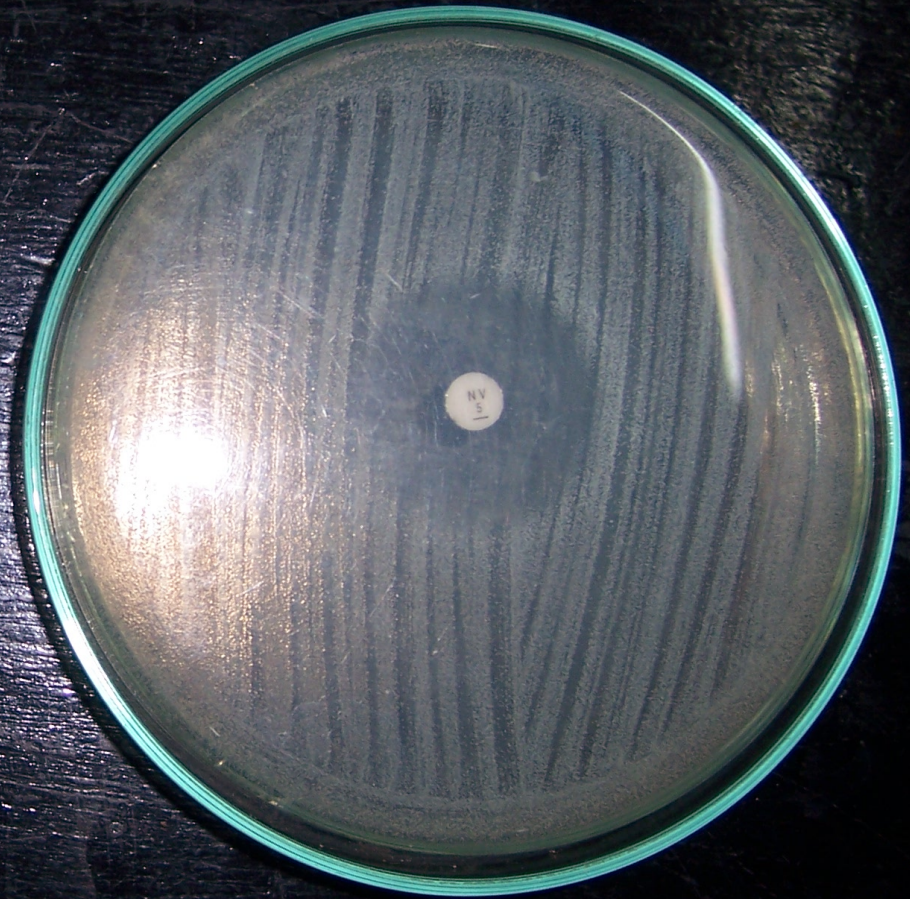
Differential Characteristics



NOVOBIOCCIN TEST



Staphylococcus saprophyticus
(resistant-Novobiocin)



Staphylococcus epidermidis
(sensitive-Novobiocin)

Antibiotic sensitivity test: Agar diffusion method



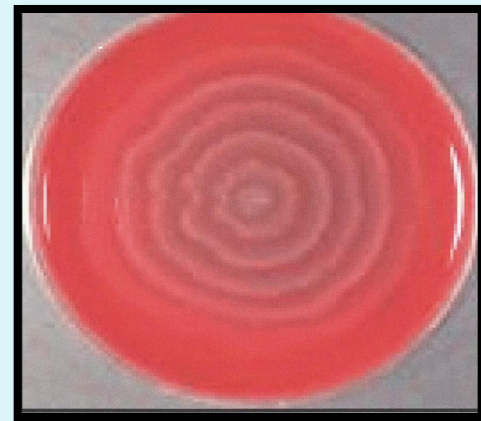
Case

These Blood agar and CLED agar plates were inoculated with MSU from a 45 years old man suspected of having bladder stone and complaining of burning micturation.

**Urine examination showed :
Moderate number of WBC and a PH of 8**



CLED

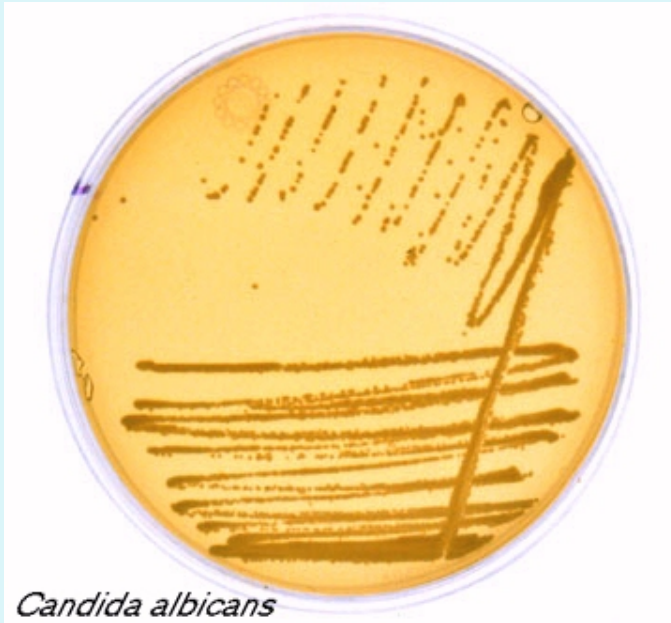


Blood agar

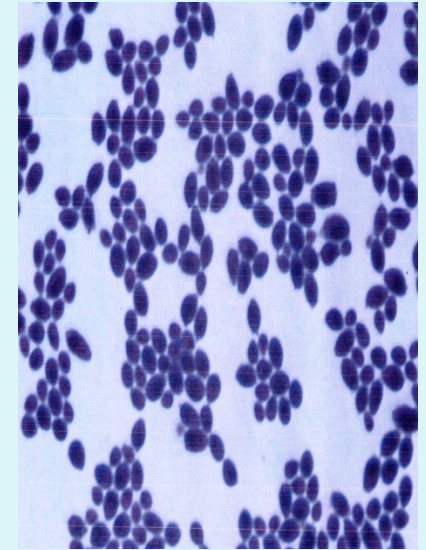
- A) What is the likely this pathogen?**
- B) How would you confirm the identity of this pathogen?**
- C) What is the role of this organism in forming stones?**

Candida albicans

**Growth on Sabouraud's
Dextrose Media**



***Candida albicans* on blood
agar;**



Candida albicans: identification tests

Chlamydospore



Germ tube test



Schistosoma haematobium



***Schistosoma
haematobium***
(urine; eggs 115-170 x 45-
65 micrometers)
(primates)

discussion

Mention one organism from each of the following which may cause urinary tract infection

- A) Bacteria**
- B) Parasites**
- C) Fungi**