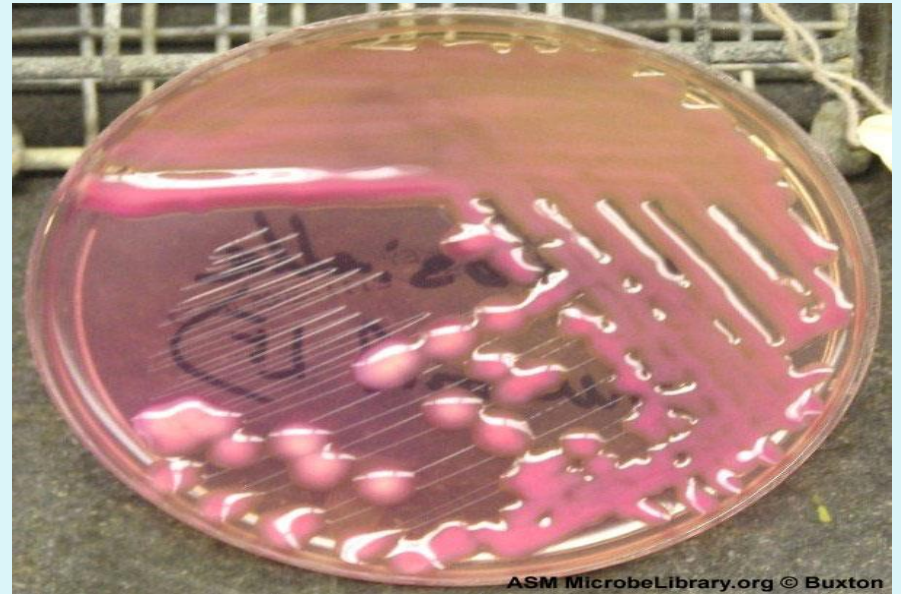
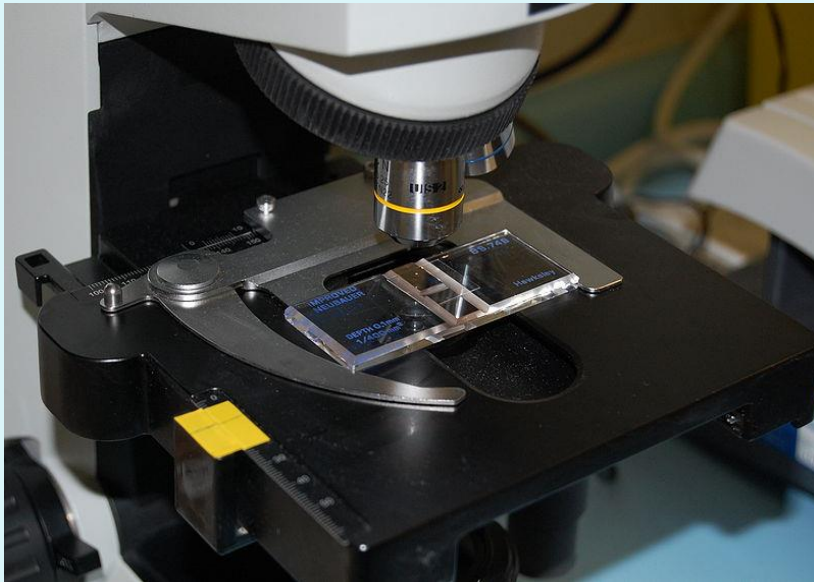


Practical of Urinary Tract Infection



Department of Microbiology

Objectives

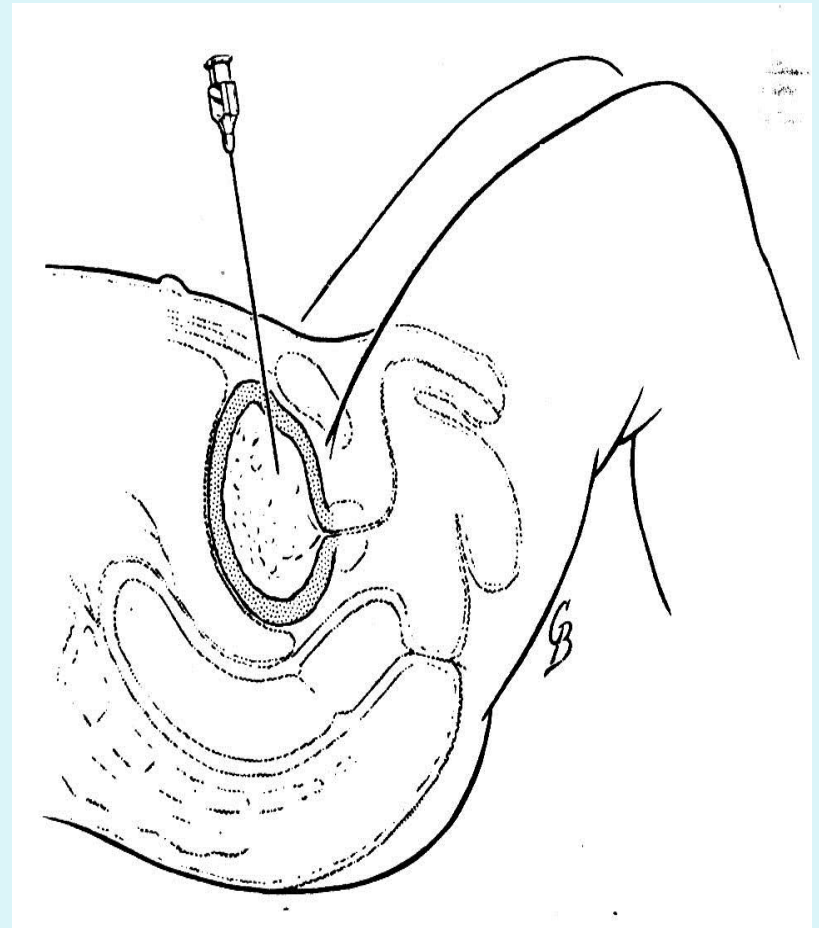
- Describe the different acceptable specimen types used for the diagnosis of cystitis
- Discuss the laboratory work up of urine specimens for analysis and culture
- Discuss important microbiological features of common causes of cystitis
- Interpret urine analysis and culture results
- List non bacterial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

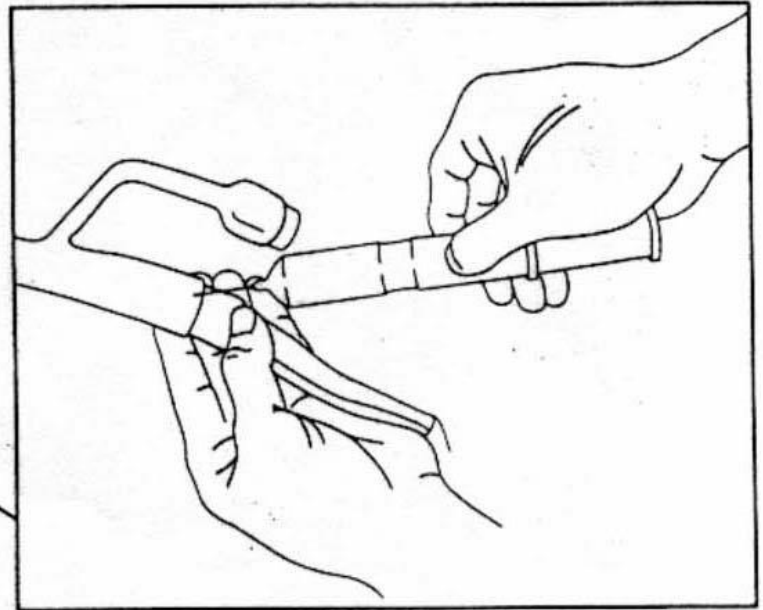
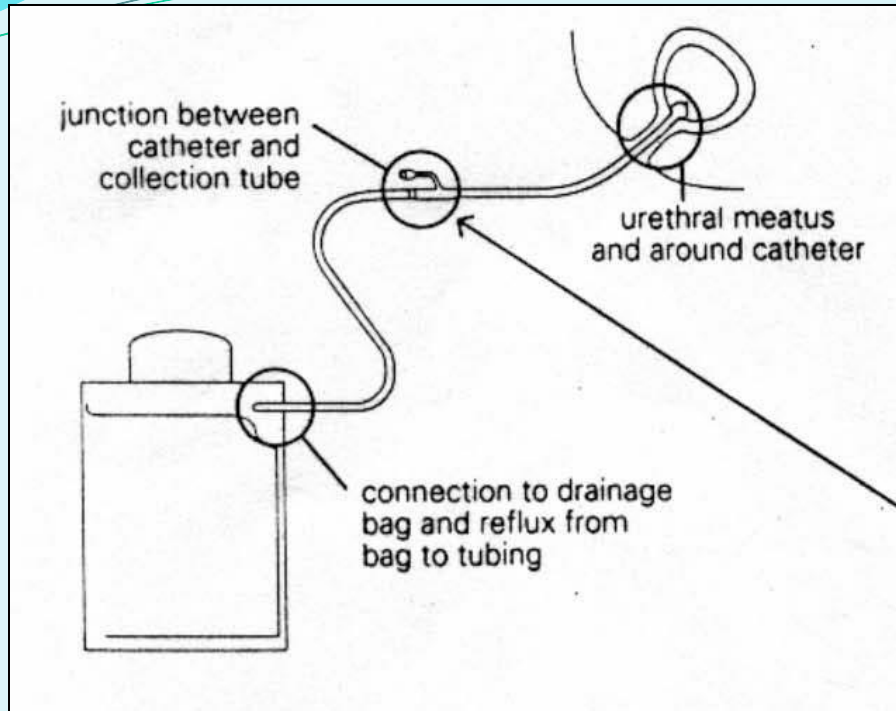
Important aspects of Microbiologic Examination of UTI:

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

Type of Specimens

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



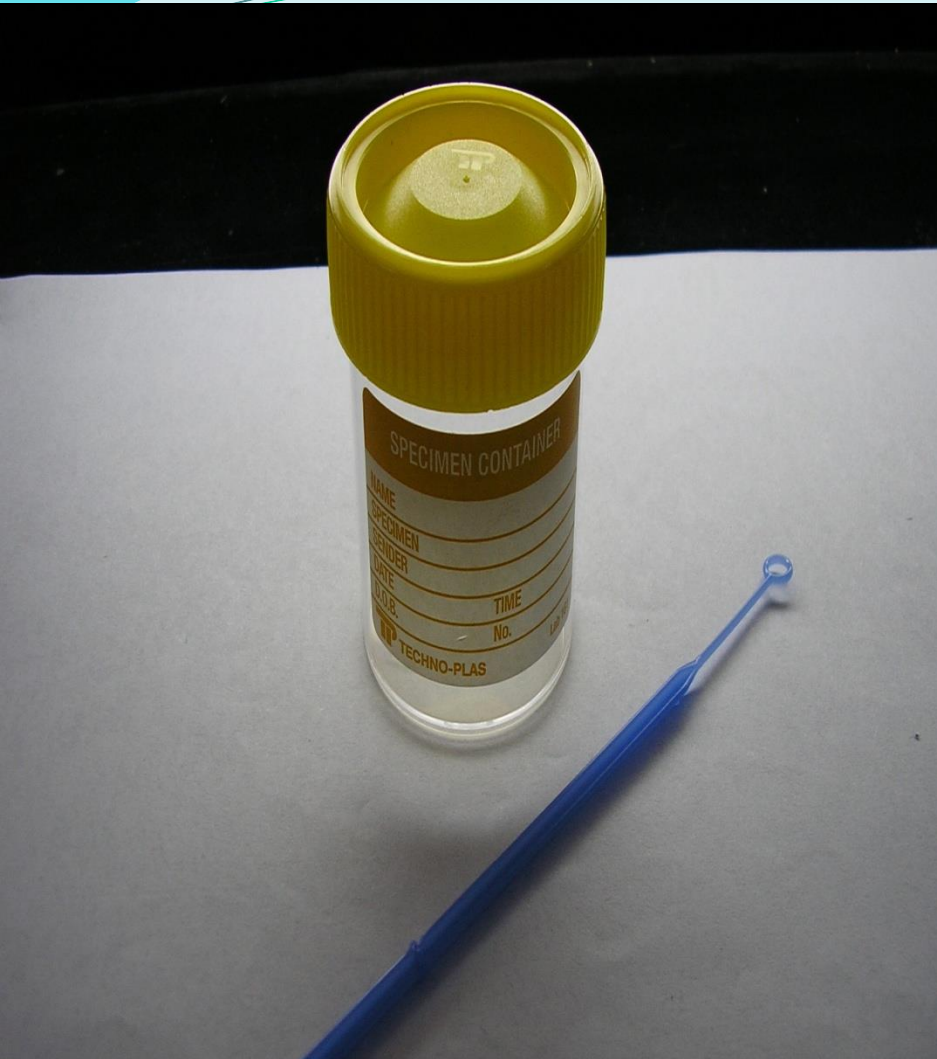


The urinary catheter

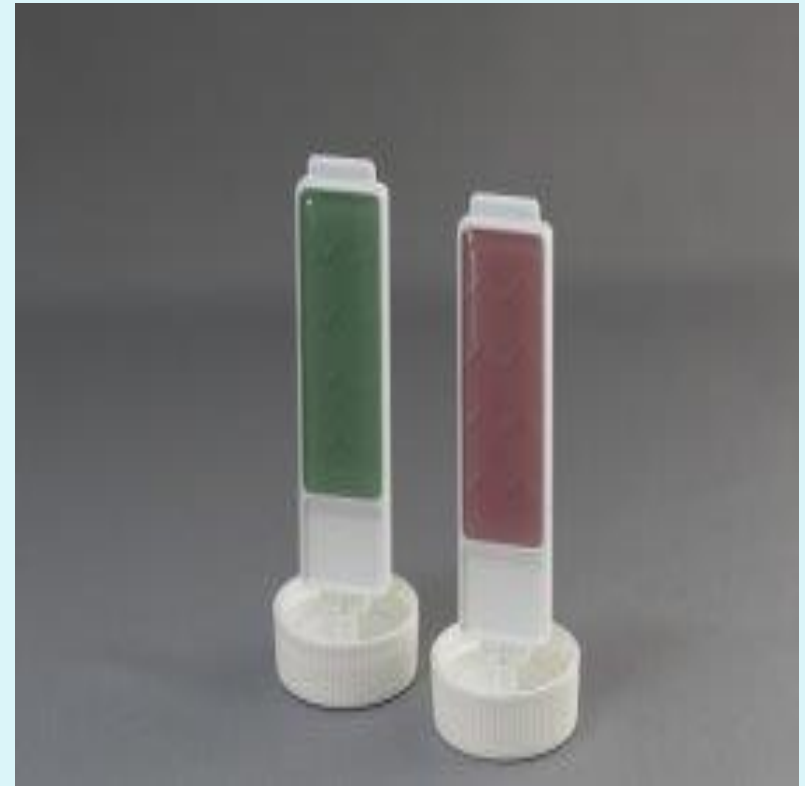
Urine specimens for laboratory investigations can be collected from catheterized patients as shown (left). The second port is for putting fluids into the bladder (right).

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

TRANSPORT MEDIA



**Sterile
Urine container**

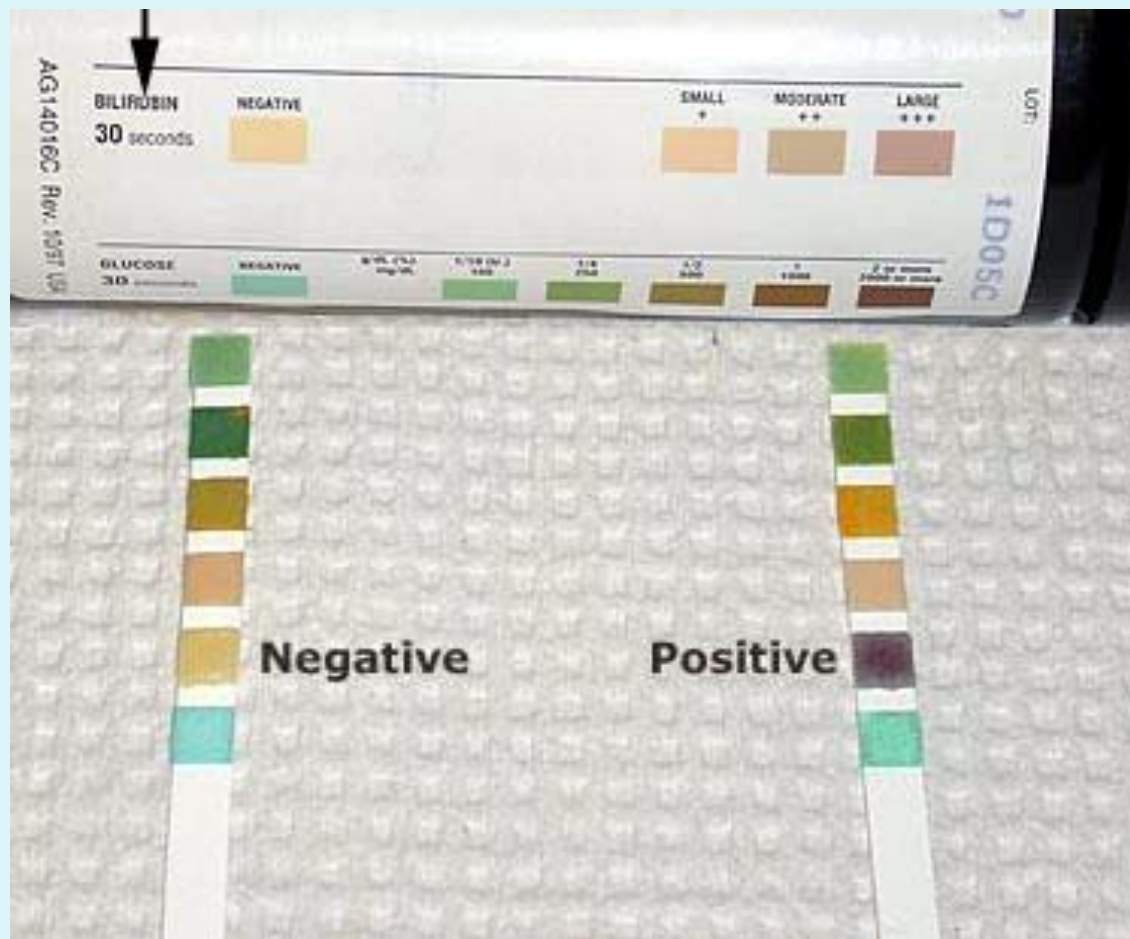


dipslides

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

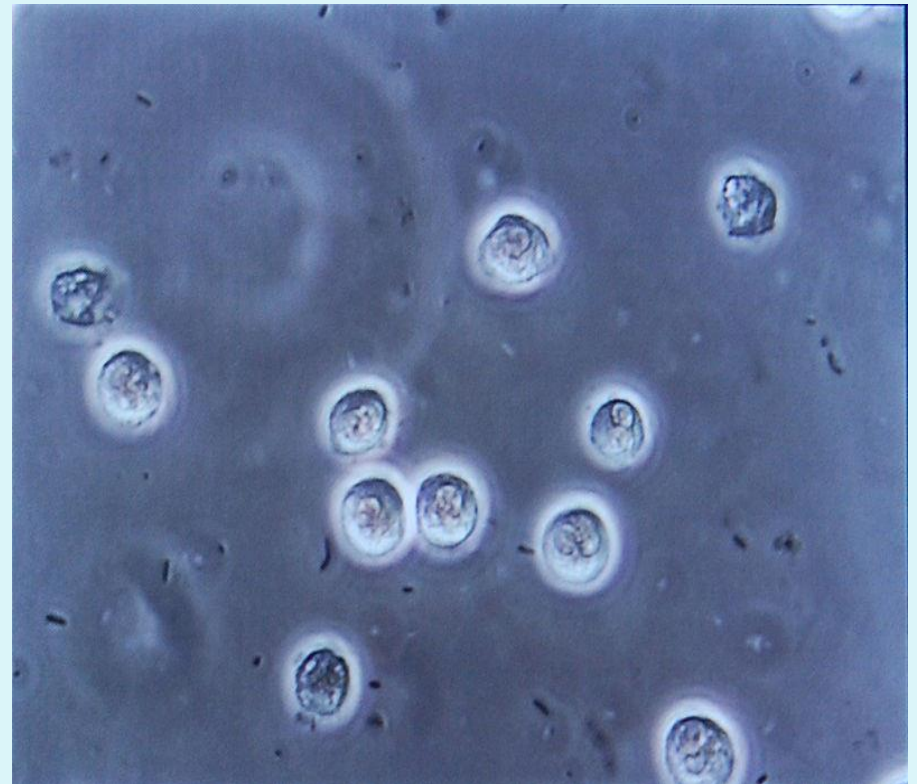
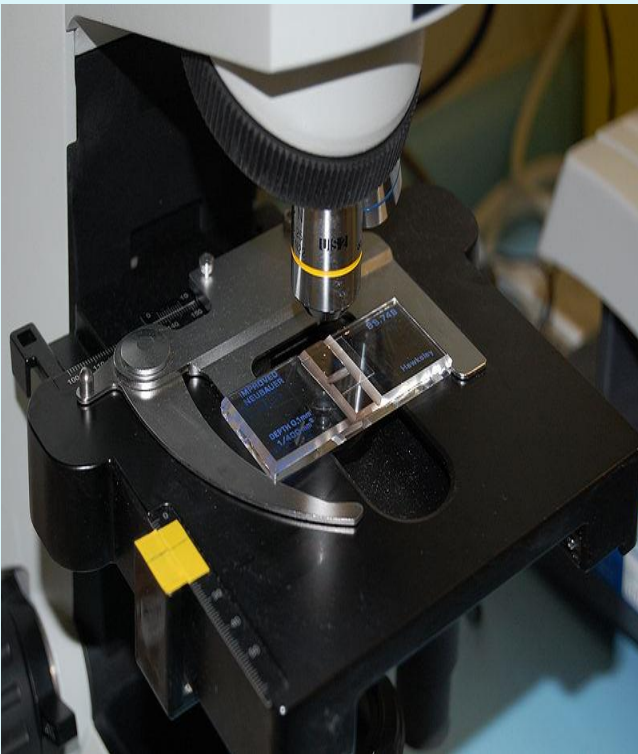
Urine analysis;

1- Dip stick (leukocyte esterase ,nitrate test)

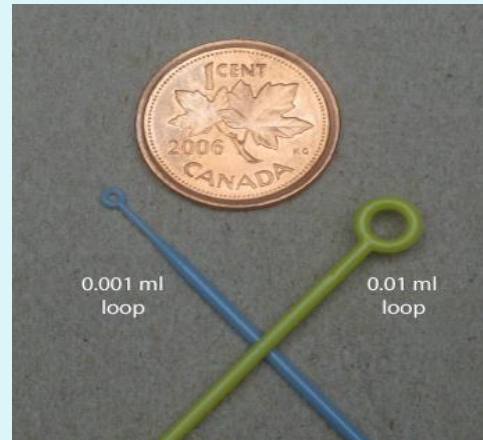
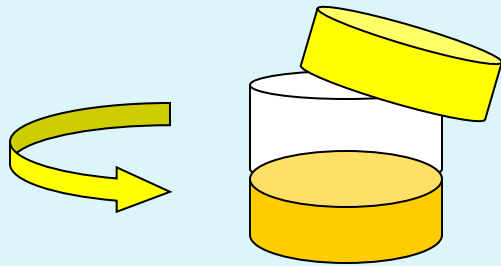


Urine analysis;

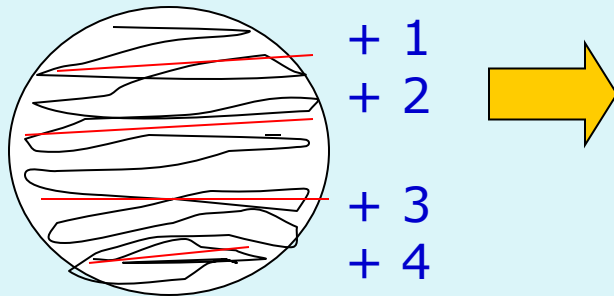
- 1- Dip stick (leukocyte esterase ,nitrate test)
- 2-microscopic ex; cell-counting chamber



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,

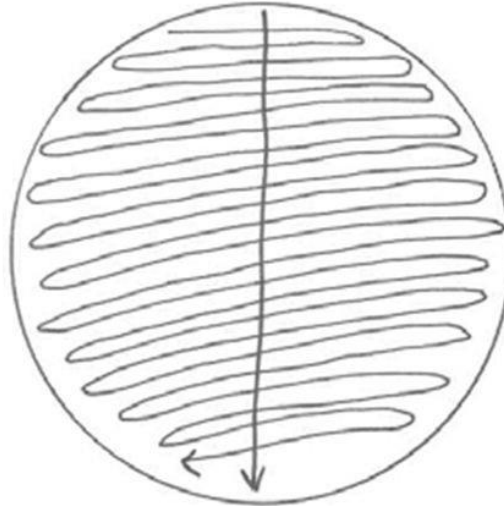
Over night incubation

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
(%)

Escherichia coli

53-72

18-57

Coagulase negative
Staphylococcus

2-8

2-13

Klebsiella

6-12

6-15

Proteus

4-6

4-8

Morganella

3-4

5-6

Enterococcus

2-12

7-16

*Staphylococcus
aureus*

2

2-4

*Staphylococcus
saprophyticus*

0-2

0.4

Pseudomonas

0-4

1-11

Candida

3-8

2-26

culture media

blood agar



an enriched medium

MacConkey agar



Selective and differential medium

CLED agar



Differential medium

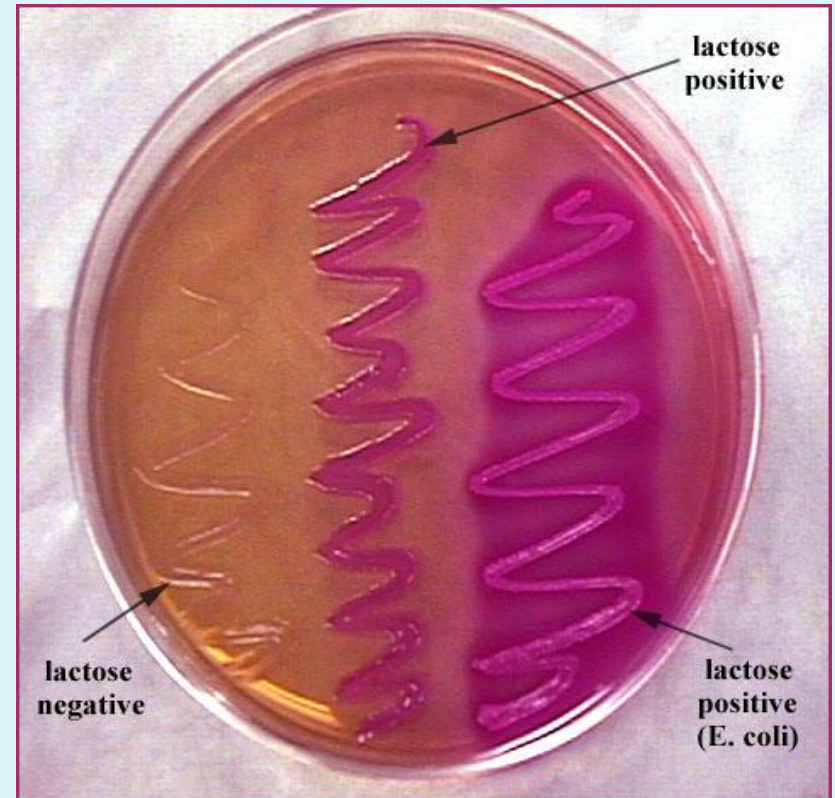
Blood agar

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





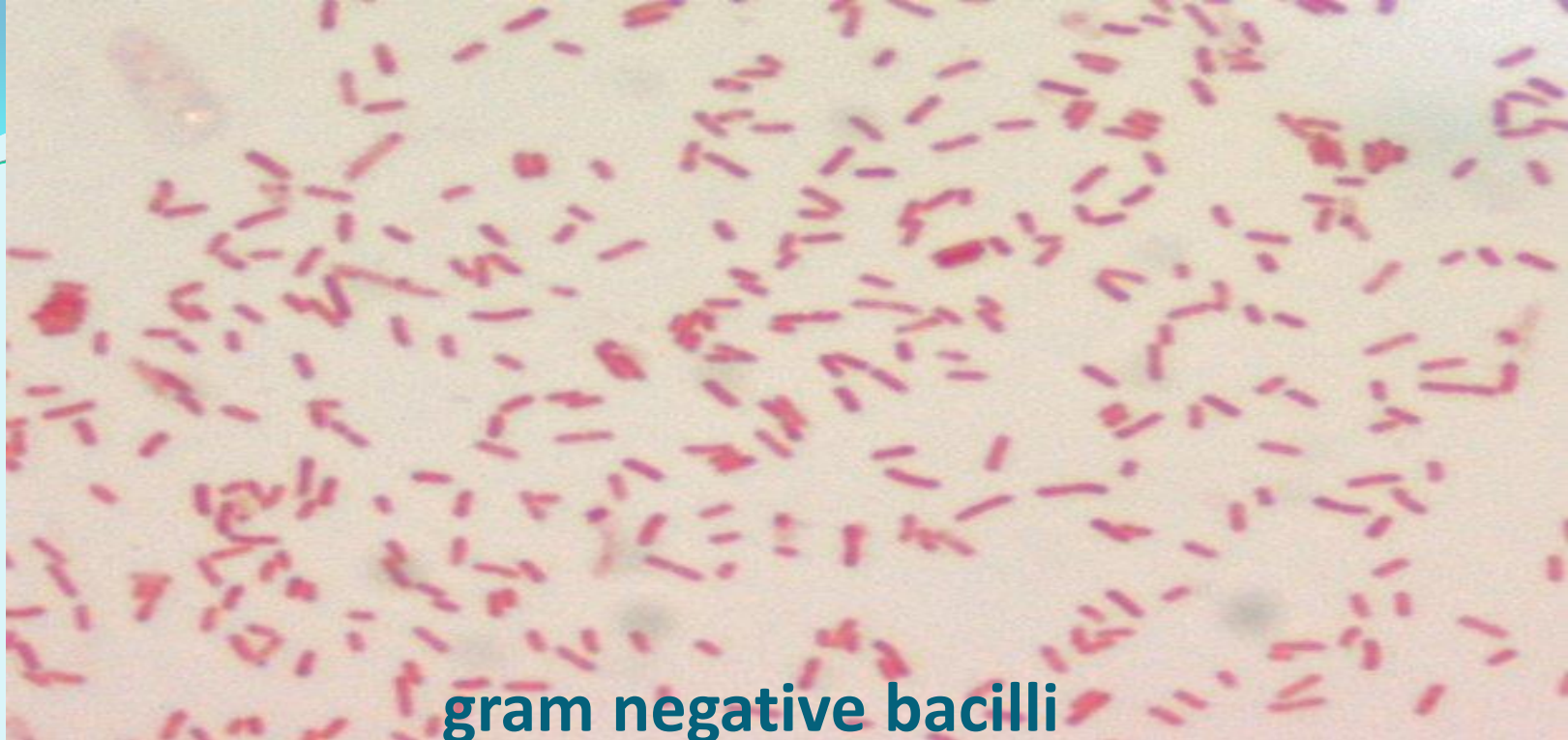
MacConkey's agar showing both lactose and non-lactose fermenting colonies. **Lactose** fermenting colonies are **pink** whereas **non-lactose** fermenting ones are **colourless** or appear same as the medium.]



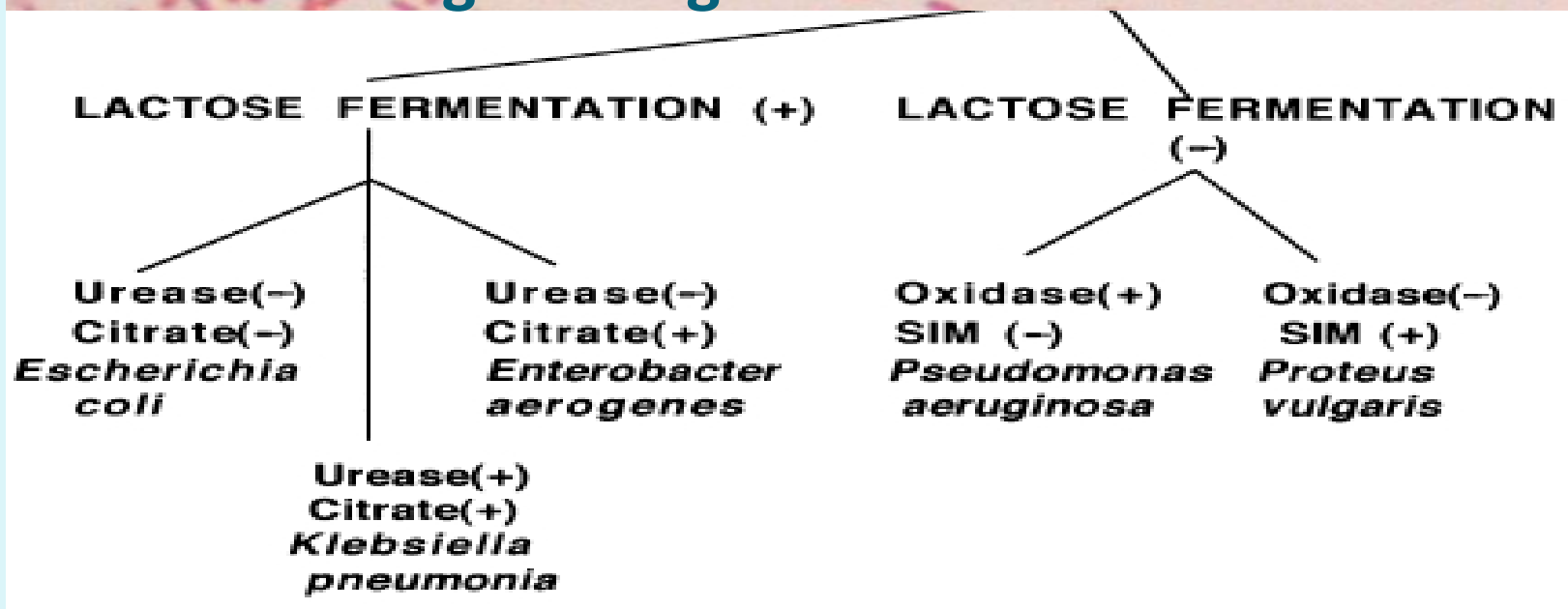
CLED agar

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

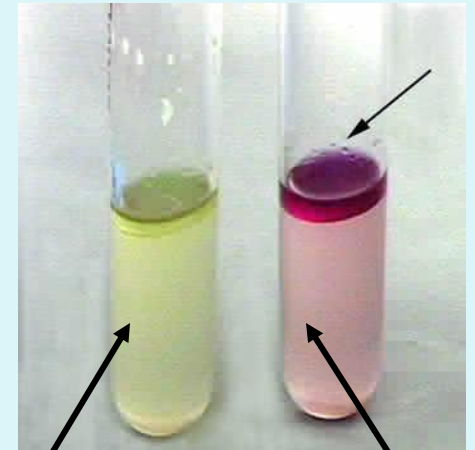




gram negative bacilli

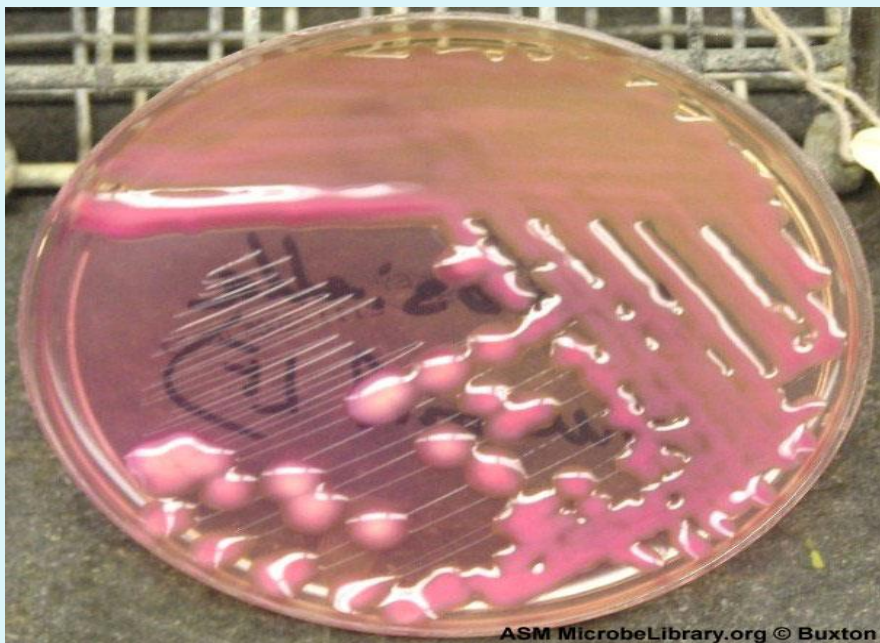


E coli



Indole Reactions
Negative **Positive**

Klebsiella pneumoniae



E coli



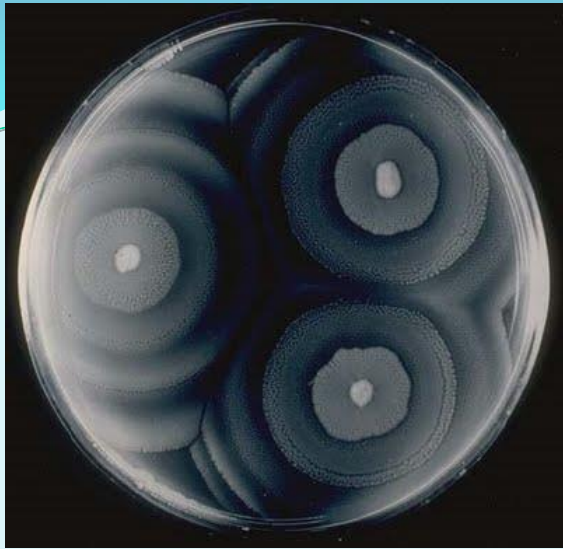
Klebsiella

Proteus growth : Swarming

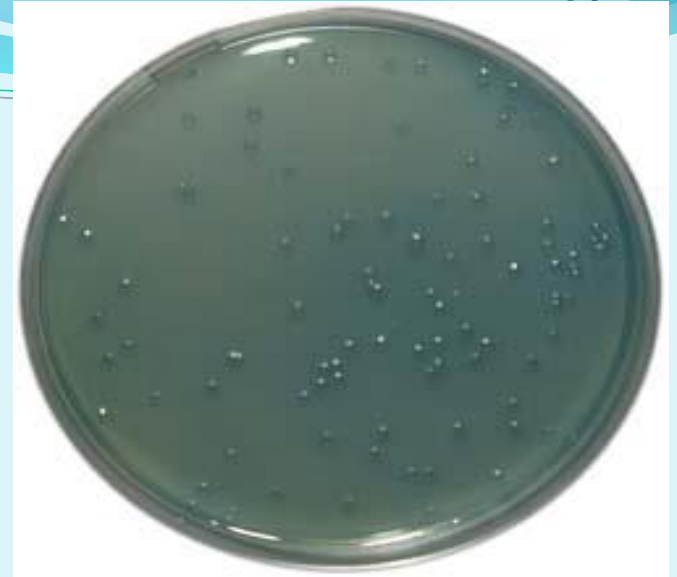


CLED [(Cystine-Lactose-Electrolyte-Deficient) - inhibits the proteus swarm

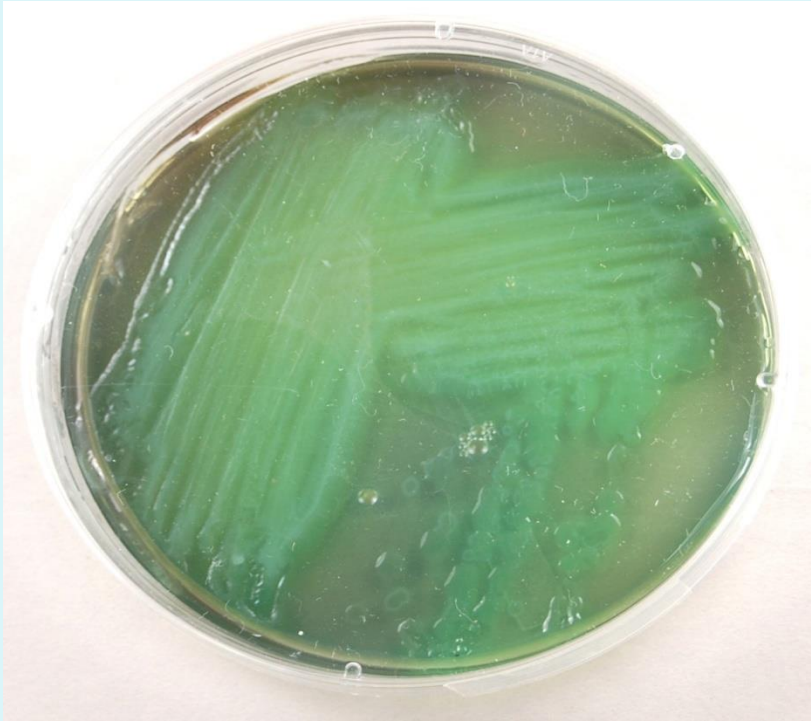
**proteus is Urease positive
Urease splits urea into ammonia; and alkalinizes the urine with production of crystals**



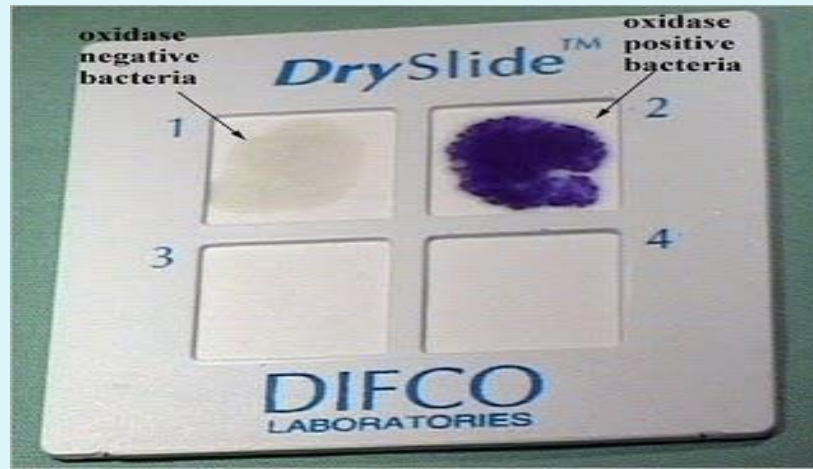
Proteus spp,



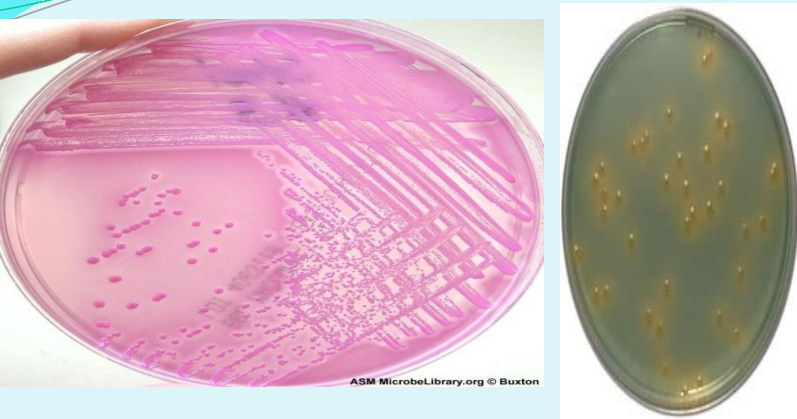
Pseudomonas aeruginosa



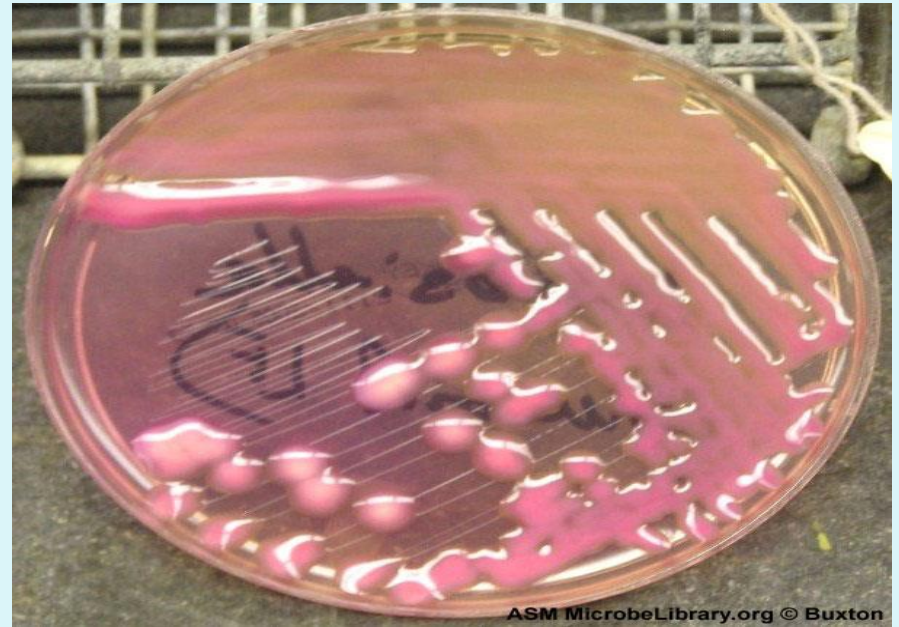
ASM MicrobeLibrary.org © Buxton



E coli



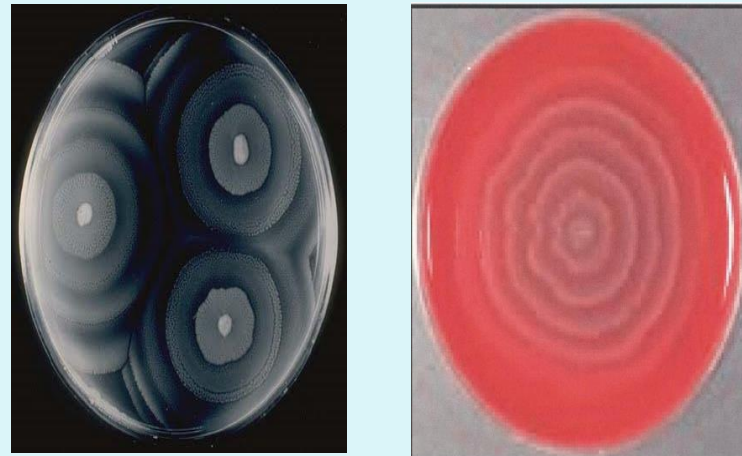
Klebsiella pneumoniae

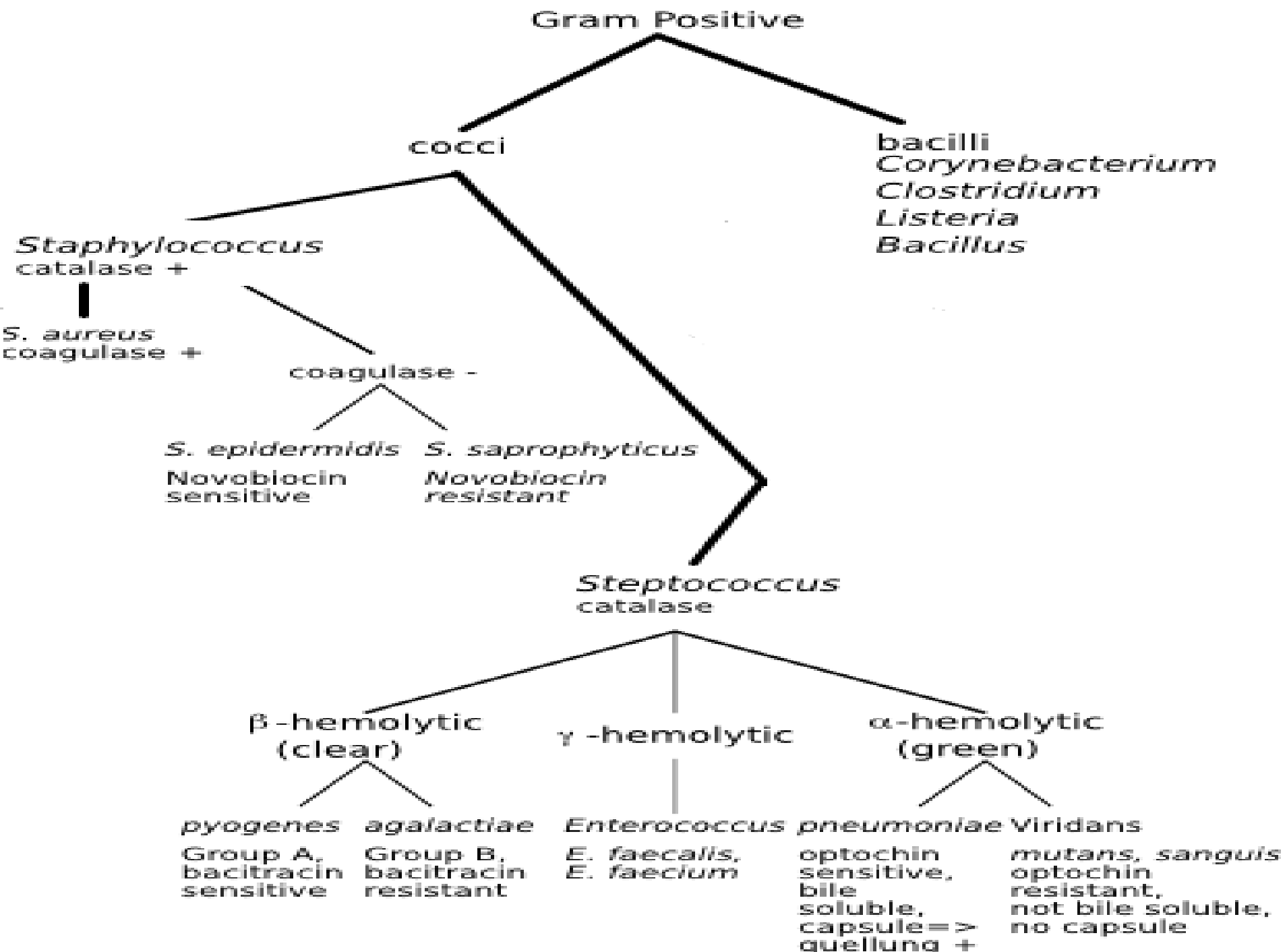


Pseudomonas aeruginosa



***Proteus* spp,**



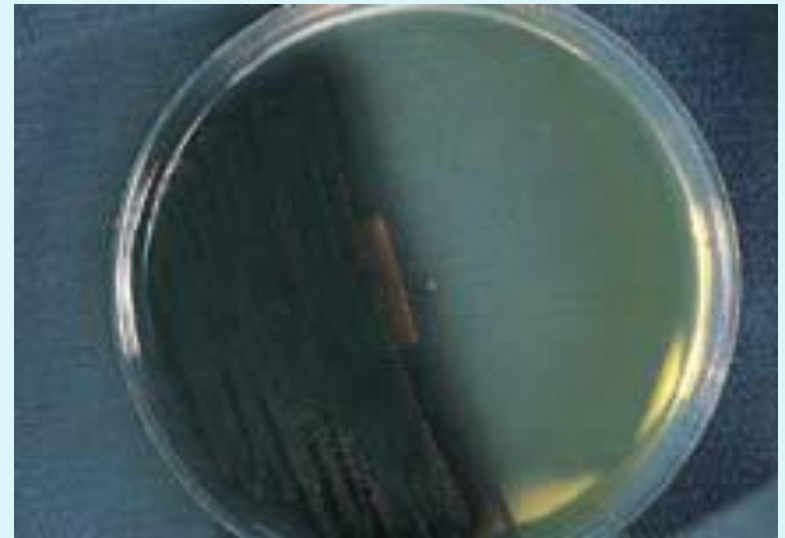


Enterococcus species



Biochemical Identification

- Bile Esculin hydrolysis



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

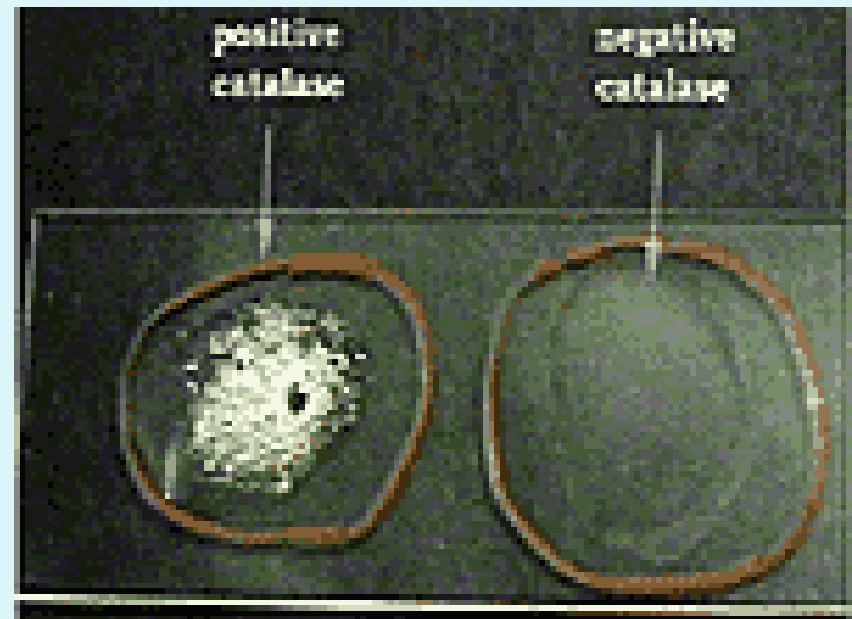
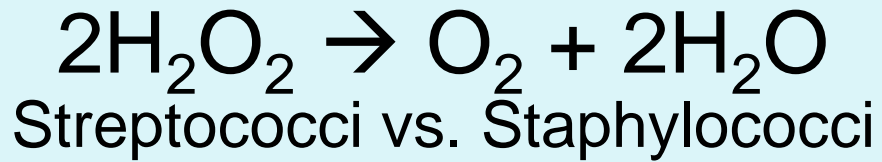


Staphylococcus spp

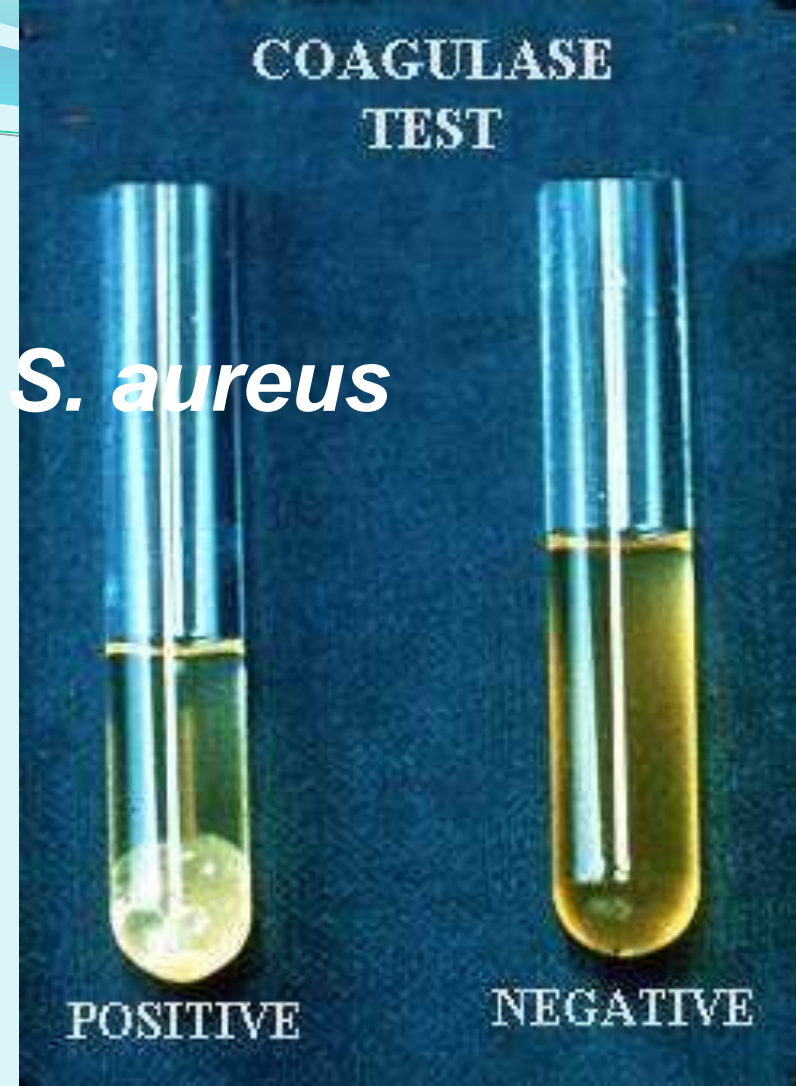
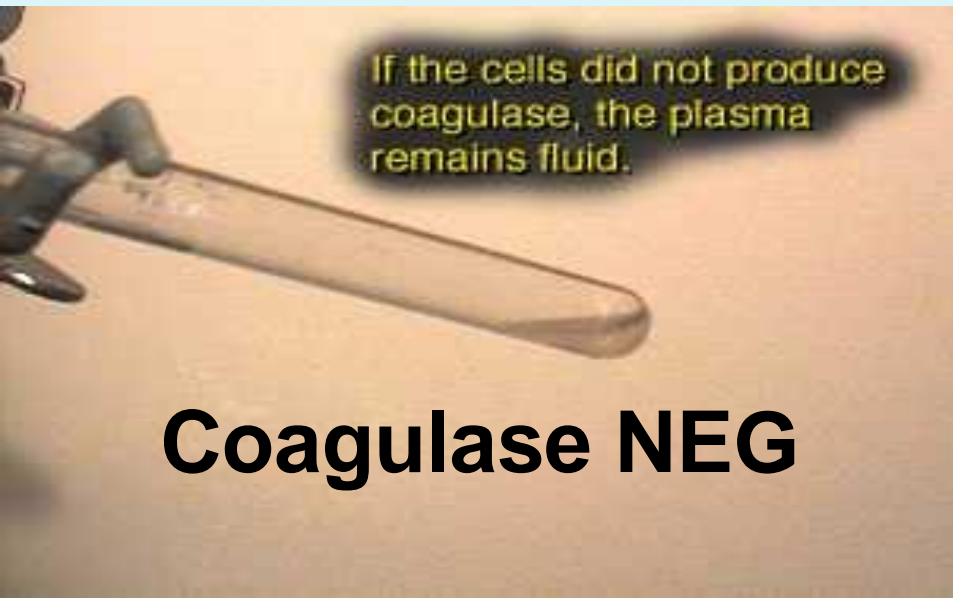
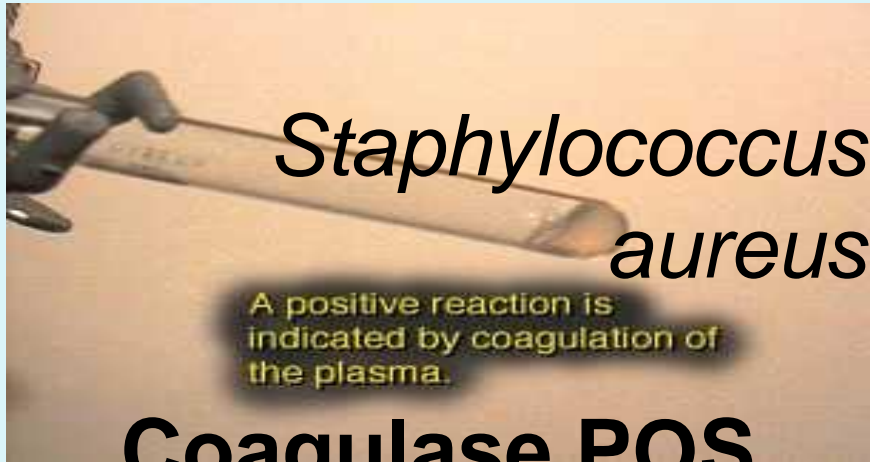


Differential Characteristics

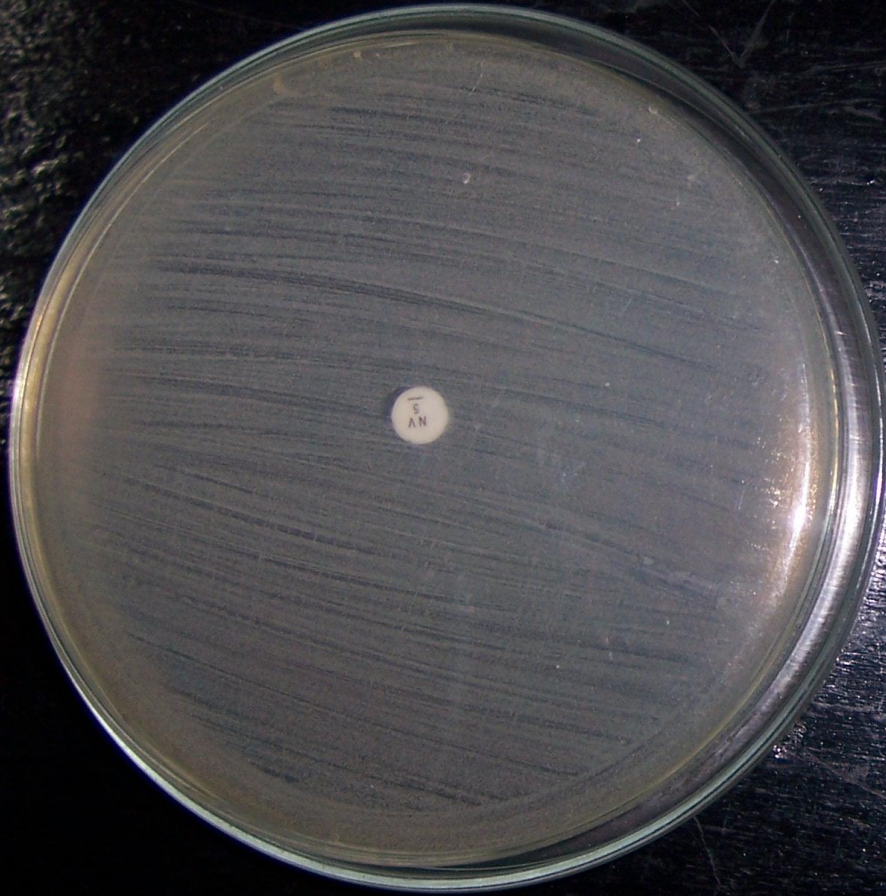
Catalase



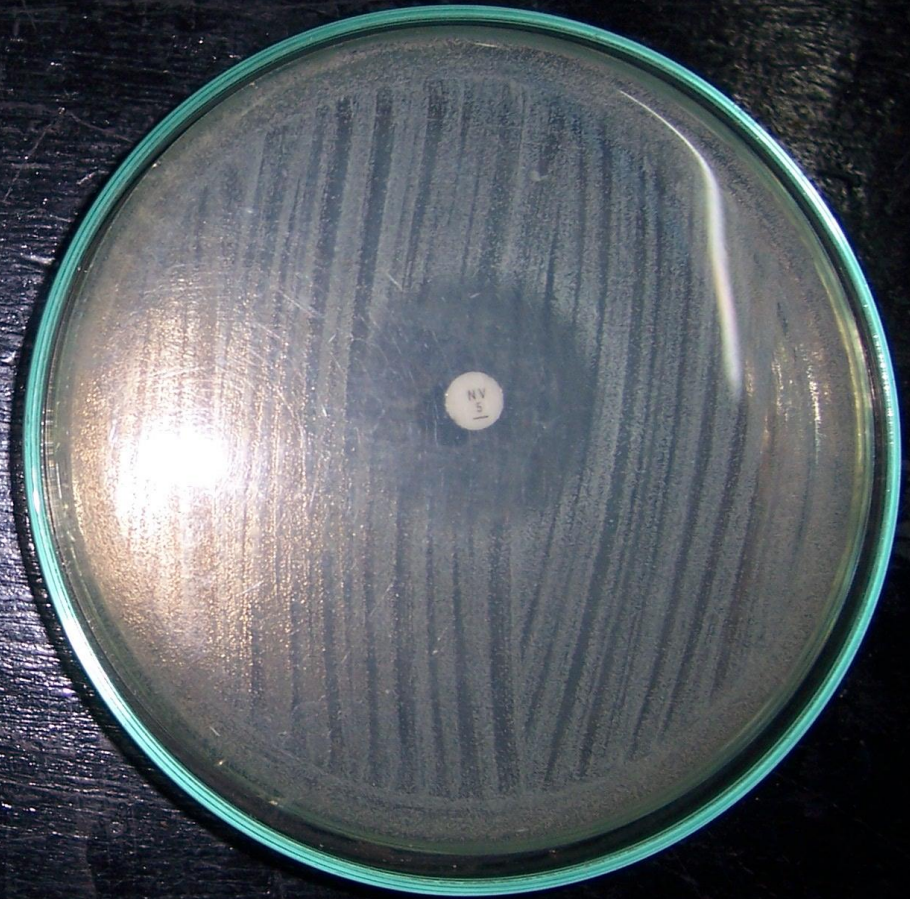
Differential Characteristics



NOVOBIOCCIN TEST



Staphylococcus saprophyticus
(resistant-Novobiocin)



Staphylococcus epidermidis
(sensitive-Novobiocin)

Antibiotic sensitivity test: Agar diffusion method

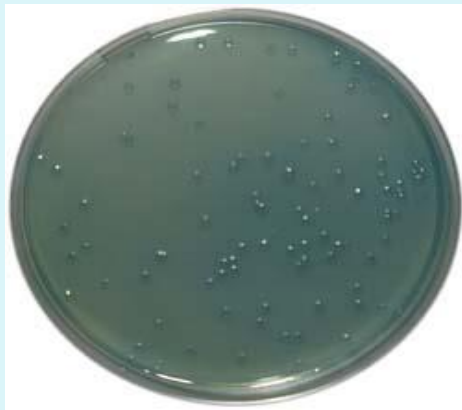


Case

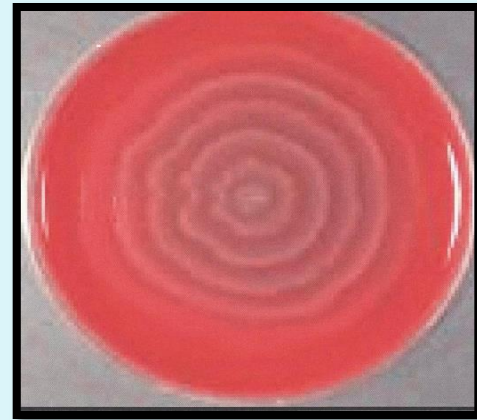
These Blood agar and CLED agar plates were inoculated with MSU from a 45 years old man suspected of having bladder stone and complaining of burning micturation.

Urine examination showed :

Moderate number of WBC and a PH of 8



CLED

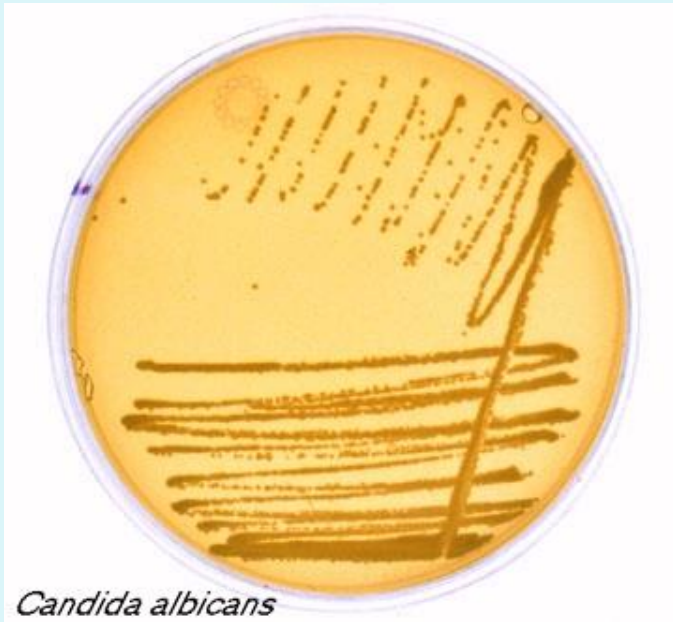


Blood agar

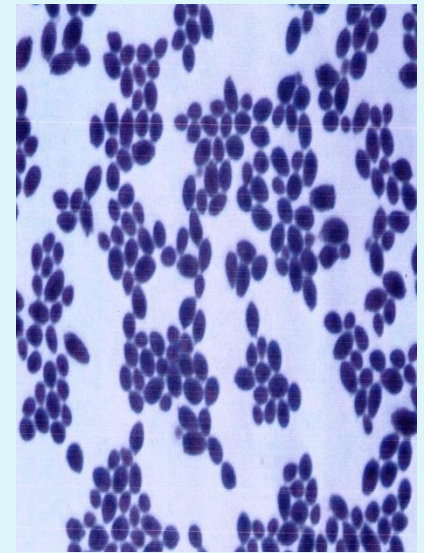
- A) What is the likely this pathogen?**
- B) How would you confirm the identity of this pathogen?**
- C) What is the role of this organism in forming stones?**

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**