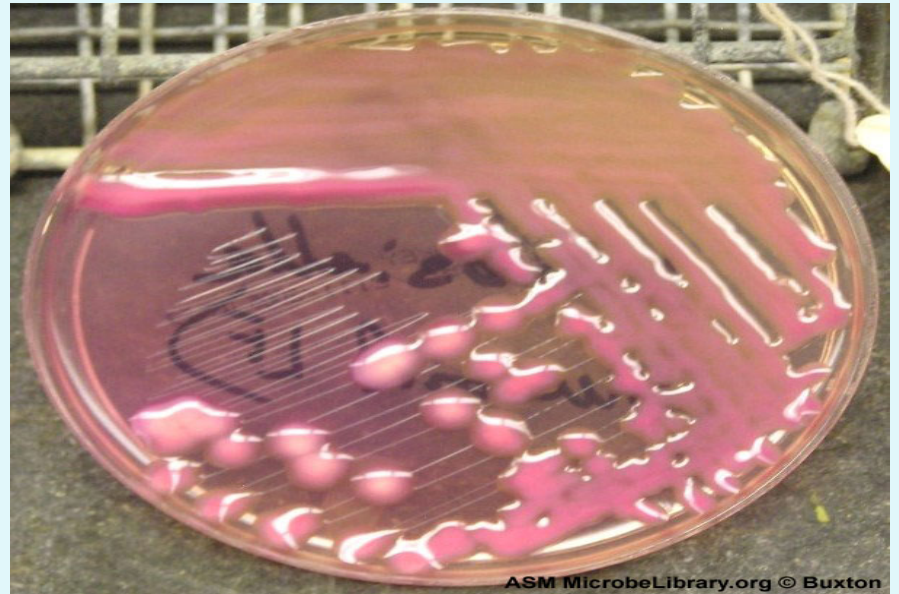
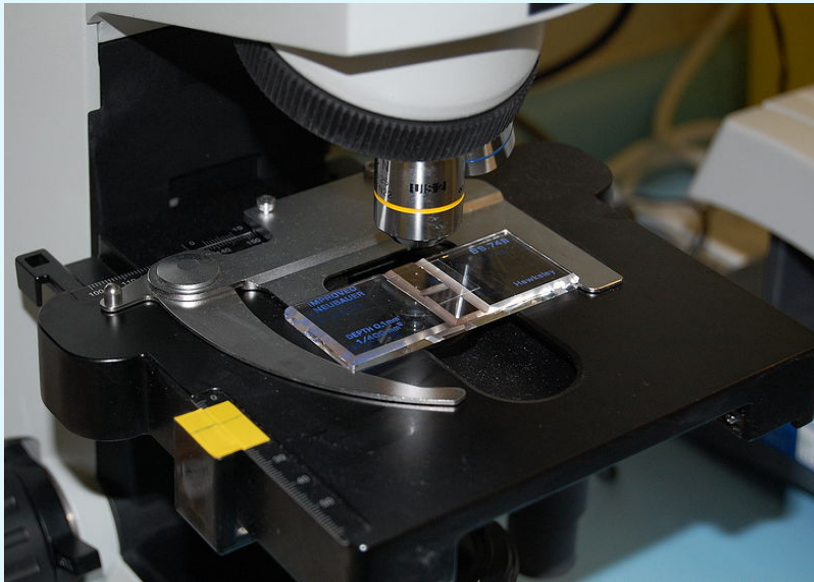


Practical of Urinary Tract Infection



ASM MicrobeLibrary.org © Buxton

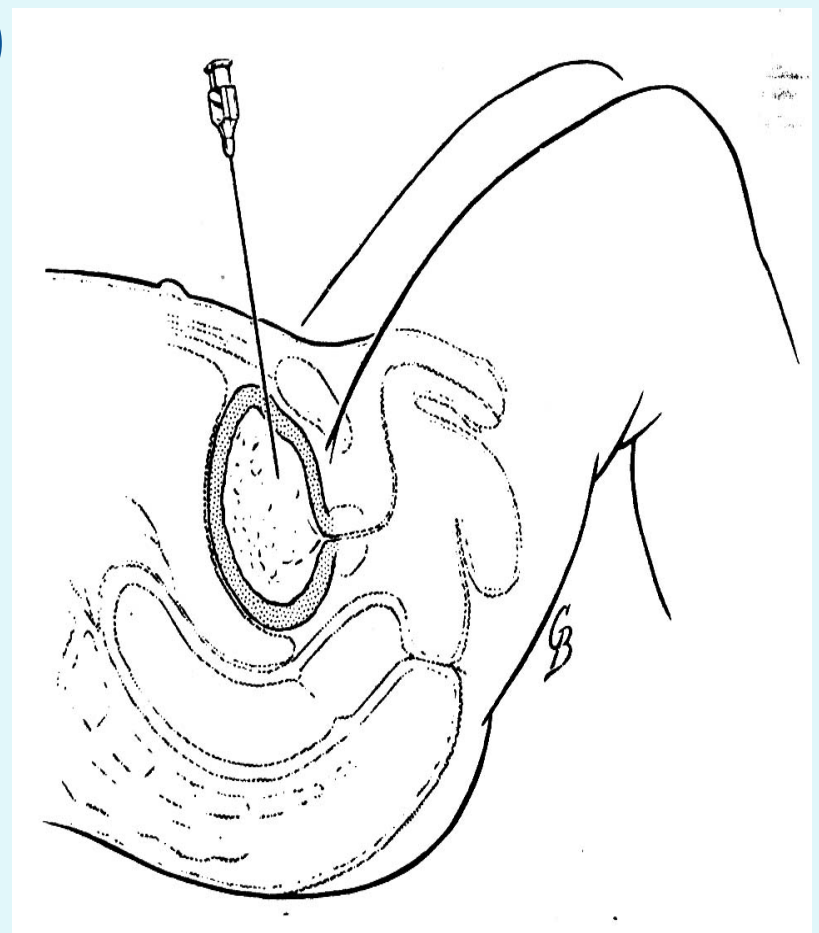
Dr. Malak El-Hazmi
Associate Professor
Department of Microbiology

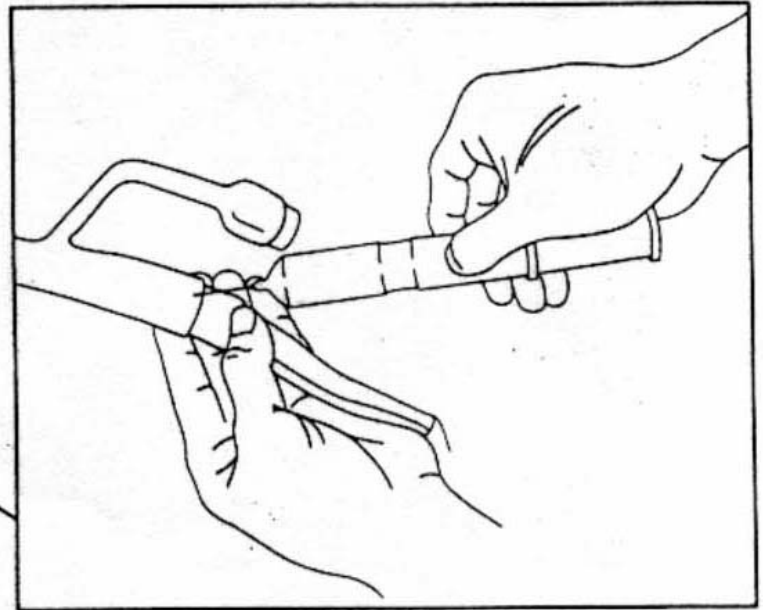
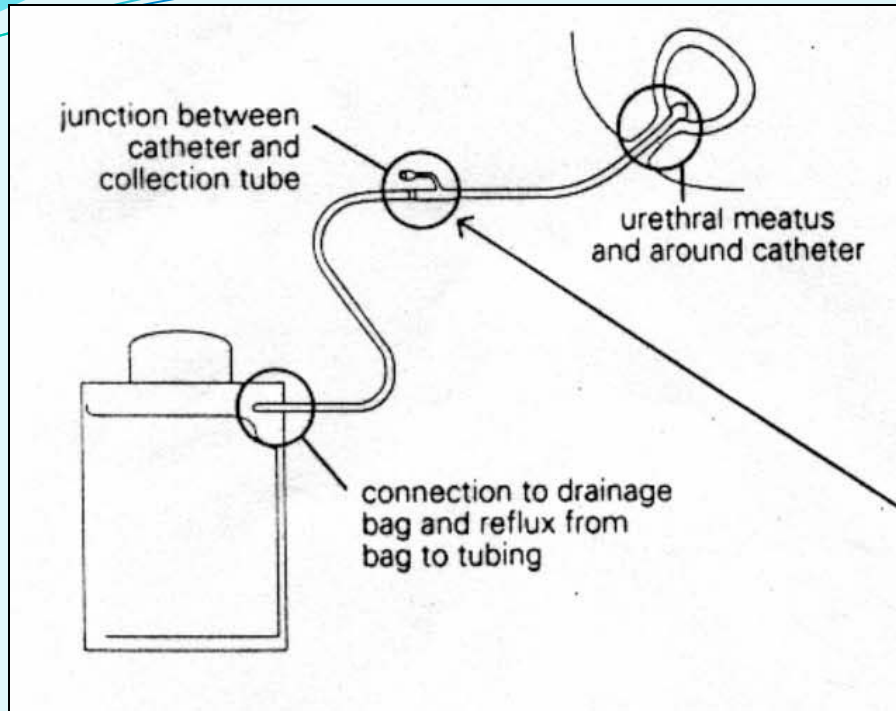
Important aspects of Microbiologic Examination of UTI:

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

Type of Specimens

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





The urinary catheter

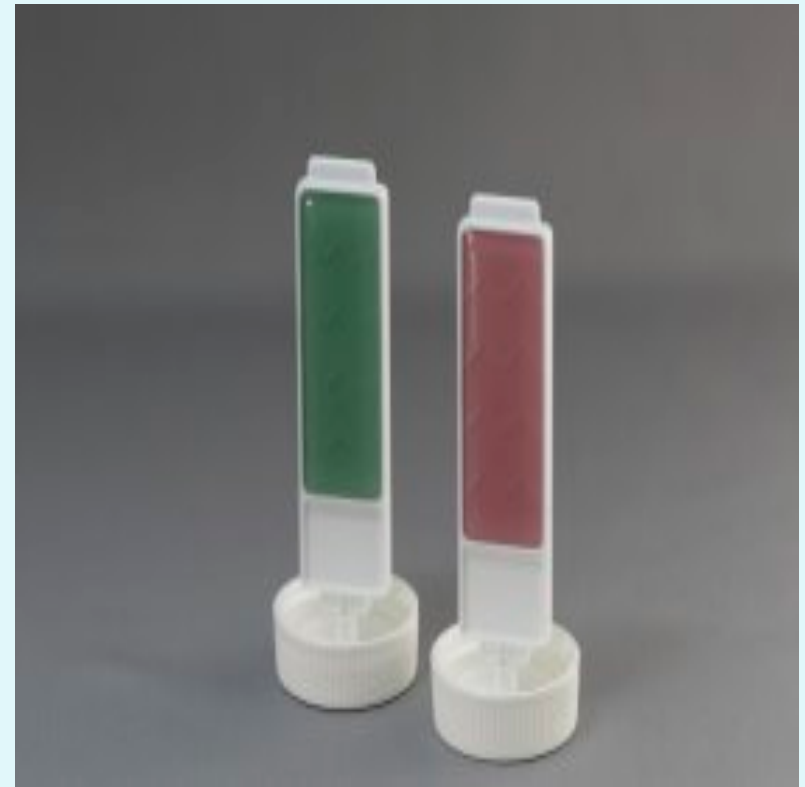
Urine specimens for laboratory investigations can be collected from catheterized patients as shown (left). The second port is for putting fluids into the bladder (right).

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

TRANSPORT MEDIA



**Sterile
Urine container**

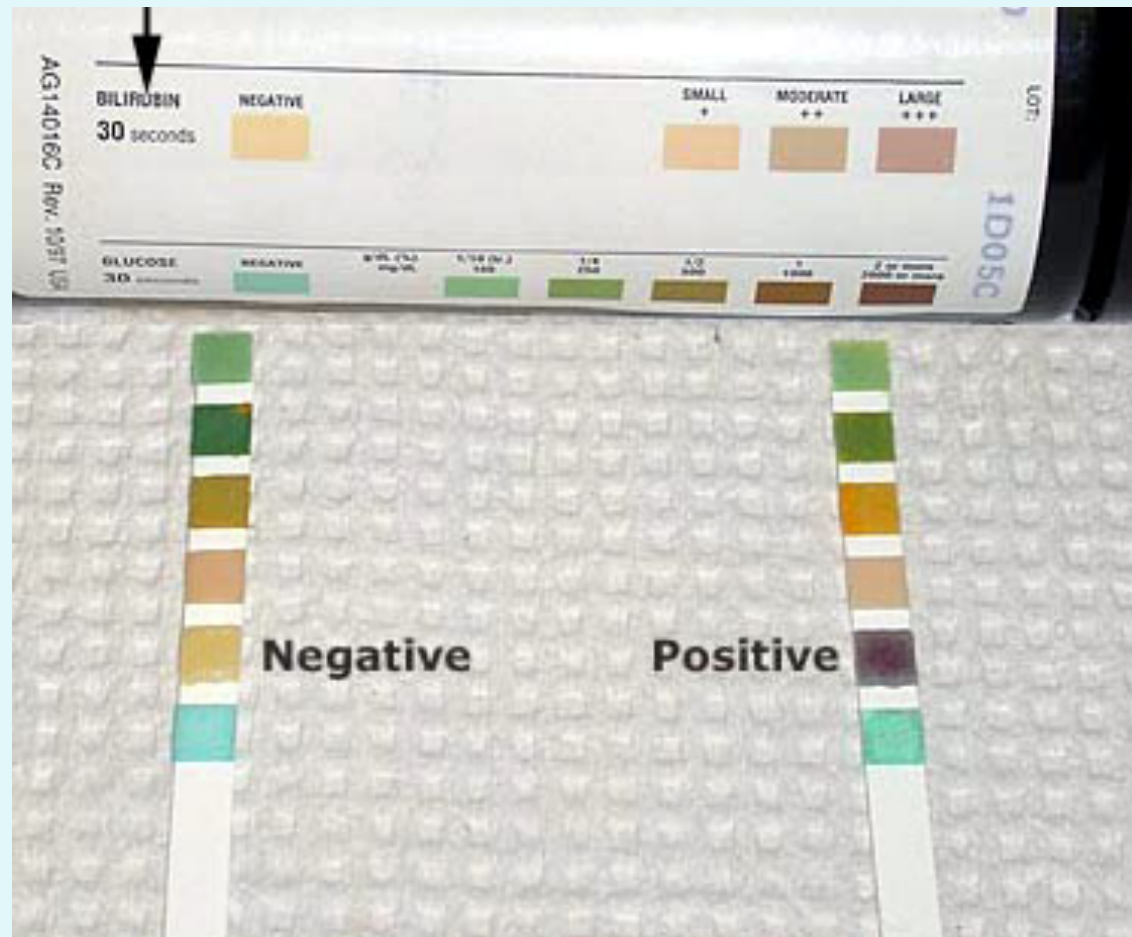


dipslides

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

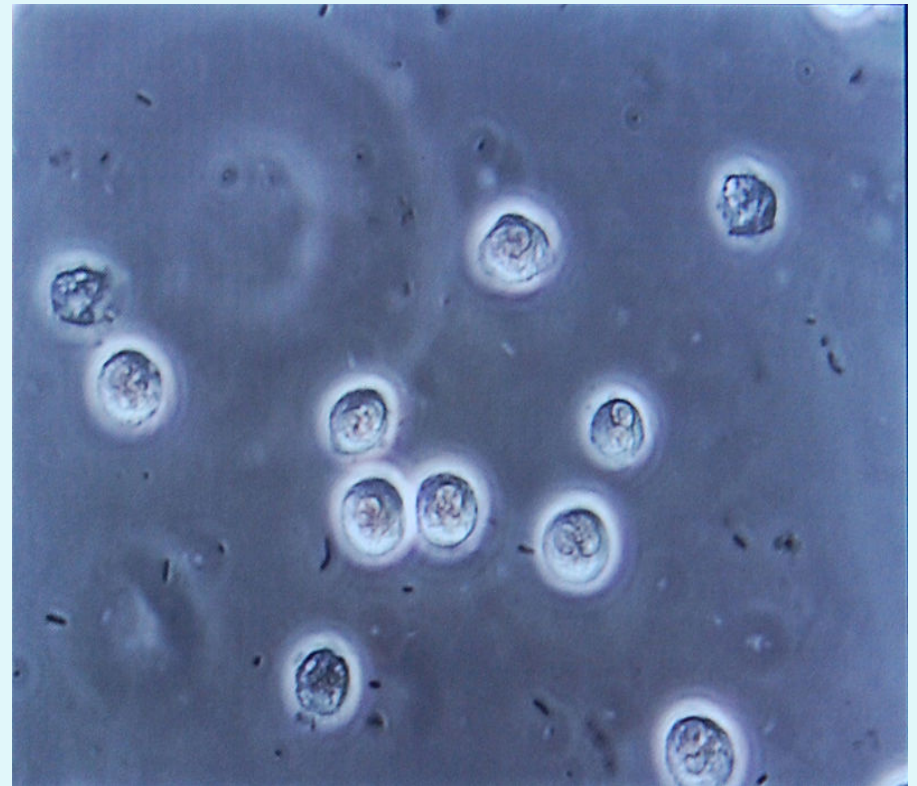
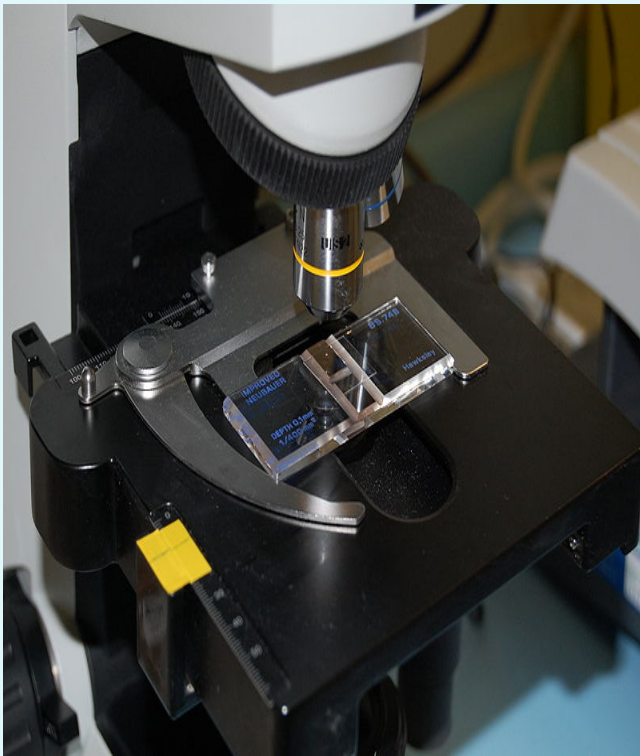
Urine analysis;

1- Dip stick (leukocyte esterase ,nitrate test)

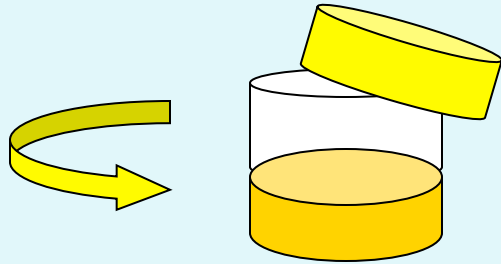


Urine analysis;

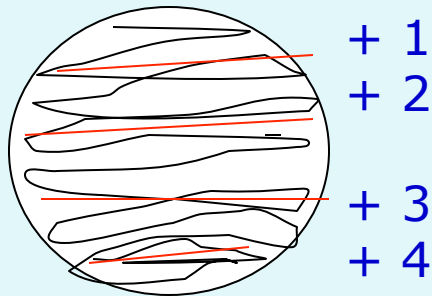
- 1- Dip stick (leukocyte esterase ,nitrate test)
- 2-microscopic ex; cell-counting chamber



Laboratory examination of urine



Quantitative (Colony counts)



a urine sample is streaked on surface of Blood Agar plate and CLED agar / Mc Conkey 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

(1mm internal diameter)

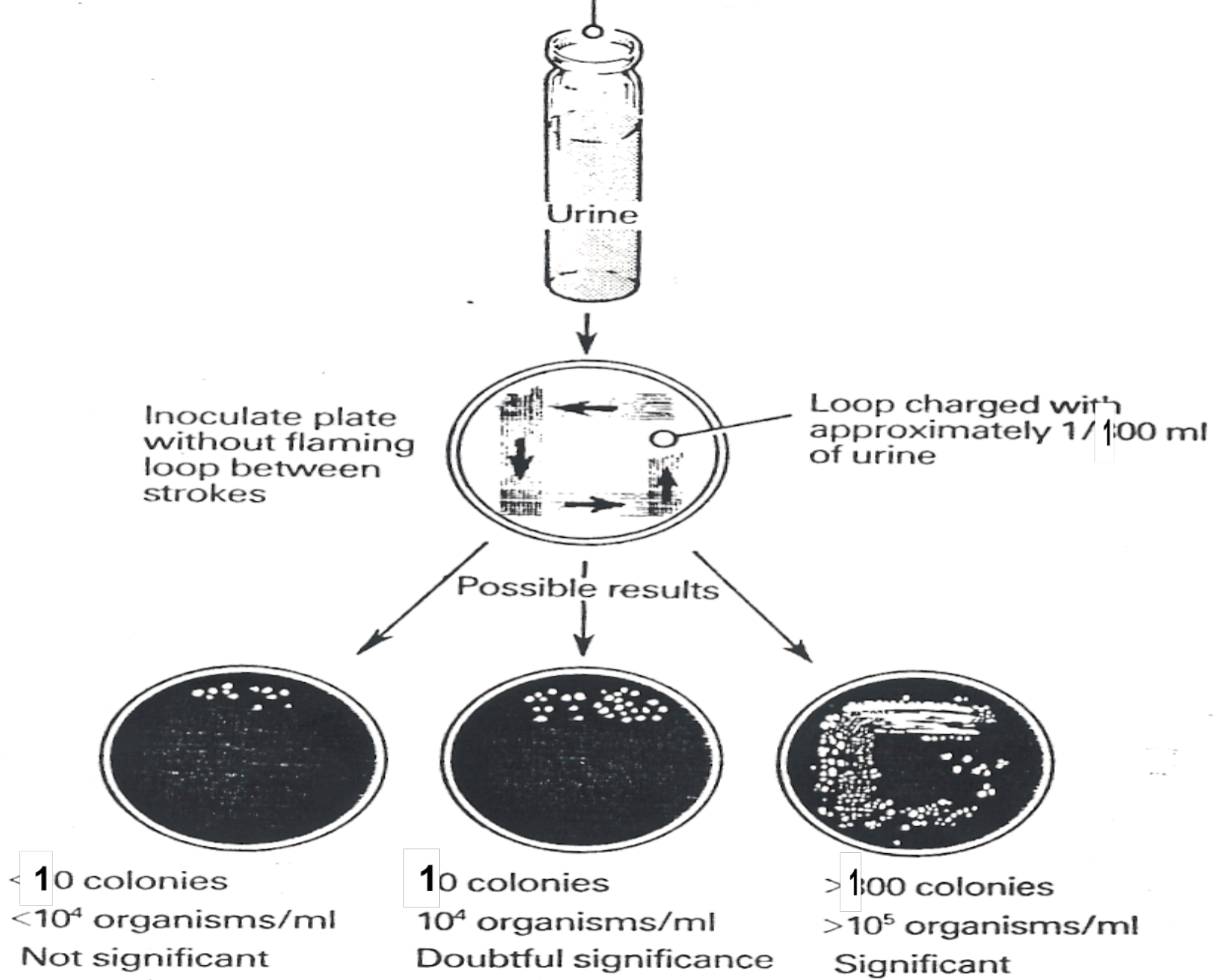


Diagram illustrating the semi-quantitative culture of urine specimens.

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



a differential medium

CLED agar

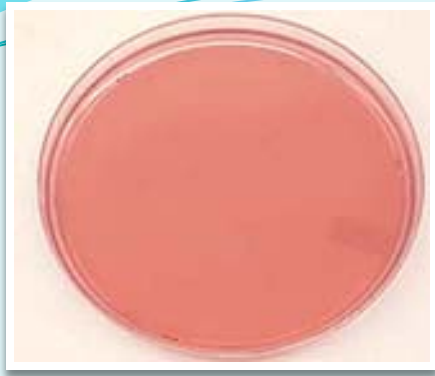


Selective medium

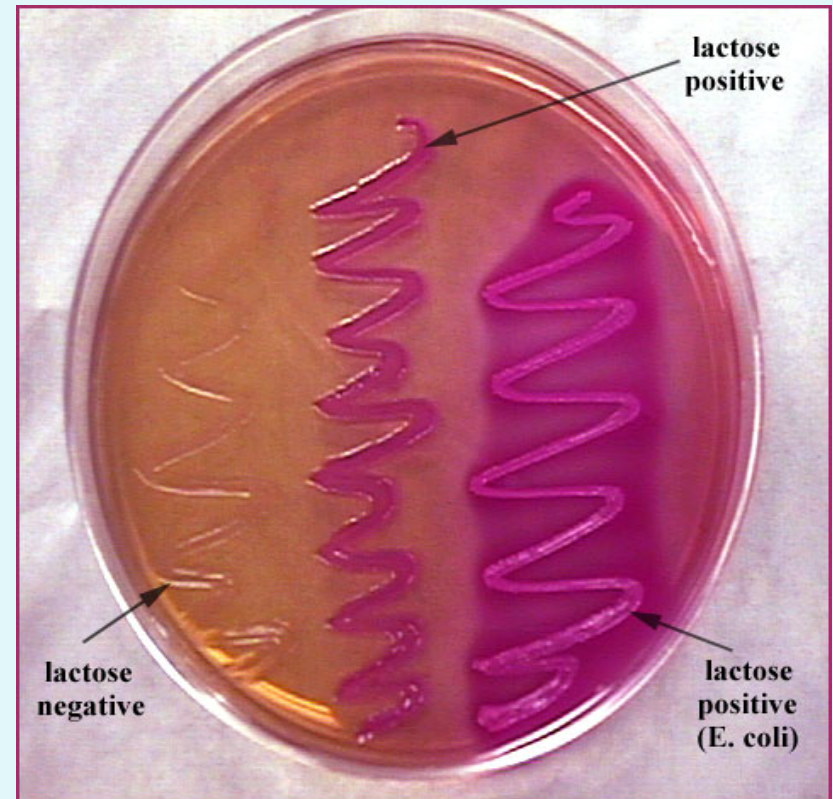
Blood agar

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





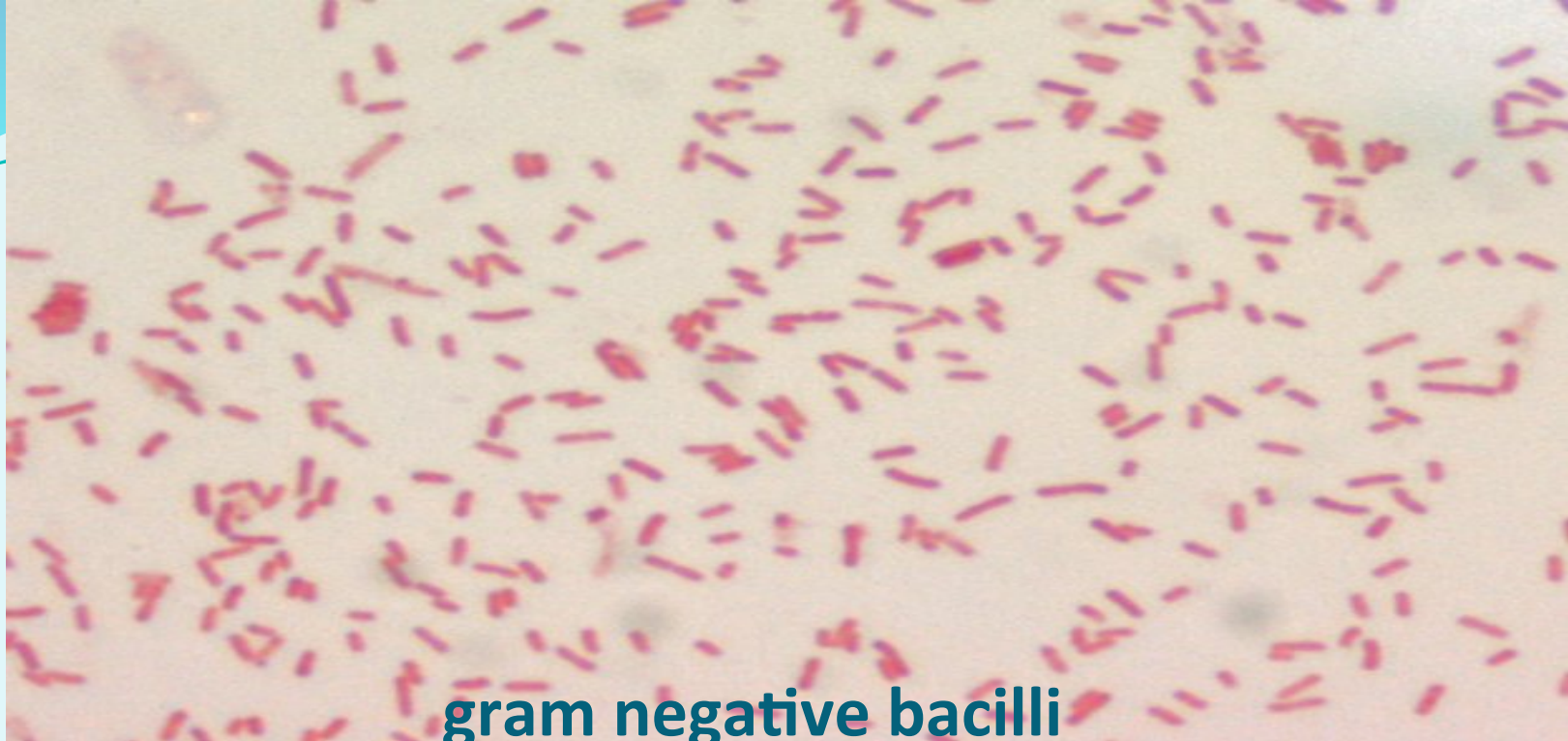
MacConkey's agar showing both lactose and non-lactose fermenting colonies. **Lactose** fermenting colonies are **pink** whereas **non-lactose** fermenting ones are **colourless** or appear same as the medium.]



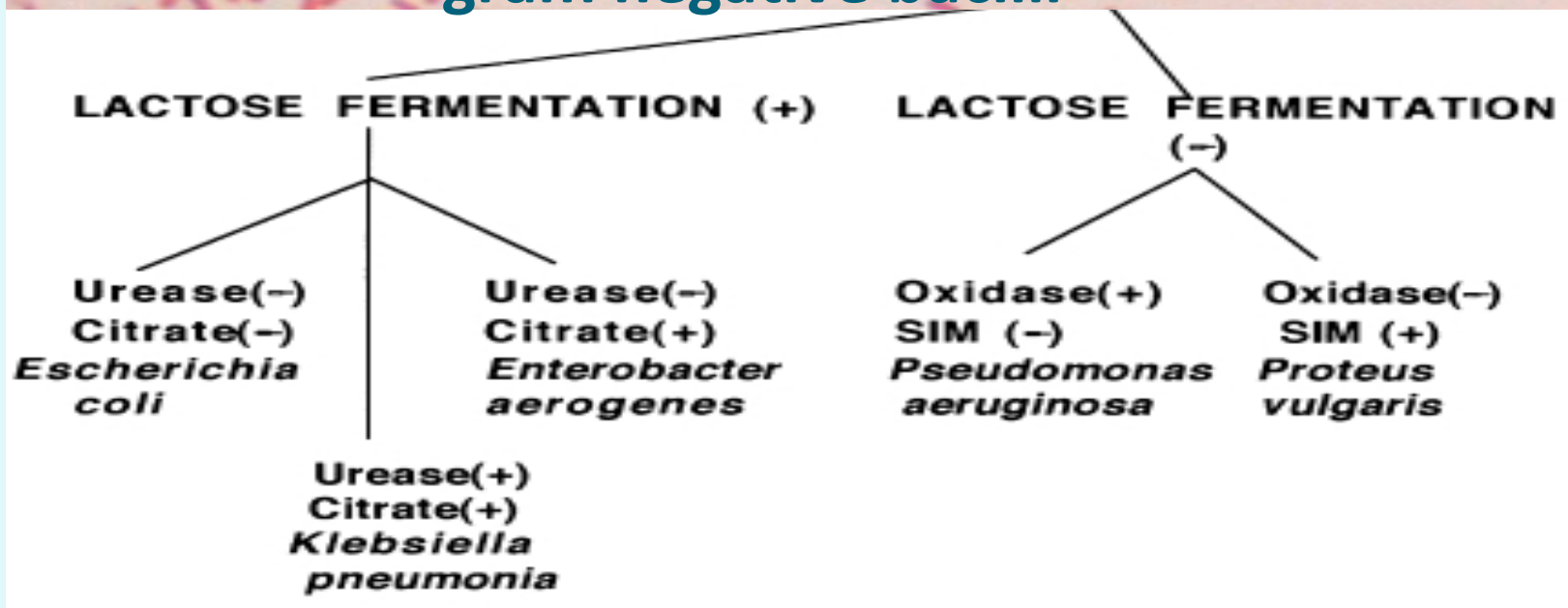
CLED agar

Selective culture medium for detection and isolation
Of *Escherichia coli* and *coliform* bacteria in urine

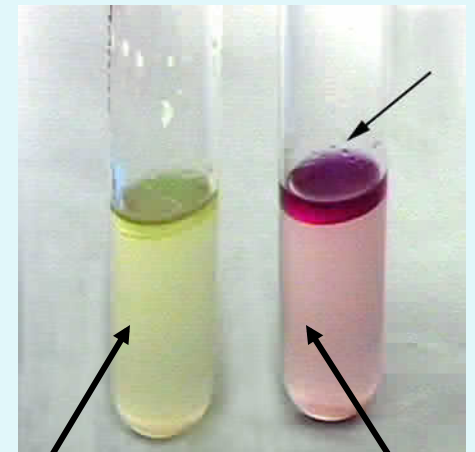




gram negative bacilli

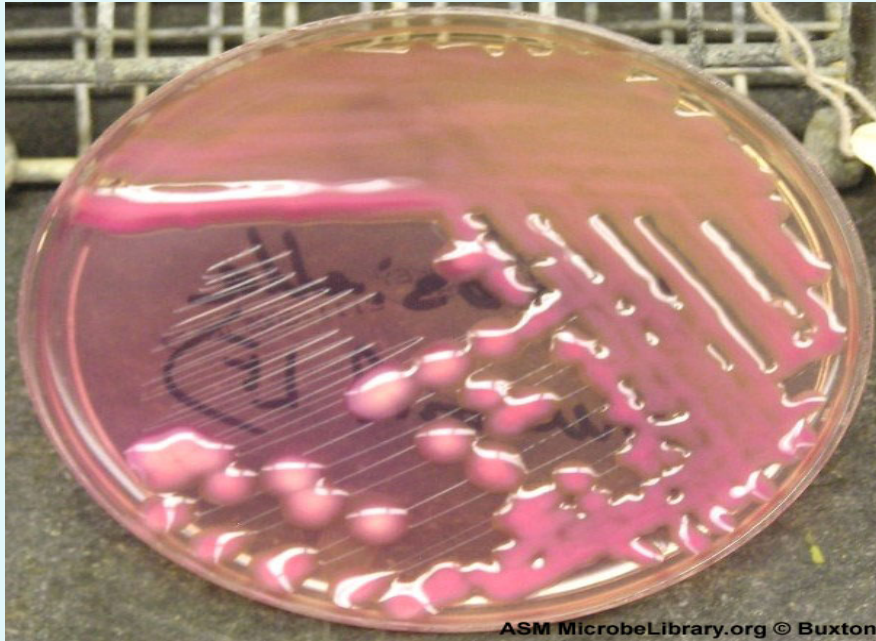


E coli

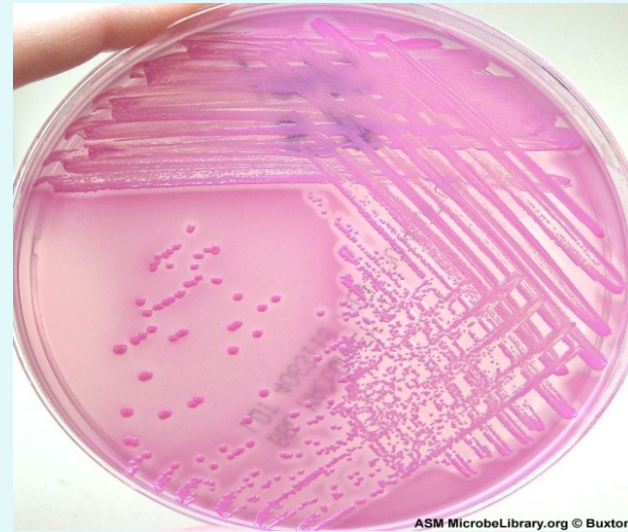


Indole Reactions
Negative **Positive**

Klebsiella pneumoniae



E coli



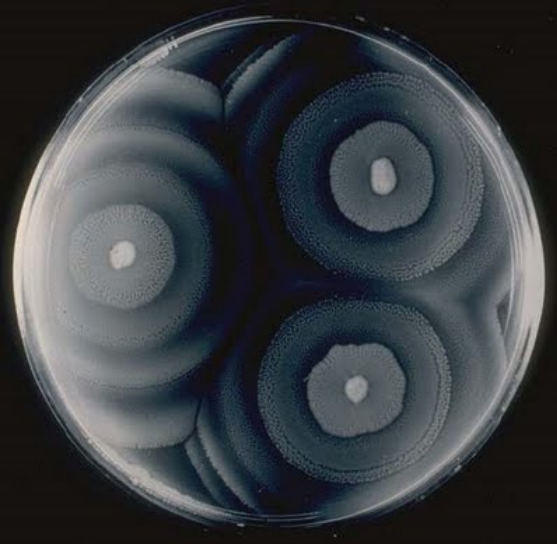
Klebsiella

Proteus growth : Swarming

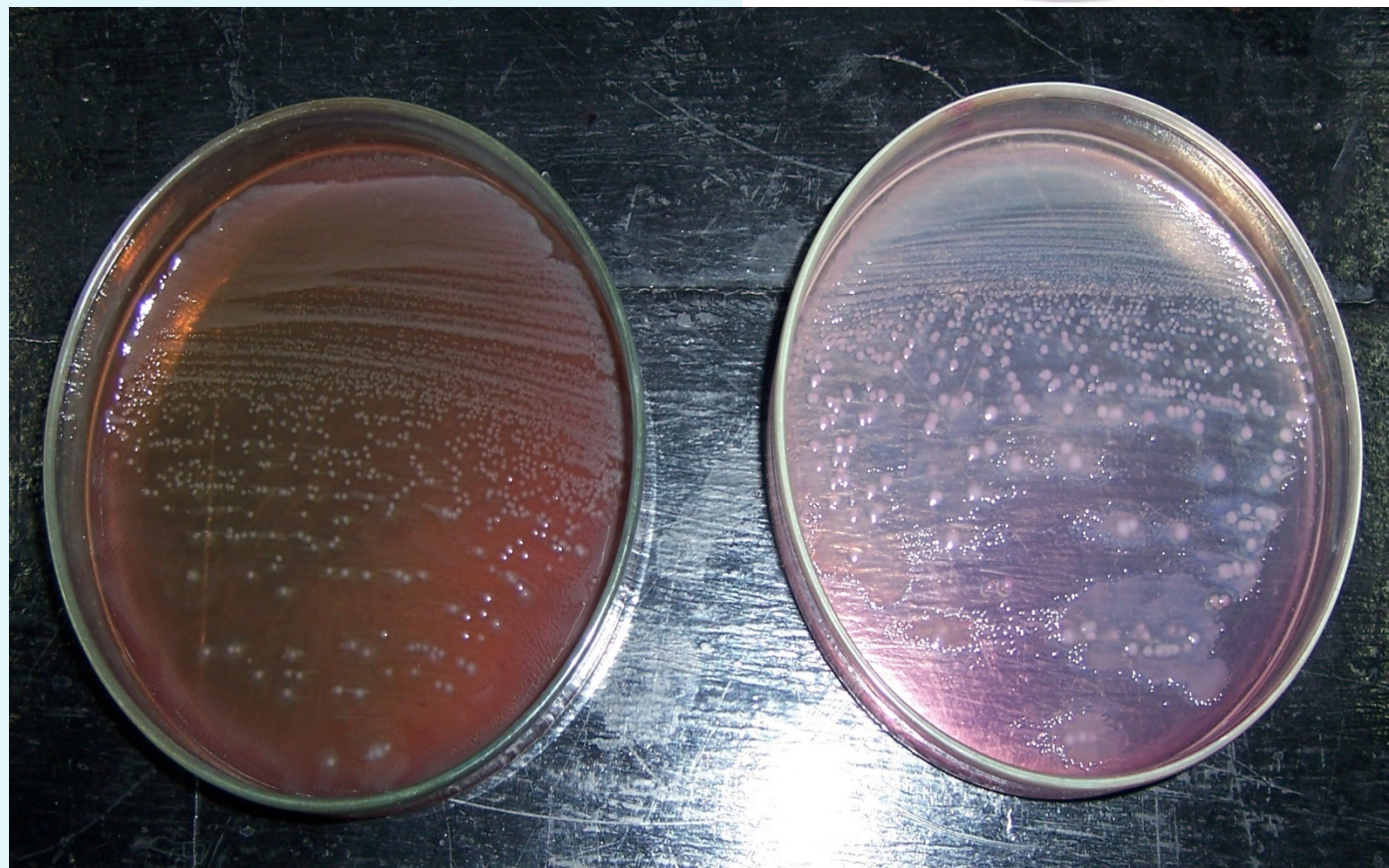


**CLED [(Cystine-Lactose-
Electrolyte-Deficient) -
inhibits the proteus swarm**

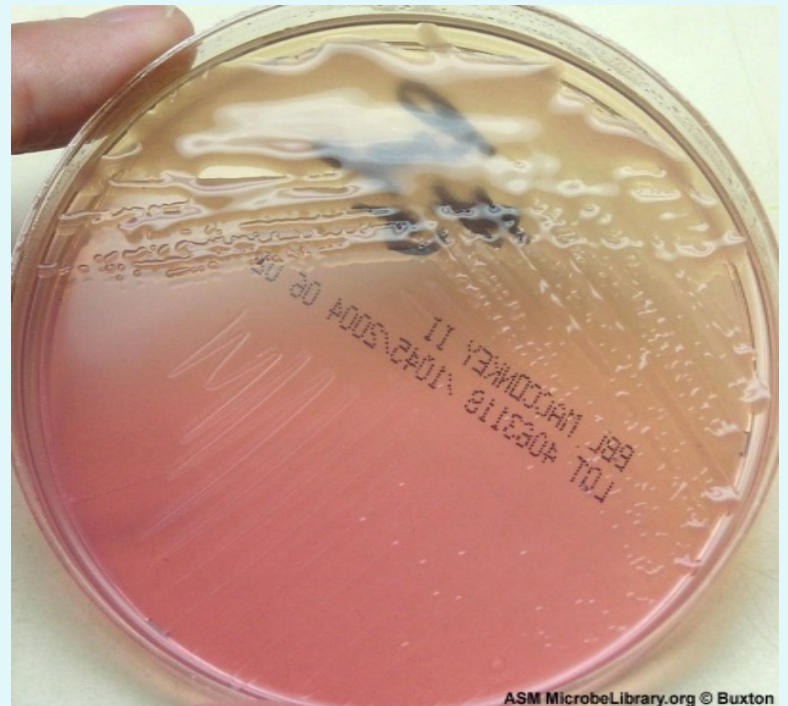
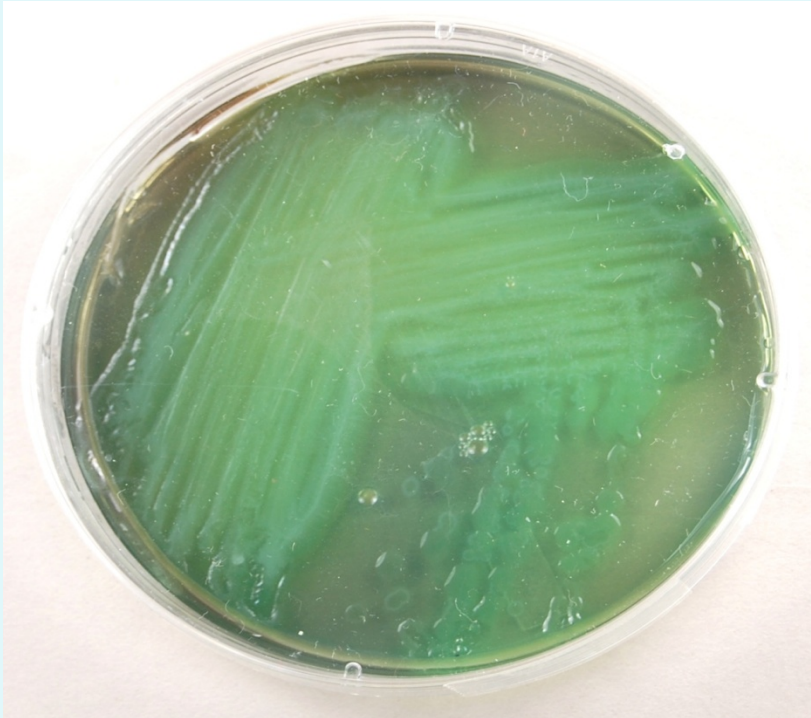
**proteus is Urease positive
Urease splits urea into
ammonia; and alkalinizes
the urine with production of
crystals**



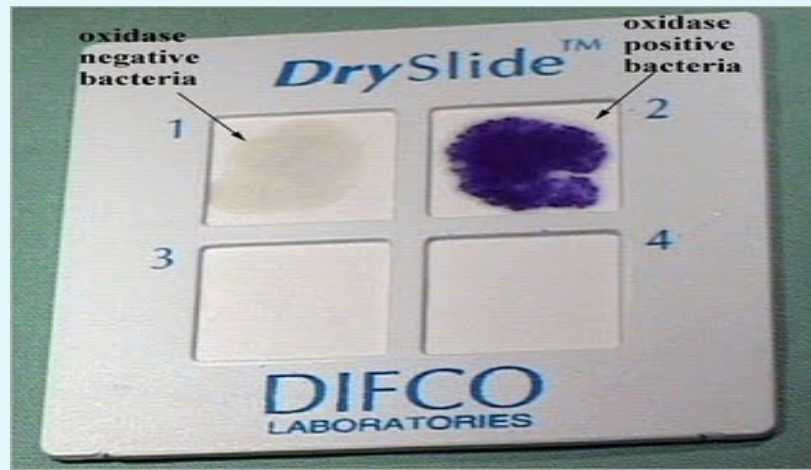
Proteus spp.



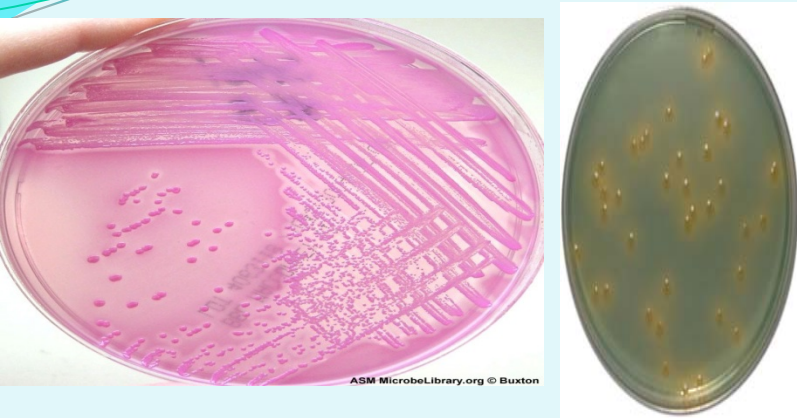
Pseudomonas aeruginosa



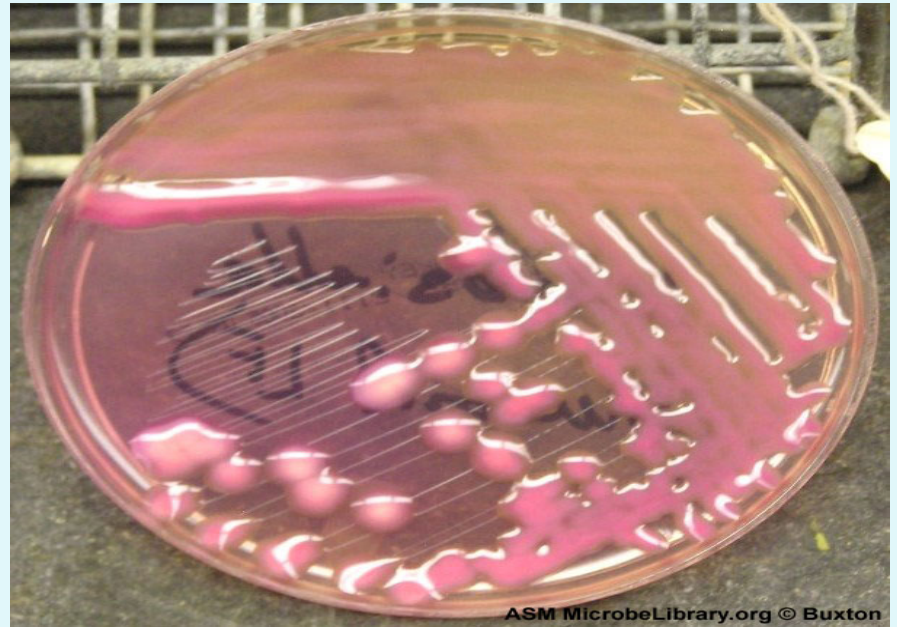
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E coli



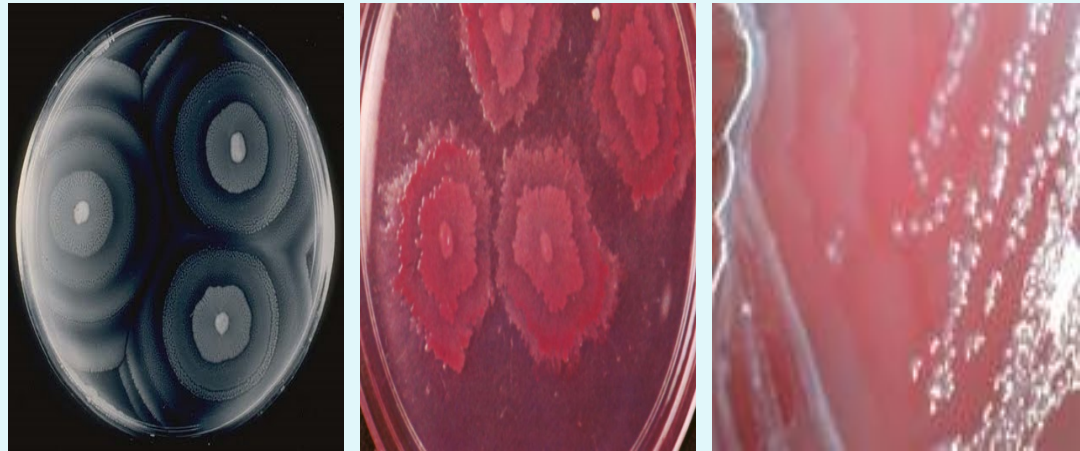
Klebsiella pneumoniae



Pseudomonas aeruginosa



Proteus spp,

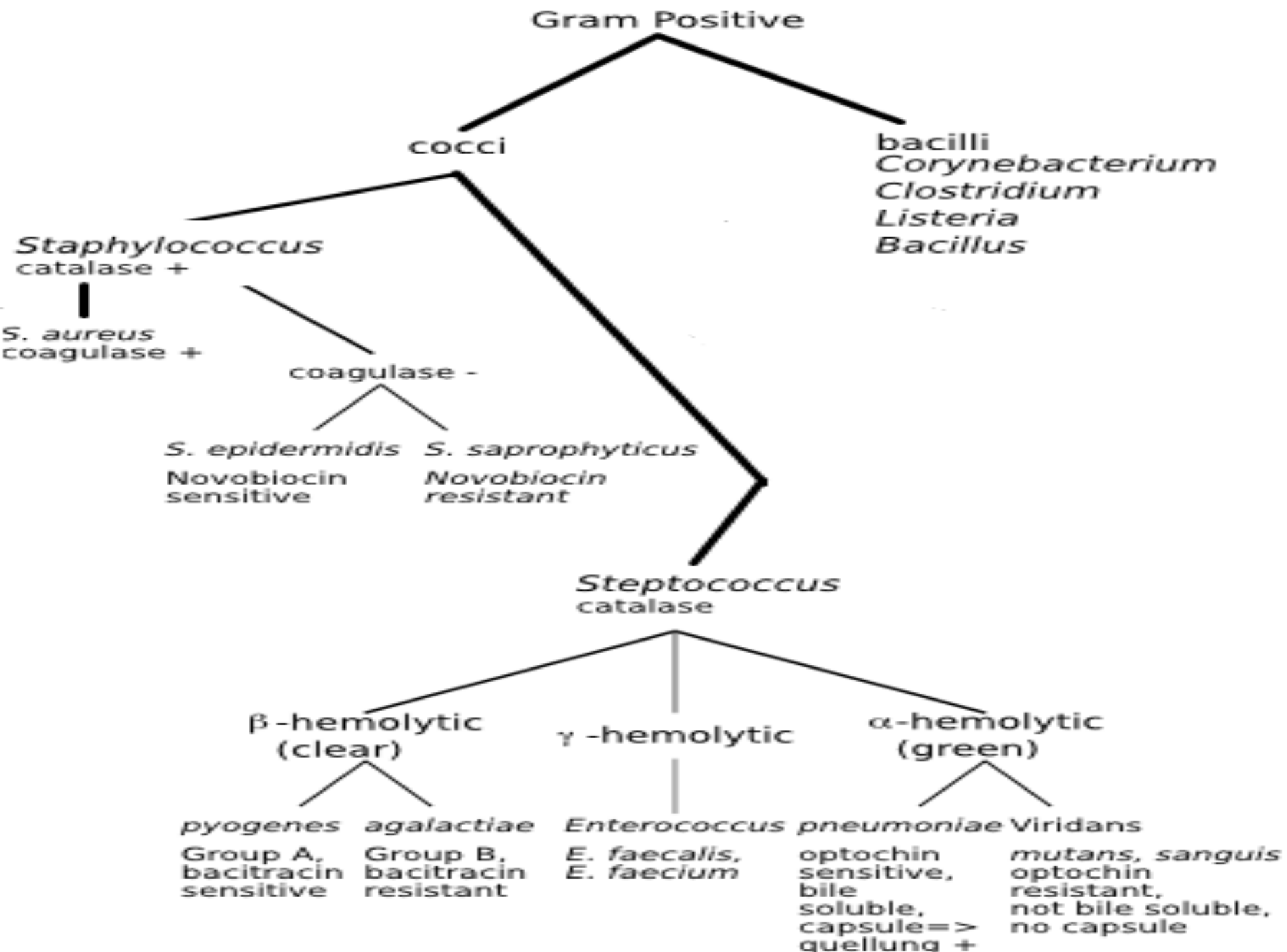




Three API 20E strips :

- Immediately after inoculation
- After 24 hours incubation
- That in (b) after addition of reagents to certain wells.

The organisms here is *Escherichia coli*. Here the first carbohydrate well (glucose) is also used for the nitrate reduction test



Enterococcus species



Biochemical Identification

- **Bile Esculin hydrolysis**



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



Staphylococcus spp

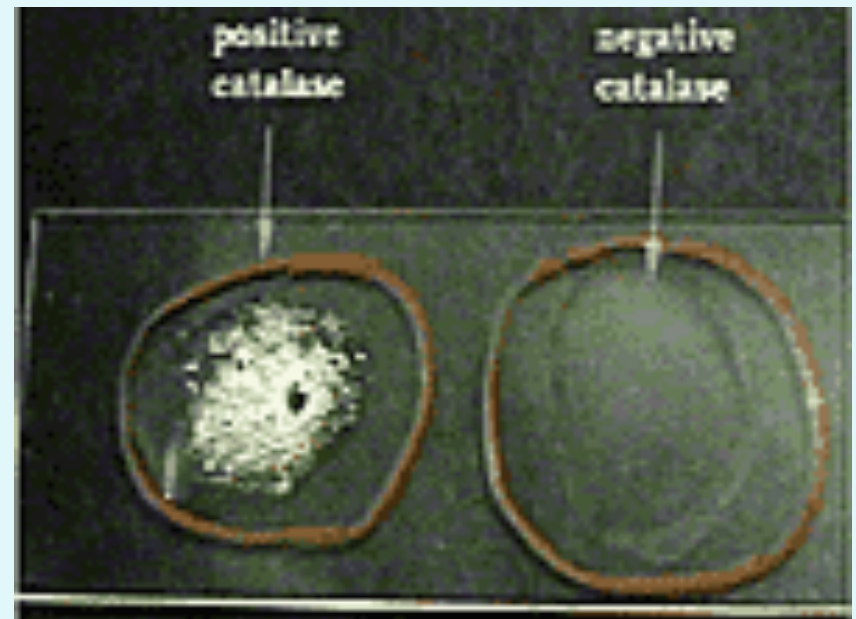


Differential Characteristics

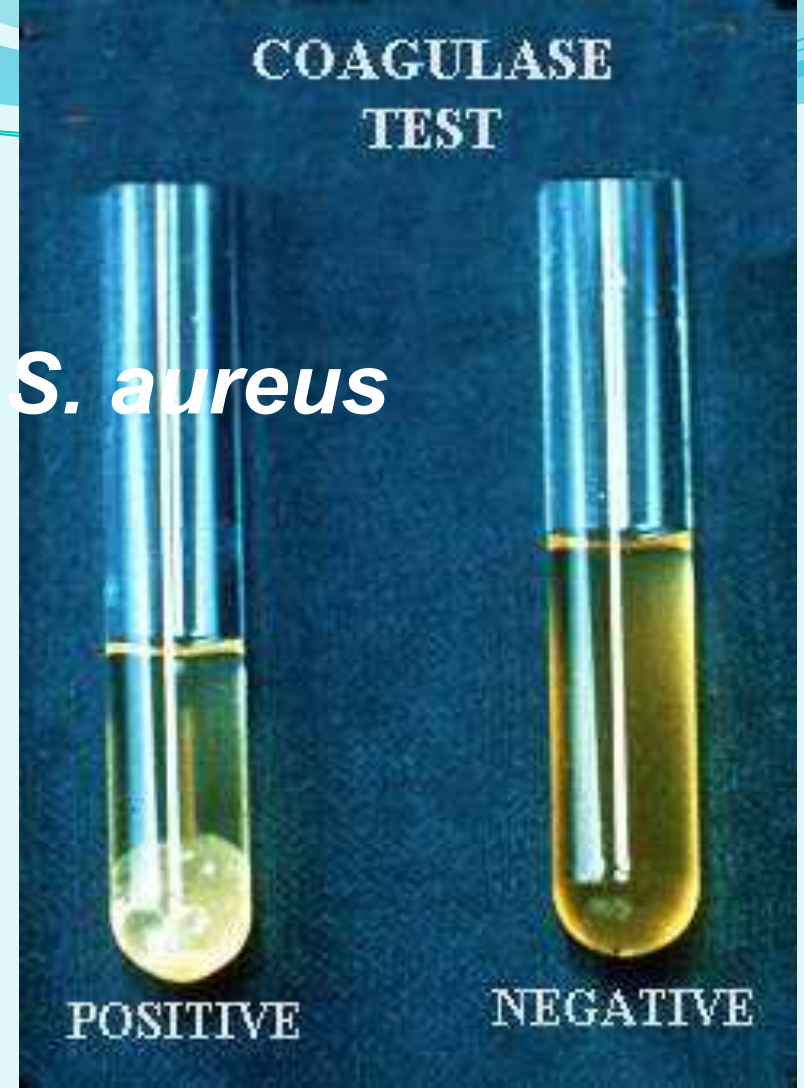
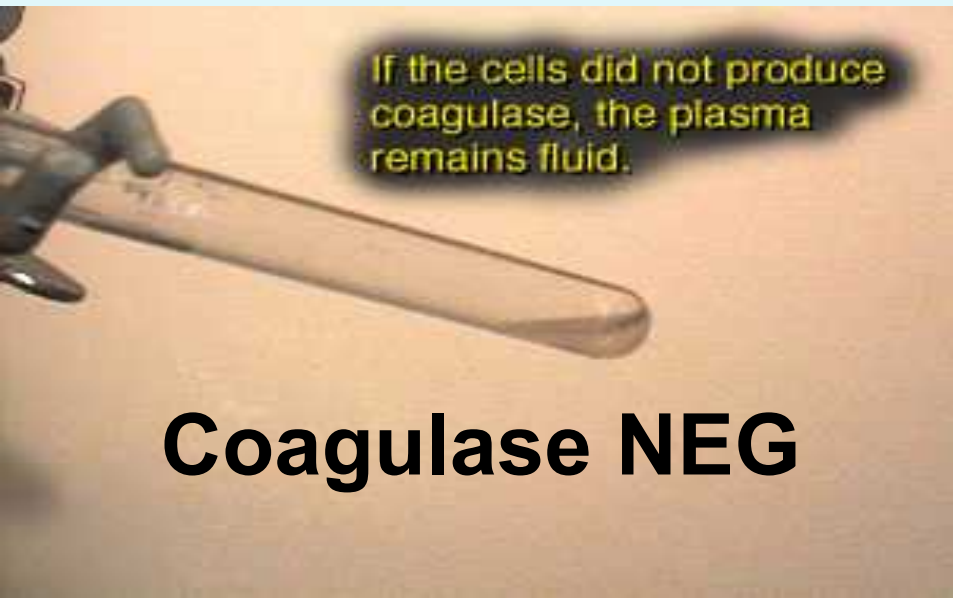
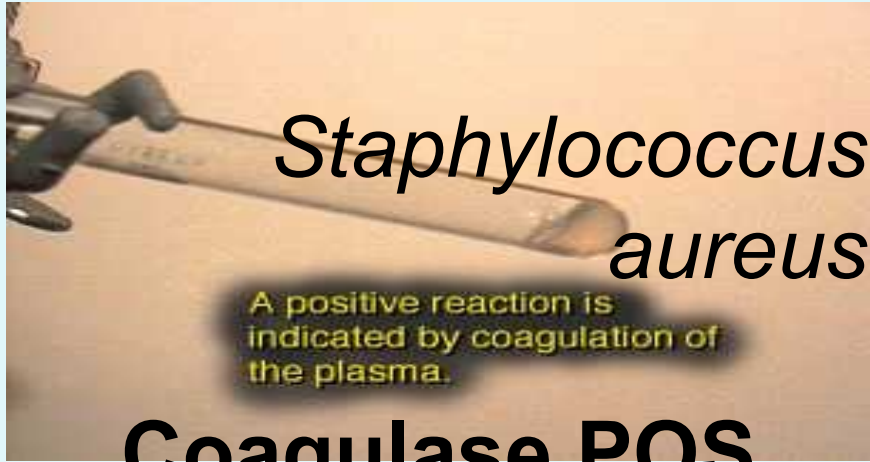
Catalase



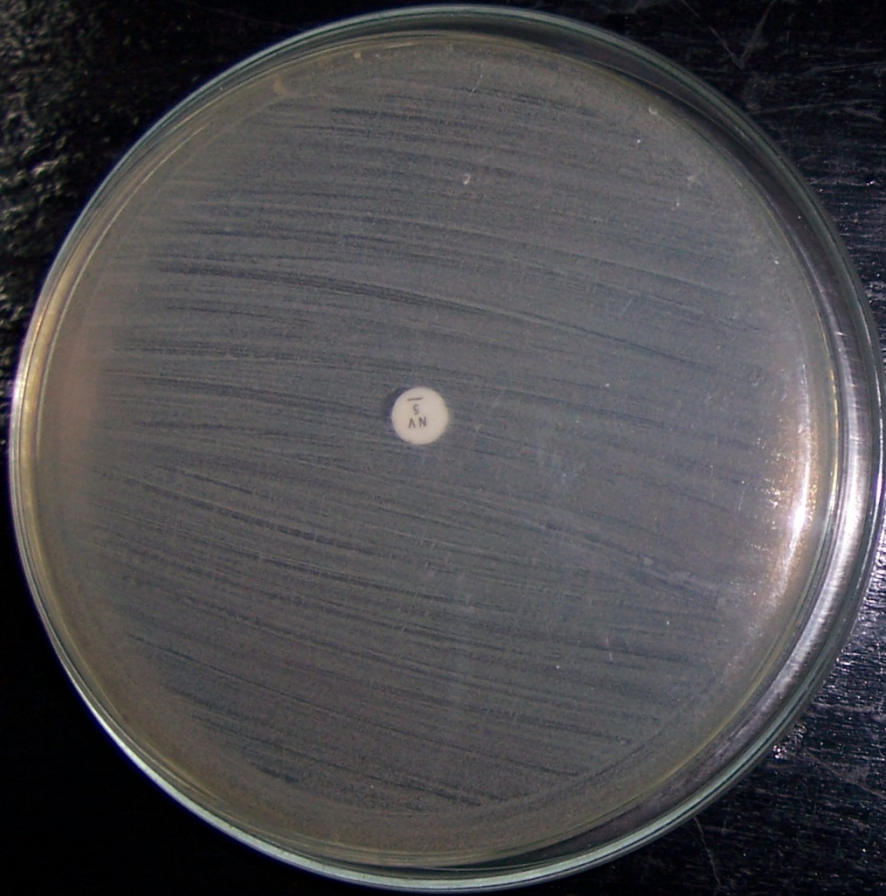
Streptococci vs. Staphylococci



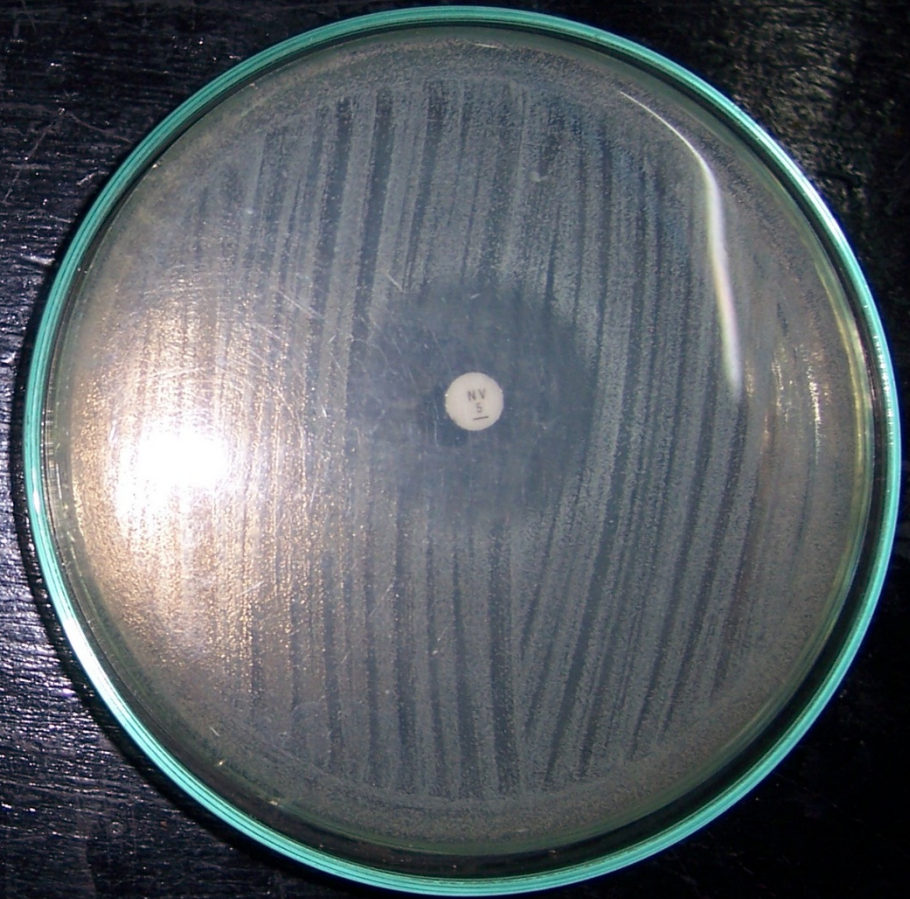
Differential Characteristics



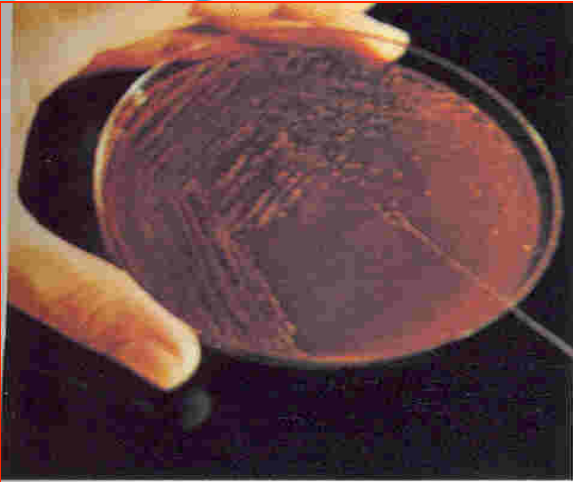
NOVOBIOCCIN TEST



Staphylococcus saprophyticus
(resistant-Novobiocin)



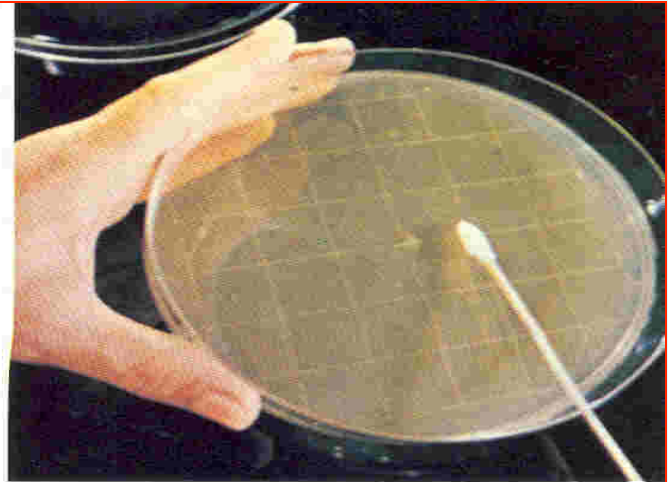
Staphylococcus epidermidis
(sensitive-Novobiocin)



[A]



[B]



[C]



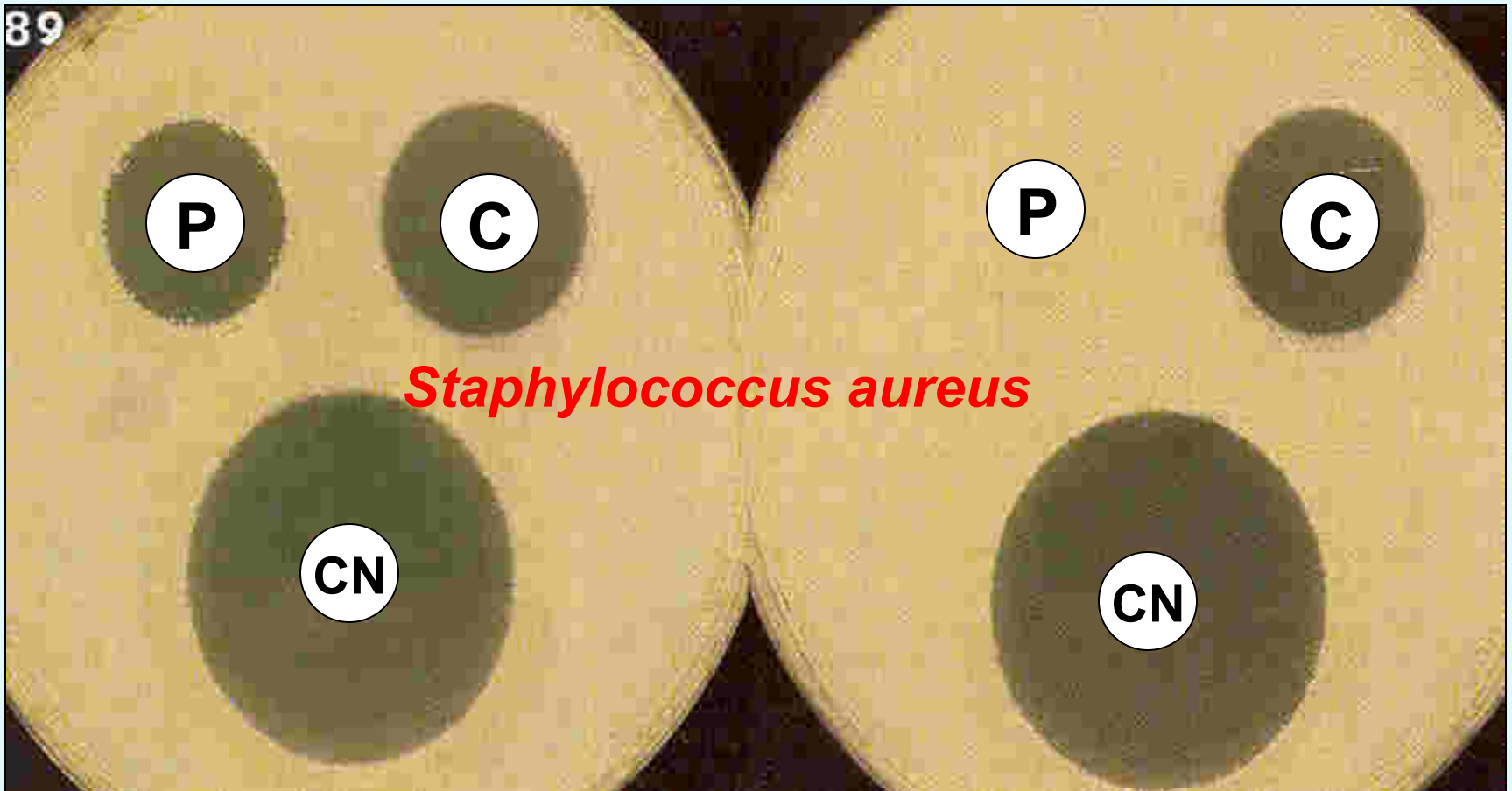
[D]



[E]

Gentamisin (CN)	: 12 - 15
Chloramphenicol (C)	: 12 - 18
Penicilin (P)	: 28 - 29

R (Resistant) ; S (Sensitive)



Antibiotic sensitivity test: Agar diffusion method



Case 1

The blood agar plate and CLED plate provided were inoculated with a sample of urine from a patient with a suspected urinary tract infection. Examine the plates and photographs provided.

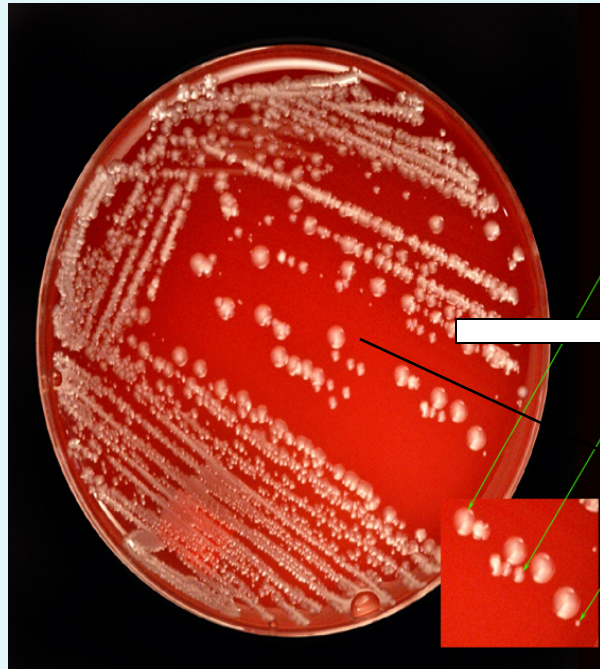
- Identify the colonies on the blood agar plates and photographs.

The photographs show the results of the Gram stain of each colony type.

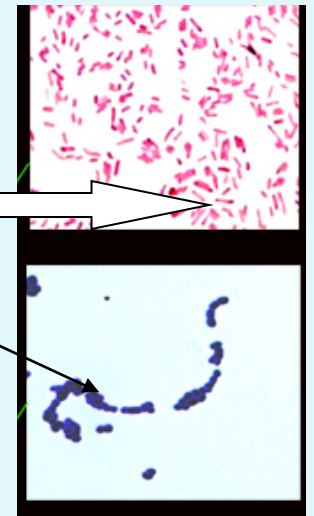
- Large colonies are Gram.....and small colonies are Gram.....



CLED plate



Blood agar



Gram stain

Case 2

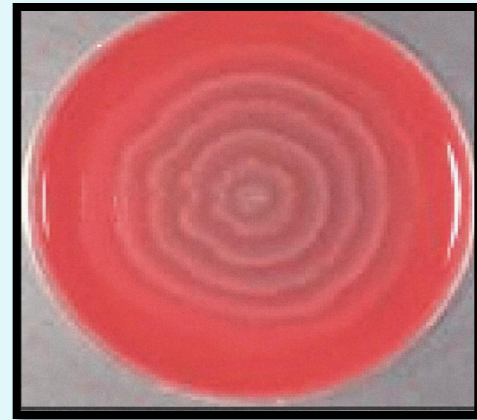
These Blood agar and CLED agar plates were inoculated with MSU from a 45 years old man suspected of having bladder stone and complaining of burning micturation.

Urine examination showed :

Moderate number of WBC and a PH of 8



CLED

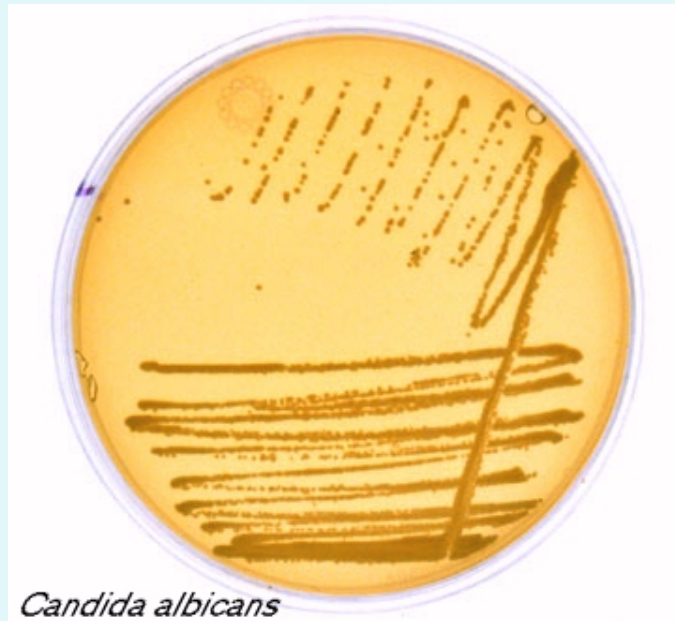


Blood agar

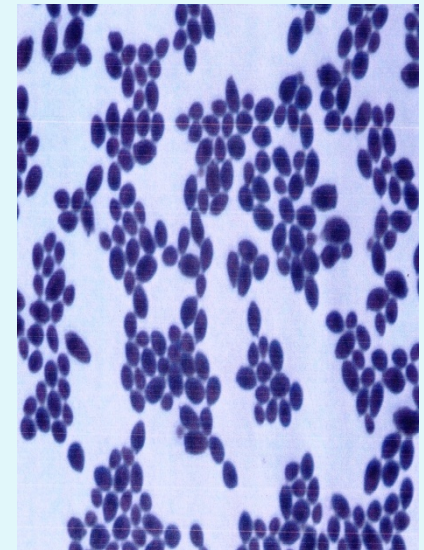
- A) What is the likely this pathogen?**
- B) How would you confirm the identity of this pathogen?**
- C) What is the role of this organism in forming stones?**

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**

