Done by:
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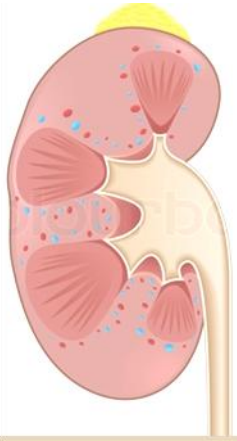
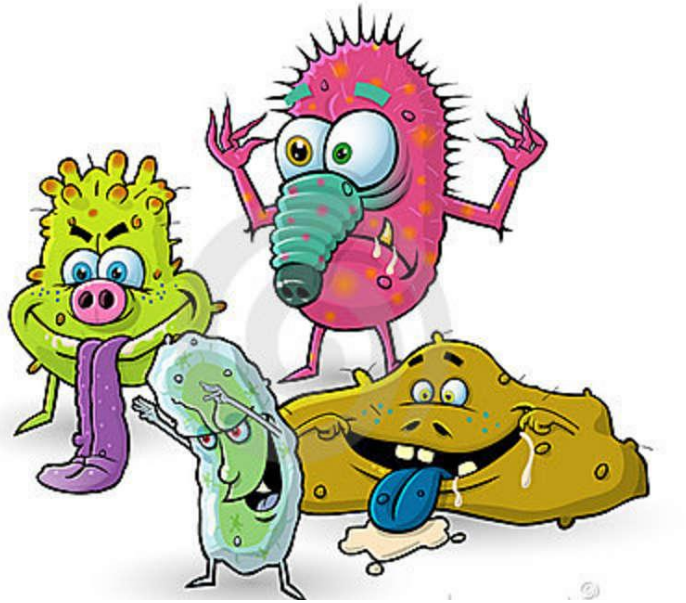


Team 432 Microbiology

PRACTICAL LECTURE
ORGANISMS CAUSING UTI

Objectives:
Were not given.



Color guide

- **Very important**
- male doctor's notes
- Additional information
- female doctor's notes

MICROBIOLOGIC EXAMINATIONS OF UTI:

1

Urine Collection:

1) collect urine sample:

- Mid Stream Urine -Catheter
- suprapubic aspiration -adhesive bag
- In and out catheter (intermittent catheter)

Urine from the bag of catheter should not be tested (standing for several hours) .So Catheter sample and adhesive bag are not prefer sample

2) Transport (quickly) by:

- sterile container
- dipslides: 1 is CLED media, the other is either MAC or blood agar.

2

Urine analysis:

1) Dip stick test to detect:

-leukocyte esterase

-Nitrate (It is not effectve with gram +)

-pH of urine

2) Microscopic examination: cell counting chamber (detects bacteria, Pus cells , crystals or casts)

3) culture

cast (important) – which indicate Upper UTI and RBC

3

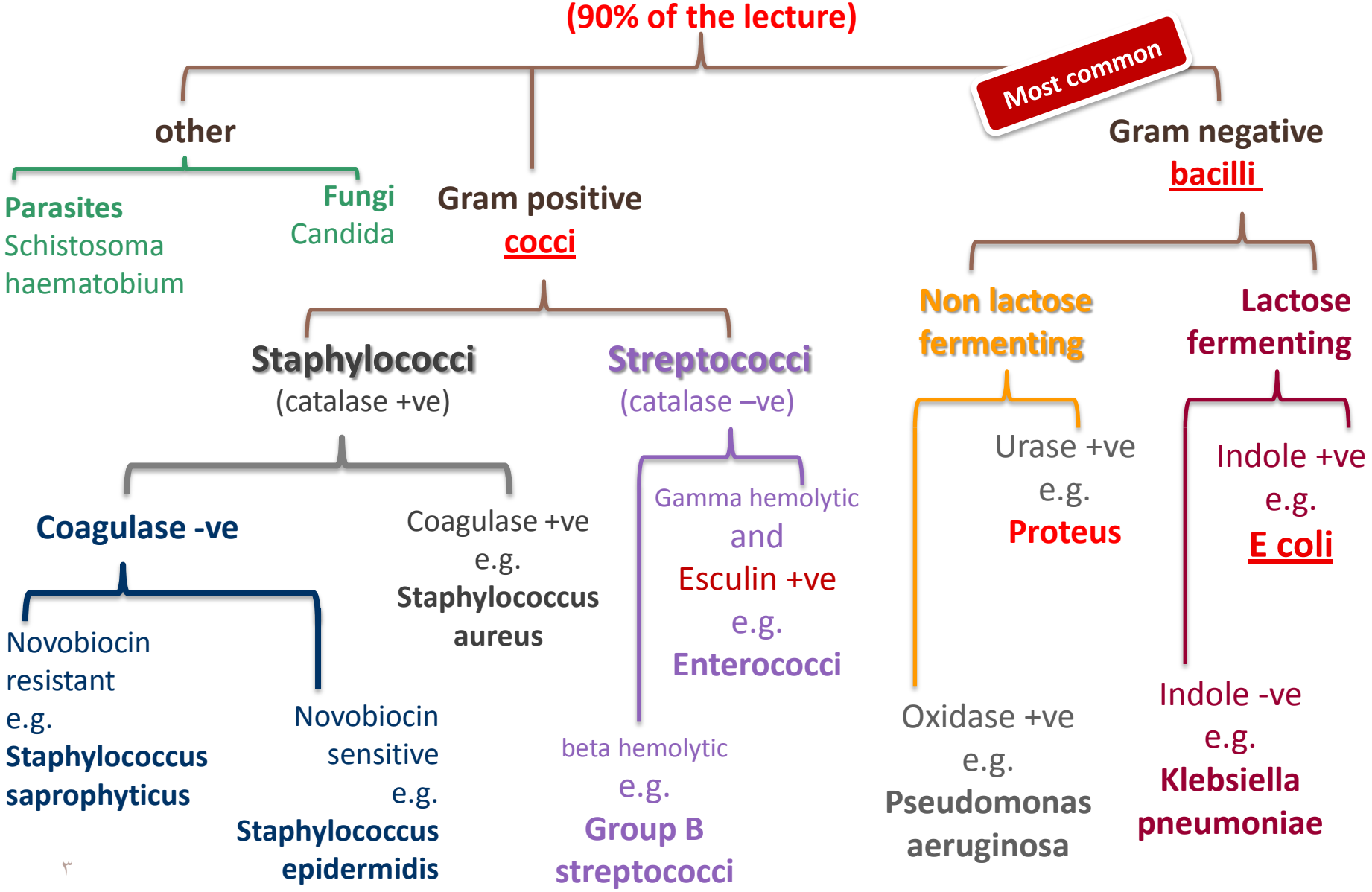
Laboratory tests:

1) Quantitative: colony count by:
culturing ➔ isolation of colonies ➔ incubation

2) Semi-quantitative: detects significant bacteruria (10^5/ml)

Summary of the causes of UTI

(90% of the lecture)

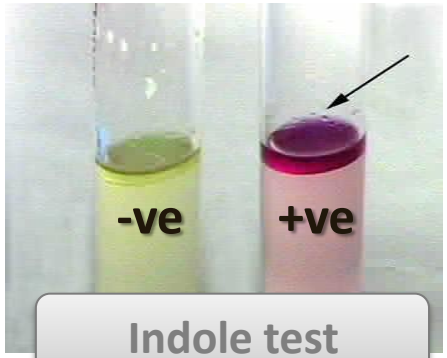


GRAM NEGATIVE BACTERIA

important

	Material to be tested	Positive result	Negative result
Gram negative Testing	1) Lactose fermentation (next slide)	▪E coli ▪Klebsiella pneumoniae	▪Proteus ▪Pseudomonas aeruginosa
	2) Urease	Proteus	_
	3) Oxidase	Pseudomonas aeruginosa	▪E coli ▪Klebsiella pneumoniae
	4) indole	E coli	Klebsiella pneumoniae

Note: E coli and Klebsiella are enterobacteriacea, they have common characteristics like:
+ve Nitrite & Lactose tests, – ve Oxidase tests



Indole test

Urase test

Oxidase test

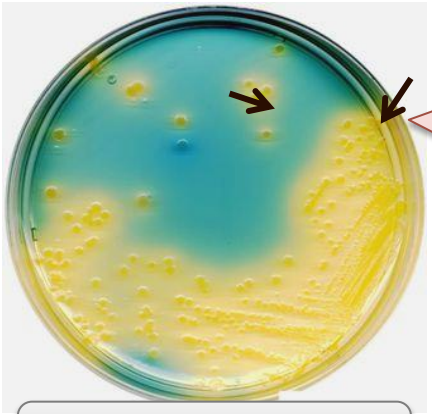
GRAM NEGATIVE BACTERIA

Different media for culture

Medium	Used for	positive result	negative result
1) Blood agar	An enriched medium, used for culturing fastidious microorganism and observed the hemolytic reaction		
2) MacConkey agar	Differential media. Differentiate b/w non-lactose fermenting colonies.	Pink color	Colorless
3) CLED		yellow	Colorless
Examples complete the missing names ;)		E coli and …….	Proteus and …….

Blood agar

MAC agar



CLED

It is Selective culture medium for detection and isolation Of E.coli and coliform bacteria in urine

GRAM NEGATIVE BACTERIA

Further details about gram –ve bacilli

E coli

Gram negative bacilli

Identification:

- Pink on MAC
- Yellow on CLED

(same as klebsiella)

- Indole positive → (in contrast of klebsiella)

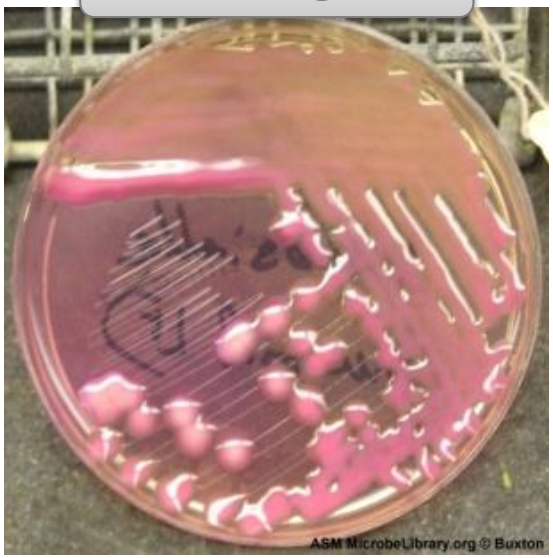
MAC agar

Klebsiella pneumoniae

Gram negative bacilli

Identification:

- **Have mucoid appearance**
- Pink on MAC
- Yellow on CLED
- Indole negative



GRAM NEGATIVE BACTERIA

Further details about gram –ve bacilli

Proteus spp: for upper and lower UTI. It produce:
1)urease
2) swarming in plate 3)stone 4) Recurrent infection

✓No swarming in CLED ➔ because it's Electrolyte-Deficient
✓No swarming in MAC ➔ because it contains bile

Swarming (circles) in blood agar

Blood agar

CLED

Proteus

Gram negative bacilli

Identification:

- **Swarming:** gives waves when tested by blood agar, not in CLED or MAC
- colorless on MAC
- colorless (blue) on CLED
- **Urase positive:** split urea to Ammonia ➔ alkaline urine ➔ ⬆ PH
  ➔ Increase the potential of renal stones

CLED

Pseudomonas aeruginosa

Gram negative bacilli

Identification:

- Colorless on MAC
- colorless on CLED
- oxidase positive

GRAM POSITIVE BACTERIA

Enterococci

Gram positive cocci in chains

Identification:

- No hemolytic reaction on blood agar (gamma hemolytic)
- Esculin positive

Examples: enterococcus faecalis and entrococcus faeclium

Blood agar

Bile esculin hydrolysis

Positive. ***why?*** because it produces enzymes that hydrolysis the bile.

GRAM POSITIVE BACTERIA

S.aureus

Gram positive cocci in clusters

Identification:

- Coagulase positive (in contrast to s.epidermidis and s. saprophyticus)

s.epidermidis

Gram positive cocci in clusters

Identification:

- Coagulase negative (in contrast to s. aureus)
- Novobiocin sensitive (in contrast to s.saprophyticus)

s. saprophyticus

Gram positive cocci in clusters

Identification:

- Coagulase negative (in contrast to s. aureus)
- Novobiocin resistance (in contrast to s.epidermidis)

Coagulase: an enzyme that changes fibrinogen to fibrin

*Catalase test differentiates between staphylococci and streptococci. Catalaseis produced by staph. So it will appear as bubbles gas if it positive

STAPHYLOCOCCI

Catalase for differentiate

All are *catalase positive

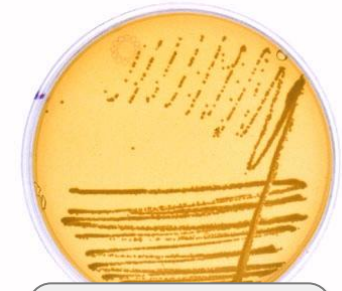
(in contrast to sreptococci)

Catalase test

This slide is not important

FUNGI

Candida albicans



Sabouraud's Dextrose Media

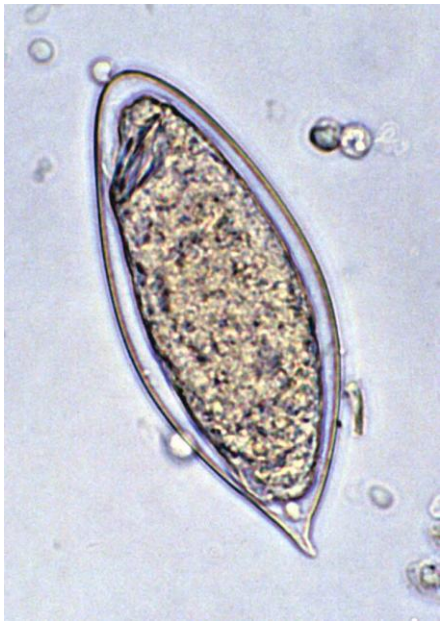
Blood agar

Chlamydospore

Germ tube

PARASITES

Schistosoma haematobium



Eggs of schistosoma causes dysuria and hematoruia

important

		MAC agar	CLED	Blood agar
Gram -	E.Coli	LF	√	X
	Klebsiella Pneum.	LF (M)	√	X
	Proteus	NF	Inhibition swarming	Swarming
	P.Aerogenosa	NF	X	X

LF : Lactose fermentation
NF : Non-Lactose fermentation
(M) : Have mucoid appearance

Important from 431

Quick Summary of Organisms

	E.Coli	Klebsiella Pneum.	Proteus	P. Aerogenosa	Entero cocci	Staph Aureus	Staph Saprophyt.
Gram	-ve	-ve	-ve	-ve	+ve	+ve	+ve
Lactose fermentation	√	√	X	X			
Oxidase	-ve	-ve	-ve	+ve			
Urease	-ve	+ve	+ve	---			
Indole	+ve	-ve					
Catalase					-ve	+ve	+ve
Coagulase						+ve	-ve
Novobiocin						Sensitive	resistant

Very important

Remember !
Entrococci is
Esculin positive

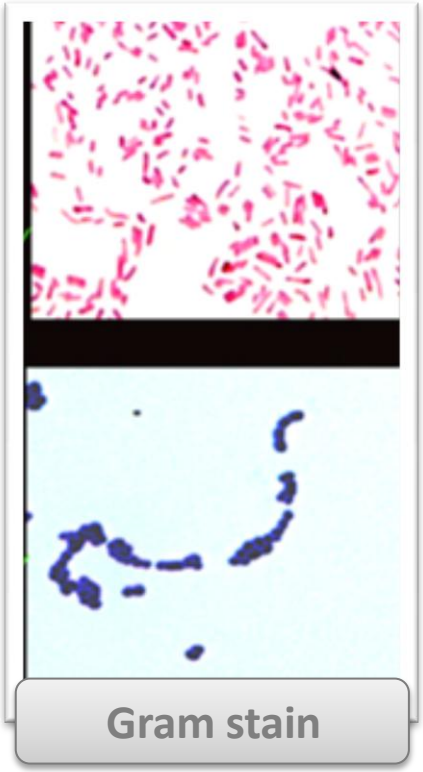
Questions!

1. These Blood agar and CLED agar plates were inoculated with MSU from a 45 years old man suspected of having bladder stones and complaining of burning micturation.
Urine examination showed :
Moderate number of WBC and a PH of 8

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

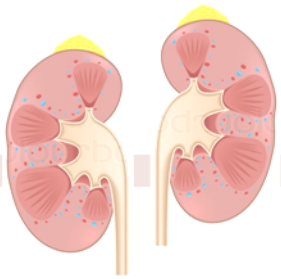
Questions!

The blood agar plate and CLED plate provided were inoculated with a sample of urine from a patient with a suspected urinary tract infection. After examining the plates and gram stain, two colonies, large and small, were found.



A. Identify the colonies (in general) on the blood agar plates and photographs.

Small colony Large colony



Questions!

Good luck 432!

answers

Question 1:

A) Proteus

B) - Swarming on blood agar. - Urase test would be positive
- colorless (takes the color of the media which is blue) on CLED
- pH=8 (protues causes alkaline urine)

C) it makes the urine alkaline. Alkalinization of urine could lead to the formation of stones

Question 2:

Large colonies: E coli. Beacause: - gram stain shows gram –ve bacilli
- CLED medium is yellow (i.e. lactose fermenting)

•It could also be klebsiella, but E coli is more likely to cause of UTI.

Small colonies: gram stain shows gram +ve cocci in clusters. So it could be one of the 3 staphylococci (further tests are needed to confirm which one)