



Practical Medical Bacteriology

4thstage Biology Department

**General Urine Examination
(Urine Analysis)
(Lab 5)**

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What is General Urine Examination?

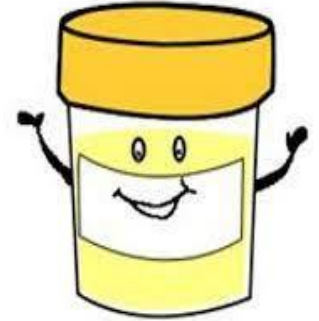
- General Urine Examination (GUE) also called urine analysis (Urinalysis).
- A urinalysis is an array of tests performed on urine.
- It's used to detect and manage a wide range of disorders, such as urinary tract infections, kidney disease and diabetes.

Collection of Urine Specimens

- The first voided morning urine (the most common)
- Random urine (for emergency)
- Clean-catch, midstream urine (for urine culture)

Attention:

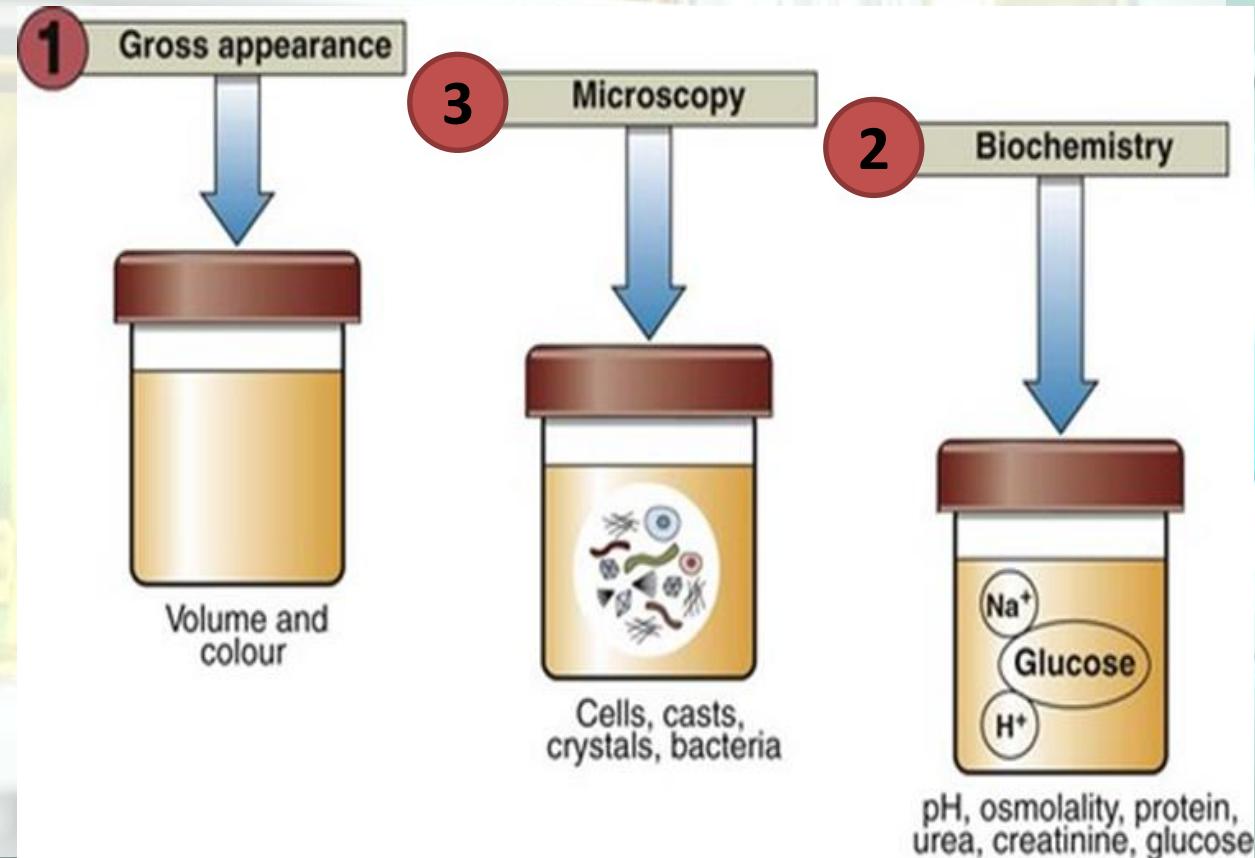
Urine need to be examined within 1-2 hour, else requires refrigeration.



GUE: What to Look for?

Urinalysis consists of the following measurements:

- Physical examination
- Chemical examination
- Microscopic examination

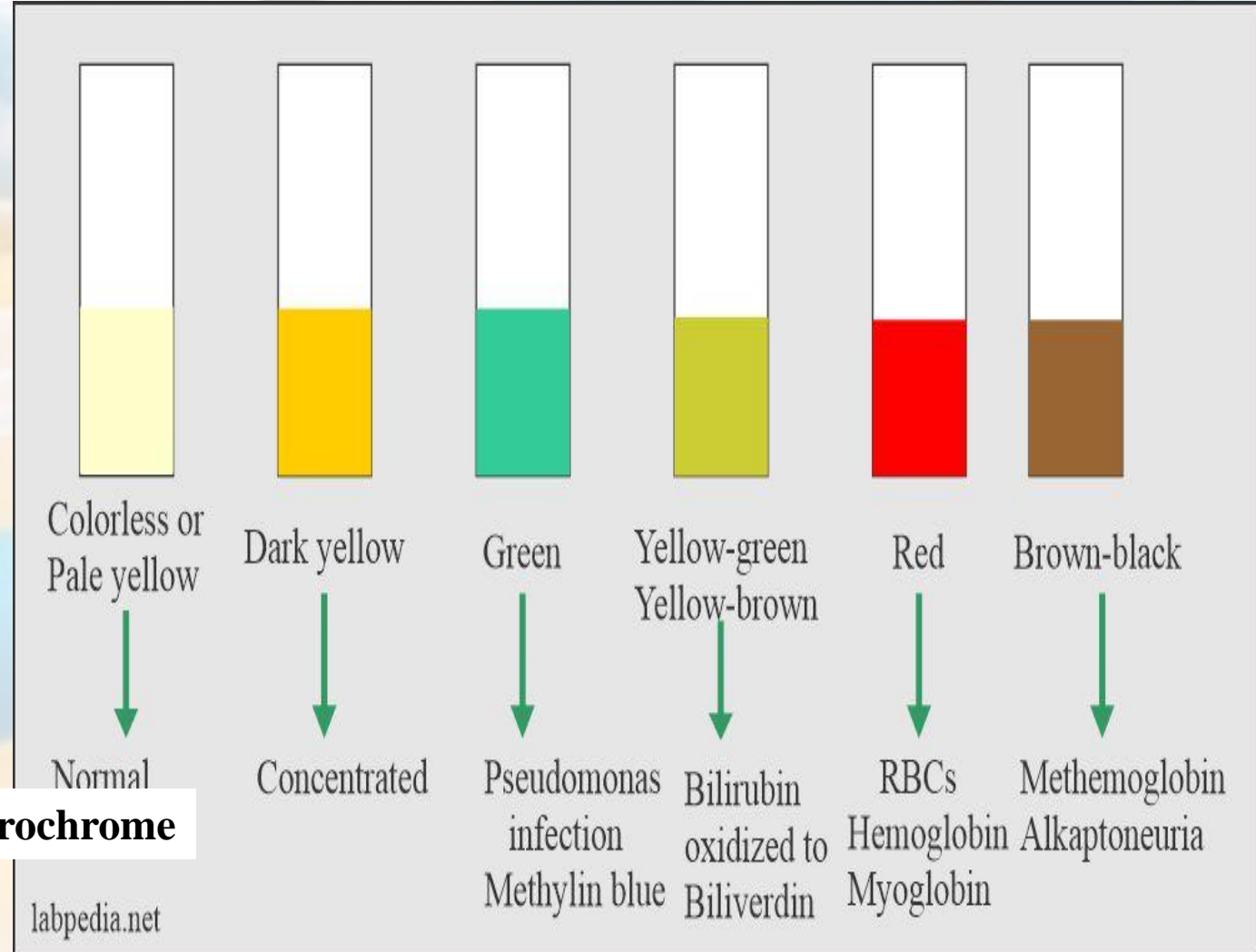


Physical Examination

- Appearance
- Urine volume: 1-2,5 L/d
- Specific gravity (SG)

Appearance:

Including color and clarity



Chemical Examination

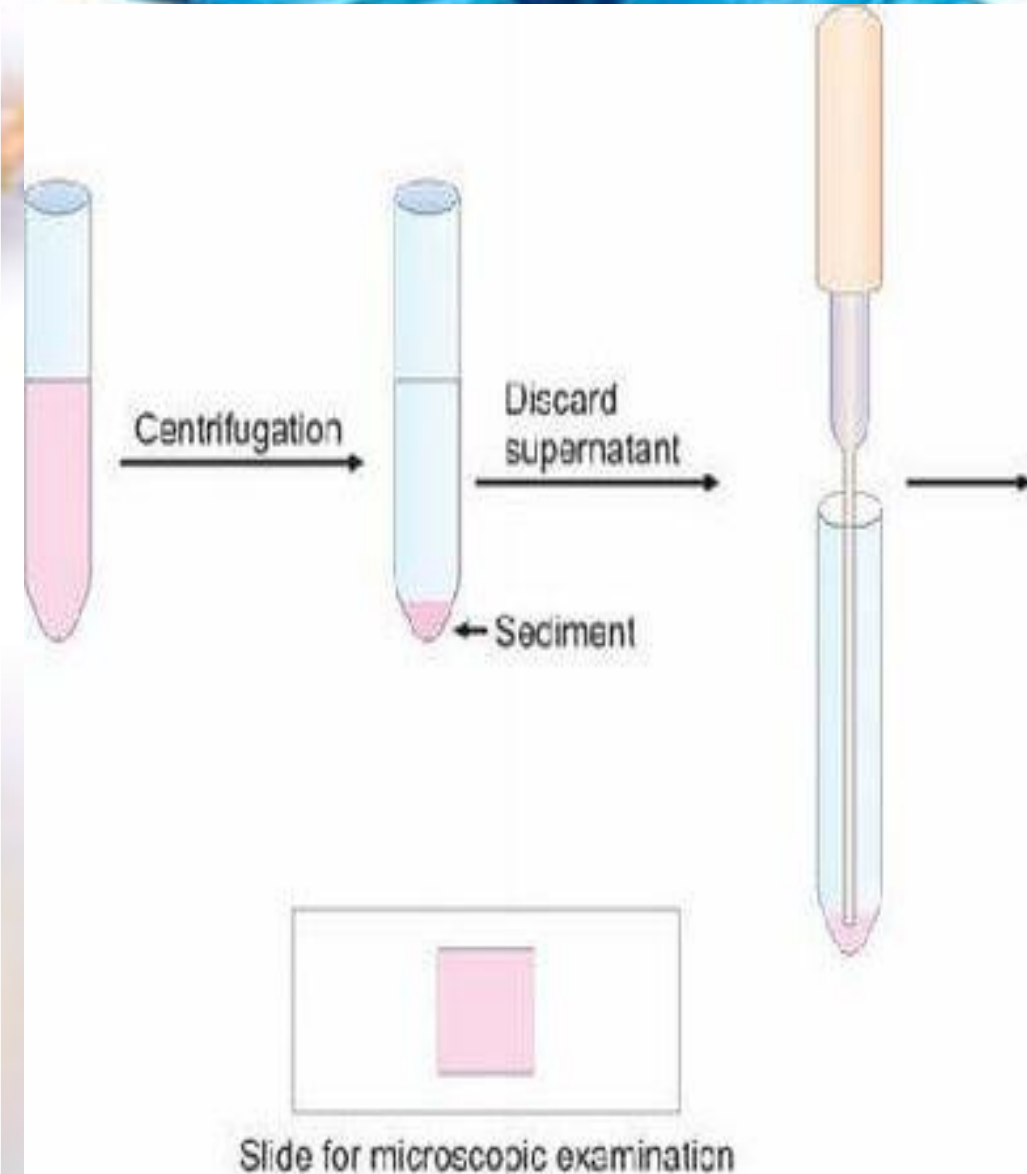
Urine dipsticks:

- The entire strip is dipped in the urine sample and color changes in each square are noted.
- The color change takes place after several seconds to a few minutes from dipping the strip.
- If read too early or too long after the strip is dipped, the results may not be accurate.



Microscopic Examination

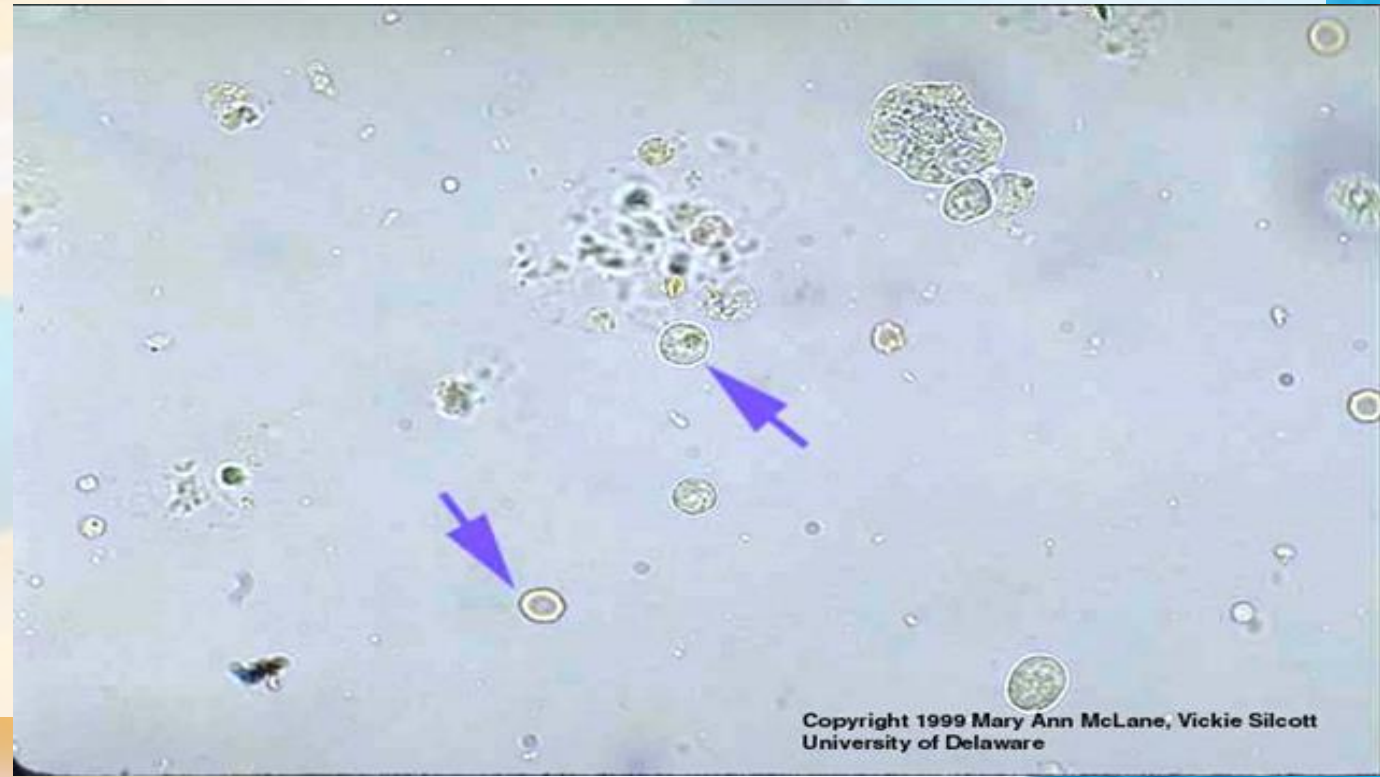
- Microscopic urinalysis is done simply by pouring the urine sample into a test tube and centrifuging it for a few minutes. The top liquid part (the supernatant) is discarded.
- The solid part left in the bottom of the test tube (the urine sediment) is mixed with the remaining drop of urine in the test tube and one drop is analyzed under a microscope.



Microscopic Examination

Contents of normal urine:

- Contains few epithelial cells.
- Occasional RBC's, WBC's, few crystals.



Microscopic Examination

Crystals in urine:

➤ Crystals in acidic urine

- Uric acid
- Calcium oxalate
- Cystine
- Leucine

➤ Crystals in alkaline urine

- Ammonium magnesium phosphates
(triple phosphate crystals)
- Calcium carbonate

urinary crystals

Normal Acid Urine



Amorphous Urate



Uric Acid



Calcium Oxalate

Normal Alkaline Urine



Amorphous Phosphate



Triple Phosphate



Ammonium Biurate



Calcium Carbonate

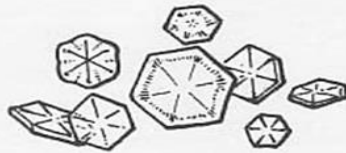


Calcium Phosphate

Abnormal Urine



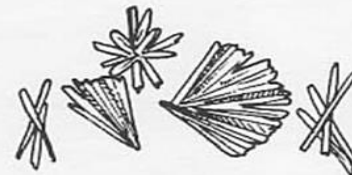
Tyrosine



Cystine



Leucine

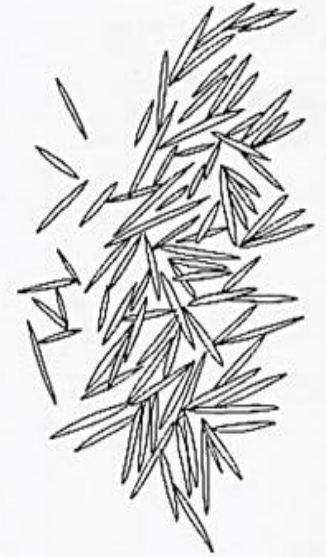


Sulfa

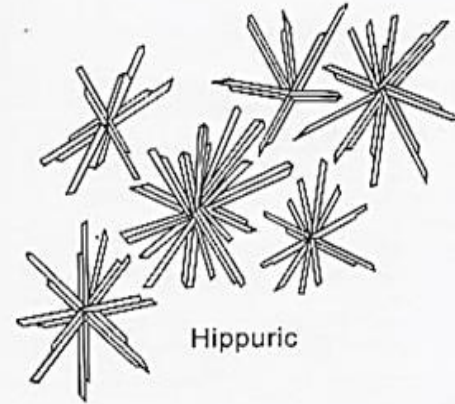
Abnormal Urine



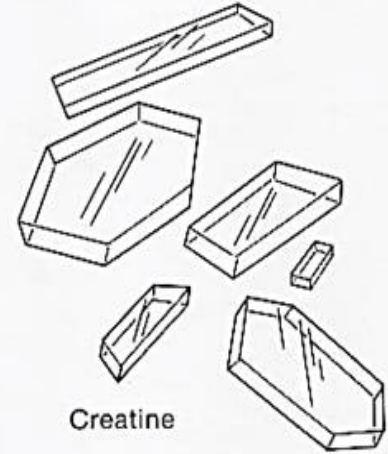
Cholesterol



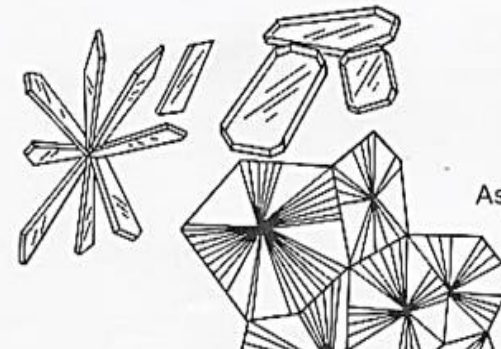
Bilirubin



Hippuric



Creatine



Aspirin

Microscopic Examination

Casts:

- Urinary casts are cylindrical aggregations of particles that form in the distal nephron, dislodge, and pass into the urine.
- In urinalysis they indicate kidney disease.

Microscopic Examination

Types of casts:

➤ Acellular casts

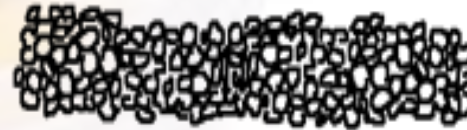
- Hyaline casts
- Granular casts
- Waxy casts
- Fatty casts
- Pigment casts
- Crystal casts

➤ Cellular casts

- Red cell casts
- White cell casts
- Epithelial cell cast



Hyaline Cast



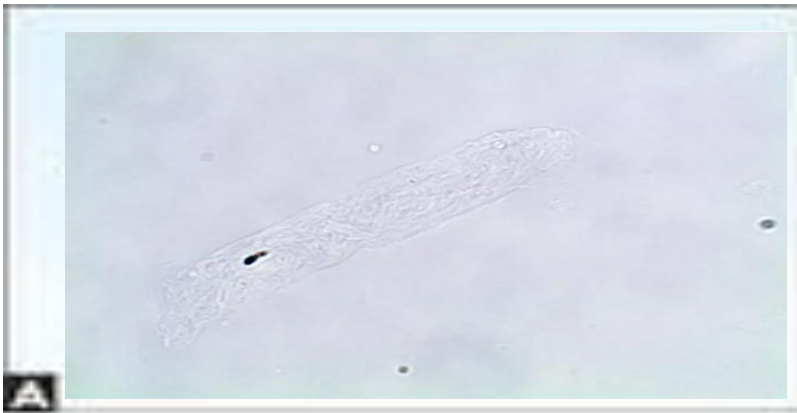
Granular Cast



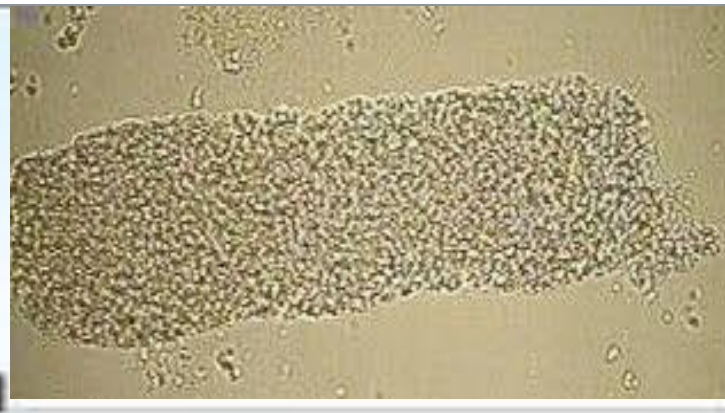
Red Blood Cell Cast



White Blood Cell Cast



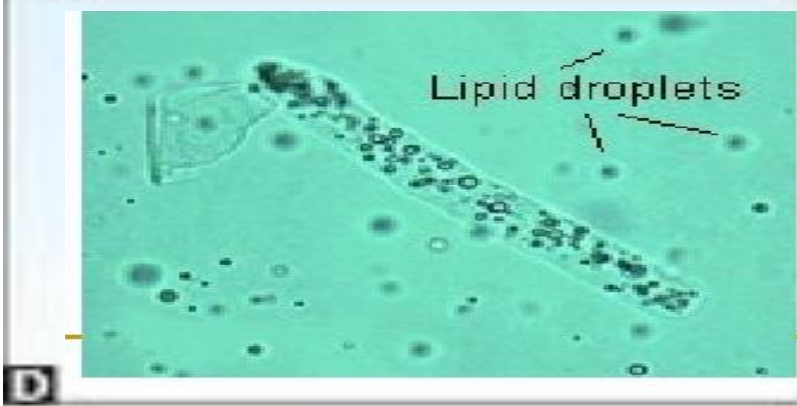
A



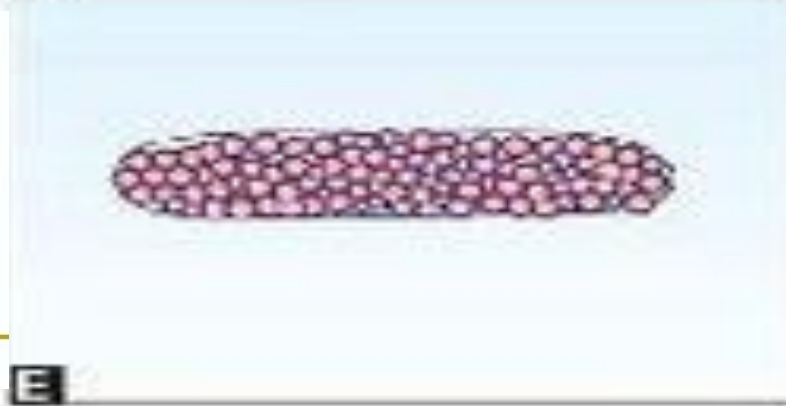
B



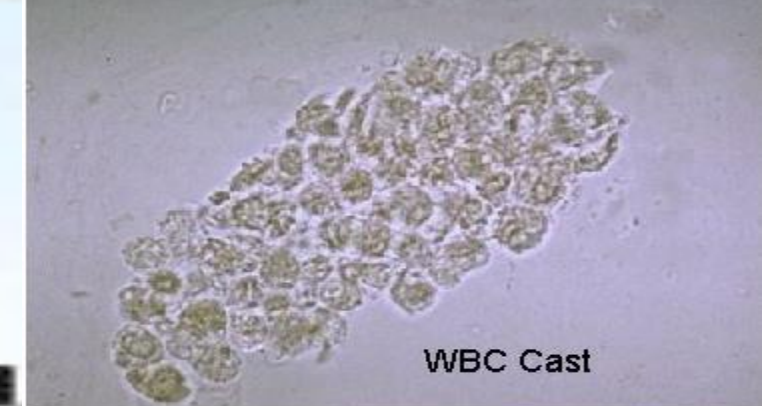
C



D



E



F



G

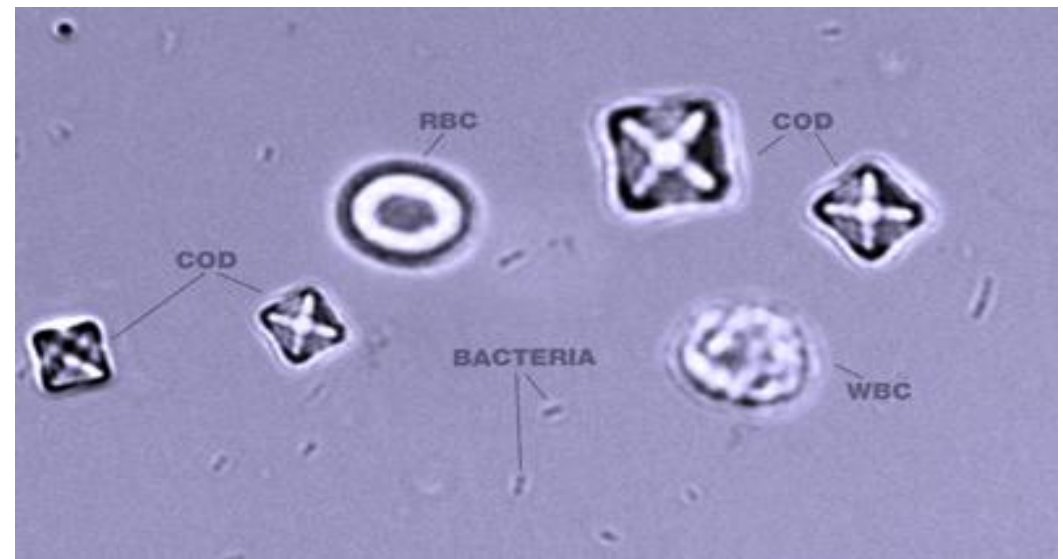
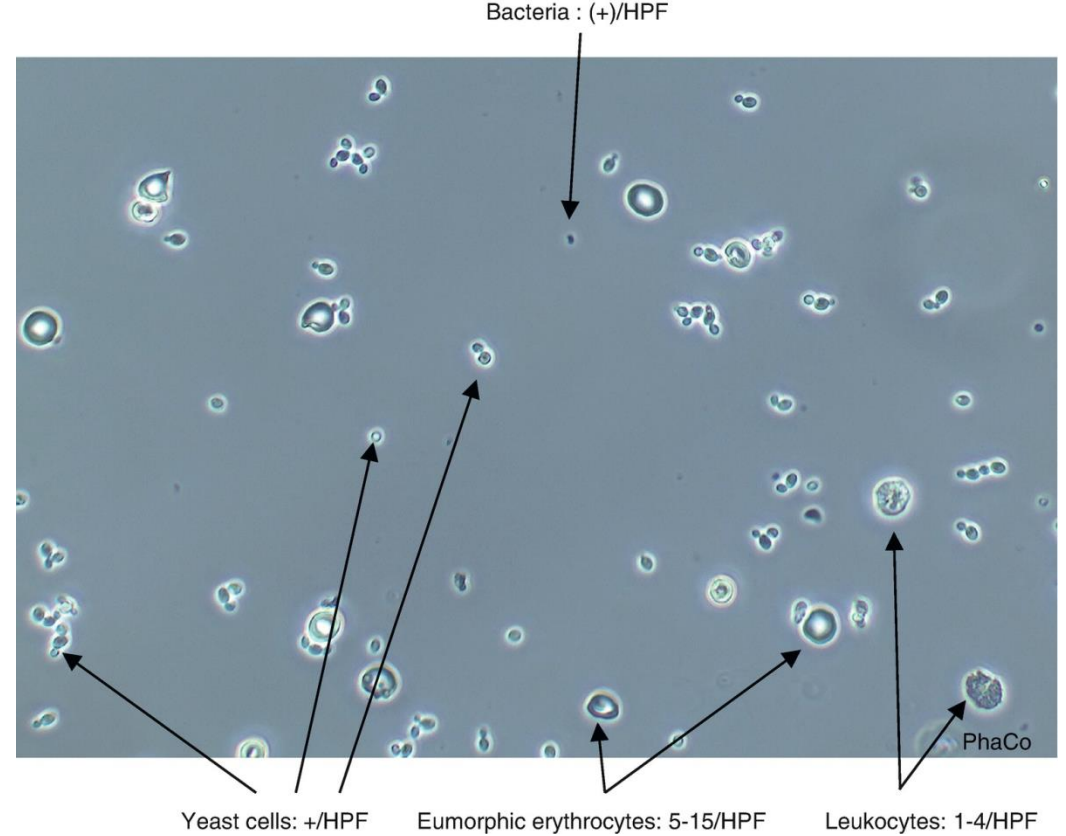
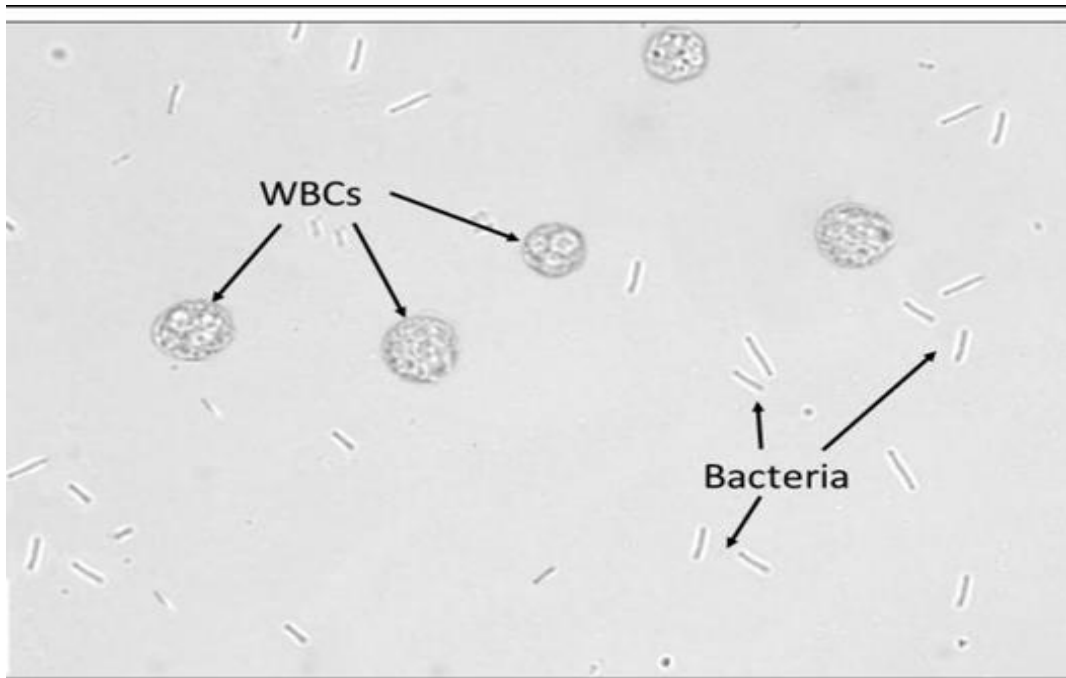
Urinary casts:

(A) Hyaline cast, (B) Granular cast, (C) Waxy cast, (D) Fatty cast, (E) Red cell cast, (F) White cell cast, and (G) Epithelial cast.

Micrbiological Examination of Urine

Expected pathogens:

- *Candida albicans*
- Enterococci
- *Escherichia coli*
- *Mycobacterium tuberculosis*
- Other Enterobacteriaceae
- Staphylococci, *Staphylococcus saprophyticus*
- *Pseudomonas* and other non-fermenters



Micrbiological Examination of Urine

Media and diagnostic reagents:

➤ Isolation:

Blood agar and MacConkey agar.

➤ Identification

For Gram-negative rods:

- Kligler iron agar (KIA)
- Kovacs reagent for indole
- Motility–indole–urease (MIU) medium
- Oxidase reagent
- Simmons citrate agar

For staphylococci and enterococci

- Catalase test (H₂O₂)
- Coagulase plasma
- Novobiocin (5mg) disc for differentiating negative-coagulase staphylococci



Squamous Epithelial Cells



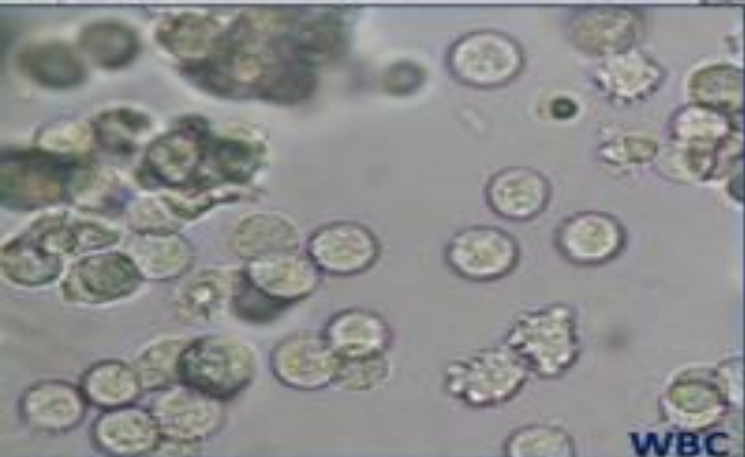
Transitional Epithelial Cells



Renal Tubular Epithelial Cell (RTEC)



Hyaline Cast



WBC



Monomorphic RBCs



Dysmorphic RBCs



Granular Cast



WBC Cast



RBC Cast



Fatty Cast



Waxy Cast



RTEC Cast

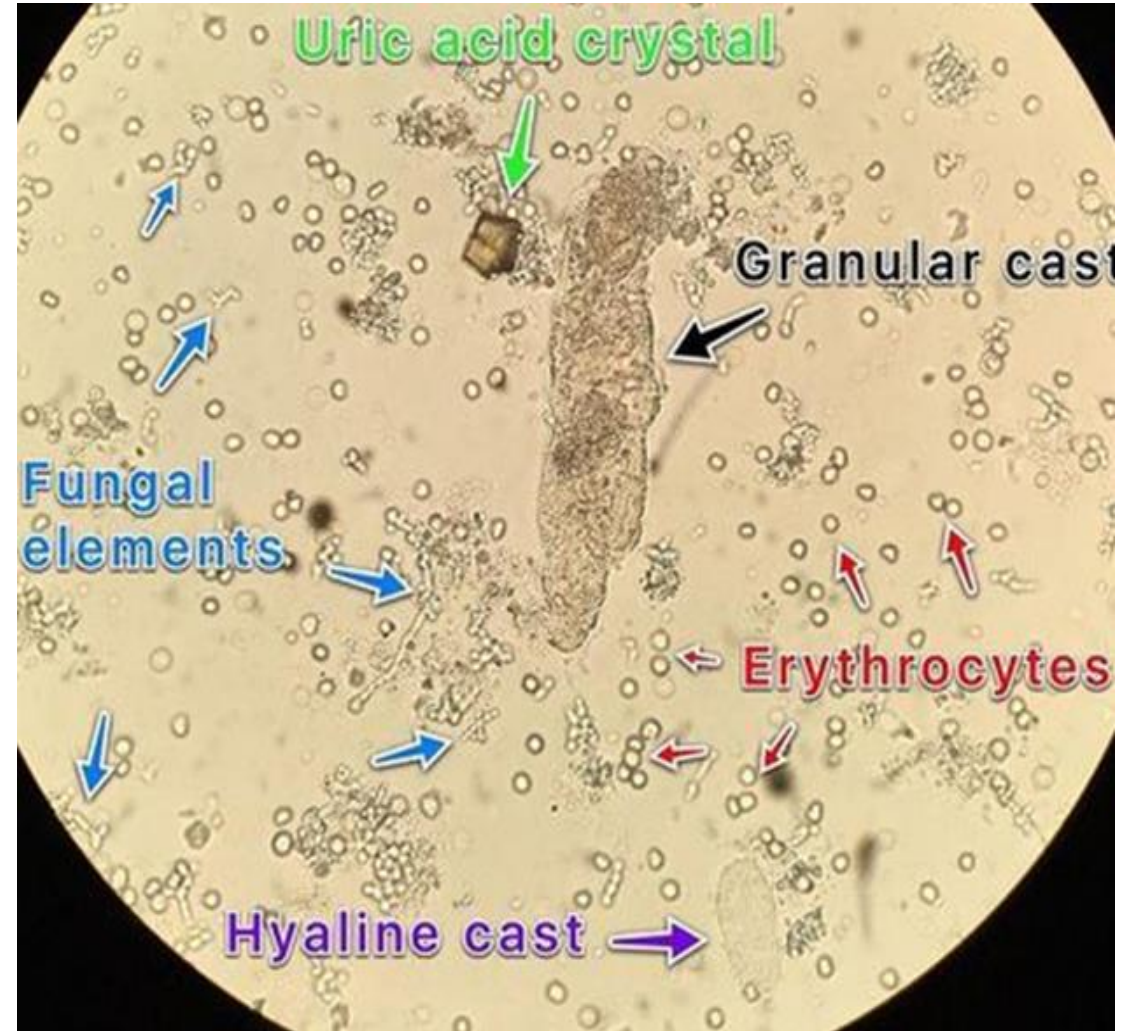
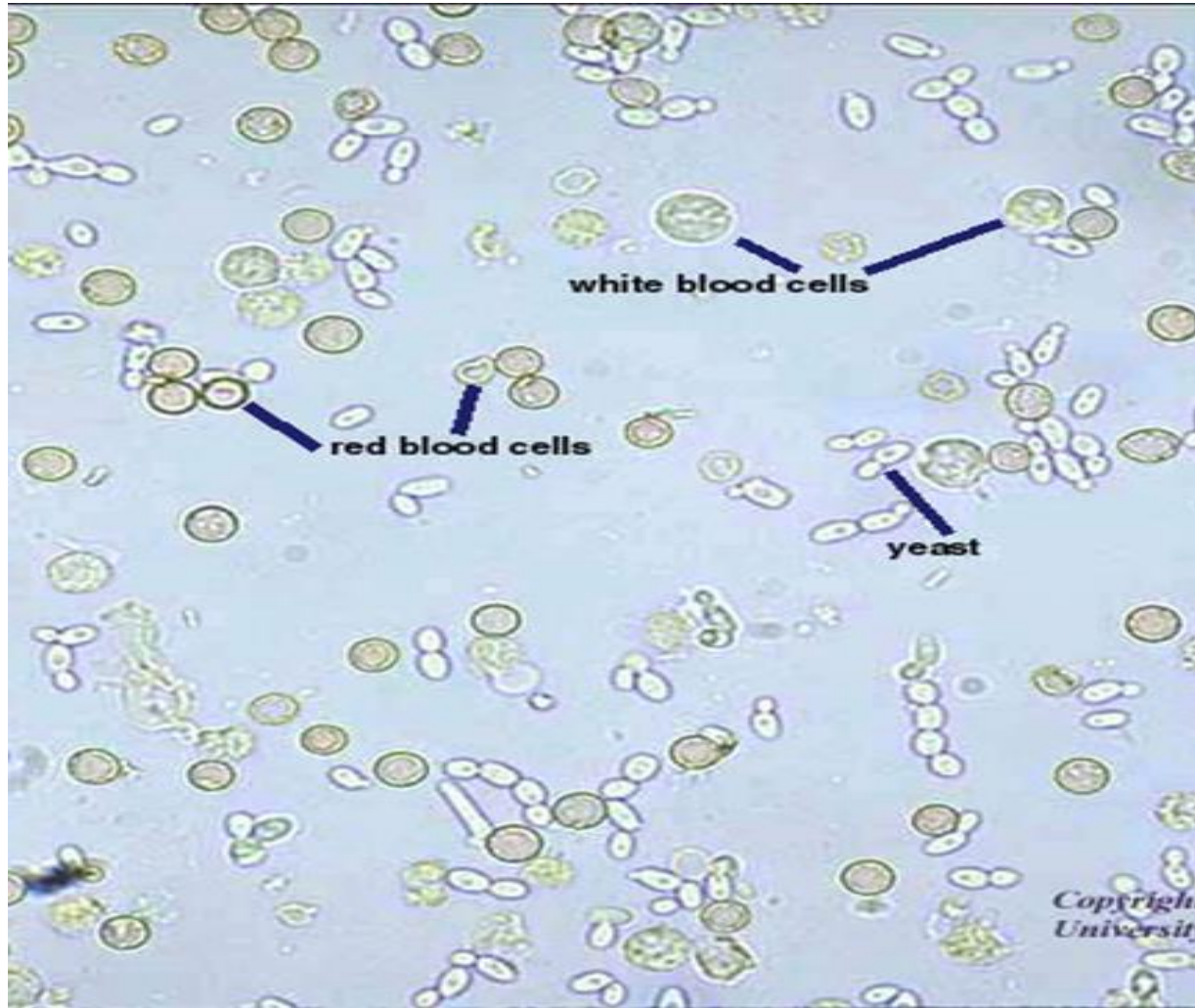


Table 4. Urinalysis Results for Case 2

<i>Component</i>	<i>Result</i>	<i>Reference range</i>
Dipstick urinalysis		
Color	Yellow	—
Clarity	Clear	—
pH	6.0	—
Specific gravity	1.010	—
Glucose	Negative	Negative
Blood	2+	Negative
Ketones	Negative	Negative
Protein	Negative	Negative
Urobilinogen	Negative	Negative
Bilirubin	Negative	Negative
Leukocyte esterase	2+	Negative
Nitrite	Negative	Negative
Urine microscopy		
White blood cells	15 per high-power field	0 to 5 per high-power field
Red blood cells	6 per high-power field	0 to 4 per high-power field
Squamous epithelial cells	None	None

If any of the following levels are above average, you might need more tests:

- **White blood cells (leukocytes)** : might be a sign of an infection.
- **Red blood cells (erythrocytes)**: might be a sign of kidney disease, a blood disorder or another underlying medical condition, such as bladder cancer.
- **Bacteria, yeast or parasites**: can indicate an infection.
- **Casts** : tube-shaped proteins, can be a result of kidney disorders.
- **Crystals**: that form from chemicals in urine might be a sign of kidney stones.
- **Nitrite Presence (Positive)**: indicate a bacterial infection

TYPE OF URINE	TYPE OF CRYSTALS	DESCRIPTION OF CRYSTALS	SIGNIFICANCE WHEN FOUND IN URINE
Abnormal Urine	tyrosine	thin, dark needles, arranged in sheaves or clumps; usually colorless, but may be pale yellow-brown	liver disease or inherited metabolic disorder
	leucine	yellow-brown spheres with radial striations	liver disease or inherited metabolic disorder
	cystine	clear, hexagonal plates	cystinuria
	hippuric acid	star-shaped clusters of needles, rhombic plates, or elongated prisms; may be colorless or yellow-brown	usually nonpathologic
	bilirubin	delicate needles or rhombic plates; red-brown in color; birefringent	bilirubinuria
	cholesterol	colorless, transparent plates with regular or irregular corner notches	chyluria, urinary tract infections, nephrotic syndrome
	creatine	pseudo-hexagonal plates with positive birefringence	destruction of muscle tissue due to muscular dystrophies, atrophies, and myositis
	aspirin	distinctive prismatic or star-like forms; usually colorless; show positive birefringence	ingestion of aspirin or other salicylates
	sulfonamide	yellow-brown dumbbells, asymmetrical sheaves, rosettes, or hexagonal plates	ingestion of sulfonamide drugs
	ampicillin	long, thin, clear crystals	parenteral administration of ampicillin
x-ray media	long, thin rectangles or flat, four-sided, notched plates	x-ray procedure with contrast media	

Next Lab.

Urine Analysis





What are the signs of infection?

- 1.
- 2.
- 3.



That's all.....
Thank you