

Al-Rasheed University College
Pharmacy Department
2nd Stage / 2nd Course
(2021 – 2022)



General Urine Examination (Urinalysis)

Physiology Lab.

2nd stage / 2nd course

Lab. (2)

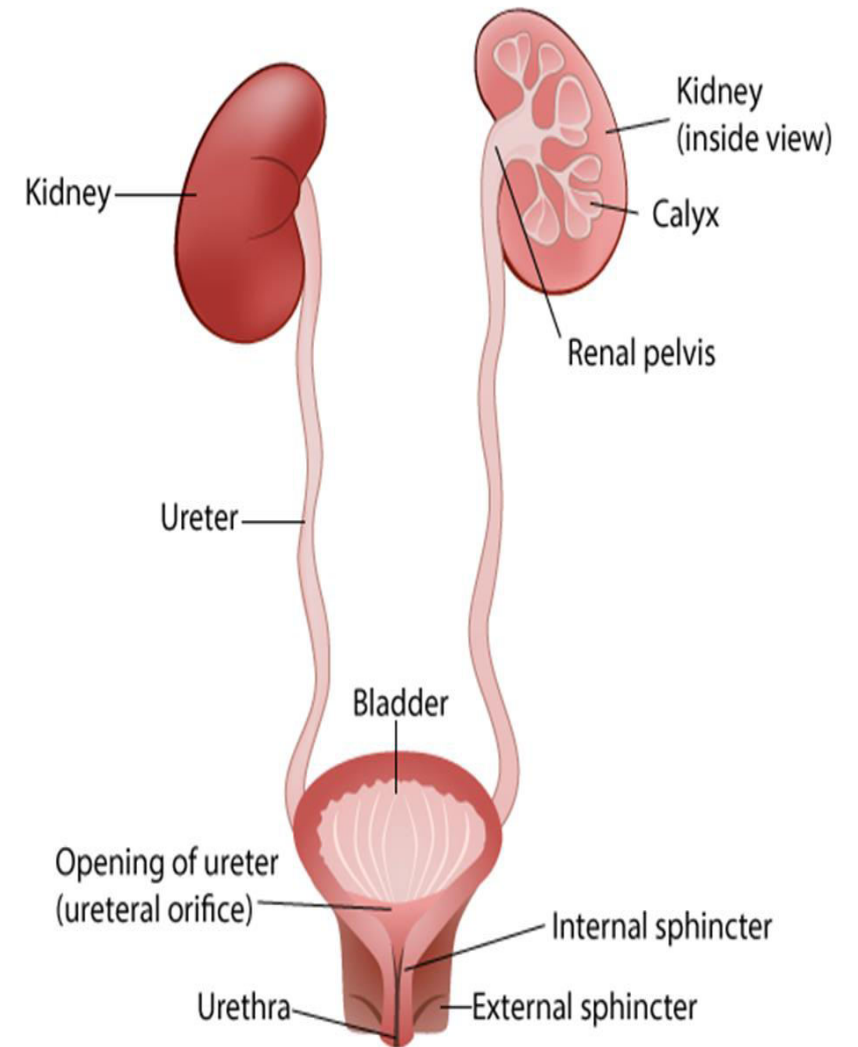
MSc Mohammed Akram ElMahdawi



Urinary System:

The urinary system is the main excretory system and consists of the following structures:

- 1. Two kidneys**, which secrete urine
- 2. Two ureters**, which convey the urine from the kidneys to the urinary bladder
- 3. The urinary bladder** where urine collects and is temporarily stored
- 4. The urethra** through which the urine passes from the urinary bladder to the exterior



General Function of the Kidney:

1. Formation and secretion of **urine**
2. Production and secretion of *erythropoietin*
3. Production and secretion of *renin*

General Urine Examination (Urinalysis)

- It is an array of tests performed on a urine sample
- considered one of the most common and oldest laboratory procedures in the practice of medicine
- It is also known as urine routine and microscopy



The Objective (Aim) of Urinalysis:

- General evaluation of health
- Diagnosis of diseases or disorders of the kidneys or urinary tract
- Diagnosis of other systemic diseases that may affect kidney function
- Monitoring of patients with diabetes
- Screening for drug overdose (like sulfonamides and aminoglycosides) and drug abuse (like opioids)

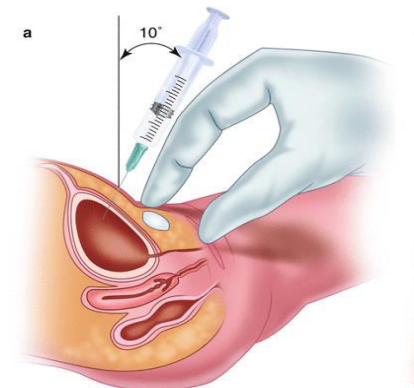
Sample collection

- Containers for urine collection should be wide mouthed, clean and dry
- Analysis of the sample should be done within 2 hours of the collection otherwise it should be refrigerated



Types of Urine Samples:

Sample type	Sampling	Purpose (Uses)
Random specimen	Anytime of the day	Routine screening
Morning sample	First urine in the morning, most concentrated	Pregnancy test, microscopic test
Clean catch midstream	Discard first few mls, collect the rest (midstream)	Culture
24 hour sample	All the urine passed during the day and night and first urine of the next day	Used for qualitative and quantitative analysis of substances
Postprandial	2 hours after meal	Determine glucose in diabetic patients
Supra-pubic aspiration	Needle aspiration	Obtaining sterile urine



Urinalysis consists of three steps

- 1) Physical Examination
- 2) Chemical Examination
- 3) Microscopic Examination
- 4) Microbiology Examination



Physical Examination:

- It is usually done by the naked eye, and through which we can examine:
 - Urine volume
 - Urine color
 - Clarity
 - Odor



Physical Examination (Cont.)

Urine Color:

- Normally **pale yellow** due to a pigment called Urochrome, comes from the breakdown of hemoglobin
- **Very pale to colorless** urine means excess of hydration (dilution)
- **Dark yellow** means dehydration (concentrated urine)
- **Pink, Red or Smokey brown** urine means bleeding due to UTI, liver disorders or some drugs

Urine Volume:

- Normally averages between 1 – 2 liters during the day
- **Polyuria or diuresis:** an excess of urine output, usually urine output of about 20L/day
- **Oliguria:** is an output of urine of less than 500ml/day
- **Anuria:** an output of urine ranges from 0 – 100ml/day

Physical Examination (Cont.)

Clarity:

- Normally Clear
- **Cloudy or Turbid** urine means the presence of various levels of bacteria, pus cells and crystals

Odor:

- Normally Aromatic
- **Foul smell** means UTI (Presence of Bacteria)
- **Sweet or Fruity** means the presence of glucose (Diabetes Mellitus)



Normal Urine Sample



Red Colored Urine
Sample, Slightly Turbid
(Bleeding)



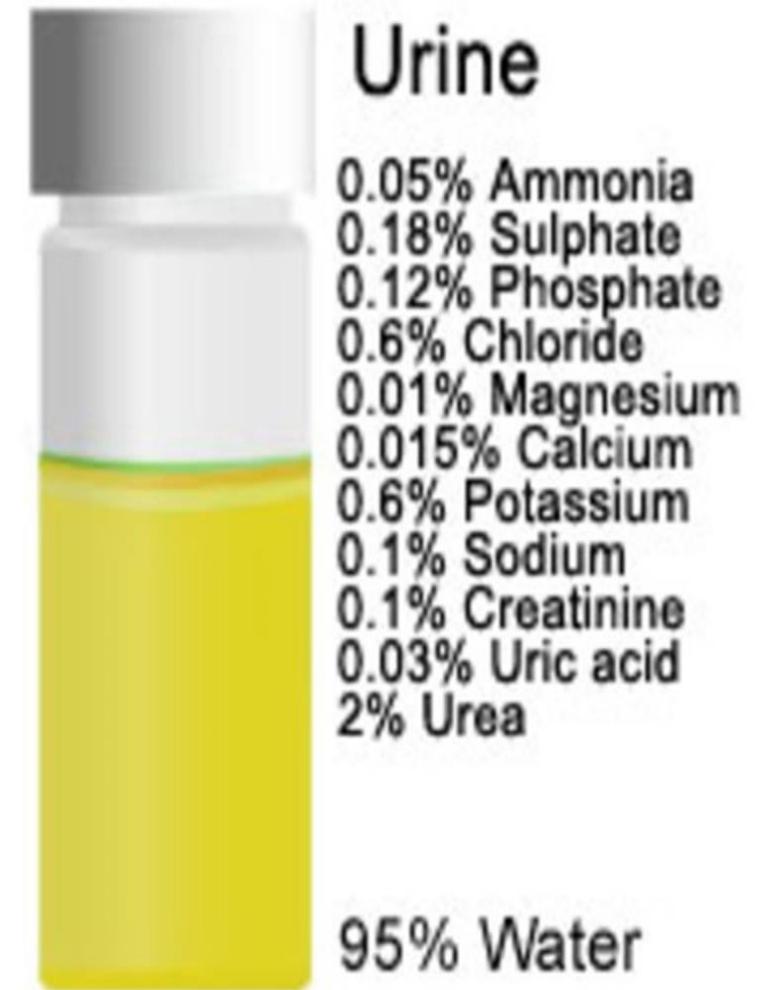
Brown colored Urine
Sample, Turbid (mostly
signs of liver disorder)



Yellow colored Urine
sample, Turbid (mostly
infection and presence of
crystals)

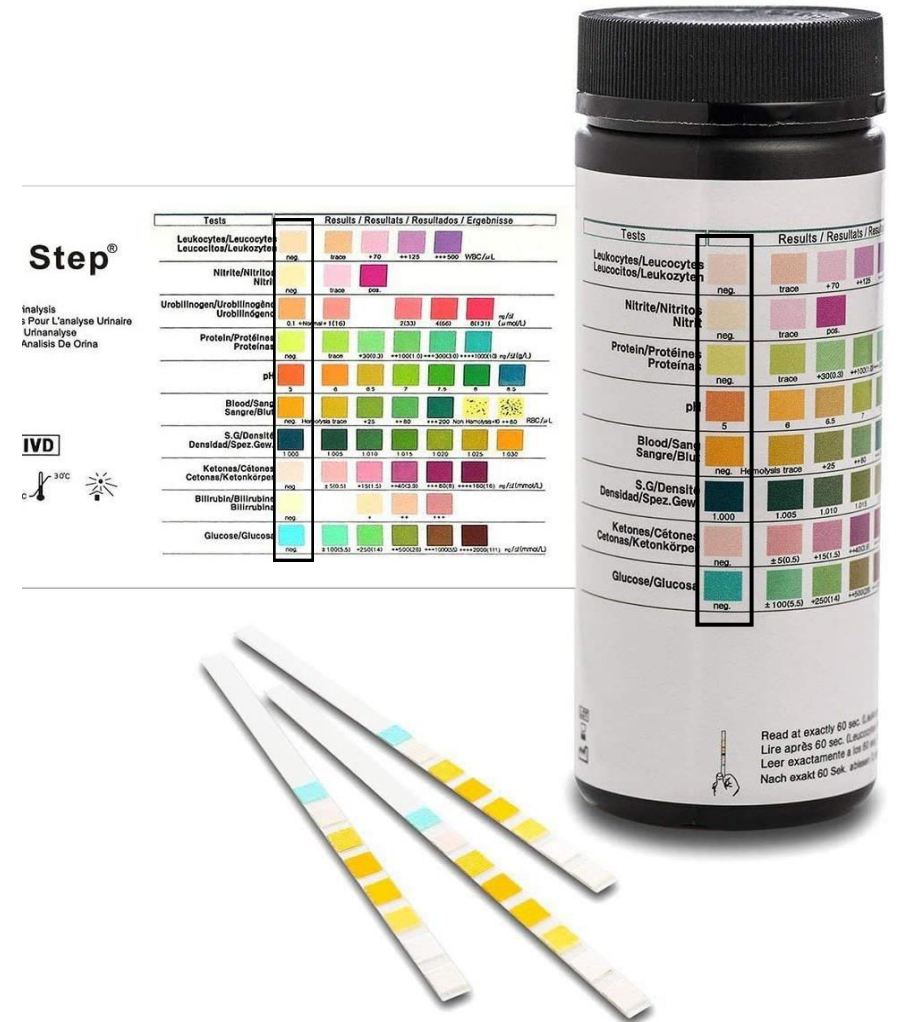
Chemical Composition of Urine:

- 95% of Urine constituent is mainly **water**
- Remaining **5% are soluble solute**:
 - Most abundant is urea
 - Sodium (Na)
 - Potassium (K)
 - Chloride (Cl)
 - Uric Acid
 - Creatinine
 - Phosphate
 - Sulphate
 - Calcium, Magnesium and traces of bicarbonate
- Presence of (Glucose, free hemoglobin, albumin, ketones, and bile pigments in the urine) are important indicators of disease

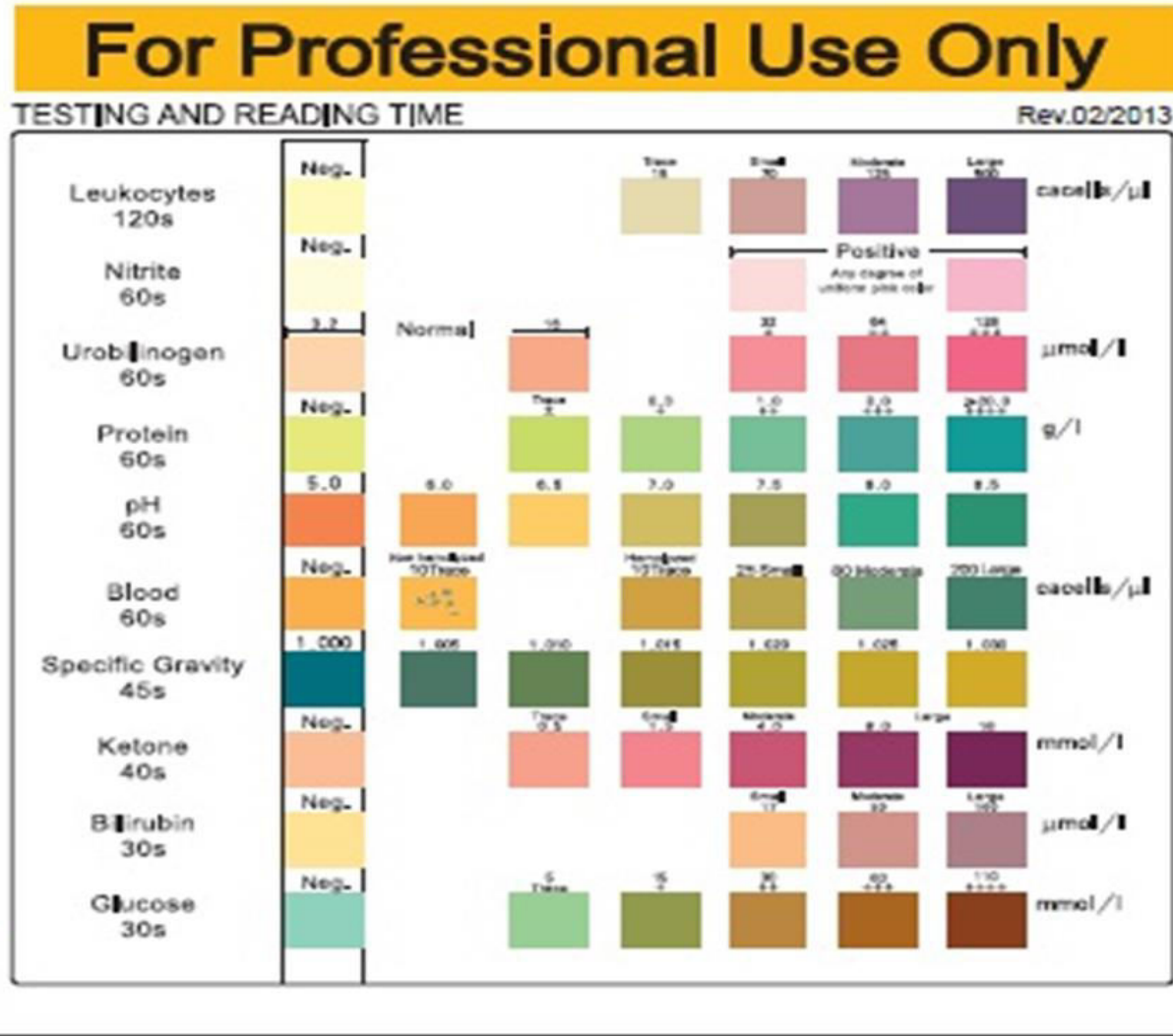


Chemical Examination:

- The chemical examination is often done with a **dipstick**, a thin strip of plastic impregnated with chemicals that change color upon reaction with certain substances present in urine.
- The color change on each segment of the dipstick is compared with a standardized color chart.



Urine Dipstick is used to determine:



Chemicals Measured by Dipstick:

- **Specific Gravity (S.G.):** is a ratio of the density (g/ml) of a substance to the density of distilled water.
- **PH:** pH of urine ranges from 4.5 to 8.2 but is **usually about 6.0 (mildly acidic)**. In patients with kidney stone disease, urine pH has a direct effect on the type of stones formed.
- **Glucose:** normally not present in urine. If present, diabetes mellitus is suspected.
- **Proteins:** should not be present in urine. A significant amount of urine protein (**proteinuria**) is usually a sign of kidney damage.

Continue:

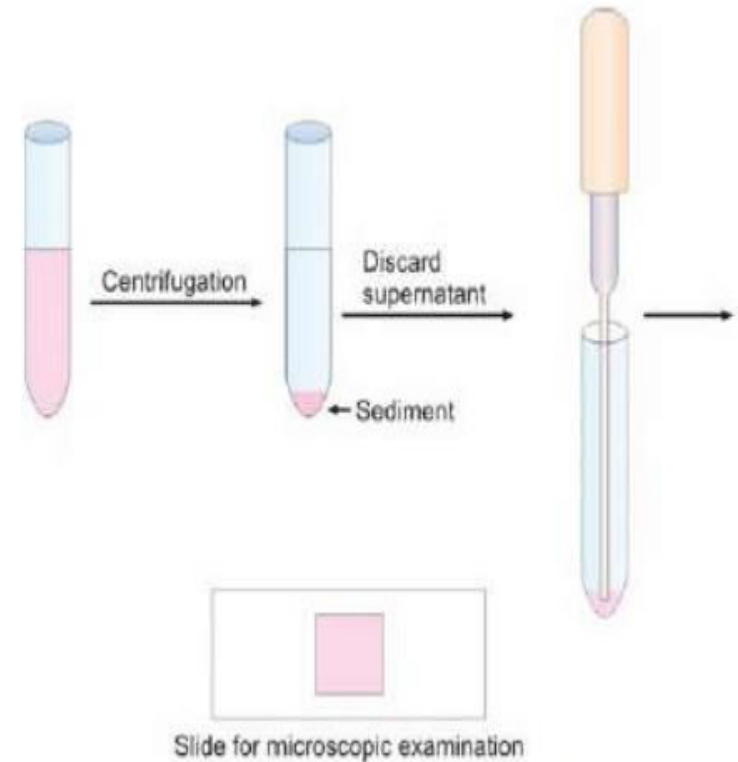
- **Bilirubin:** by-product of hemoglobin degradation is not normally present in the urine. High levels of bilirubin may indicate liver disease.
- **Urobilinogen:** by-product of bilirubin degradation is normally present in very small amounts. High levels of urobilinogen may indicate liver disease.
- **Ketones:** by-product of fat metabolism, normally not found in urine. The presence of ketones in the urine may indicate diabetes mellitus or use of a low-carbohydrate diet.

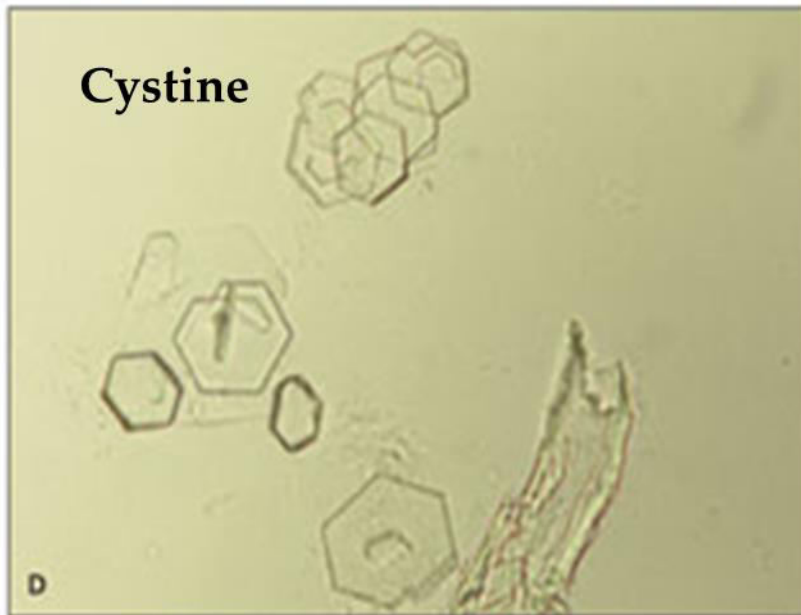
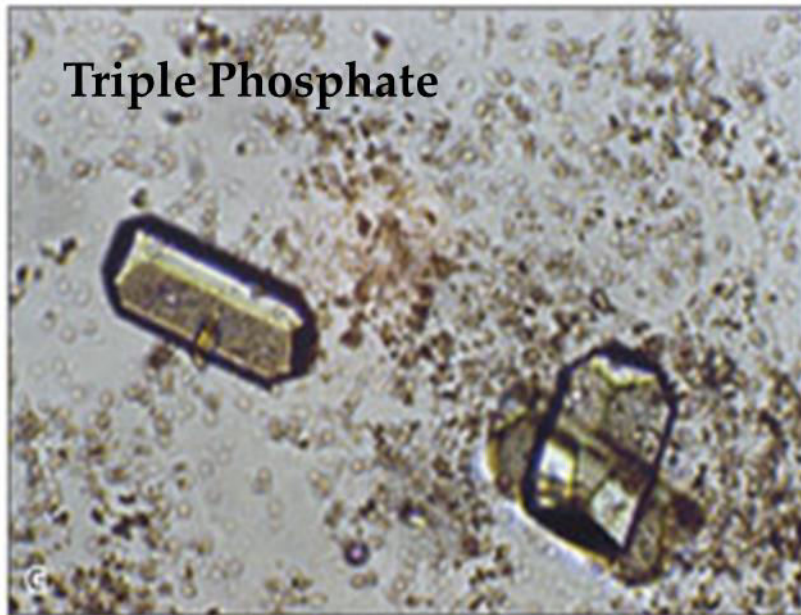
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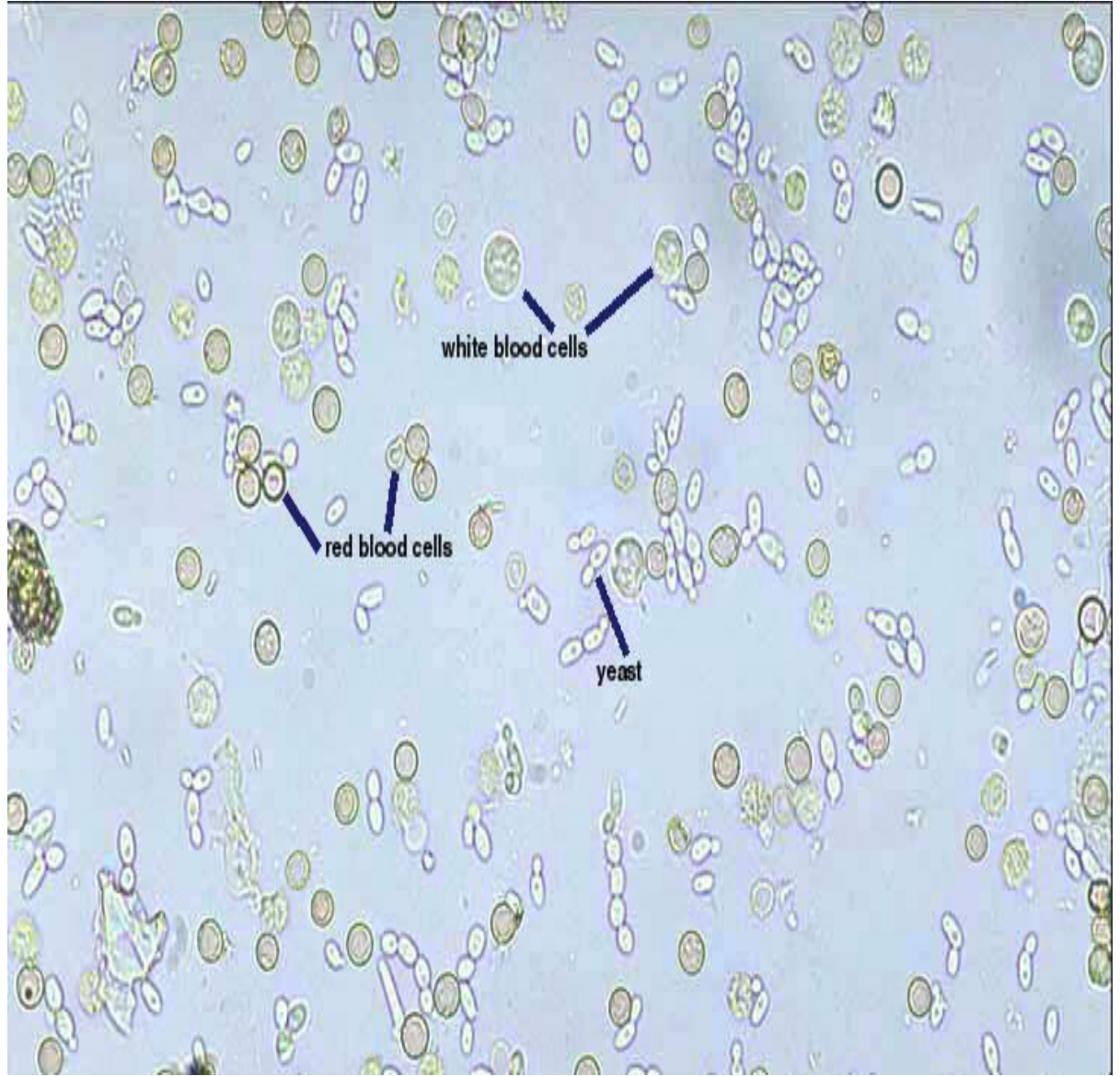
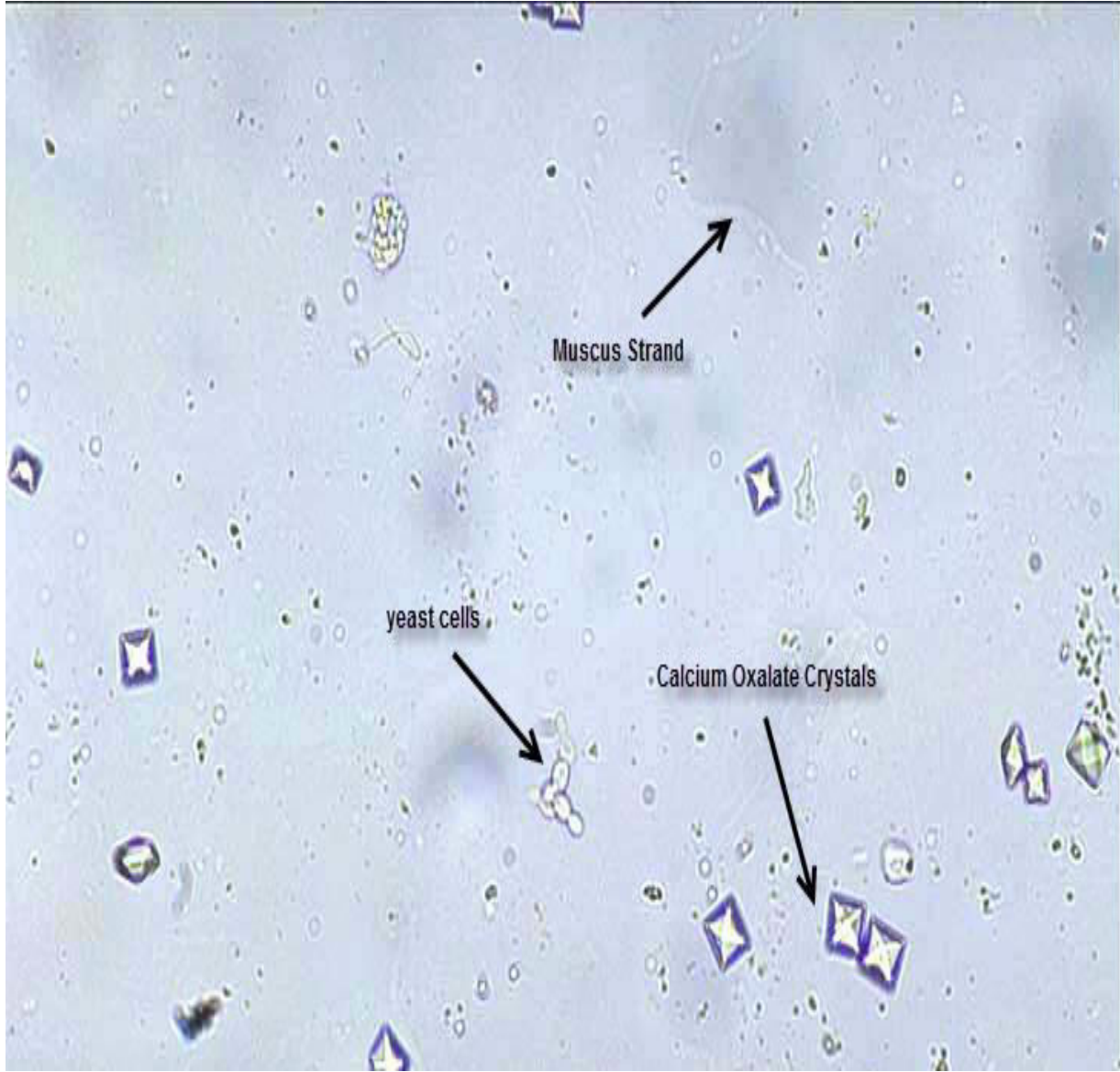
- **Leukocytes:** normally negative. A high urine WBC count usually indicates a bacterial infection somewhere in the urinary tract.
- **Nitrite:** Urine typically does not contain nitrates. The presence of nitrites is a sign of urinary tract infection (**specifically gram negative bacteria**).
- **Blood:** may present during menstruation in women, and other times if present may indicate bacterial infection or kidney damage.

Microscopic Examination:

- the urine is centrifuged
- the sediment (solid material) is examined under a microscope
- The presence of crystals in the urine is a characteristic of kidney stones, kidney damage, or problems with metabolism.







NORMAL CRYSTALS



Uric Acid



Ca Oxalate



Hippuric



Ca Phosphate



Triple Phosphate



Ca Carbonate



Ammon. Biurate

ABNORMAL CRYSTALS



Bilirubin



Cholesterol



Cystine



Leucine



Tyrosine



Sulfa



Acyclovir



Indinavir

Summary:

- **Basic requirements for Urinalysis:**

- Urine cups to collect samples
- Perform physical examination
- Perform chemical examination (using Dipstick)
- Microscopic examination
- Record your results



Report ID: 5007504004-3157004

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CONFIDENTIAL TEST REPORT

Christopher A. Eccles
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Program: WADA Full Menu	Collection Date: 12/4/2014
Lab ID: 276286	Lab Receipt Date: 12/5/2014
Specimen ID: 5007504004	Report Date: 12/23/2014
Test type: Out of competition	Orig. Report Date:
Mission Ref#: UFC-182	Gender: Male
Sport: Mixed Martial Arts	Sample Matrix: Urine
Discipline: Mixed Martial Arts	pH: 6.8
Container: A Bottle 276286-1	Specific Gravity: 1.002
	LH: .5 mlU/ml

Analyzed: Specimen was analyzed for Anabolic Agents (S1); Peptide Hormones, Growth and Related Substances (S2); Beta-2 Agonists (S3); Hormone and Metabolic Modulators (S4); Diuretics and Other Masking Agents (S5); Stimulants (S6); Narcotics (S7); Cannabinoids (S8) and Glucocorticosteroids (S9) using GC/MS, LC/MS and Immunoassay test methods.

Results: Adverse analytical finding.

Sample sheet of Urinalysis:

Patient name:

Age:

Date:

Gender:

1) Macroscopic Examination:

- Appearance:
- Color:
- Odor:
- S.G.:
- pH:
- Sugar:
- Protein:
- Ketones:
- Bilirubin:
- Urobilinogen:
- Nitrite:
- RBC:
- WBC:

2) Microscopic Examination:

- RBCs: /HPF
- WBCs: /HPF
- Casts:
- Crystals:
- Epithelial cells:
- Others:

Gràcies

