



# University Of Fallujah College Of Medicine Medical Biochemistry



## **Lecture 4: Estimation of Serum Sodium and Potassium**

**Stage: 2<sup>nd</sup> Year**

**Lecturer: Yousif Saleh**

**Department: Medical Biochemistry**

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# Learning Objectives

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- Describe the physiological distribution of sodium and potassium in body fluid compartments.
- Explain the major functions of sodium and potassium
- Identify the normal serum levels
- Recognize the main dietary sources of sodium and potassium.
- Discuss the pathophysiological conditions associated with abnormal sodium and potassium levels.
- State the principles and methods used for laboratory estimation of serum sodium and potassium
- Interpret laboratory results of serum sodium and potassium in relation to clinical findings.



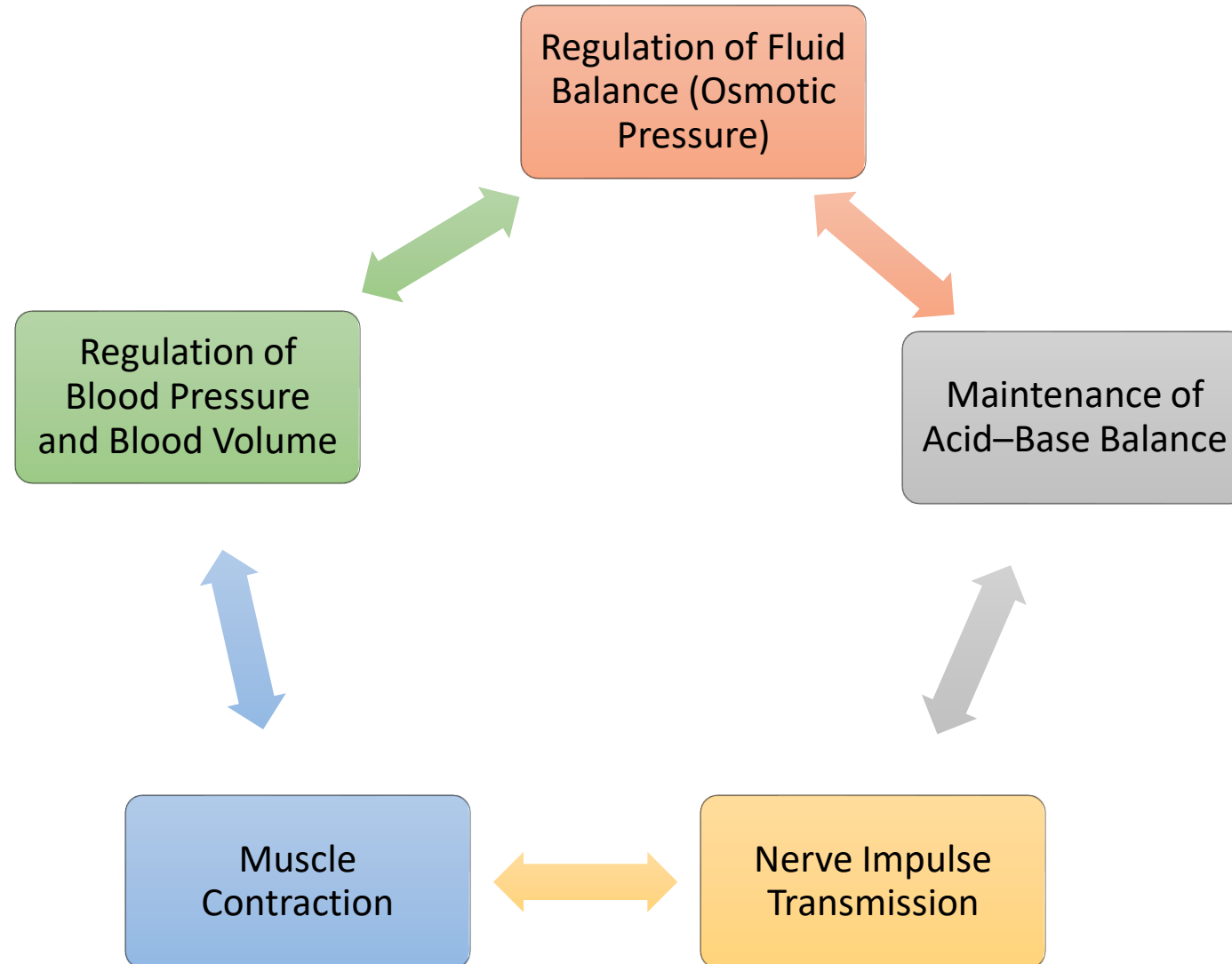
# Estimation of blood Sodium

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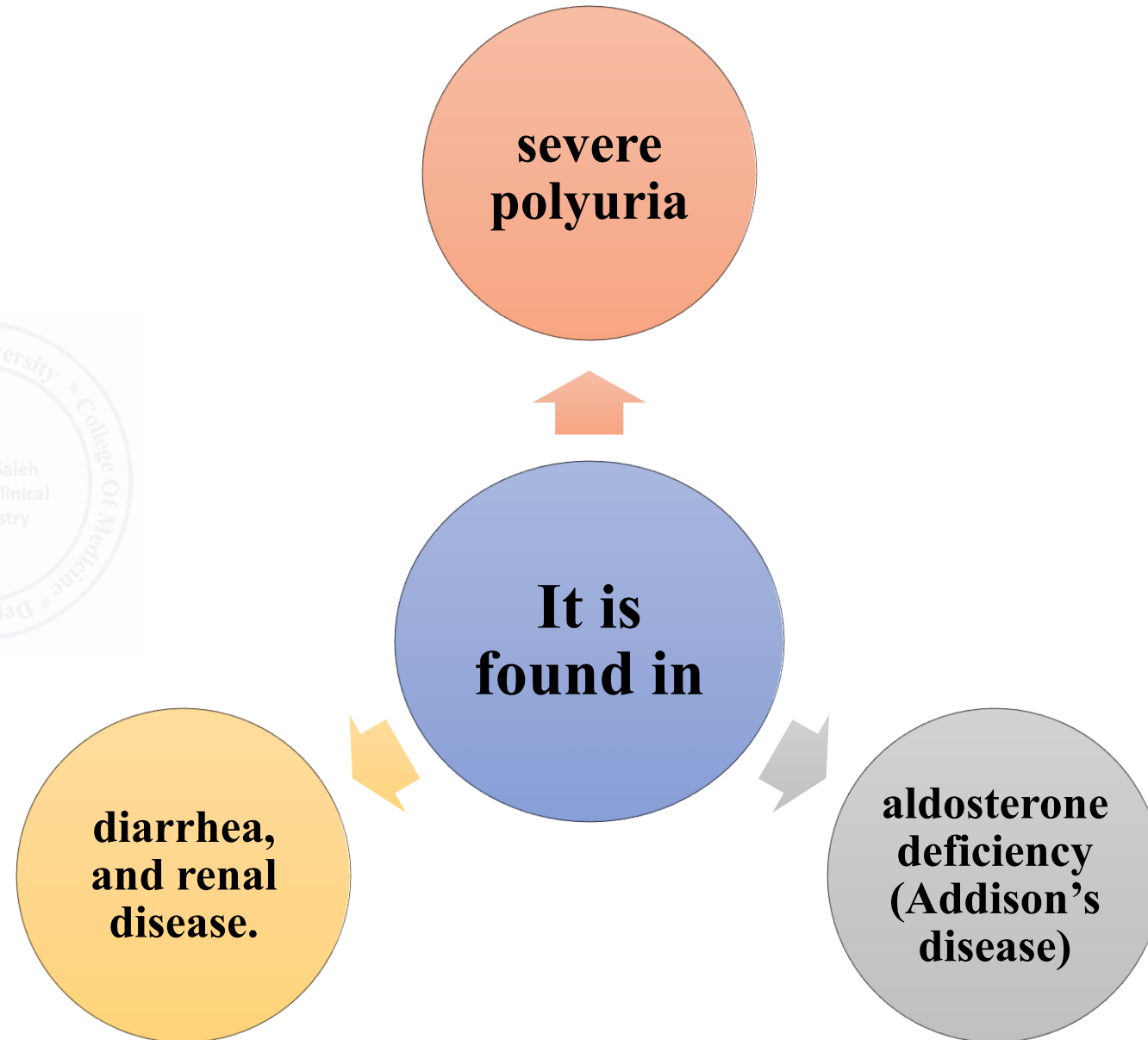
- **Sodium** is the major cation of extracellular fluid.
- It plays a central role in the maintenance of water and the osmotic pressure in the various fluid compartments.
- The main source of body sodium is sodium chloride contained in ingested foods.
- About 50% of Sodium is in bones, 40% in extracellular fluid, and 10% in soft tissues.



# Physiological functions



# Hyponatremia (low serum sodium level)





## **Hypernatremia (increased serum sodium level):**

**It is found in the following conditions:**

severe dehydration

excess treatment with sodium salts

excessive aldosterone secretion

# Dietary food sources



Table salt (NaCl)



Salty foods



Animal foods



Milk and some vegetables



## Normal levels:

- **Serum/Plasma: 135-145 mmol/ L.**

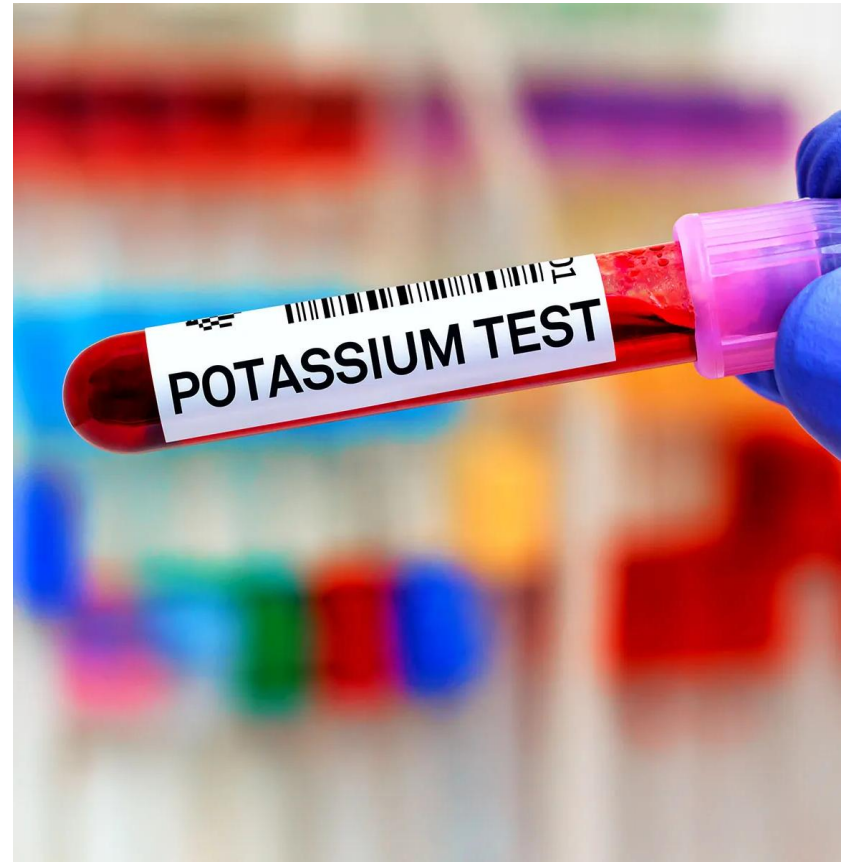
## Sample collection:

- Serum
- Heparinized plasma collected.
- (EDTA, oxalate, and citrate) must not be used.

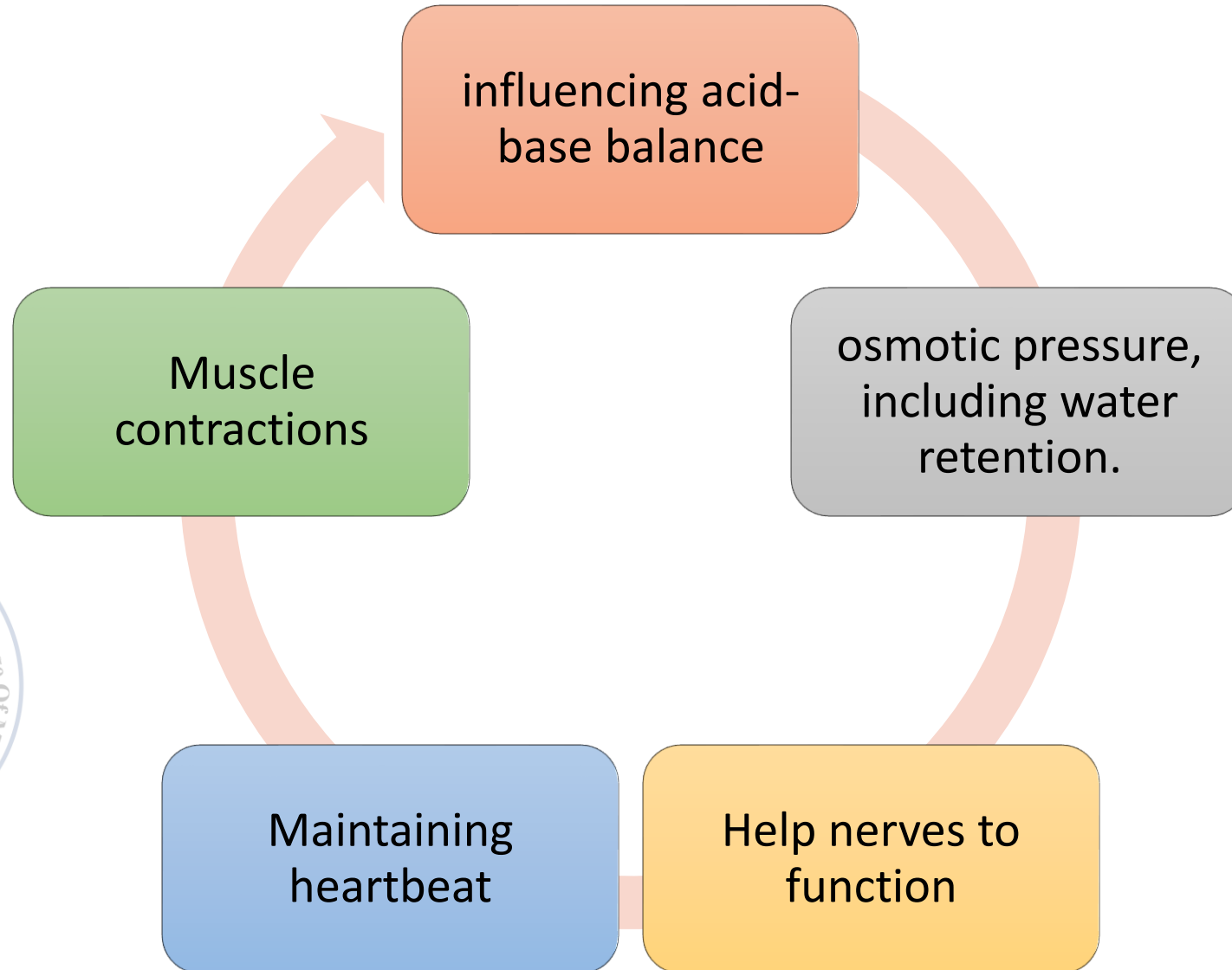
# Estimation of blood Potassium

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- **Potassium** is the principal cation of the intracellular fluid.
- It is also an important constituent of the extracellular fluid due to its influence on muscle activity.
- 98% of potassium in the body is present within the cells, and only 2% is present in the plasma.



# Functions of Potassium



# Hyperkalemia and hypokalemia

## High potassium levels (hyperkalemia)

- Renal failure.
- Dehydration shock.
- Adrenal insufficiency (Aldosterone).  
( low aldosterone )

## Low potassium levels (hypokalemia)

- Malnutrition.
- Negative nitrogen balance.
- Hyperactivity of the adrenal cortex.  
( High aldosterone )

# Sources and Normal Values

## Sources:

- Leafy greens, such as spinach and collards
- grapes and blackberries.
- Root vegetables, such as carrots and potatoes

## Normal Values:

- **Adults 3.5 to 5.1 mmol/L**



# Samples

Non-hemolysed serum is recommended.



Blood specimens should also be separated from the red cells shortly after collection to prevent any leakage of potassium from the intracellular into the extracellular.



Plasma from anticoagulants not containing potassium is also suitable.

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## Notes:

Use a serum free of hemolysis as a specimen. As red blood cells contain about 25 times the amount of potassium, they have to be separated from the serum within one hour after blood collection. Otherwise, falsely elevated potassium concentrations will be found.

If your potassium levels are too low, your body may make less insulin. That could lead to high blood sugar. Studies show that people with low potassium levels release less insulin, have higher blood sugar levels, and are more likely to get type 2 diabetes than those with normal potassium levels.

# Procedure

- Label test tubes: standard, control, patients, etc.
- Pipette 1.0 mL of Potassium Reagent.
- Add (10  $\mu$ l) of samples to respective tubes.
- Mix and let sit at room temperature for 3 minutes.
- After 3 minutes, set the wavelength of the spectrophotometer to 500 nm, and zero the spectrophotometer with a reagent blank.
- Read and record the absorbance of all tubes.

## **CALCULATION**

Abs. = Absorbance

STD = Standard

$$\frac{\text{Abs. of unknown}}{\text{Abs. of STD}} \times \text{Conc. of STD (mEq/L)} = \text{Potassium (mEq/L)}$$

# Thank you

