Al-Rasheed University
College
Medical Instrumentation
Tech. Eng.

Clinical Chemistry Instrumentation and Technology

Lecture (1)
Introduction to clinical chemistry instrumentation

2nd stage – 2022/2023

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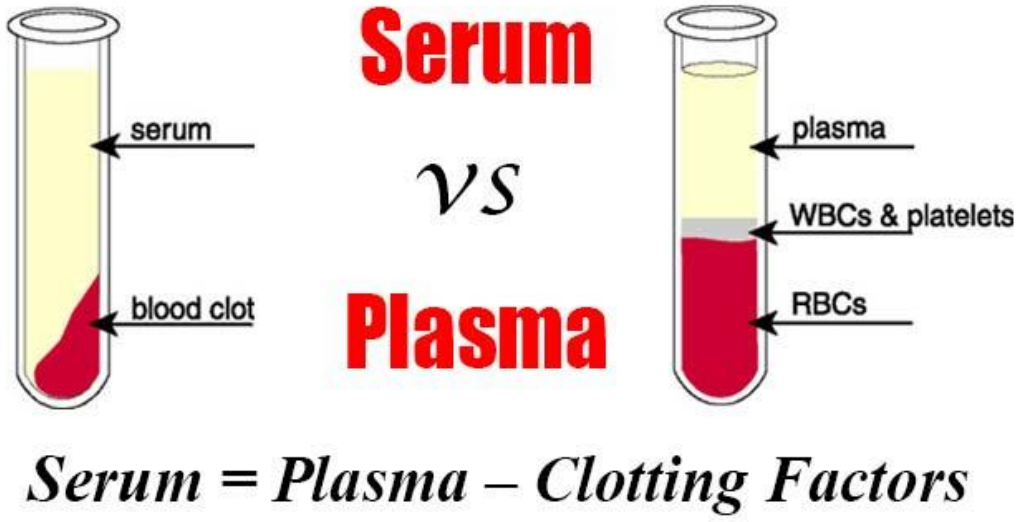
Clinical chemistry is a part of medical diagnosis (علم التشخيص الطبي) that includes analysis of body fluids such as blood (serum and plasma), urine الإدرار, spinal fluid, saliva, milk, and sweat.

- It is known as **clinical biochemistry**, **chemical pathology**, **medical biochemistry** or **pure blood chemistry**).
- Therefore, it has a primary role in diagnosing many diseases (تشخيص العديد من الأمراض) by knowing the connotations of changes (استدلالات التغيرات) in the natural levels (المستويات الطبيعية) of these chemicals in the human body.
- Any change in any chemical substance inside any organ or any human body fluid indicates a change in the health condition of that part; for example, the pH of the venous (الدم الوريدي) has a standard range of pH between pH = 7.35 to pH = 7.45; rising or decreasing beyond this range would causes death.

Blood is the common body fluid used in the clinical chemistry tests.

- Whole blood = Plasma + Cells (Red blood cells, White blood cells, and Platelets).
- Plasma = Serum (water and others) + Clotting factors عوامل التخثر such as fibrinogen.
- Serum = Plasma – Clotting factors (تم استنزاف جميع عوامل التخثر لعمل الخثرة الدموية).

Serum is widely used in clinical chemistry tests as compared to **plasma**, because the concentrations of components in the serum such as proteins, enzymes, and others can be maintained for 24 hours without been affected.



Plasma 55 %

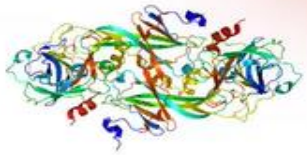
10 % Other

90 %

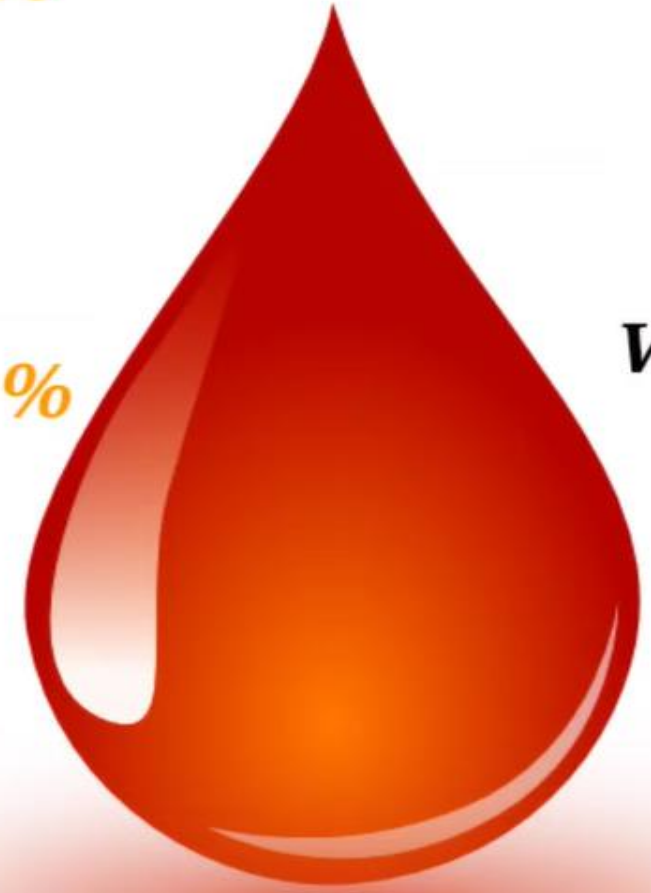
- الهرمونات Hormones
- الإنزيمات Enzymes
- الأملاح Minerals
- الكلوكوز Glucose
- وغيرها ... Others

البروتينات

- .....
- .....
- عوامل التخثر



i.e., Fibrinogen



Cells 45 %

Red Blood Cells

White blood cells

platelets

We can get the serum and plasma by using specific tubes.

By using Tubes that contains anticoagulant material, we can get plasma after centrifugation.

By using Tubes that does NOT contain anticoagulant material, we can get Serum after centrifugation.

Some tests needs serum for diagnosis, while other needs plasma for better diagnosis. Mostly, serum is applied.

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Material exist in the blood	Example	Abnormal Range Indication
Sugar	Glucose	Testing the glucose helps in diagnosis of diabetes مرض السكري, and hypoglycaemia.
Electrolytes	Sodium, Potasium, Chloride, and others	Helps in diagnosis of metabolic and kidney disorder.
Enzymes	CK-MB an isomerate of creatinine kinease	Helps in diagnosis of heart muscle failure.
Hormones	Disorder in glands.	
Lipids	HDL (high density lipoprotein) الدهون الحميده LDL (Low density lipoprotein)	Helps in daignosis of cardiovascular disease (CVD)
Metabolic substances	Creatinine وجوده في الدم يعني أن الكلية لا تقوم بعملية ترشيحه الى البول	Helps in diagnosing specific organ functions such as kidney.
Proteins		Gives indication for metabolic and nutrtional disorder.

- The concentration of all these materials are measured using clinical chemistry instruments.

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Quiz (1)

Answer the given questions