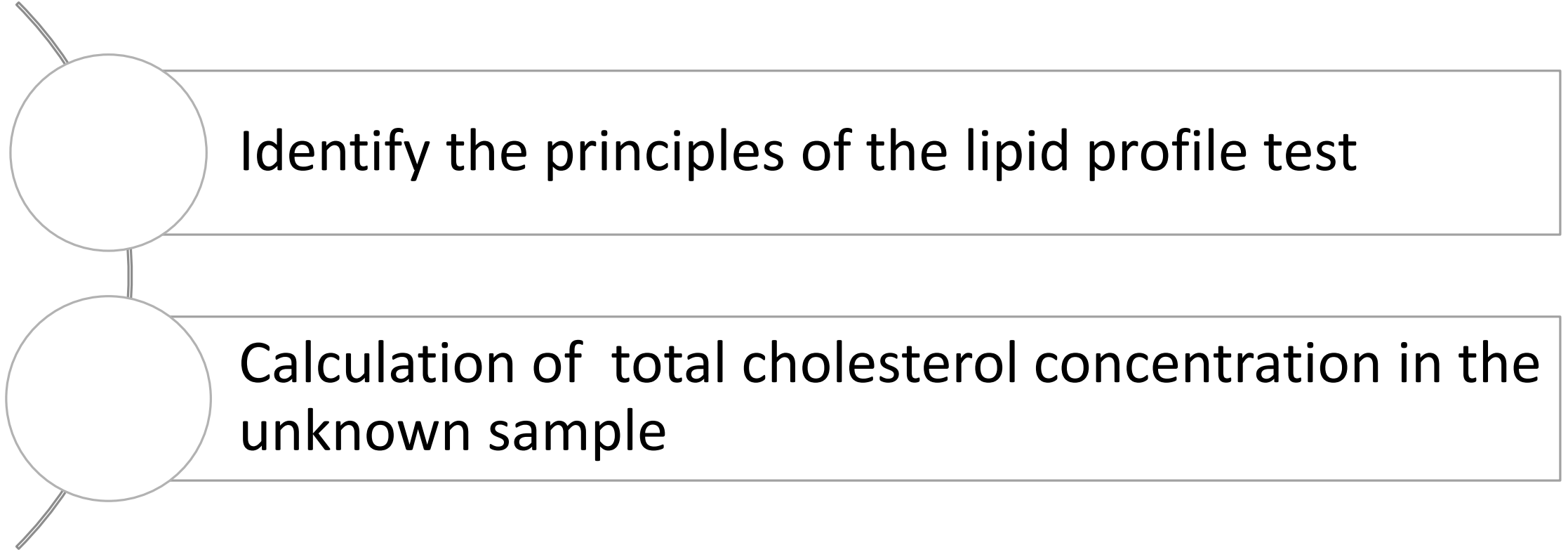


Lipid Profile

By Dr. Yasmine Sami

Medical biochemistry 2022-2023

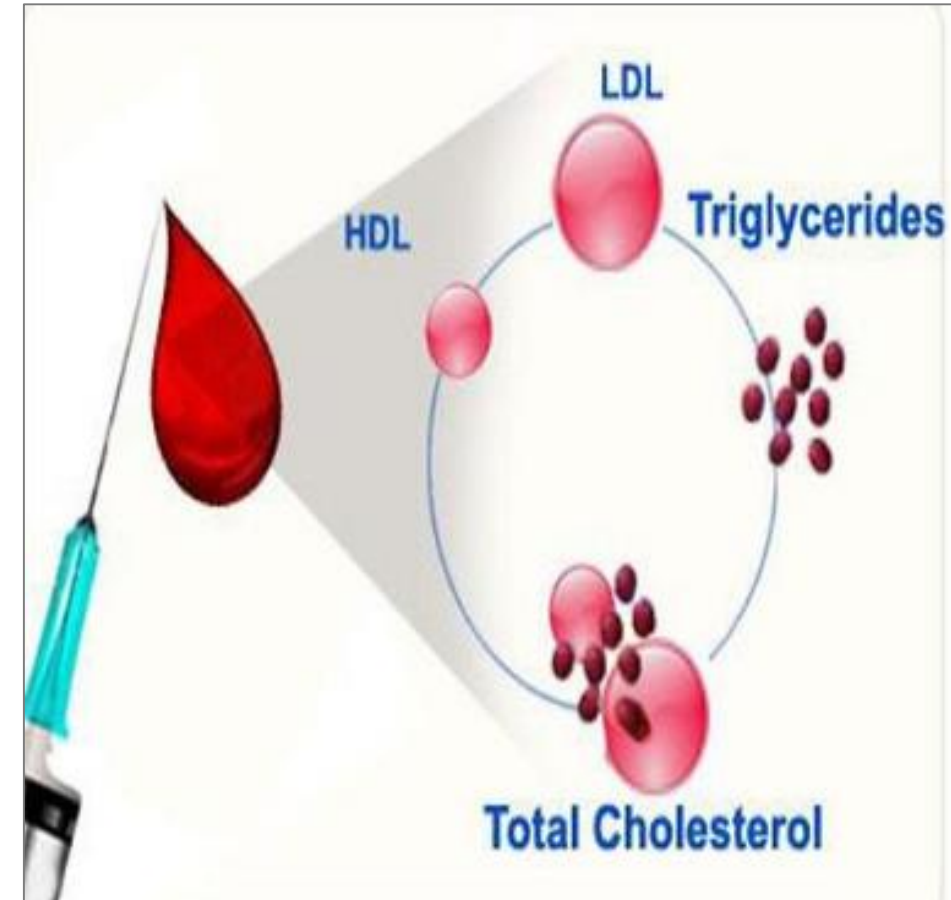
Intended learning outcomes

- 
- Identify the principles of the lipid profile test
 - Calculation of total cholesterol concentration in the unknown sample

Lipids profile

Lipid profile: A pattern of lipids in the blood.

A lipid profile usually includes the levels of **total cholesterol**, **high-density lipoprotein (HDL)**, **low-density lipoprotein (LDL)** and **triglycerides (TG)**, by using these values, a laboratory may also calculate: **Very low- density lipoprotein (VLDL)** and **triglyceride:HDL ratio**



Lipids profile

It is used to determine the risk of **heart diseases**

Lipids are different from most tests in that it is not used to diagnose or monitor a disease but is used to estimate the risk of developing a disease, specifically the heart diseases.

Blood lipoprotein

- They are lipids carrier particles .

Composed of:

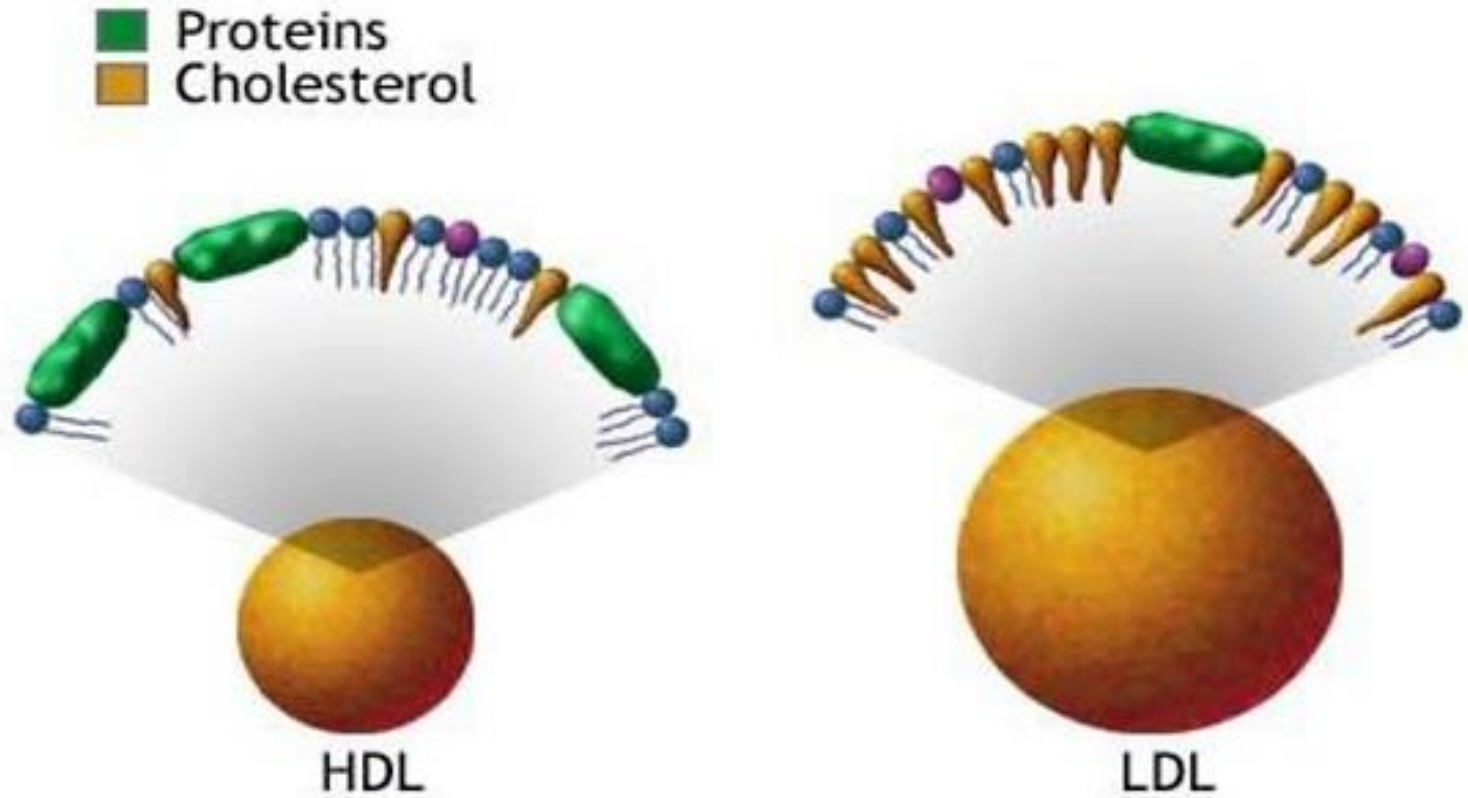
cholesterol, cholesterol ester, TG, phospholipids and protein

- **Four major types:** vLDL, LDL, HDL and chylomicron

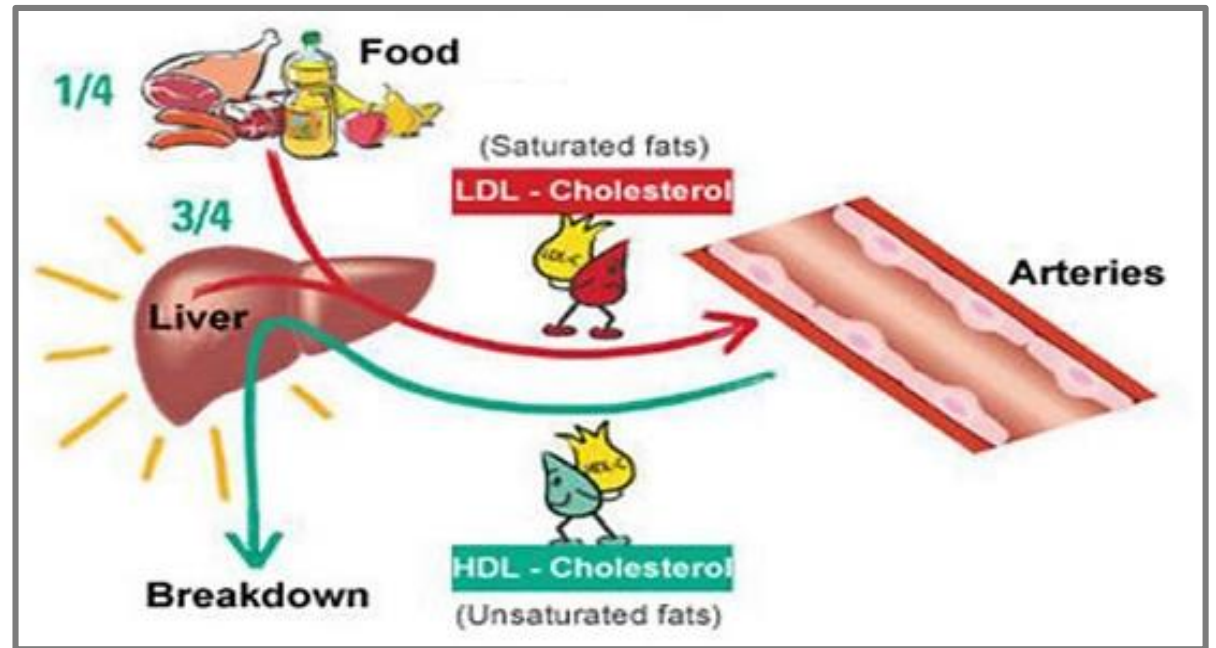
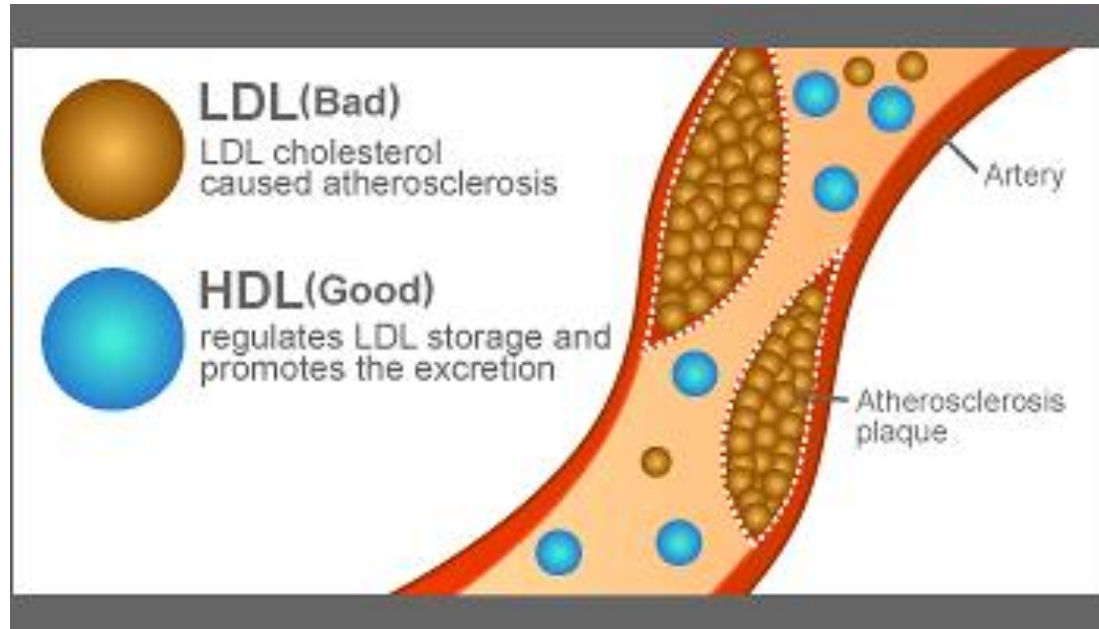
They differ in the contents of each composition.

- **Function:** transport lipids in blood to organs (lipids are hydrophobic and can't transport in blood without carrier)
- Then these lipids are either: stored in adipose tissue or oxidized to give energy

Lipoproteins vary in size and composition



HDL vs. LDL cholesterol



Cholesterol

❑ It is **steroid**. Cholesterol is a type of fat, found in the blood.

❑ **Sources:** Diet and It is synthesized de novo

70% synthesized in body

30% from food (animal source as meat, eggs and dairy products)

❑ Cholesterol is needed by the body to maintain the health of the cells. Too much cholesterol leads to coronary artery disease. Blood cholesterol level is related to the foods you eat or to genetic conditions (passed down from other generations of family members).

Cholesterol

❑ **Excretion:** mainly excreted in the form of bile salts

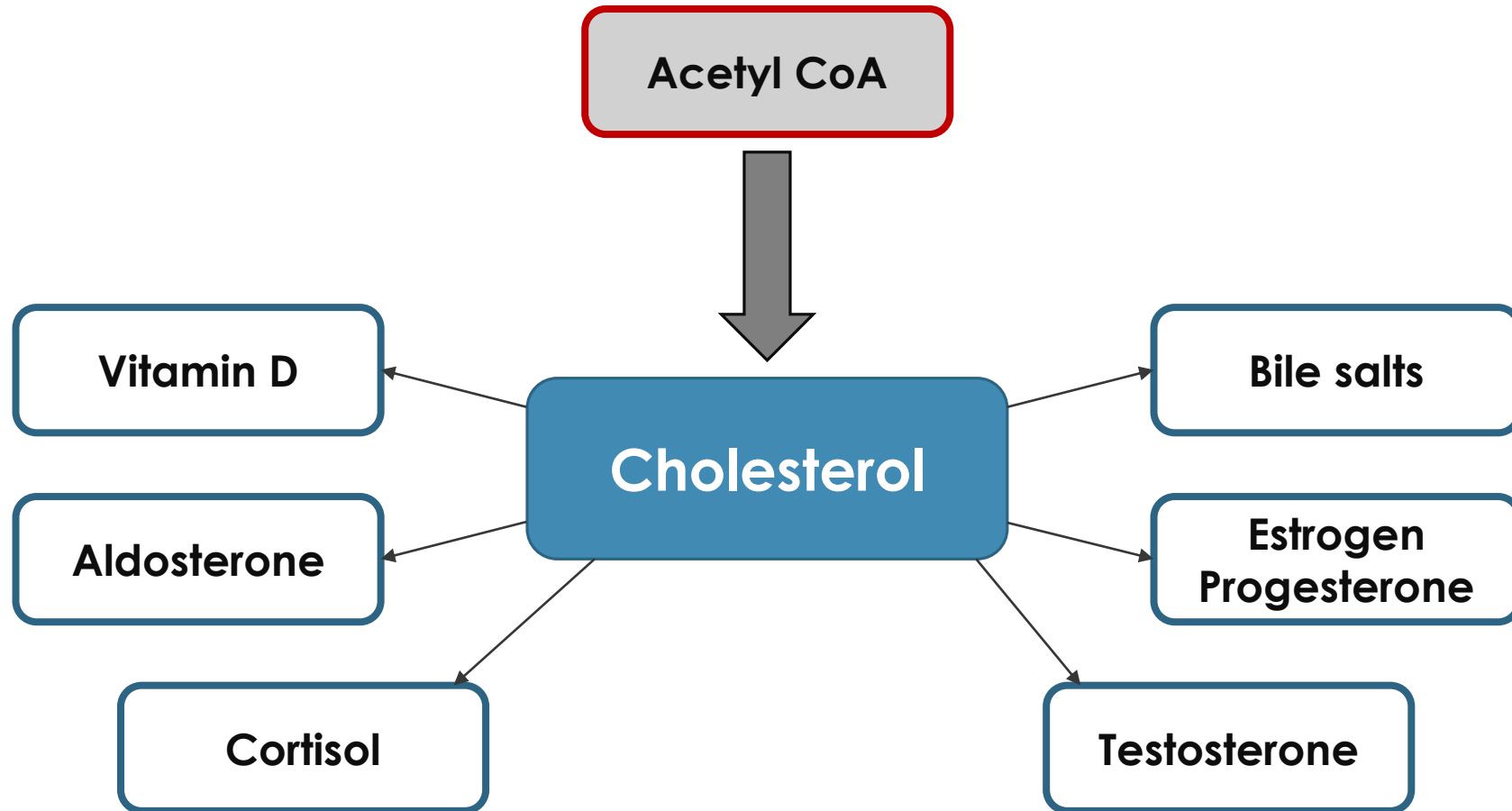
❑ **Functions**

Cholesterol has important function in body:

- Important part in membrane of cells, organs and tissues in the body
- It is the precursor for many vital substances in our body

Therefore, cholesterol deficiency is not good.

Cholesterol



Normal range

Total cholesterol (mg/dl)	<200	Desirable
	200-239	Borderline high
	≥240	High

Sample collection

- ❖ Fasting sample is **required** for estimation of lipid profile
- ❖ Examine the gross appearance of serum for **lipemia**

Cholesterol – enzymatic method

Principle:

These measure total cholesterol directly in plasma/serum through a series of reaction in which cholesterol esters are hydrolyzed, the 3- OH group of cholesterol is oxidized & H₂O₂ is liberated which is measured

Cholesterol – enzymatic method

- a. Cholesterol esters + H₂O \longrightarrow Cholesterol + free fatty acids
- b. Cholesterol + O₂ $\xrightarrow{\text{(Cholesterol oxidase)}}$ Cholesten-4 en-3-one + H₂O₂
- c. H₂O₂ + phenol + 4-aminoantipyrine $\xrightarrow{\text{(peroxidase)}}$ quinonimine dye+2H₂O

The intensity of this red quinonimine dye formed is proportional to the concentration of cholesterol in the original sample.

Procedure

Concentration of the **standard** 200 mg/dl

Set up 2 test tubes as following , and then add:

Reagent	Test	Standard	Blank
Working solution	1ml	1 ml	1 ml
Serum	10 μ l	-	-
Standard	-	10 μ l	-

Mix well, incubate at room temperature for 10min, then the absorbance of quinonimine produced is measured at 500 nm

Concentration of total cholesterol

Use **Beer-Lambert equation** to receive to the concentration of total cholesterol in the patient sample:

Total cholesterol (mg/dl):

$$C_{\text{test}} = \frac{A_{\text{test}}}{A_{\text{standard}}} \times C_{\text{standard}}$$

Clinical significance

1. Hypercholesterolemia

a. Primary:

- i.* Polygenic hypercholesterolemia
- ii.* Familial hypercholesterolemia
- iii.* Familial combined hyperlipidemia

b. Secondary:

- i.* Nephrotic syndrome
- ii.* Obstructive jaundice
- iii.* Hypothyroidism

Clinical significance

2. Hypocholesterolemia

- I. Malabsorption and malnutrition
- II. Hemolytic jaundice
- III. hyperthyroidism

Clinical significance

Hypercholesterolemia is a major risk factor for:

- I. Atherosclerosis
- II. Hypertension
- III. Coronary artery disease (CAD)

Therefore, it is mandatory to assess lipid profile in:

- a. CAD and CVA patients
- b. A family history of premature CAD
- c. Other major risk factors of CDA (DM, hypertension)
- d. Patients with clinical features of hyperlipidemia
- e. Patients whose plasma is seen to be lipemic

THANK YOU !

ANY QUESTIONS ??

PLEASE ASK