

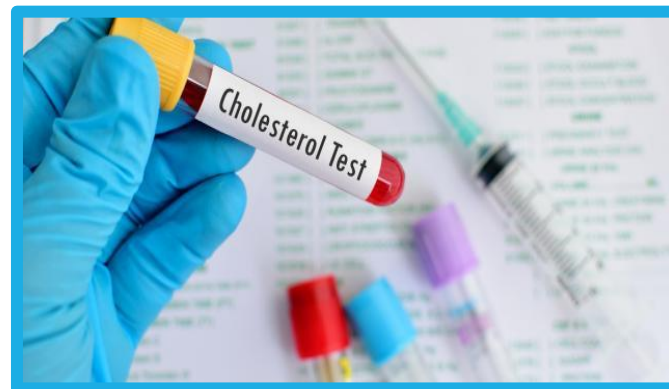


# Al-Mustaqbal University College Pharmacy Department – Fifth Class



## Practical Clinical Chemistry

### Estimation of Lipid Profile



***Third Lec.***

***Asst. Lec. ZAINAB GHALEB***

## Lipid Profile Tests

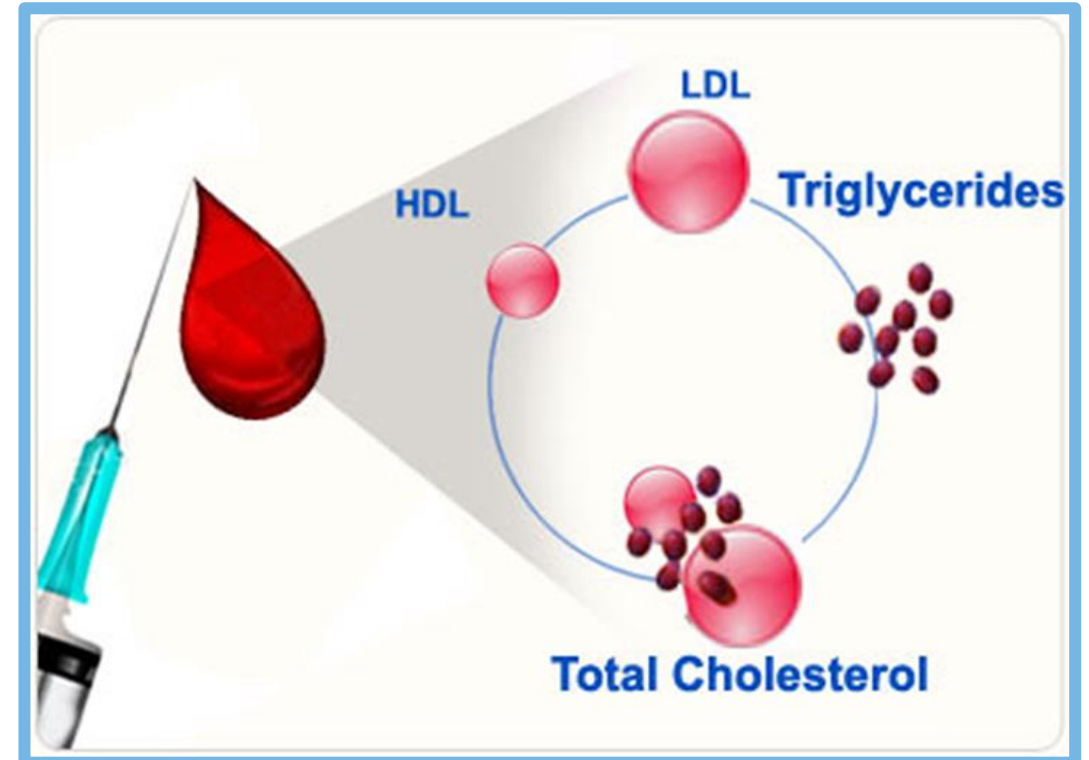
- ❑ It is a **group of tests** used together to **determine the risk of Heart disease**.
- ❑ The results of the lipid profile along with other known risk factors of **heart disease** are important for **know the proper treatment**.

Includes:

- ✓ Triglycerides
- ✓ Total Cholesterol
- ✓ HDL Cholesterol
- ✓ LDL Cholesterol

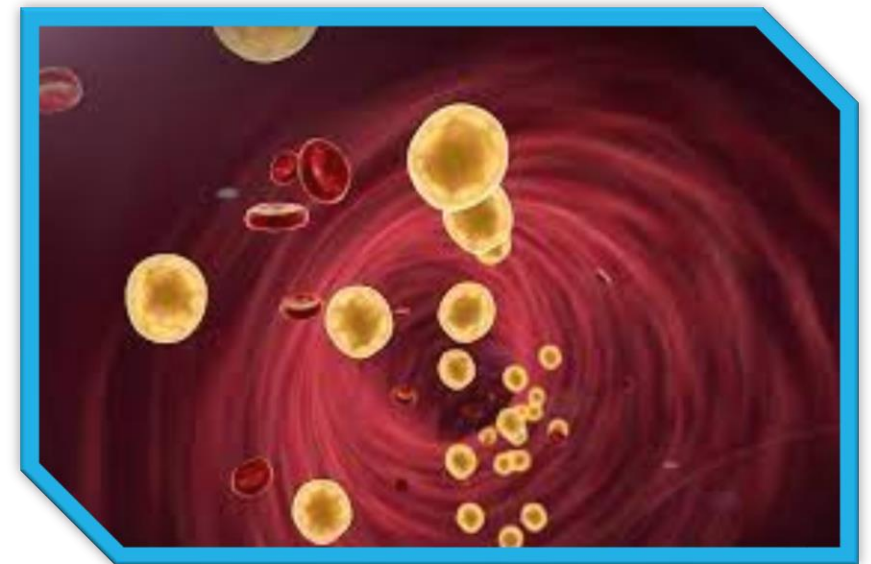
□ The results of this test can identify certain genetic diseases and can determine approximate risks for cardiovascular disease, certain forms of pancreatitis, and other diseases.

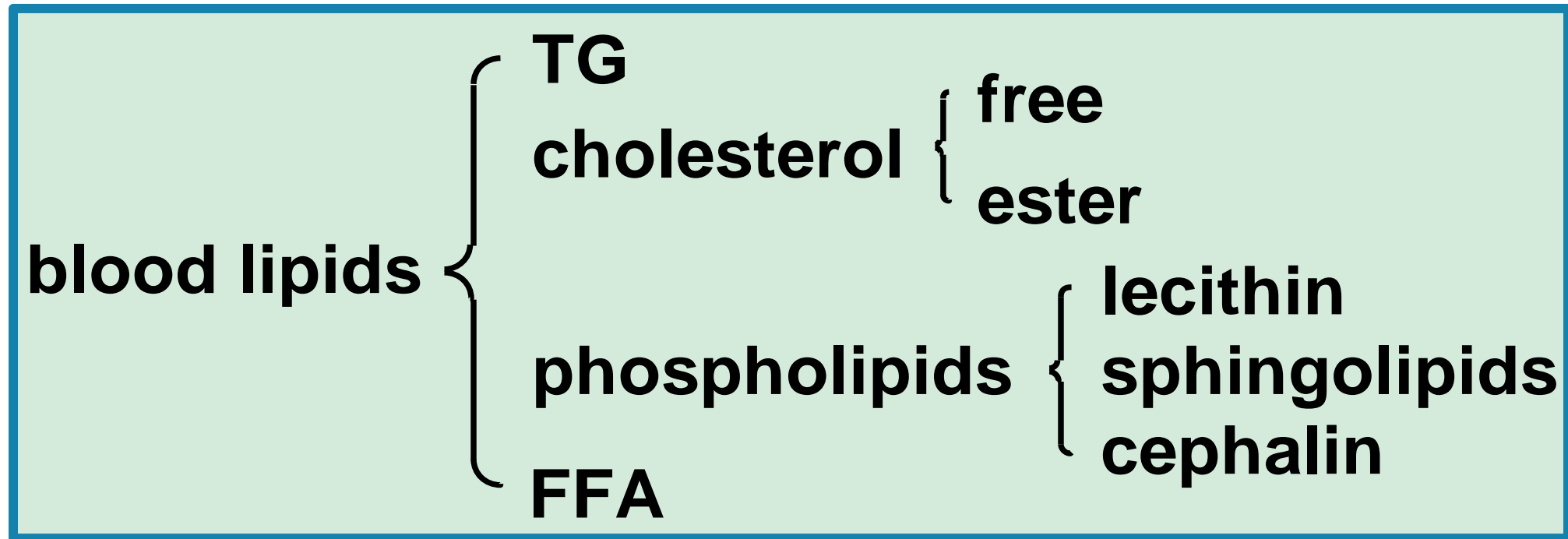
□ In labs may also calculate: Very low-density lipoprotein VLDL & Cholesterol :HDL ratio.



## Blood lipid

- ❑ **Concept:** All the lipids contained in plasma, including fat, phospholipids, cholesterol, cholesterol ester and fatty acid.
- ❑ **Blood lipid exist and transport in the form of lipoprotein.**



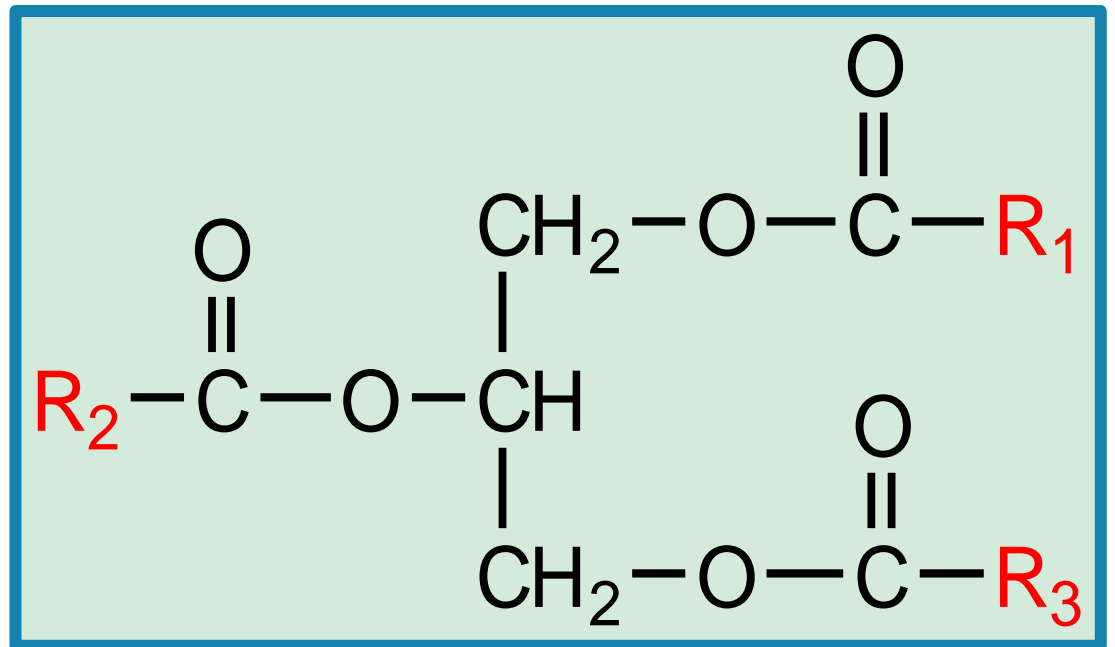


## Triacylglycerol

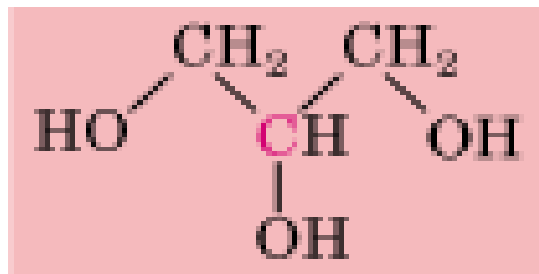
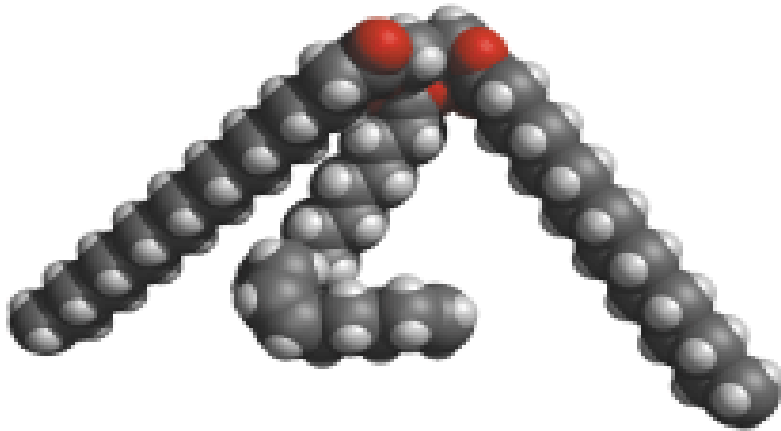
- ❑ TG are the **major fat** in the human diet and comprise **85-90%** of body lipids.
- ❑ TG give energy (in case of absence of carbohydrates) for the body and store in adipose tissue.
- ❑ TG in human plasma can be **exogenous** (**derived from food**) or can be **endogenous** (**synthesized in the body**).

# Triacylglycerol

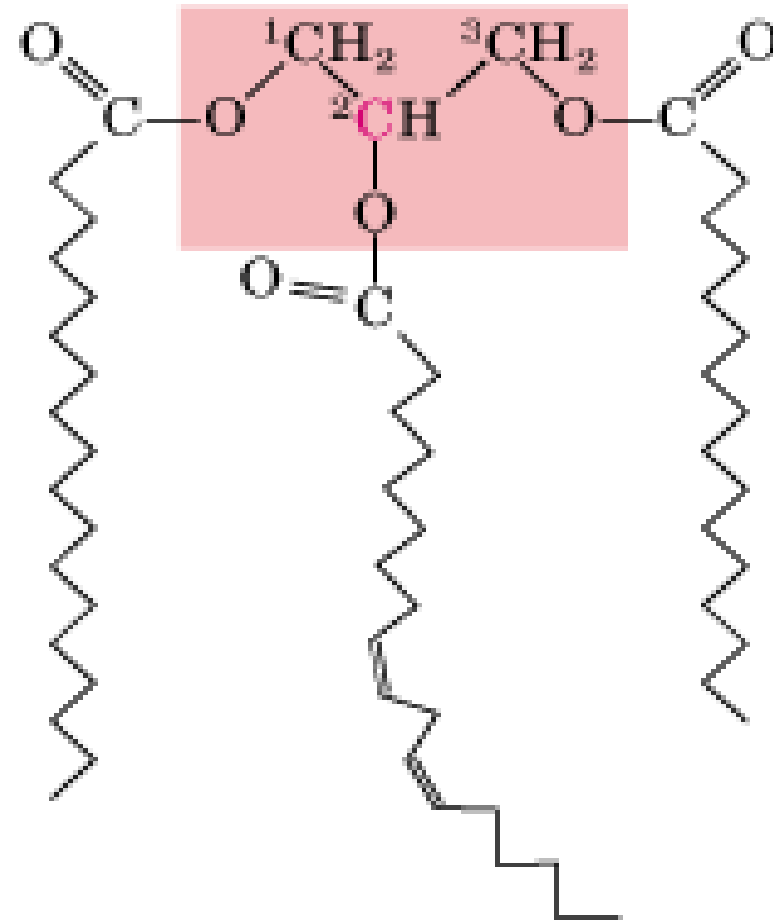
- Triglycerides are **water-insoluble** lipids consisting of **three fatty acids** linked to one **glycerol** molecule.
- They represent a concentrated source of metabolic energy contributing **9 kcal/gm**.



# Triglyceride (TG) or triacylglycerol (TAG)



**Glycerol**





## Normal Value:

➤ The Normal Value of Triglyceride (TG) is must be between:

35 – 160 mg/dl

Or

0.45 – 1.81 mmol/l

➤ Elevated: more than **200** mg/dl (2.3 mmol/l).

- TG test needs **12** hrs. fasting because its level is effected by meal (fatty meal, high carbohydrates meal).
- High TG leads to fatty liver.

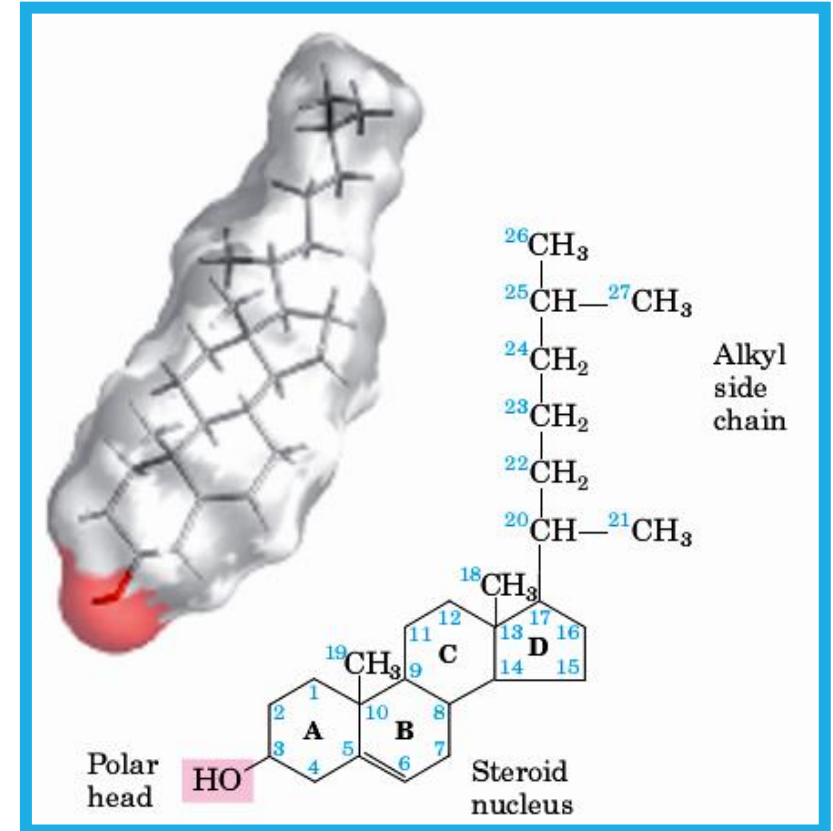
## Clinical Significance

**In general Triglycerides increased in the following conditions:**

- 1. Overweight and obesity.**
- 2. Physical inactivity.**
- 3. Excess alcohol intake.**
- 4. Very high carbohydrate diets (>60% of energy).**
- 5. Other disease (diabetes, renal failure, nephrosis).**
- 6. Drugs: steroids, estrogen, etc.**
- 7. Atherosclerosis.**
- 8. Genetic factors.**

# Cholesterol

- ❑ **What is Cholesterol?**
- ❑ Cholesterol is a fatty substance (lipid), which is essential to healthy life.
- ❑ It is **Amphipathic**:
  - It has both a **water-soluble region** (a polar -OH group) and a **fat-soluble region** (a non-polar steroid ring structure and hydrocarbon tail).

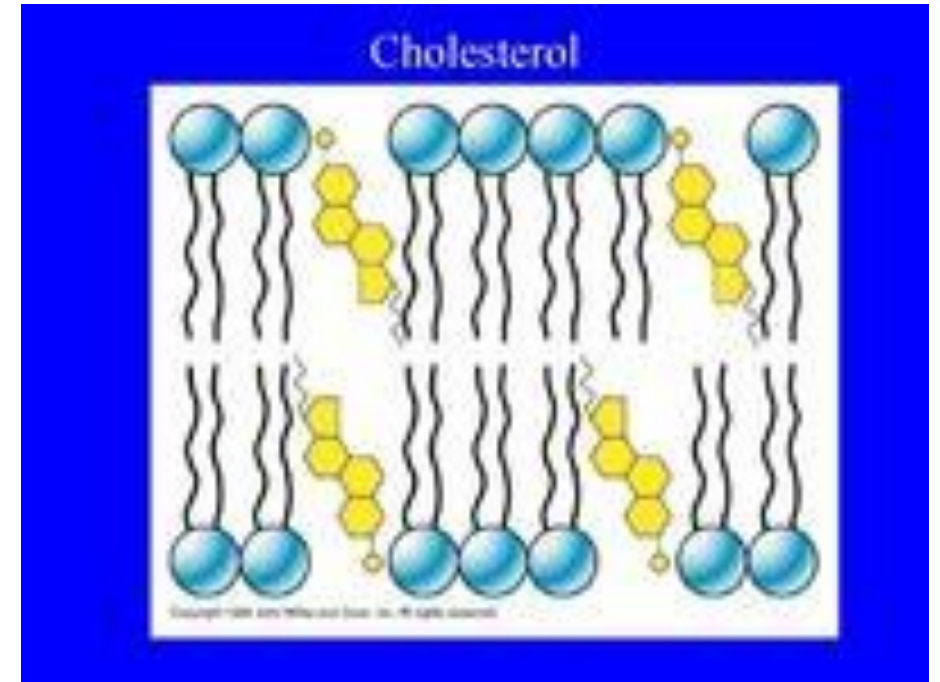


- ❑ **Cholesterol found in blood. It is produced by body and also comes from the foods (animal products). 70% synthesized in body, 30% from food.**
- ❑ **Too much cholesterol leads to coronary artery disease. blood cholesterol level is related to the foods or to genetic conditions (passed down from other generations of family members).**

# Cholesterol Functions

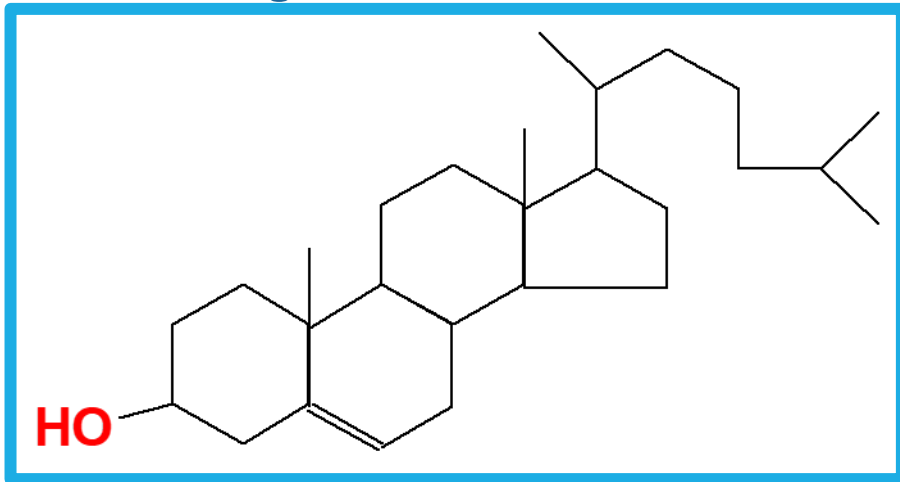
❑ **It is Essential for many body functions:**

- **Formation & Maintenance of cell membranes.**
- **Formation of several Hormones.**
- **Production of bile salts which help digest food.**
- **Conversion into Vitamin D in the skin when exposed to sunlight.**

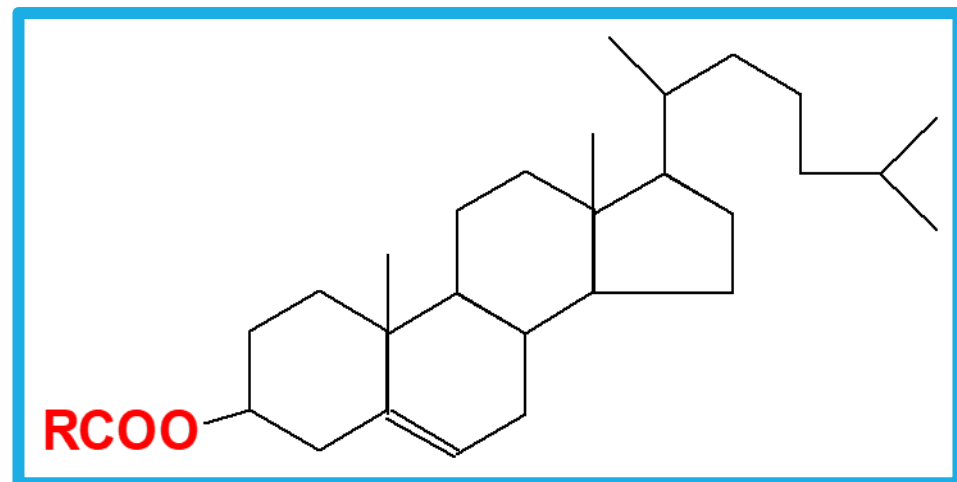


# Cholesterol(Ch) and Cholesterol Ester(CE)

- Cholesterol is transported in the bloodstream of all animals. A **large portion** of the cholesterol in blood is in the form of **cholesteryl esters**.



**Cholesterol**



**Cholesterol Ester**

## Normal Value:

➤ **The Normal Value of Cholesterol (Cho) is must be between:**

**At birth to one month:**

**45 – 100 mg/dl**

**Adult:**

**150 – 250 mg/dl**

- **Cholesterol is 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 heart disease.**

**Clinical  
Significance**

```
graph TD; A([Clinical Significance]) --> B([Hypercholesterolemia]); A --> C([Hypocholesterolemia]);
```

**Hypercholesterolemia**

**Hypocholesterolemia**



## Hypercholesterolemia

1. **Nephrotic syndrome.**
2. **Diabetes mellitus.**
3. **Hypothyroidism.**
4. **Obstructive Jaundice.**
5. **Cirrhosis.**
6. **Atherosclerosis.**
7. **Obesity.**

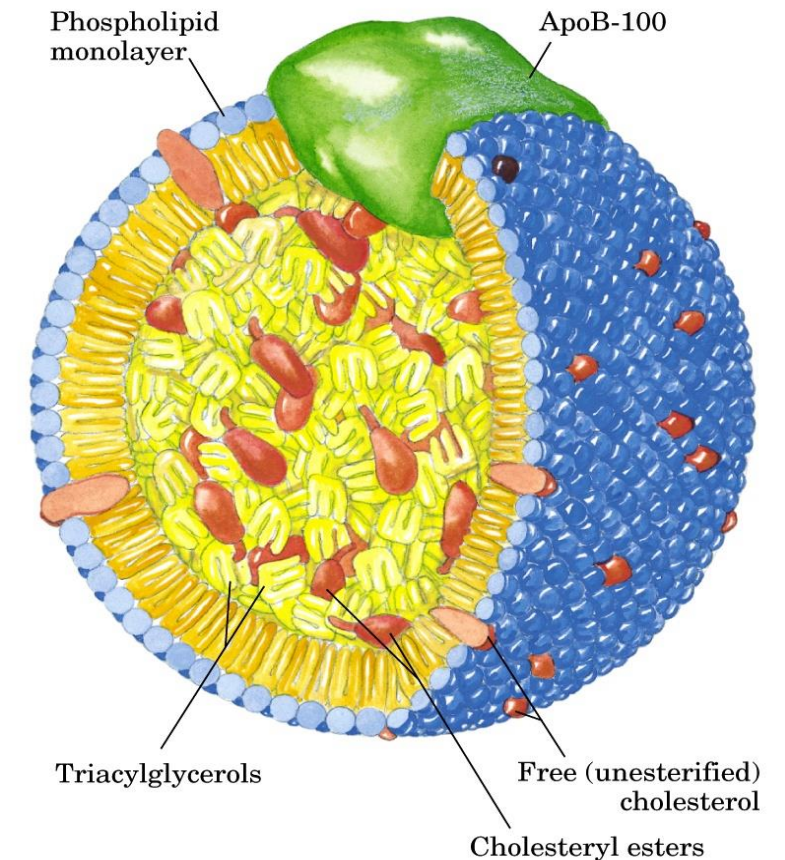
## Hypocholesterolemia

1. **Hyperthyroidism.**
2. **Low absorption of lipid from intestinal.**
3. **Several inflammation of liver.**
4. **Starvation.**

# Lipoproteins

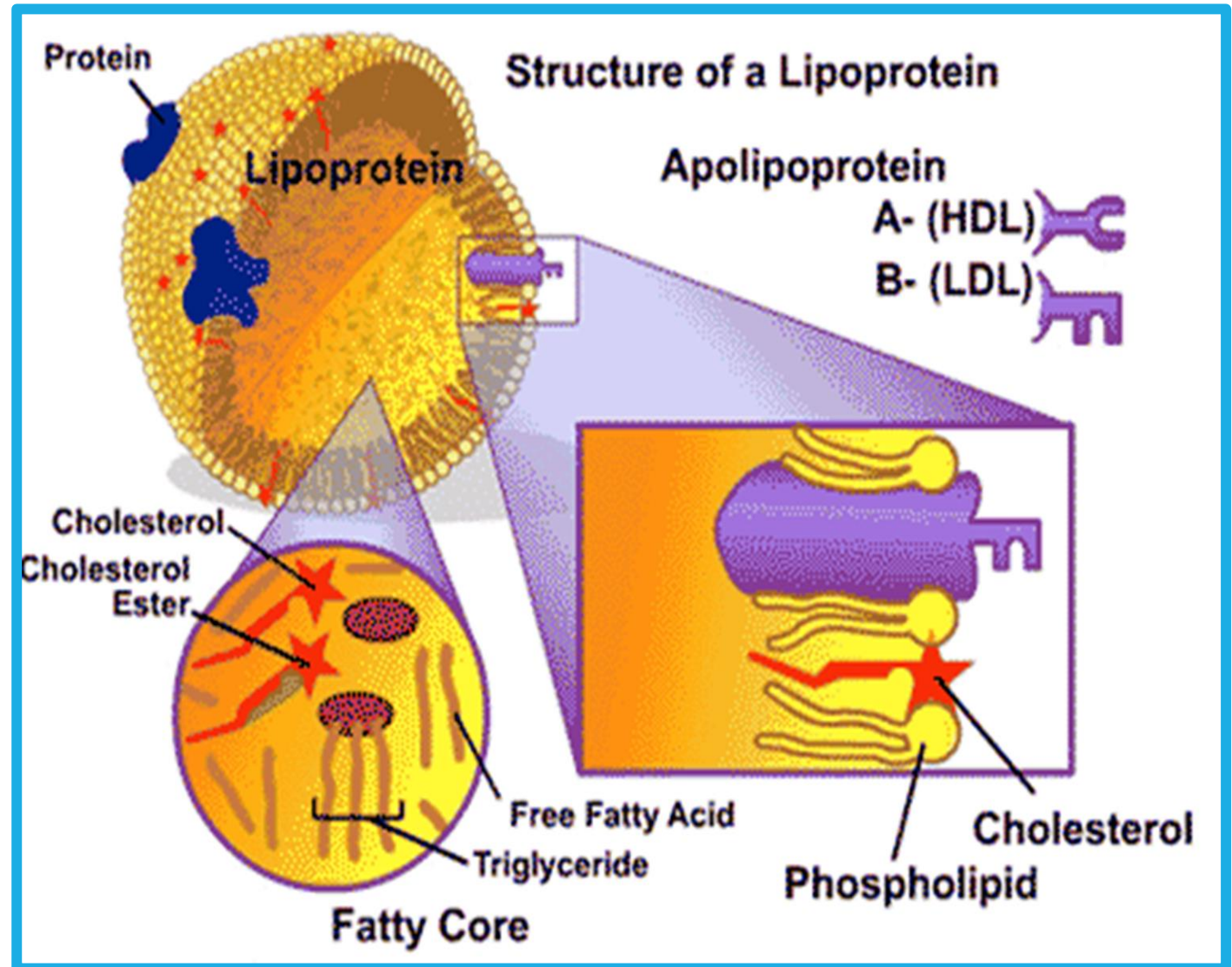
## What are lipoproteins?

- Lipoproteins are **Non-covalent** assemblies of **lipids** and **proteins**.
- LP are **soluble in water** because the surface consists of polar lipids.
- Mainly transport lipids in blood plasma.



## Structure:

- **LP core:**
  - **Triglycerides.**
  - **Cholesterol esters.**
- **LP surface:**
  - **Phospholipids.**
  - **Proteins.**
  - **Cholesterol.**



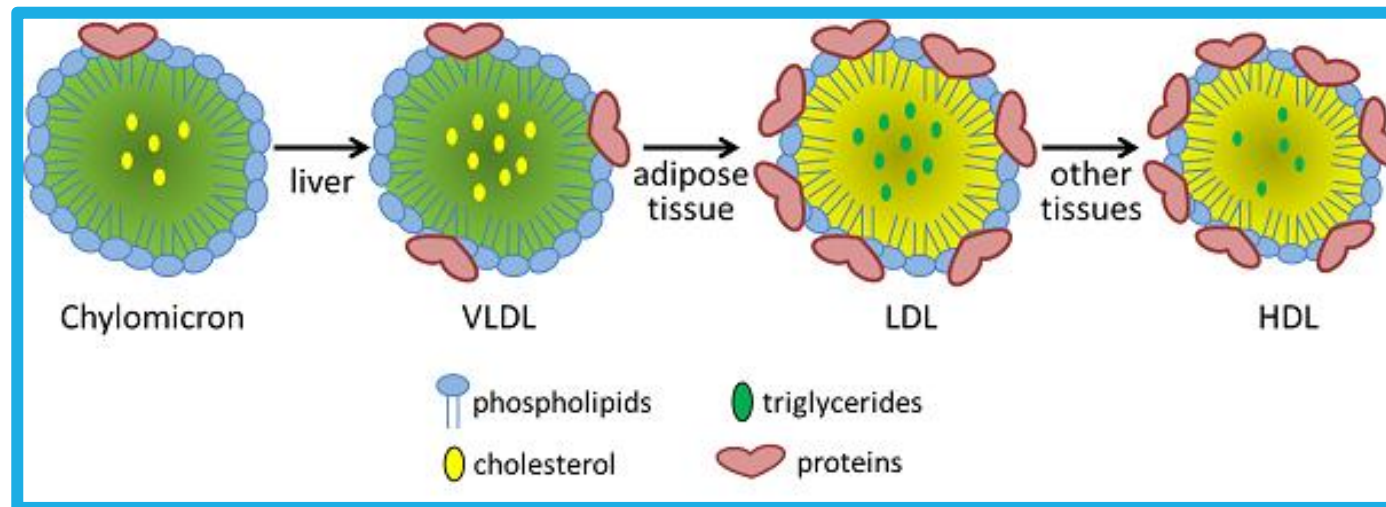
## Classification of plasma lipoproteins

□ **Classification of plasma lipoproteins according to their density:**

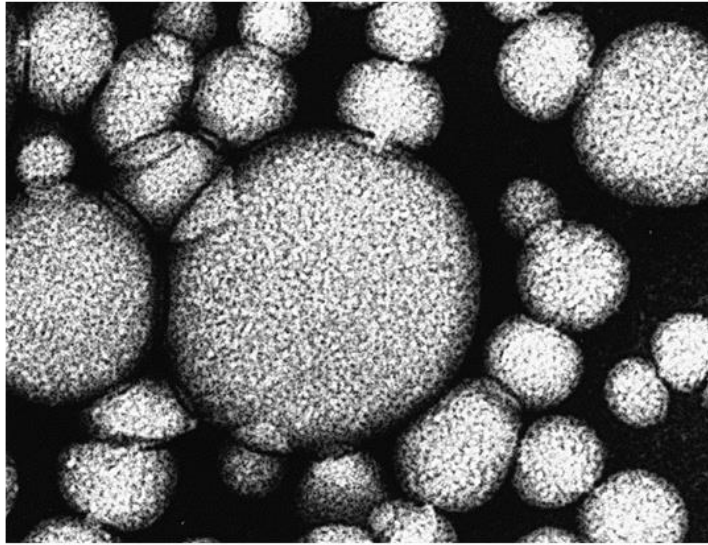
- ✓ **High density lipoprotein (HDL).**
- ✓ **Low density lipoprotein ( LDL).**
- ✓ **Very low density lipoprotein ( VLDL).**
- ✓ **CM (chylomicron).**

# Apolipoproteins (apoproteins)

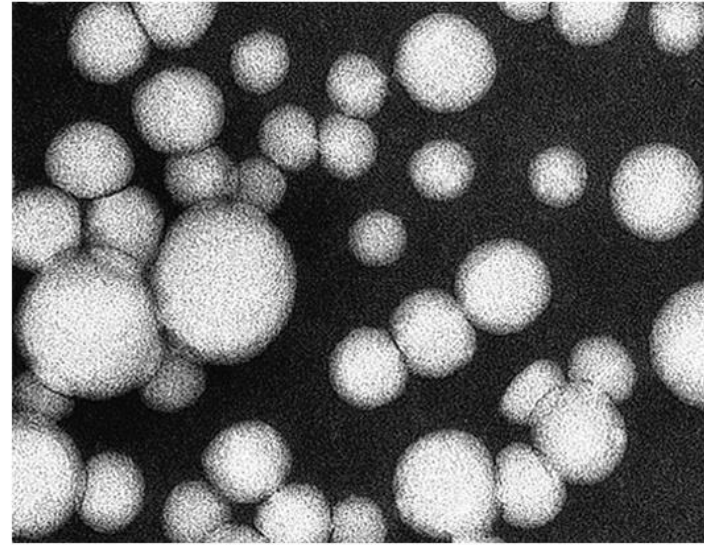
- They are the protein components of lipoproteins Consisting:
  - ✓ 60% of some lipoproteins (**HDL**).
  - ✓ and 1% of some lipoproteins (**chylomicrons**).



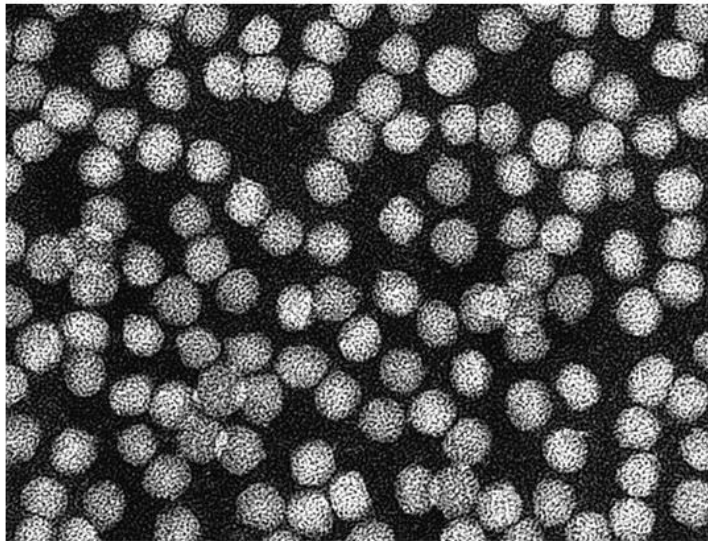




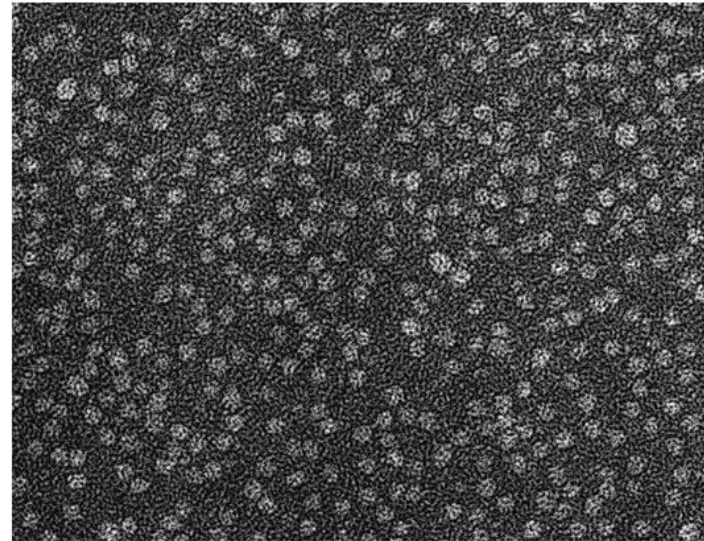
Chylomicrons (x60,000)



VLDL (x180,000)



LDL (x180,000)



HDL (x180,000)

# HDL

- ❑ **High Density Lipoproteins (HDL).**
- ❑ Are the **smallest** and the **most dense** lipoprotein particles.
- ❑ They contain **large amount** of **proteins** (50-60%) and very little **triglycerides**, while the predominant lipid is **phospholipid**.
- ❑ HDL: **good cholesterol**, carry cholesterol from **organs** and blood to **liver** to get rid of it (It **removes excess cholesterol** from **tissues** (it cleans blood)).

- ❑ HDL is **Very safe**.
- ❑ The level of HDL in serum is **inversely** related to **atherosclerosis** and **myocardial infarction**.
- ❑ High levels linked to a reduced risk of **heart** and **blood vessel** disease.
- **Normal value: 40 - 42 mg/dl.**



## Clinical significance

□ **There are many factors effect on conc. Of HDL:**

- 1. Smoking.**
- 2. Obesity.**
- 3. Physical inactivity.**
- 4. Hypoalphalipoproteinemia.**

# LDL

- ❑ **Low Density Lipoproteins (LDL).**
- ❑ **LDL: bad cholesterol (carry cholesterol from liver to blood then to organs).**
- ❑ **It has less protein content and contains more cholesterol.**
- ❑ **LDL is a cholesterol-rich particle, because it has minimum TG.**
- ❑ **LDL cholesterol is easy to stick to the walls of blood vessels.**

- ❑ **High LDL** in blood associated with **atherosclerosis, heart disease and myocardial infraction.**
- ❑ Because high LDL in blood will **deposited** in blood artery and lead to **clot formation.**
- ❑ If a **clot forms** and **blocks** a narrowed artery, **heart attack or stroke** can result.

## VLDL

- ❑ **VLDL** carry newly synthesized triacylglycerol from the liver to adipose tissue.
- ❑ In the blood, VLDL release triglycerides and some cholesterol and become **LDL**.

## Chylomicron

- ❑ Function of Chylomicron is **transport exogenous TG (dietary fat)** from the **intestine** to the **peripheral tissues**; where TG is used as an energy source or stored in adipose tissue.
- ❑ The lipid component **is very high**, thus, it is of least **density**.



Asst. Lec. ZAINAB GHALEB ABDUL KAREEM