



Determination of Cholesterol in Serum

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NUTRITIONAL BIOCHEMISTRY II LAB. W6

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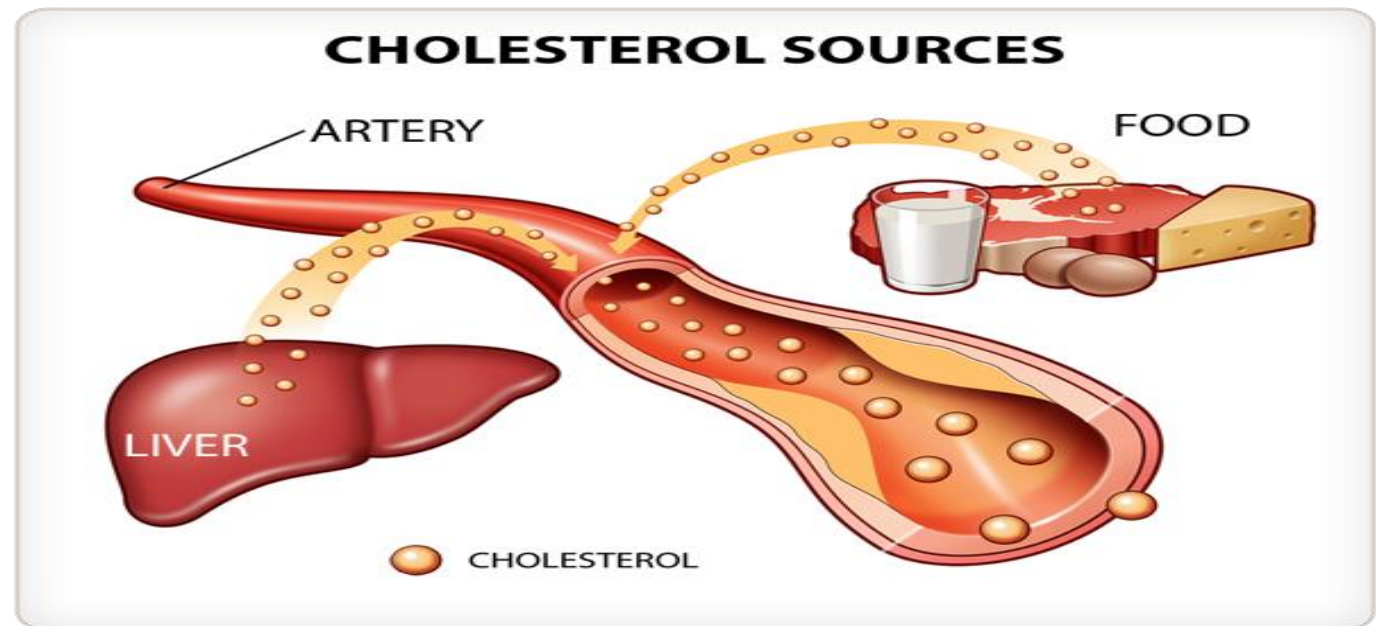
What is cholesterol?

Cholesterol is a substance (a steroid), like fat that is essential for life and it is found in all parts of your body.

The body needs a little cholesterol for;

- make **hormones** including **vitamin D**,
- they are essential for development, growth, and reproduction of cells,
- It forms **bile acids** that are needed to absorb nutrients from food.

-
- Every cell in our bodies makes cholesterol.
 - The liver produces 75% of the cholesterol that circulates in the blood.
 - The other 25% comes from food we eat, is absorbed into the blood stream from the stomach and circulates with our blood.



Cont.

Cholesterol and other fats are carried in your bloodstream in tiny molecules wrapped inside proteins, as spherical particles called **lipoproteins**.

The two most commonly known lipoproteins are low-density lipoproteins (LDL) and high-density lipoproteins (HDL).

A third type of lipid, called a **triglyceride**, also circulates in your blood.

Measuring your LDL (“bad” cholesterol), HDL (“good” cholesterol), and triglycerides will give you a number called your **total blood cholesterol**, or **serum cholesterol**.

Your serum cholesterol levels can help to figure out your risk for developing **heart disease**.

Types of cholesterol



HDL (good)

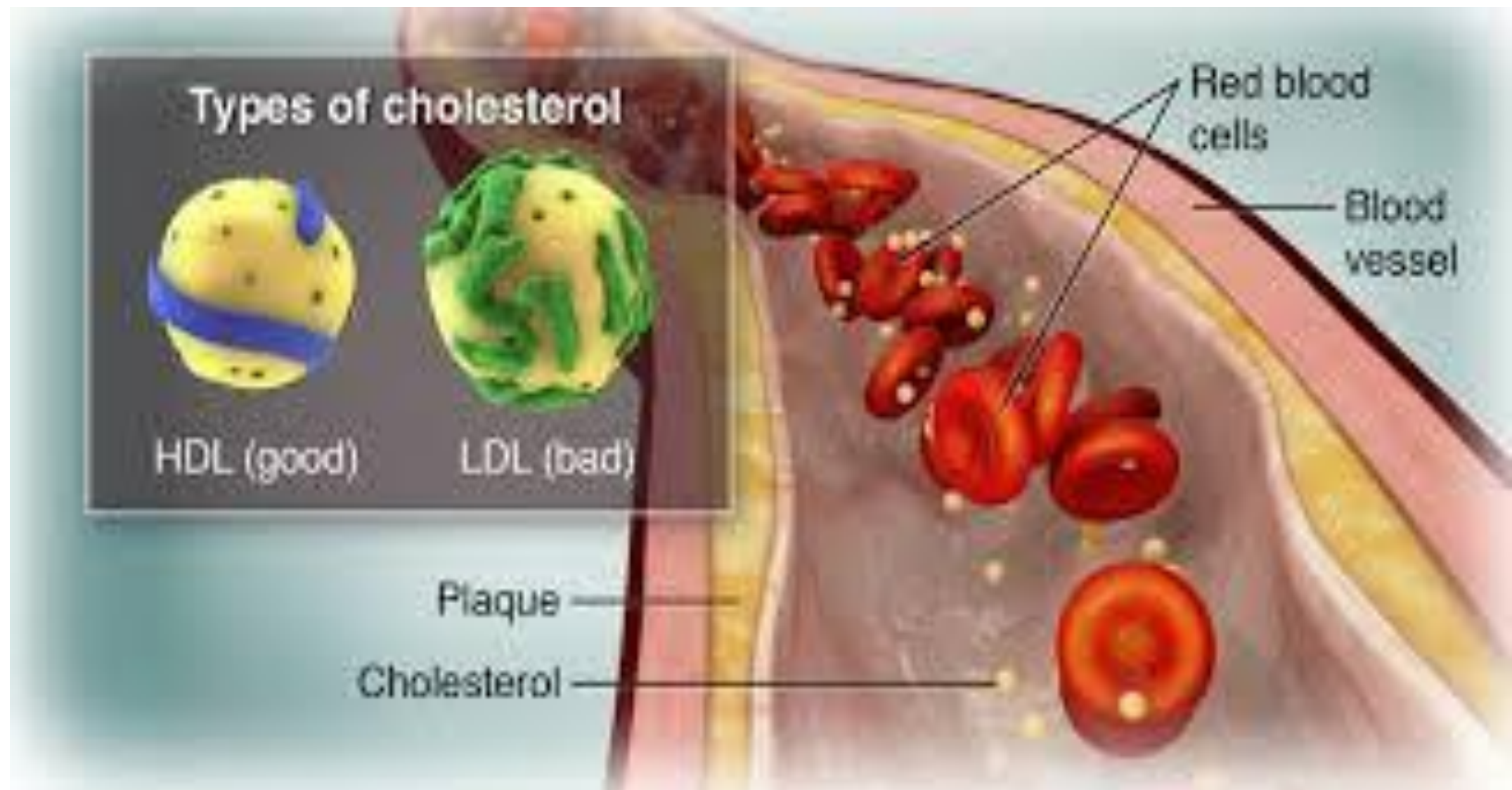


LDL (bad)

Plaque
Cholesterol

Red blood cells

Blood vessel



Low Density Lipoproteins

- ❖ “Bad ” Cholesterol.
- ❖ High levels of LDL can increase risk of heart disease.
- ❖ Composed mainly of cholesterol and a few proteins.
- ❖ **“ Primarily responsible for depositing cholesterol within arteries”.**

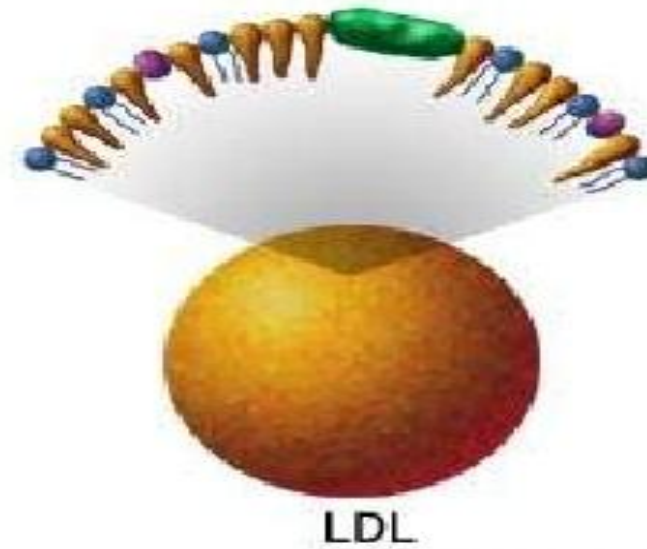
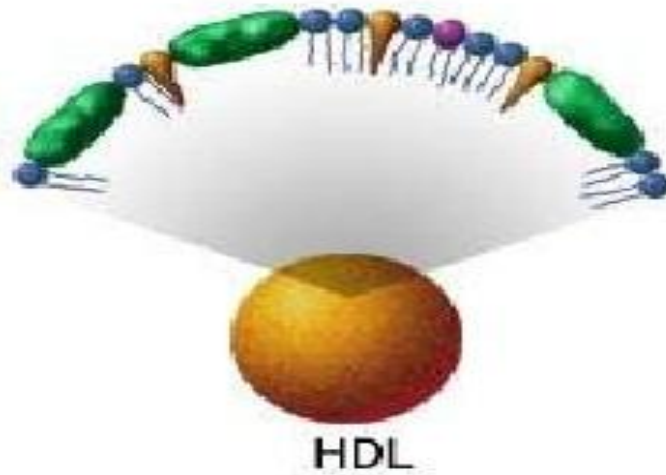
High Density Lipoproteins

- ❖ “ Good ” Cholesterol,
- ❖ High levels of HDL have been found to lower risk of heart attack,
- ❖ Risk of heart disease increases when there are lower of HDL.
- ❖ Mostly protein, and few cholesterol.
- ❖ **“ Help remove cholesterol from artery walls and transport it to the liver for elimination from the body”.**
- ❖ **HDL cholesterol can help control your LDL cholesterol.**
- ❖ HDL lipoproteins help move LDL particles out of the bloodstream. Higher levels of HDL are associated with better cardiovascular health.

HDL & LDL

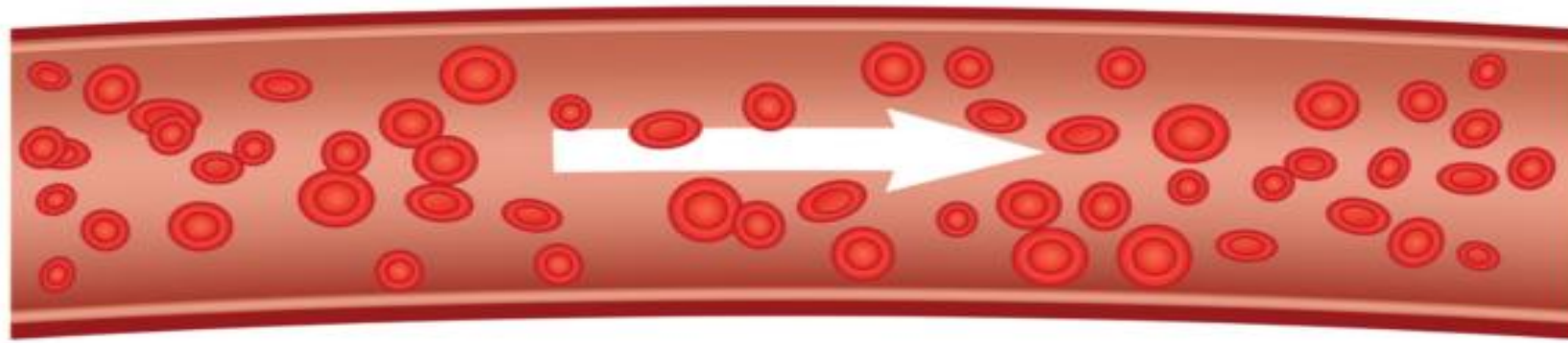
Lipoproteins vary in size and composition

■ Proteins
■ Cholesterol

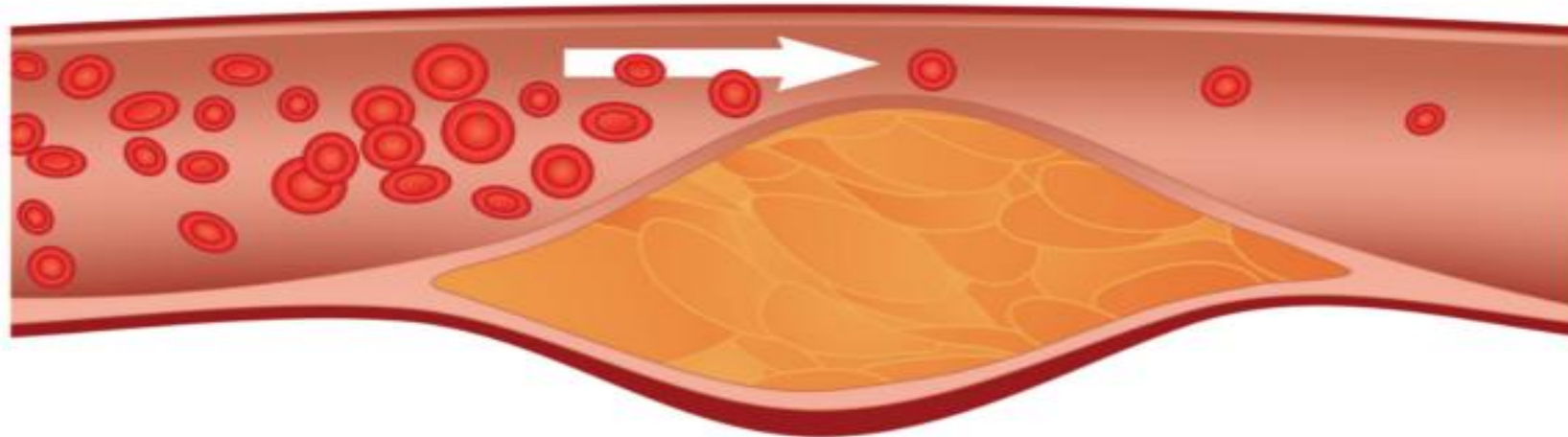


ADAM.

<http://www.clarian.org/ADAM/doc/OrthopedicsCenter/10/000362.htm>



Normal
blood flow



Cholesterol
plaque causes
blood vessel
narrowing



Blood clot
blocks the
arteries causing
heart attack

The body requires only small amount of cholesterol to function normally, and excess amounts may lead to build up of plaque inside the arteries.

Known as **atherosclerosis**, this condition narrows the space available for blood flow and can trigger **heart disease** and **heart attach**.

Risk Factors

Several factors can make you more likely to *develop high cholesterol*;

- Diet high in saturated fats and cholesterol,
- Family history of high cholesterol,
- Being overweight or obese,
- Getting older,
- Hypertension or diabetes (type 2),
- Smoking.

Management

- Eat healthy diet,
- Doing exercise regularly,
- Keep weight in normal range,
- If hypertensive or diabetic keep it under control,
- Avoid smoking,
- Get your cholesterol checked at least once a year if you have a risk factors.

Lipoprotein Levels: The Breakdown

Type of Lipoprotein	Normal Level (mg/dL)	Borderline High Level (mg/dL)	High Level (mg/dL)
Very-Low Density Lipoprotein (VLDL)	5-40		>40
Low Density Lipoprotein (LDL)	<100 (optimal) 100-129 (near optimal)	130-159	>159
High Density Lipoprotein (HDL)	>60 (best)	50-59 (better)	<50 (poor)
Total Cholesterol	<200	201-249	>249
Triglycerides	<150	150-199	>199

Clinical Significance

- Used in diagnosis of **hyperlipidemia**.
- Increased levels are also seen in hepatic and thyroid disorders.
- Lipid profile assays are useful in the prediction of coronary heart diseases.
- **Hypercholesterolemia*** can also be observed in certain cases of Diabetes.
- Secondary disorders that elevate cholesterol levels should be ruled prior to initiating therapy with cholesterol-lowering drugs.

Principle

Enzymatic method described by Allain and al., which reaction scheme is as follows:



PAP= 4-Amino-antipyrine

POD= Peroxydase

Procedure

	Blank	Standard	Sample
Reagent	Pipette 1 ml	Pipette 1ml	Pipette 1ml
D.W	Add 10 µl		
Standard		Add 10 µl	
Sample (serum)			Add 10 µl
Mix them well, let stand for 5 minutes at 37 °C Record absorbances at 500 nm against reagent blank Color is stable for 1 hour			

Calculation

Calculate the concentration of the sample;

$$\text{Result} = \text{Abs}(\text{sample}) / \text{Abs}(\text{Standard}) * \text{Standard concentration}$$

