Lect.2.

cholesterol

What is cholesterol?

Cholesterol is a waxy, fat-like substance that's found in all the cells in your body. Your body needs some cholesterol to make hormones, vitamin D, and substances that help you digest foods. Your body makes all the cholesterol it needs. Cholesterol is also found in foods from animal sources, such as egg yolks, meat, and cheese.

Cholesterol is essential for life the formation of bile acids, which allow you to be able to digest fats. Cholesterol is also utilized by the body to produce cell membranes.

cholesterol (from the Greek chole- (bile) and stereos (solid), followed by the chemical suffix -ol for an alcohol) is an organic molecule. It is a sterol (or modified steroid) a type of lipid molecule, and is biosynthesized by all animal cells, because it is an essential structural component of all animal cell membranes and is essential to maintain both membrane.

In addition to its importance for animal cell structure, cholesterol also serves as a precursor for the biosynthesis of steroid hormones, bile acid and vitamin D.

Everybody needs to have some cholesterol in order to be healthy, however it is when you have too much cholesterol that problems occur.

When you have too much cholesterol medical professionals will say you are hypercholesterolemia, meaning that you have hypercholesterolemia, or too high of blood cholesterol. High blood cholesterol is a major risk factor for coronary heart disease and for stroke.

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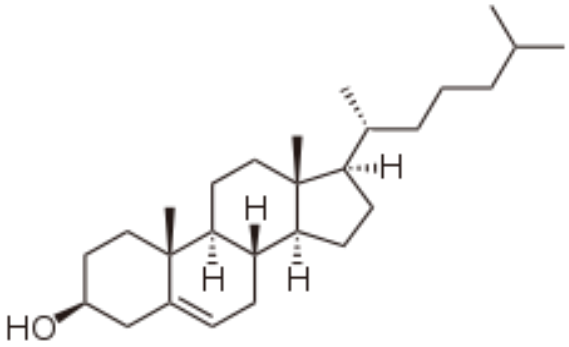

Cholesterol structure

Triglycerides (TG) :

TG are ester of glycerol and 3 fatty acid . they are important energy from 95% of lipid in adipose tissues , the source of Triglycerides is either exogenous &endogenous by liver synthesis from carbohydrates) .

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Cholesterol Transporters

Cholesterol is transported through your blood stream by lipoproteins.

Lipoproteins

A lipoprotein is a biochemical assembly whose primary purpose is to transport hydrophobic lipid , molecules in water, as in blood or extracellular fluid.

They have a single-layer phospholipid and cholesterol outer shell, with the hydrophilic portions oriented outward toward the surrounding water and lipophilic portions of each molecule oriented inwards toward the lipids molecules within the particles.

Apolipoproteins : are embedded in the membrane, both stabilising the complex and giving it functional identity determining its fate.

They play role in transport of lipid in plasma, They also active some enzymes of lipoprotein in metabolism.

lipoprotein classified as

(HDL , LDL , IDL , VLDL &, chylomicrons)

Chylomicrons

Main function transport Triglycerides from intestine to tissues.

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What are LDL, HDL, and VLDL

There are different types of cholesterol

HDL : High -density lipoprotein. It is called the(good cholesterol) because it carries cholesterol from tissue back to liver.

LDL: Low-density lipoprotein. It is called the bad cholesterol because transport the cholesterol manufactured in the liver to tissue where it used

VLDL :Very low-density lipoprotein. It is also a bad cholesterol because transport Triglycerides from liver to adipose tissue and muscle.

IDL: they are formed from VLDL by the removes of some Triglycerides

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What causes high cholesterol?

Unhealthy eating habits, such as eating lots of bad fats. One type, saturated fat, is found in some meats, dairy products, chocolate, baked goods, and deep-fried and processed foods. Another type, trans fat, is in some fried and processed foods. Eating these fats can raise your LDL (bad) cholesterol.
Lack of physical activity, with lots of sitting and little exercise. This lowers your HDL (good) cholesterol.
Smoking, which lowers HDL cholesterol, especially in women. It also raises your LDL cholesterol.

How is high cholesterol diagnosed?

There are usually no signs or symptoms that you have high cholesterol. There is a blood test to measure your cholesterol level. When and how often you should get this test depends on your age, risk factors, and family history. The general recommendations are:

For people who are age 19 or younger:

The first test should be between ages 9 to 11
Children should have the test again every 5 years
Some children may have this test starting at age 2 if there is a family history of high blood cholesterol, heart attack, or stroke

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For people who are age 20 or older:

- **Younger adults should have the test every 5 years**
- **Men ages 45 to 65 and women ages 55 to 65 should have it every 1 to 2 years**

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Total Cholesterol

Numbers you should know:

Blood Value	Risk Level
> 200 mg\dl	Desirable
200- 239 mg\dl	Borderline High Risk
≤ 240 mg/dL	High Risk

LDL Cholesterol

Blood Value	Risk Level
<100 mg/dL	Optimal
100- 129 mg/dL	Near Optimal
130- 159 mg/dL	High Borderline
160- 189mg/dL	High
mg/dL150	Very High

HDL

Male >40 mg/dL

Female > 50 mg/dL

Triglycerides

150> mg\dL Desirable range
150-199 mg\dL Borderline high
High 200-499 mg\dL
v. High > 500mg\dl

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INTENDED USE

For the measurement of cholesterol concentration in human serum or plasma.

PRINCIPLE OF THE METHOD

The enzyme cholesterol esterase is used to hydrolyze the cholesterol esters present in the serum to free cholesterol and free fatty acids.

The enzyme cholesterol oxidase in the presence of oxygen to oxidizes the cholesterol to cholest-4-en-3one and hydrogen peroxide.

Hydrogen peroxide oxidizes phenol and 4-aminoantipyrine to produce red color.

Cholesterol esters + H_2O →cholesterol + fatty acids

Cholesterol + O_2 → cholest-4-en-3-one + H_2O_2

H_2O_2 + Phenol + 4-A aminoantipyrine → Quinoneimine dye

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ASSAY PROCEDURE

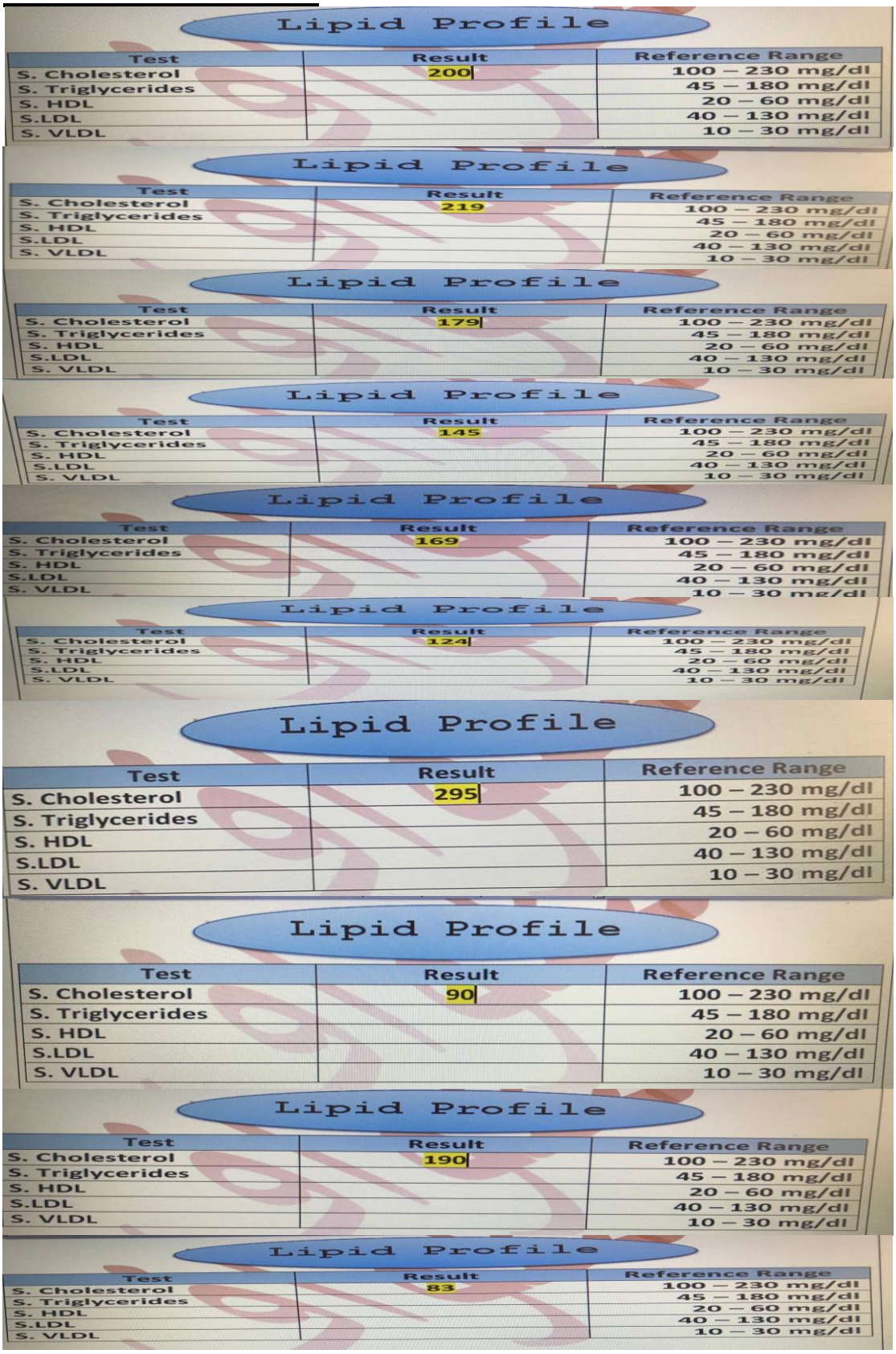
Wavelength……505nm (500-550)
Cuvette……1cm.light path .
Temperature……37C .

	Blank	Standard	Sample
Standard	-	10ml	-
Sample	-	-	10ml
Work reagent	1ml	1ml	1ml

CALCULATIONS:

conc. = O.D Sample \ O.D Standard x n cholesterol
Mg\dl :n=200
g\l: n= 2
mmol\l : n=5.17

Result of Cholesterol



Lipid Profile

Test	Result	Reference Range
S. Cholesterol	200	100 – 230 mg/dl
S. Triglycerides		45 – 180 mg/dl
S. HDL		20 – 60 mg/dl
S.LDL		40 – 130 mg/dl
S. VLDL		10 – 30 mg/dl

Lipid Profile

Test	Result	Reference Range
S. Cholesterol	219	100 – 230 mg/dl
S. Triglycerides		45 – 180 mg/dl
S. HDL		20 – 60 mg/dl
S.LDL		40 – 130 mg/dl
S. VLDL		10 – 30 mg/dl

Lipid Profile

Test	Result	Reference Range
S. Cholesterol	179	100 – 230 mg/dl
S. Triglycerides		45 – 180 mg/dl
S. HDL		20 – 60 mg/dl
S.LDL		40 – 130 mg/dl
S. VLDL		10 – 30 mg/dl

Lipid Profile

Test	Result	Reference Range
S. Cholesterol	145	100 – 230 mg/dl
S. Triglycerides		45 – 180 mg/dl
S. HDL		20 – 60 mg/dl
S.LDL		40 – 130 mg/dl
S. VLDL		10 – 30 mg/dl

Lipid Profile

Test	Result	Reference Range
S. Cholesterol	169	100 – 230 mg/dl
S. Triglycerides		45 – 180 mg/dl
S. HDL		20 – 60 mg/dl
S.LDL		40 – 130 mg/dl
S. VLDL		10 – 30 mg/dl

Lipid Profile

Test	Result	Reference Range
S. Cholesterol	124	100 – 230 mg/dl
S. Triglycerides		45 – 180 mg/dl
S. HDL		20 – 60 mg/dl
S.LDL		40 – 130 mg/dl
S. VLDL		10 – 30 mg/dl

Lipid Profile

Test	Result	Reference Range
S. Cholesterol	295	100 – 230 mg/dl
S. Triglycerides		45 – 180 mg/dl
S. HDL		20 – 60 mg/dl
S.LDL		40 – 130 mg/dl
S. VLDL		10 – 30 mg/dl

Lipid Profile

Test	Result	Reference Range
S. Cholesterol	90	100 – 230 mg/dl
S. Triglycerides		45 – 180 mg/dl
S. HDL		20 – 60 mg/dl
S.LDL		40 – 130 mg/dl
S. VLDL		10 – 30 mg/dl

Lipid Profile

Test	Result	Reference Range
S. Cholesterol	190	100 – 230 mg/dl
S. Triglycerides		45 – 180 mg/dl
S. HDL		20 – 60 mg/dl
S.LDL		40 – 130 mg/dl
S. VLDL		10 – 30 mg/dl

Lipid Profile

Test	Result	Reference Range
S. Cholesterol	83	100 – 230 mg/dl
S. Triglycerides		45 – 180 mg/dl
S. HDL		20 – 60 mg/dl
S.LDL		40 – 130 mg/dl
S. VLDL		10 – 30 mg/dl

Questions for Lec.2.

Q1\ What is cholesterol?& write the structure of Cholesterol?

Q2\ Defined (Triglycerides , Lipoproteins, Apolipo proteins?

Q3\ classified lipoprotein with function?

Q4\ write Principle of cholesterol &with equation?

Q5\ Assay

1-Wavelength of cholesterol…….

2-Temperature of cholesterol ……

3-cholesterol conc. = ---------- x n

n=

n=

4- Total Cholesterol ……..Borderline High Risk.

5 -Cholesterol …….. Desirable.

6-Cholesterol……. High Risk.

7- LDL Cholesterol……..Very High.

8- LDL ……..High Borderline.

9-LDL…….. High.

10-LDL……..Near Optimal

Q6\ What causes high cholesterol?

Q7\ How is high cholesterol diagnosed?

Q8\full in the blank.

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