

PRINCIPLES OF ORGAN FUNCTION TESTS

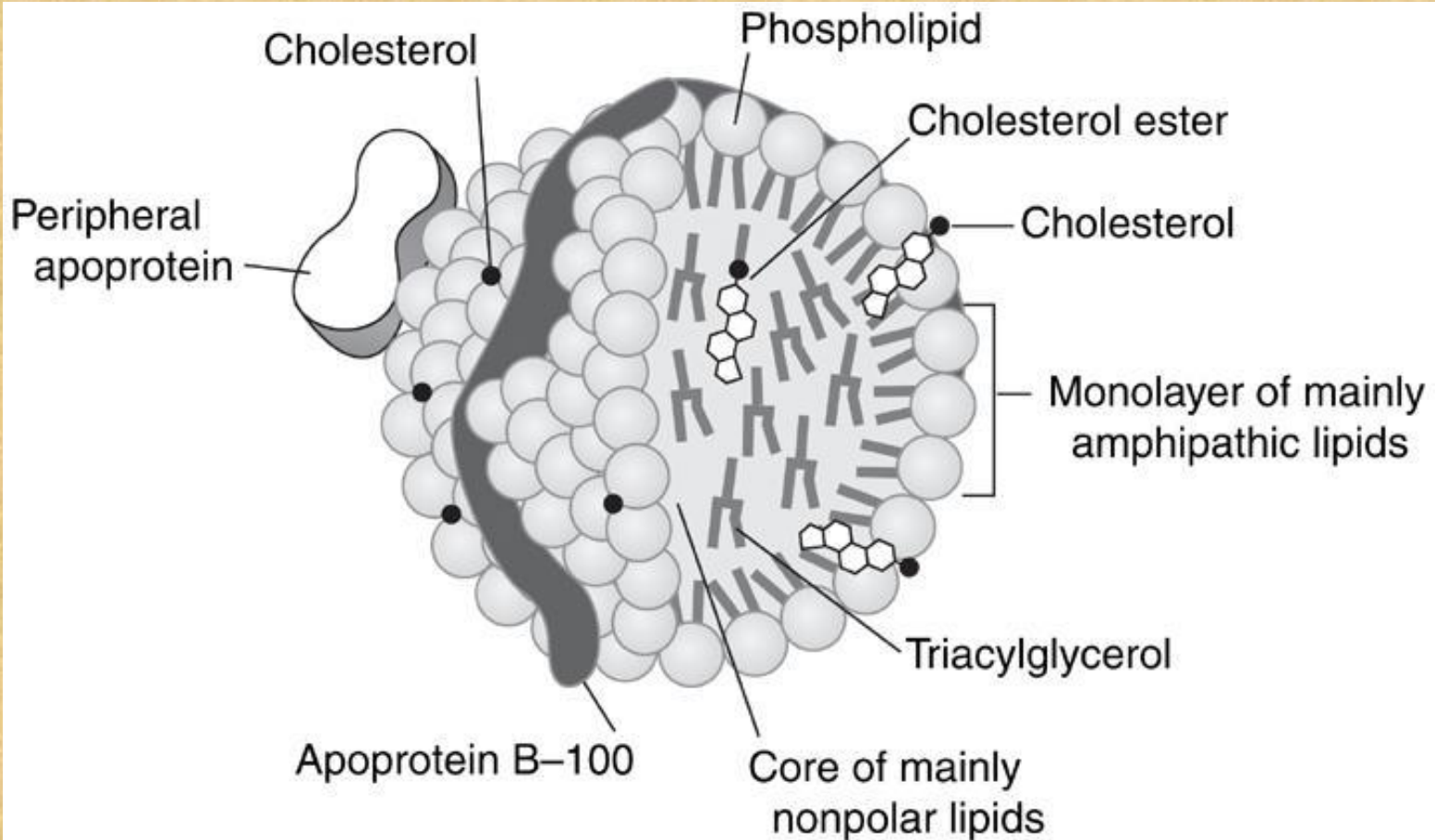
Dr G V Pujar

Professor & Head
Dept of Pharm Chemistry

lipoprotein

- A lipoprotein basically consists of a neutral lipid core (with triacylglycerol and/or cholesteryl ester) surrounded by a coat shell of phospholipids, apoproteins and cholesterol
- The polar portions (amphiphilic) of phospholipids and cholesterol are exposed on the surface of lipoproteins so that lipoprotein is soluble in aqueous solution.

Lipoprotein structure



Lipoprotein: types and functions

- **Chylomicrons** : They are synthesized in the intestine and transport exogenous (dietary) triacylglycerol to various tissues.
- **Very low density lipoproteins (VLDL)** : They are produced in liver and intestine and are responsible for the transport of endogenously synthesized triacylglycerols
- **Low density lipoproteins (LDL)** : They are formed from VLDL in the blood circulation. They transport cholesterol from liver to other tissues
- **High density lipoproteins (HDL)** : They are mostly synthesized in liver. HDL particles transport cholesterol from peripheral tissues to liver

Lipoproteins

TABLE 14.5 Characteristics of human plasma lipoproteins

<i>Characteristic</i>	<i>Chylomicrons</i>	<i>VLDL</i>	<i>LDL</i>	<i>HDL</i>
Electrophoretic mobility	Origin	Pre- β	β	α
Density	<0.96	0.96–1.008	1.006–1.063	1.063–1.21
Diameter (nm)	100–1,000	30–90	20–25	10–20
Apoproteins	Ai, Aii B ₄₈	B ₁₀₀ , Ci, Cii Ciii, E	B ₁₀₀	Ai, Aii, Ci, Cii, Ciii, D, E
Composition (% , approximate)				
Protein	2	10	20	40
Lipid (total)	98	90	80	60
Lipid components (%)				
Triacylglycerol	88	55	12	12
Cholesterol (free and ester)	4	24	59	40
Phospholipids	8	20	28	47
Free fatty acids		1	1	1

(VLDL : Very low density lipoproteins; LDL : Low density lipoproteins; HDL : High density lipoproteins).

LIPID PROFILE TESTS

- The lipid profile is a group of tests that are used to determine risk of coronary heart disease.
- They are good indicators to check heart attack or stroke caused by blockage of blood vessels (hardening of the arteries).
 - To the known risk factors of heart disease
 - High blood pressure, Diabetes or prediabetes, Overweight or obesity, Smoking, Lack of exercise, Diet of unhealthy foods, Stress, High total cholesterol
 - To develop a plan of treatment and follow-up.
- The lipid profile includes
 - Total lipids
 - Serum total cholesterol
 - Serum HDL cholesterol (often called good cholesterol)
 - LDL-cholesterol (often called bad cholesterol)
 - Serum triglycerides

Normal values of lipid profiles in serum

SL No	Lipid Profile	Normal level /dl of serum	Mean value
1	Total lipids	350-800mg	570mg
2	Serum total cholesterol	150-250mg	200mg
3	Serum HDL cholesterol	25-100mg	63mg
5	Serum triglycerides	75-175mg	140mg
6	Serum phospholipids	125-400mg	210mg

Determination of serum total cholesterol

- Cholesterol in serum is extracted with ferric chloride-acetic acid reagent to precipitate serum proteins.
- The protein free filtrate containing cholesterol along with ferric chloride is treated with concentrated sulfuric acid to form a reddish purple colored complex.
- The intensity of reddish purple color formed in the test solution is measure of the amount of cholesterol present.
- The absorbance of test and standard solution are measured colorimetrically at 560 nm against blank

Clinical significances

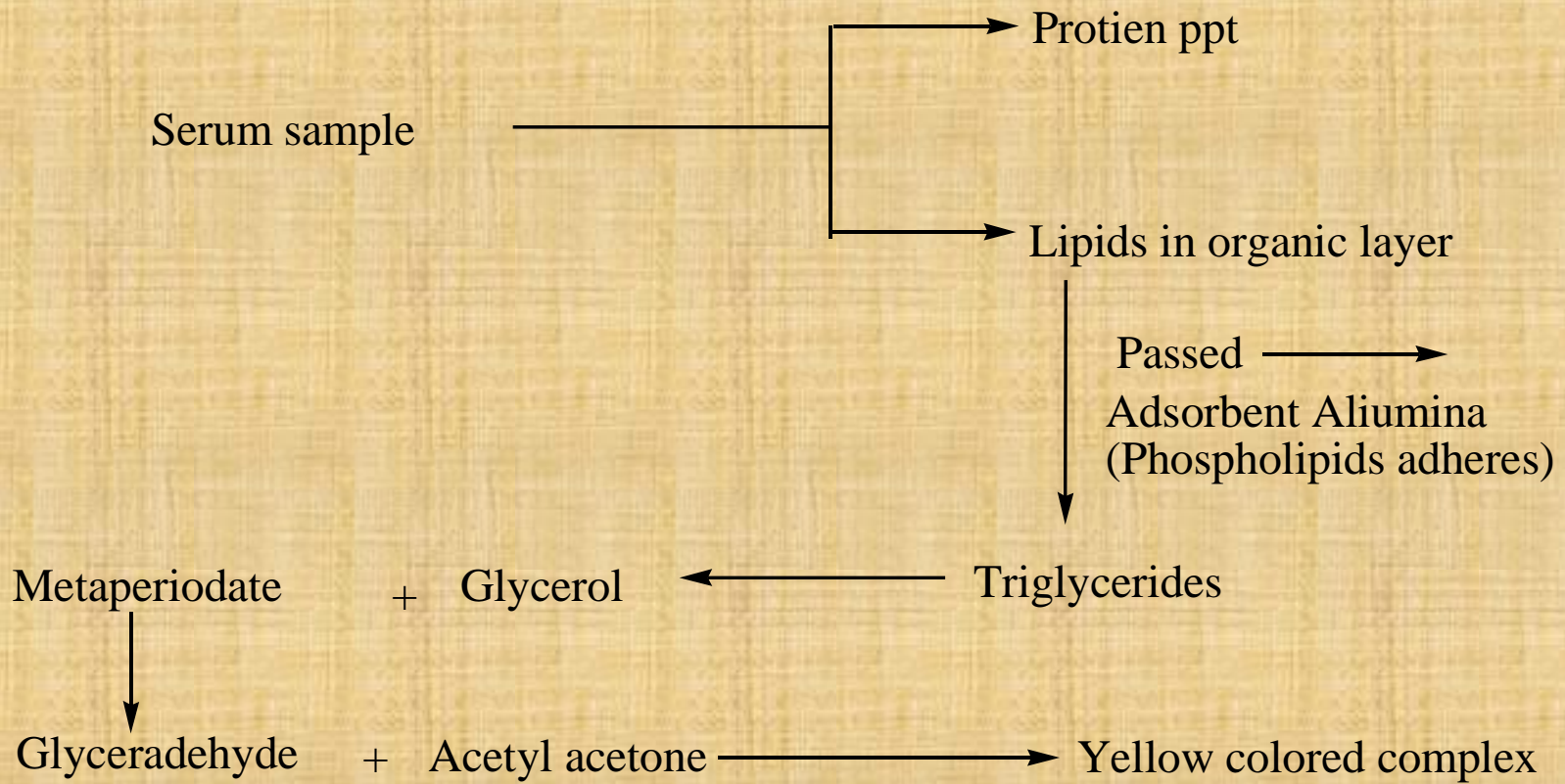
- Normal serum / blood cholesterol level is 150 –250 mg/dl.
- Good Value:
 - 75-169 mg/dL for those age 20 and younger
 - 100-199 mg/dL for those over age 21
- Elevated levels are observed in diabetes mellitus, nephritic syndrome, obstructive jaundice, hypothyroidism.
- Decreased levels are observed in hyperthyroidism, hepatocellular damage, anemia, acute infections, and intestinal obstruction.

Determination of serum HDL cholesterol

- Serum is treated with phosphotungstic acid and magnesium chloride, which precipitates LDL, VLDL and chylomicrons.
- On centrifugation leaves only HDL cholesterol on the supernatant.
- The cholesterol in the HDL fraction can be estimated by Zak's method.
- Normal level of serum/blood HDL cholesterol 25-100 mg/dl
- HDL is a lipoprotein (a combination of fat and protein) found in the blood. It is called "good" cholesterol because it removes excess cholesterol from the blood and takes it to the liver.
- A high HDL level is related to lower risk of heart and blood vessel disease.
- Good Value is Greater than 40 mg/dL

Determination of serum triglycerides

- **Acetyl acetone method**
- The lipids of serum are extracted by isopropanol, which also precipitates proteins.
- The interfering phospholipids (containing glycerol as integral part) are removed by adsorption on alumina. Filtrate is used for saponification, which results in the separation of glycerol from triglycerides.
- Action of metaperiodate converts glycerol into glyceraldehydes, which forms a yellow colored complex with acetyl acetone.
- The intensity of yellow color formed in the test solution is measure of amount of triglycerides present. The intensity of yellow color is measured colorimetrically at 410nm.



Clinical Significance

- Normal level of serum / blood triglycerides is 75 – 175mg/dl.
- Good value is less than 150 mg/dl
- Elevated levels are observed in atherosclerosis, hyperlipidemia, nephrosis, diabetes mellitus, biliary obstruction and other metabolic disorders.
- Elevated levels also due to being overweight, having thyroid or liver disease and genetic conditions.
 - Level increases from eating simple sugars or drinking alcohol. Associated with heart and blood vessel disease.

- <http://slideplayer.com/slide/8911960/>