ESTIMATION OF TOTAL CHOLESTEROL

CLINICAL BIOCHEMISTRY

Lab: 6

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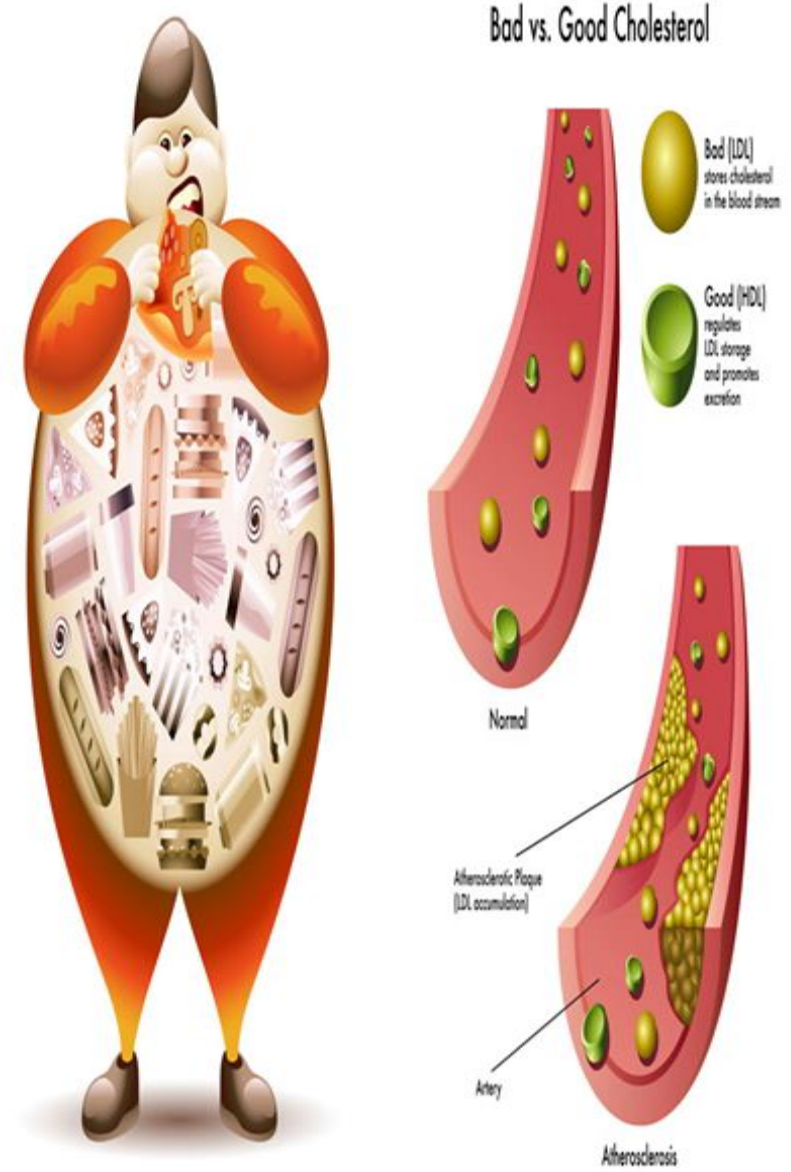
Fall Semester (2024-2025)

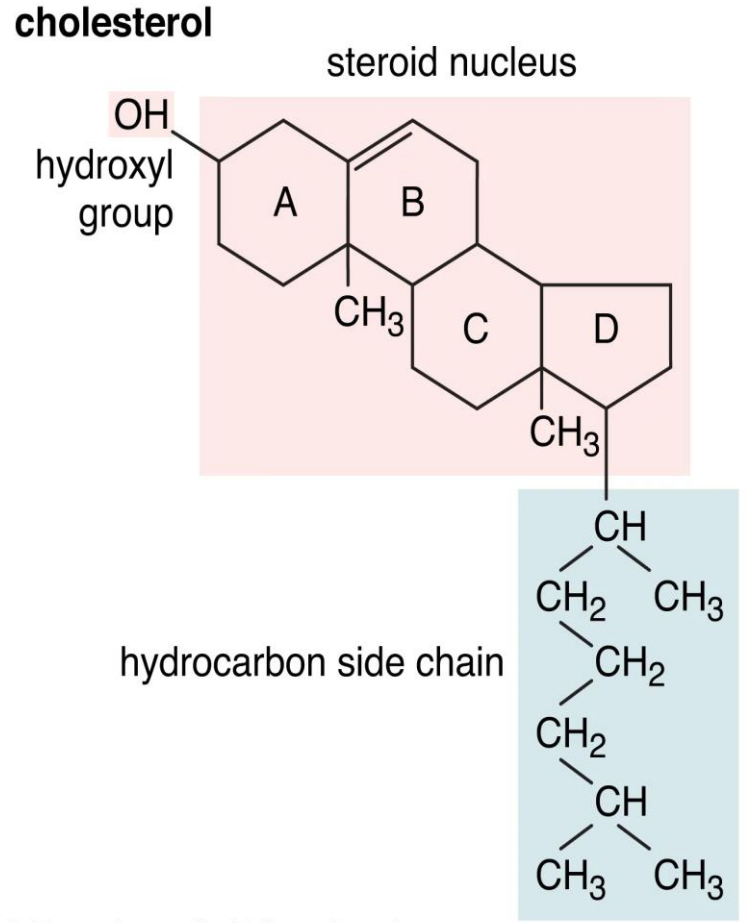
Outlines

- ✓Clinical importance of cholesterol
- ✓Principle
- ✓Calculation
- ✓Hypercholesterolemia
- ✓Hypocholesterolemia



Cholesterol

- Cholesterol is a steroid alcohol, synthesized in all body cells , **mainly in the liver.**
- Cholesterol is the precursor to steroid hormones, bile acids, and vitamin D.

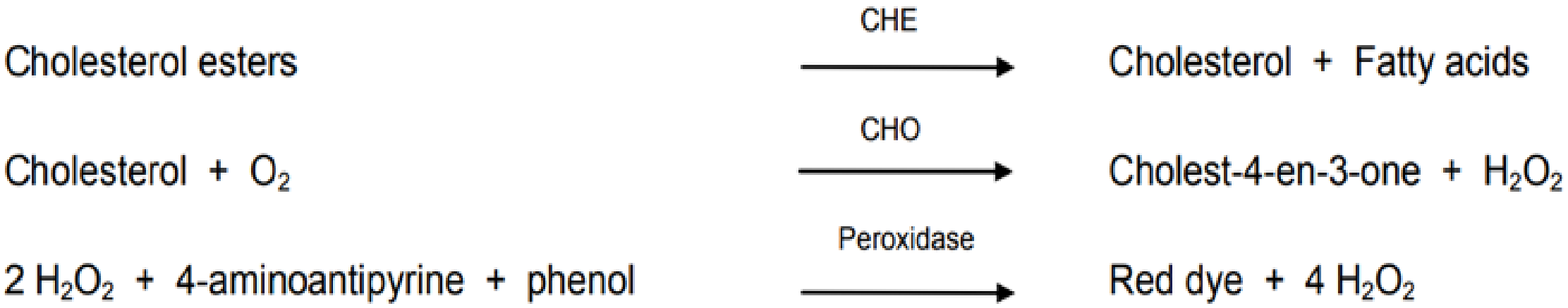


Clinical importance of cholesterol

- The determination of serum cholesterol is one of the important tools in the diagnosis and classification of lipemia.
- Elevated cholesterol levels are a major component in the hereditary Hyperlipoproteinemias, which is related to CHD and atherosclerosis.
- Cholesterol determinations are also frequently a part of thyroid function, liver function, renal function, and diabetes mellitus studies.
- It is also used to monitor effectiveness of diet, medications, lifestyle changes (e.g., exercise), and stress management.

Principle

- This method for the measurement of **total cholesterol** in serum involves the use of three enzymes: cholesterol esterase (CE), cholesterol oxidase (CO) and peroxidase (POD)
- The intensity of the color formed is proportional to the cholesterol concentration in the sample



Procedure

1. Adjust the instrument to zero with distilled water.
2. Pipette into a cuvette:

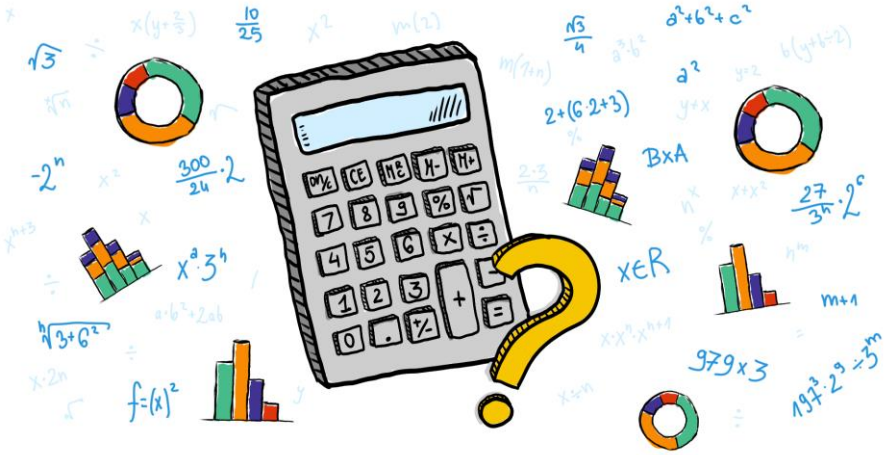
Pipet into Tubes	Blank	Standard	Sample
Reagent	500 µL	500 µL	500 µL
D.W	5 µL		
Standard		5 µL	
Test sample			5 µL

3. Mix and incubate for 5 min at 37 C°or 10 min at room temperature (15-25 C°).
4. Read the absorbance (A) of the samples and standard, against the Blank. The color is stable for at least 60 minutes.

Calculations

$$\frac{\text{A (Sample)}}{\text{A (Standard)}} \times 200 \text{ (Standard conc.)} = \text{mg/dL cholesterol}$$

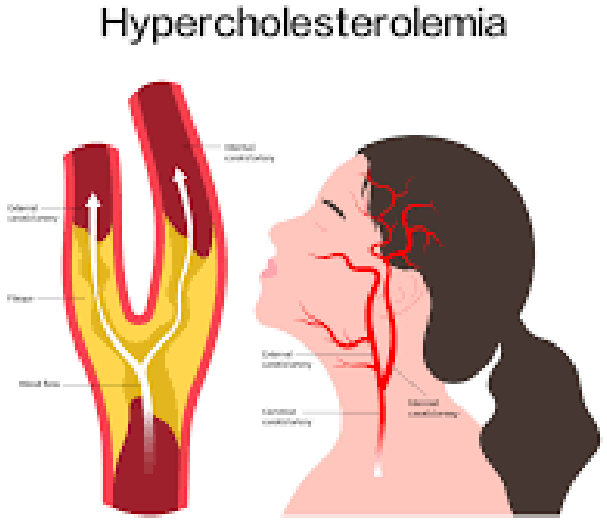
Conversion factor: mg/dL x 0.0259= …….. mmol/L.



Total cholesterol level

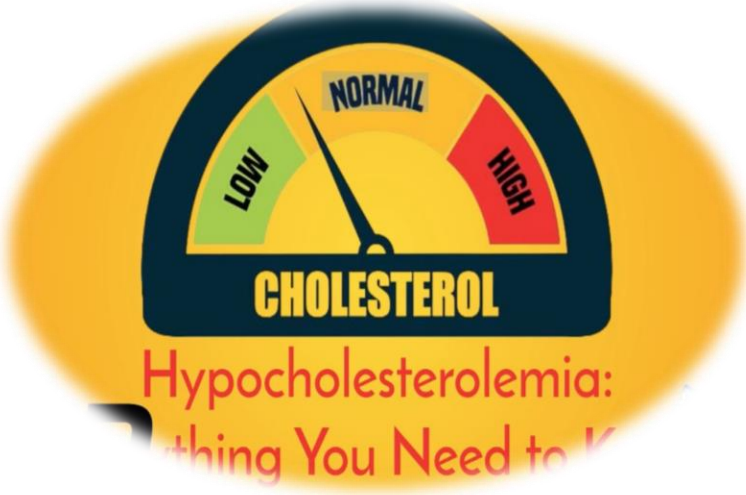
What causes hypercholesterolemia?

- Genetics: familial hypercholesterolemia
- Nephrotic syndrome (Impaired clearance of **LOW** density lipoproteins)
- Chronic kidney failure
- HYPOTHYROIDISM
- Obstructive liver diseases
- Cushing's syndrome
- Medications (bile acid sequestrants)
- Starvation
- Obesity
- Diet rich in saturated fat
- Idiopathic



Hypocholesterolemia

- Hypocholesterolemia is a condition where total blood cholesterol level is less than 160 mg/dL
- Hypolipidemia is a common disorder affecting about 2–3% of apparently healthy individuals and up to 6% of hospitalized patients.



What causes hypocholesterolemia?

Primary disorders

Abetalipoproteinemia
Hypobetalipoproteinemia
Chylomicron retention disease

Secondary disorders

Infection (acute or chronic)
Malabsorption and undernutrition
Anemia
Chronic inflammation
Critical illnesses
Malignancies
Hyperthyroidism
Chronic liver disease
Gaucher disease
Drug induced: statins

References

- H. Varley , A.H. Gowenlock and M. Bell, Practical Clinical Biochemistry Vol.2 Fifth Ed.(whitefriars press Itd, Tonbridge, Great Britain, 1984)
- Marshall WJ, Bangert SK, Lapsley M. Clinical Chemistry. 7th ed. Mosby Elsevier; 2012. Accessed October 17, 2024.