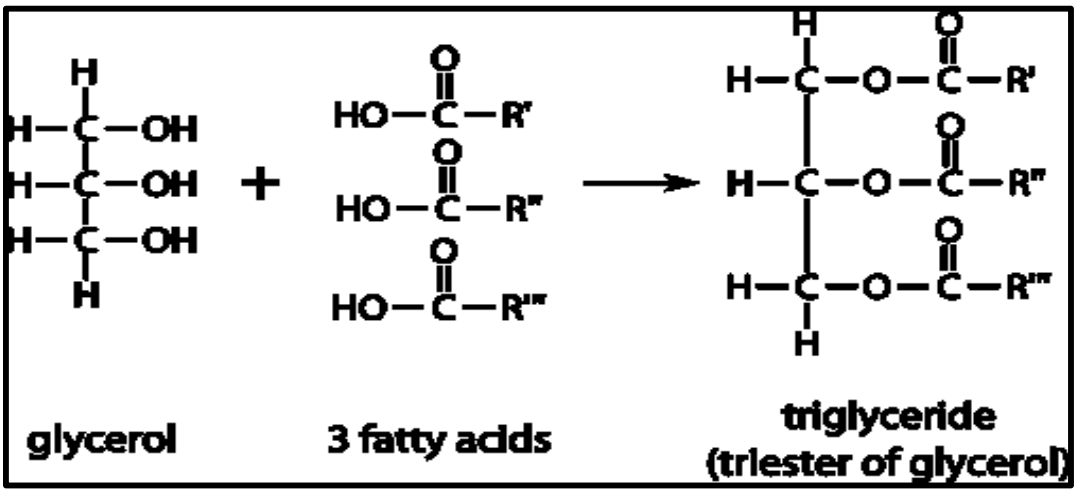
Measurement of serum triglycerides concentration

A triglyceride is an ester of glycerol with three fatty acids. Triglycrides are the most common type of fat in the body.

Triglycerides are obtained from certain foods such as butter, cream, full fat milk, olive, animal fat and vegetable oils used in cooking or salads. Triglycerides are also made in the body from excess calories taken in the food. The body convert these extra calories into triglycerides that are stored as depot fat in fat cells (adipocytes). When the body needs energy, it releases the triglycerides from this depot fat.



Functions of triglycerides

- The major type of lipids in the body.
- The stored fat provides about 60% of the body's resting energy.
- Provide electrical and thermal insulation.
- Provide mechanical protection of many organs.

Carriers or transporters of triglycerides in blood stream:

Triglycerides are transported by :

1. **Chylomicrons**: These transport exogenous or triglycerides of the diet.

2. **Very low-density lipoproteins (VLDL):** VLDL transports endogenous triglycerides that are synthesized by the liver.

Metabolism of triglycerides:

1- Triglycerides are a source of rich energy through their fatty acid content. A special enzyme on the blood vessel wall, called lipoprotein lipase, breaks down triglycerides into free fatty acid and glycerol. Then free fatty acids pass through the vascular endothelium.
2- Measurement of serum triglycerides level needs fasting of the patient for 10-14 hours before the test.
3- Very high levels of triglycerides can cause acute pancreatitis and upper abdominal pain.

Hypertriglyceridemia

Causes of high serum triglycerides:

This may be associated with the following conditions:

- Certain primary (Inherited) disorders of triglyceride metabolism
- Obesity with excessive carbohydrate intake
- Chronic alcohol intake
- Lack of physical activity
- Primary hypothyroidism
- Nephrotic syndrome
- Intake of certain drugs such as thiazide diuretics and β – blockers.
- Moderate or severe type 2 diabetes
- Pregnancy

Hypotriglyceridemia

Causes of low serum triglycerides:

- Hyperthyroidism
- Malnutrition or malabsorption syndrome
- Use of certain drugs
- Low-fat diet

Normal range:

- Normal: Less than 150 milligrams per deciliter (mg/dl),i.e., less than 1.7 millimoles per liter (mmol/L)
- Borderline high: 150 to 199 mg/dl (1.8 to 2.2 mmol/L)
- High: 200 to 499 mg/dl (2.3 to 5.6 mmol/L)
- Very high: 500 mg/dl or above (5.7 mmol/L or above)

Category	Triglcyeride Level
Normal	Less than 150mg/dL
Borderline high	150 to 199 mg/dL
High	200 to 499 mg/dL
Very high	500 mg/dL and above

Method of measurement of TG concentration in serum

Principle:

Triglycerides are measured enzymatically in serum or plasma using a series of coupled reactions in which triglycerides are hydrolyzed to produce glycerol. Glycerol is then oxidized using glycerol-P oxidase, and H_2O_2. The H_2O_2 as one of the reaction products can be measured as described earlier in cholesterol estimation. The absorbance of the color product is measured at 505 nm. The reaction sequence is as follows:

Lipoprotein lipase (LPL)

Triglycerides + $3H_2O$ ----------> glycerol + fatty acids

Glycerokinase (GK)

Glycerol + ATP ----------> glycerol-3-phosphate + ADP

Glycerophosphate oxidase

(GPO)

Glycerol-3-phosphate + O2 ----------> dihydroxyacetone phosphate + H_2O_2

Peroxidase (POD)

H2O2 + 4-aminoantipyrine + TOPS ----------> H_2O + quinonimine

(Violet color)

- **Procedure:**

1- Pipette into 3 test tubes :

	Blank	Standard	Sample
Working reagent (ml)	**2.0**	**2.0**	**2.0**
Standard (µL)	**------**	**20**	**------**
Sample (µL)	**------**	**------**	**20**

2- Mix and incubate for 5 min. at 37 ºC (or 10 min. at room temperature)

3- Read the absorbance of the samples and standard against Blank at 505 nm wavelength.

- **Calculations:**

$$\text{Triglycerides conc. mg/dl} = \frac{\text{Absorbance of sample}}{\text{Absorbance of standard}} \times \text{Conc. of standard}$$

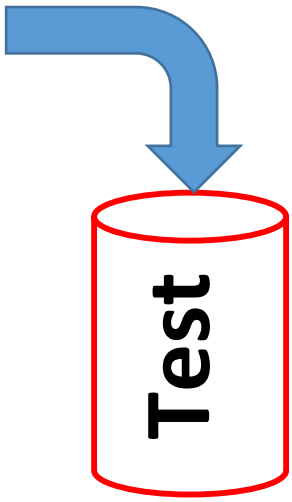
Conc. of standard = 200 mg/dl

Prepared by: Ali Abdulrasool Hussein
Reviewer: Abdulkareem H. Issa

2 ml Working Reagent

+

20 µl Serum



2 ml Working Reagent

+

20 µl Standard