

الكيمياء الحياتية  
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المرحلة الأولى

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# Fatty Liver

**Fatty liver:** Define as deposition of excess triglycerides in the liver cells in excess of 5% of the weight of liver.

The reasons of fat accumulation in liver is mainly due to:

1. High up take of fatty acid from blood stream , this is dependent on concentration of fatty acids in the blood.
2. The liver has only limited capacity for oxidation of fatty acids.
3. The elimination of triglyceride from liver as VLDL , is also limited.

## Factors increase liver fat

- 1- Dietary lipids
- 2- Synthesis of FA  
From CHO and  
Proteins
- 3- Mobilization of FA  
from depots to liver



## Factors decrease liver fat

- 1- Mobilization of fats from  
liver as VLDL.
- 2- Degradation of FA in the liver

## Causes of Fatty Liver

1. physiological : increase mobilization of fat from depots to liver, ocure in
  - a. diabetes mellitus.
  - b. starvation
  - c. Carbohydrate deprivation.
2. pathological: there is metabolic blockage in the synthesis of VLDL due to.
  - a. Deficiency of fatty acids.
  - b. Choline deficiency
  - c. Deficiency in coenzyme such as, Vit E, pantothenic, pyridoxine and inositol.
  - d. Alcoholism.
  - e. Poisoning CCl<sub>4</sub>.

**Lipotropic factor**: substances prevent accumulation of fat in liver such as choline and methionine.

**Ketone body**: acetoacetic acid, B- hydroxy butyric acid and acetone are ketone bodies produced in liver from acetyl COA, they are acidic.

**Ketone bodies causes in :** 1. diabetes melletis.

2. starvation.

oxaloacetate utilise to produce glucose for brain and muscle.

Reduce amount of oxaloacetate lead to acetyl COA cannot be metabolized for Krebs cycle.

Therefore acetyl COA tend to form ketonebodies.

**Normal level of ketone body in blood, below 1 mg per 100 ml.**

**Normal level in urine, less than 125 micro gm In 24 hrs.**

## Normal concentration of plasma lipids

<u>fractions</u>	<u>range ( mg/dl)</u>	<u>mean</u>
Total lipids	360- 820	560
Triglyceride	80- 180	150
Total phospholipids	125- 390	210
Lecithin	50- 200	
Cephalin	50- 130	
Sphingomyelin	15- 35	
Total cholesterol	150- 250	200
Serum HDL- cholesterol		
Male	35- 60	
Female	40- 70	
Serum LDL- cholesterol	up to 190	

## Abnormalities in blood lipids

### Hypertriglyceridemia:

Increase the level of triglyceride in the blood more than normal value i

1. hypothyroidism
2. uncontrolled diabetic
3. kidney disease
4. pancreatitis
5. alcoholic consumption

### Hypercholesterolemia:

Increase the level of cholesterol in the blood more than normal value i

1. atherosclerosis
2. Diabetes mellitus
3. hypothyroidism
4. Pancreatitis
5. obstructive jaundice

## Familial hypercholesterolemia:

- Excessive synthesis of cholesterol by the liver
- Leading to increase in level of chol and LDL in plasma.

## Hyperlipoproteinemia:

- Increase the level of lipoproteins in plasma more than normal value as in:
  1. increase in Chylomicrons due to absence of lipase enzyme.
  2. Increase in VLDL and LDL , allow to increase in Cholesterol and TG which give strong point to atherosclerosis.

## Hypolipoproteinemia:

- Decrease the level of lipoproteins from their normal value due to Genetic disorder . **Ex : B- lipoproteinemia** : it is rare inherited disease , chol is low due to absence of LDL, TG, no chylomicron and VLDL is formed, allow to accumulate of TG in liver and intestine.



**Ketonemia:** the concentration of ketonebodies in the blood increase more than normal value.

- At this stage ketone bodies appear in urine.

**Ketoneuria:** detectable amount of ketone bodies appear in urine.

**Ketosis:** ketonemia, ketoneuria and smell of acetone in breath appear.

**Acidosis:** severe ketosis accompanied by excretion of large amount of water carry ketone bodies.

# Proteins

The name protein is derived from Greek word Proteios which means first because proteins essential for growth and maintenance of life.

Proteins: are complex nitrogenous polymers present in all living matter, contain C,H,O and nitrogen,also contain sulfur,phosphorous,zinc,copper and iron.



# Amino acids

Amino acids :are organic acids containing an amino group ( $\text{NH}_2$ ) and a carboxylic acid( $\text{COOH}$ )group. The side chain can be,hydrogen,aliphatic,aromatic or heterocyclic group.

All amino acids are L-amino acids configuration.

Proteins are made up of 20 amino acids in different sequences and numbers.

## Classification:

Amino acids are classified into three groups

**1. neutral amino acids are the largest group which are divided into:**

a.aliphatic amino acids(glycine,valine,alanine,leucine,isoleucine).

b. aromatic amino acids ( tyrosine, phenylalanine)

c. heterocyclic amino acids( tryptophan, histidine).

d. sulphur containing amino acids(cystine,cysteine,methionine).

2. Acidic amino acids( glutamic acid, aspartic acid).

3. Basic amino acids(Lysine,arginine).

Amino acids are **not** synthesized in the body and are essential as constituents of tissue proteins , therefore it must be supplied in food.

- Essential amino acids are ( **valine, phenylalanine, lysine, tryptophan,leucine,isoleucine, methionine**).

## Functions or importance of amino acids

Amino acids are monomeric constituents of proteins peptides and many actions.

1. Some a.a converted to CHO , called as glucogenic a.a.
2. Some amino acid are converted to acetyl COA called ketogenic amino acids.
3. All these are formed from amino acid tyrosine.
4. Glycine and cysteine help in synthesis of bile salts.
5. Thyroid hormone, epinephrine, norepinephrine, and pigment melanine are synthesis from tyrosine.

# Classification of proteins

**1. simple proteins:** on complete hydrolysis yield only amino acids such as, globin of hemoglobin.

**2. conjugated proteins:** complex of simple proteins with Nonprotein fraction ,such as glycoproteins, lipoproteins, Phosphoproteins, metalloproteins.

Apoprotein + prosthetic group ----- holoprotein  
(protein part) (non protein part)

**3. Derived proteins:** are produced from natural proteins by various physical and chemical factors ,divided in to:

**a. primary derived proteins:** they are coagulated and denatured proteins, like albumin, globulin.

**b. secondary derived proteins:** hydrolytic of proteins by the action of pepsin or trypsin.They are soluble in water and not coagulated by heat like gelatin and casein.

## (stages of hydrolytic decomposition of a protein)

Protein----- proteases ----- peptones-----peptides----- amino acids.

## **Functions or importance of proteins**

1. proteins are present in all living tissues as building or structural elements.
2. produce energy.
3. formation of enzymes.
4. some hormones are proteins.
5. structural proteins like actin and myosin are contractile proteins.
6. Defence proteins like immunoglobulins (antibodies).
7. proteins as molecular receptors bind with specific molecules such as vitamins, hormones to mediate in the cellular actions.
8. Transport action, across the membrane like sodium pump or Hemoglobin transport oxygen.
9. Storage protein like ferritin stores iron in spleen and liver cells.
10. Plasma proteins, albumin, globulin, clotting blood, thrombin, fibrinogen.