

فريق طوفان الأقصى



# METABOLISM

Modifide N.

**Writer:** Ismail alardah & Laila oraikat **Corrector:** Omar smadi

# Fibrinogen

It is a protein that differentiates between plasma and serum.

Also called **clotting factor-1**

Constitutes 4-6% of total protein

-Fibrinogen has very low concentrations of absolute values versus albumin.

-It could be determined spectrophotometrically in order to see if that person has a deficiency of this protein.

-There is a specific method equation to determine how many grams per deciliter of fibrinogen

-Sometimes, it is routinely ordered to know the absolute value of its concentration in the blood

-It is an important protein because determining it has a good clinical significance

Highly elongated with axial ratio of 20:1 (length:diameter)

Imparts **maximum viscosity to blood**

-It is important because of its contribution to the blood viscosity

It is a rod like structure

Synthesized in liver

Made up of 6 polypeptide chains

Chains are linked together by S-S linkages

**Its structure is stabilized by S-S bond**

Amino terminal end is highly negative due to the presence of glutamic acid

**Negative charge contributes to its solubility in plasma and prevents aggregation due to electrostatic repulsions between the fibrinogen molecules.**

It stays soluble in the blood because of repulsive forces

some people could have deficiency of this protein so they must be provided them with fibrinogen in order to maintain the homeostasis of clotting.

# Transport proteins

This table memorizes the transport function of different plasma proteins

Where can we get fatty acid? **fatty acids** come from the stored lipids as **triglycerides in the adipose tissue**.  
 so, when the body requires energy and the carbohydrates storage material isn't sufficient or isn't used, lipases will hydrolyze triglycerides, and fatty acids will be released in the blood, after that albumin will bind these fatty acids in a non-esterified form and it's termed NEFA (**non-esterified fatty acids**) and transport them via blood to the liver where they get oxidized and the energy will be extracted from them.



Compounds transported

**Fatty acids, bilirubin**, hormones, calcium, metals, drugs etc.

Steroid hormones thyroxin, Retinol

Retinol (Vitamin A)

Thyroxin

Cortisol and corticosteroids

Hemoglobin

Free haem

iron

Name

Albumin heavy

Prealbumin-(Transthyretin)

Retinol binding protein

Thyroxin binding protein(TBG)

Transcortin(Cortisol binding protein)

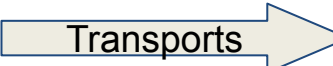
Haptoglobin

Hemopexin

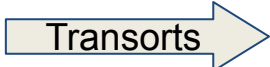
transferrin

# What's bilirubin?

- 1-Bilirubin comes as an end product of the metabolism of heme which comes from hemoglobin
- 2-It is yellow in color and is conjugated in the liver in order to be excreted
- 3-Sometimes, if the liver has a disorder in its function, bilirubin will be accumulated in the liver and blood
- 4-one of the symptoms of accumulation of highly abnormal concentrations of bilirubin is the icterus index of the yellow coloring of the skin or the eye
- 5-sometimes, it is important to determine the concentration of bilirubin in blood in order to confirm the diagnosis of liver diseases like hepatitis, liver cirrhosis and obstructive jaundice , in all of these conditions bilirubin will be elevated
- 6-when bilirubin is transported from one side to another, it is bound by albumin

HDL(High density lipoprotein)  Transports Cholesterol (**Tissues to liver**)

- Because of it secreted from tissue to liver, it is a good cholesterol
- The excess cholesterol in tissues will be collected and delivered by specific apoprotein and transported back to the liver

LDL(Low density lipoprotein)  Transports Cholesterol(**Liver to tissues**)

- It is a bad cholesterol that's cause blockage of the blood vessel and cause problems for the heart, it will deliver cholesterol or transported from liver to other tissue
- If there is a problem of metabolism of LDL, there will be accumulation in blood vessels of this LDL and they will block blood vessels and cause heart problem

# Acute Phase Proteins

the levels of certain proteins may increase in blood in response to inflammatory and neoplastic conditions , these are called **acute phase proteins**

-It is important to remember these proteins,tests are routinely done in medical labs to check the levels of these proteins to confirm inflammatory diseases and neoplastic conditions

## Examples-

### ❑ C- reactive proteins (CRP)

-The most routinely required test to be done or to be determined in blood of patient who is suspected inflammatory diseases

### ❑ Ceruloplasmin

### ❑ Alpha -1 antitrypsin

### ❑ Alpha 2 macroglobulins

❑ -It inhibit proteases which some of them are clotting factor and they participate in the process or the mechanism of blood clotting will be inhibited and this is why it consider as in the vivo anticoagulant

### ❑ Alpha-1 acid glycoprotein

# Negative Acute Phase Proteins

The levels of certain proteins are decreased in blood in response to certain inflammatory processes.

## Examples-

- ❑ Albumin
- ❑ Transthyretin
- ❑ Retinol binding protein
- ❑ Transferrin

• Biochemistry

# Clinical significance of plasma proteins

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-This slide and the next slide are going to be dealing with the clinical significance of proteins .  
- Total Proteins could be easily determined in the blood and if you are interested you can also check the fractions.

**Hyperproteinemia-** Levels higher than 8.0gm/dl ( could be 10 or 12 gm/dl )

**Causes:** Causes of hyperproteinemia

Water level decrease. = Volume decrease = concentration increase

- **Hemoconcentration-** due to dehydration, albumin and globulin both are increased Albumin to Globulin ratio remains same.

**Causes:** ( reasons of dehydration )

- Excessive vomiting
- Diarrhea
- Diabetes Insipidus
- Diuresis
- Intestinal obstruction



# Hypoproteinemia

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Decrease in total protein concentration in the blood

- **Hemodilution**- Both Albumin and globulins are decreased, A:G ratio remains same, as in water intoxication (consuming extremely excessive water)
- **Hypoalbuminemia**- low level of Albumin in plasma

**Causes:** (cause of hypoproteinemia)

- Nephrotic syndrome
- Protein losing enteropathy
- Severe liver diseases
- Malnutrition or malabsorption
- Extensive skin burns
- Pregnancy
- Malignancy

# Hypogammaglobulinemia

Gamma immunoglobulin concentrations will be decreasing

Reasons for hypogammaglobulinemia :

- **Losses from body**- same as albumin- through urine, GIT or skin
  - Decreased synthesis
  - Primary genetic deficiency
- **Secondary** – drug induced (some drugs cause a decrease in the production of these immunoglobulins) (Corticosteroid therapy), uremia, hematological disorders
  - AIDS(Acquired Immuno deficiency syndrome)

# Hypergammaglobulinemia



: It could either be

## 1) Polyclonal- (More than one type of gamma globulins are elevated)

- ❑ Chronic infections
- ❑ Chronic liver diseases
- ❑ Sarcoidosis
- ❑ Auto immune diseases

## 2) Monoclonal (Only one specific type of gamma immunoglobulins is elevated , may be because of class switching and alternative splicing)

- ❑ Multiple myeloma
- ❑ Macroglobulinaemia
- ❑ Lymphosarcoma
- ❑ Leukemia
- ❑ Hodgkin's disease

اللهم انا نستودعك غزة وأهل غزة .. نساؤها وأطفالها .. كبارها وصغارها وصغارها .. شبانها وشيبانها ..  
اللهم سدّد رميهم .. وآمن روعتهم .. وانصرهم بنصرك المبين ...  
اللهم كن لأهل غزة عوناً ونصيراً .. وبذل خوفهم أمناً .. واحرسهم بعينك التي لا تنام...  
اللهم اكتب لهم النصر والعزة والغلبة والقوة وثبّت أقدامهم..  
اللهم انصرهم نصراً عزيزاً مؤزراً .. ومدّهم بمدد من عندك يا رب العالمين...  
اللهم آمين  

وإن سألك عن #غزة ..



قل لهم : بها شهيد

يُسعفه شهيد

ويُصوره شهيد

ويُودّعه شهيد

ويُصليّ عليه شهيد !

 محمود درويش 

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