

Clinically Important Plasma Enzymes

Gamma – glutamyl transferase.

Creatine kinase.

Lactate dehydrogenase.

Cholinesterase.

Objectives:

- 1. To study the clinical significance of plasma Gamma – glutamyl transferase.**
- 2. To study the clinical significance of plasma creatine kinase.**
- 3. To study the clinical significance of plasma lactate dehydrogenase.**
- 4. To study the clinical significance of plasma cholinesterase.**

GAMMA-GLUTAMYL TRANSPEPTIDASE (γ -GT)

GAMMA-GLUTAMYL TRANSFERASE (GGT)

IMPORTANT POINTS:

1. It is extremely sensitive indicator of liver disease.
2. It rises early in liver disease before aminotransferases and alkaline phosphatase.
3. It is valuable in identifying alcoholic liver disease.
4. It is important in identifying that the elevation of alkaline phosphatase is of hepatic origin.
5. It is elevated markedly in extrahepatic cholestasis

Organs: Liver, pancreas, kidneys

Normal values: Male: 10-55 IU/L, Female: 5-35 IU/L

IT IS ELEVATED IN:

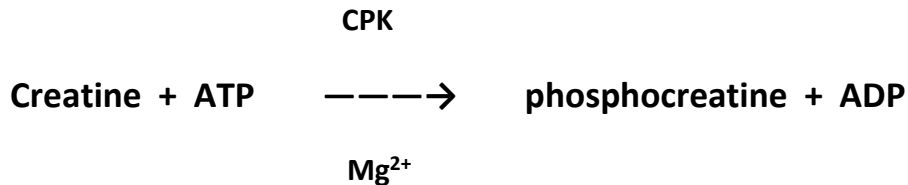
- 1. Acute hepatitis**
- 2. Subacute or chronic hepatitis**
- 3. Cholestasis**
- 4. Liver neoplasm**
- 5. Alcoholic liver disease**
- 6. Liver cirrhosis**
- 7. Enzyme inducers (Rifampicin, Phenytoin, Phenobarbitone)**
- 8. Congestive heart failure (occasionally)**
- 9. Post MI (rarely)**
- 10. Pancreatitis (rarely)**
- 11. Ca pancreas (rarely)**

CREATINE KINASE CK
(CREATINE PHOSPHOKINASE CPK)

Normal values: **Males: 24-195 IU/L**

Females: 24-170 IU/L

There are 3 CK isozymes (CPK 1 – 3) separated by electrophoresis all catalyzes the same reaction:-



Each isozyme consists of 2 polypeptide chains : B and M

Izoenzyme: CK 1 (BB):

Organ: Brain

% of total CK activity: 0%

Clinical significance:

- 1 . CNS diseases**
- 2 . Severe shock**
- 3 . Motor neuron disease**

Isoenzyme: CK 2 (MB):

Organ: Heart

% of total CK activity: 0-6 %

Clinical significance:

Myocardial Infarction (MI)

Isoenzyme: CK 3 (MM):

Organ: Skeletal Muscles

% of total CK activity: 94-100 %

Clinical significance:

- 1. Acute muscle injury**
- 2. Heavy exercise**
- 3. Muscular dystrophies**
- 4. Polymyositis**
- 5. Intramuscular injection**
- 6. Post operative**

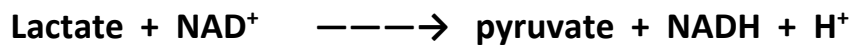
LACTATE DEHYDROGENASE

(LDH)

Normal values: 100-225 IU/L

There are 5 LDH isozymes (LDH 1 – 3) separated by electrophoresis all catalyzes the same reaction:-

LDH



Each isozyme consists of 4 polypeptide chains : H and M

Isoenzyme: LDH 1 (H₄):

Organ: Heart

% of total LDH activity: 28 (15-30)%

Clinical significance:

Myocardial Infarction

Isoenzyme: LDH 2 (H3M):

Organ: Heart , Kidney, RBCs

% of total LDH activity: 36 (22-50)%

Clinical significance:

1. Myocardial Infarction
2. Haemolytic anaemia
3. Renal cortex infarction

Isoenzyme: LDH 3 (H2M2):

Organ: Widely distributed

% of total LDH activity: 23 (15-30)%

Clinical significance:

Little significance

Isoenzyme: LDH 4 (HM3):

Organ: Widely distributed

% of total LDH activity: 6 (0-15)%

Clinical significance:

Little significance

Isoenzyme: LDH 5 (M4):

Organ: Liver, Skeletal muscle

% of total LDH activity: 6 (0-15)%

Clinical significance:

- 1. Acute hepatitis**
- 2. Acute muscle injury**
- 3. Muscle diseases**
- 4. Malignant disease**
- 5. Heavy exercise**
- 6. I.M. injection**

PLASMA CHOLINESTERASE

There are normally 2 isoenzymes of cholinesterase:

1. **Cholinesterase “ pseudocholinesterase”** found in the liver, pancreas, heart, white matter of the brain and the plasma.
2. **Acetylcholinesterase “ true cholinesterase”** found predominantly in RBCs and nerve endings, lungs, spleen and gray matter of the brain.

Cholinesterase serum levels are useful for:

1. An indication of **poisoning** with compounds such as parathion, sarin , tetraethyl pyrophosphate.
2. Detection of individuals with **atypical forms of the enzyme**, (Patients with low enzyme activity or with weakly active enzyme variants are susceptible to “ Scoline Apnoea”)
3. A test of **liver function**. (low enzyme levels in acute hepatitis, liver cirrhosis, and neoplastic liver disease)

Succinylcholine (suxamethonium), “ scoline”

Drug used in anesthesia as a muscle relaxant, and is also hydrolyzed by cholinesterase.

Patients with low enzyme activity or with weakly active enzyme variants may enter period of prolonged apnoea “ **Scoline Apnoea**” requiring mechanical ventilation.