

Markers of Liver Disease.

The enzymes used in assessment of liver disease may be divided into two groups:

- (a) Those indicating hepatocellular damage and
- (b) Those indicating cholestasis (obstruction)

Markers of Liver dysfunction.

Enzyme indicating Hepatic cell damage.

- ALT
- AST.

Enzyme indicating cholestasis (obstructive liver disease)

- ALP
- GGT
- NTP.
(5' nucleotidase)

• Enzymes

• 1. Alkaline phosphatase.

• catalyze hydrolysis of phosphate esters at alkaline pH (9-10)

• Zn containing enzyme.

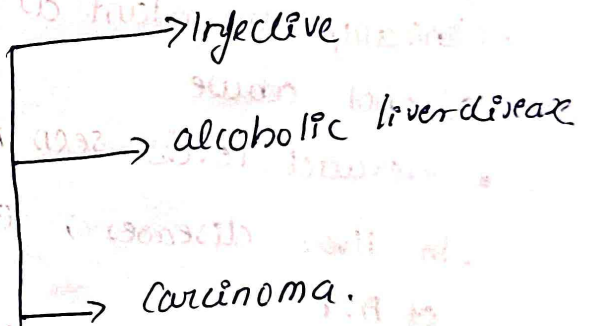
• It is an ectoenzyme - asso: with membranes of liver, kidney, intestine, bone osteoblasts.

• Normal serum level - 40 - 125 IU/L.

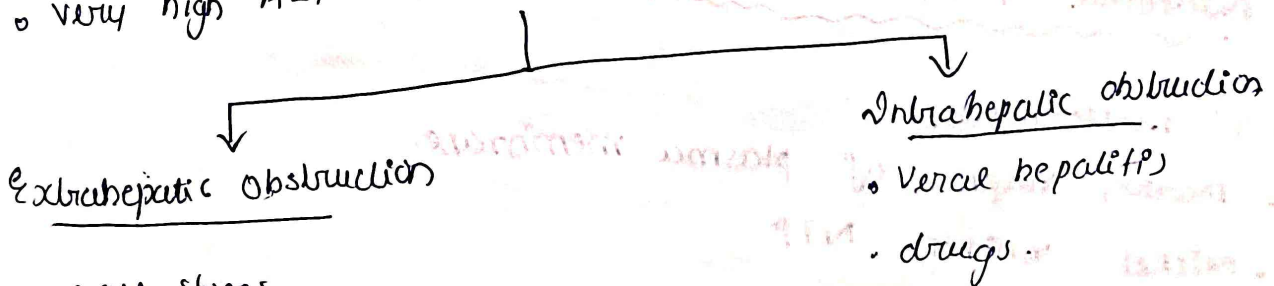
• measured by mg & mn.

Increase in ALP

• Moderately high (hepatic disease)
2-3 times



• very high ALP noted in obstructive jaundice or hepatic carcinoma.



- gall stones
- carcinoma.
- the head of pancreas.

- Viral hepatitis
- drugs

Dramatically high ALP : (10-25 times of upper limit)
• not found in bone disease.

- Pagets
- Rickets
- Osteoblastoma
- Metastatic carcinoma of bone.
- Hyperparathyroidism.

2. Gamma Glutamyl Transaminase (GGT)

- Normal serum value - 10-30 IU/L
- Clinically important as it is sensitive to detect alcohol abuse
- elevated levels seen in chronic alcoholism.
- In liver diseases, GGT levels increase like that of ALP
- very sensitive of biliary tract diseases.

3. Nucleotide phosphatase (NTP)

- 5' nucleotidase
- marker enzyme of plasma membrane.
- Nickel inhibits NTP
- Ecto-enzyme
- Normal level : 2-10 IU/L

#. Enzyme Indicating hepatic cell damage.

(1) Alanine Transaminase. (ALT)

• serum glutamate pyruvate transaminase.
(SGPT).

• Normal level in Serum.

• males - 13-35 IU/L.

• females - 10-30 IU/L.

13-35
10-30

In Liver diseases, ALT > AST.

• very high ALT (300-1000 IU/L).

• acute hepatitis - toxic or viral.

• moderately high ALT (50-100 IU/L).

• Chronic hepatitis.

• cirrhosis

• Hepatitis C

• NAFLD (nonalcoholic steatohepatitis)

2. AST,

Normal 20 - 40 IU/L.

• AST is significantly elevated in liver disease.

✓ primary hepatoma

✓ alcoholic hepatitis.

Markers of prostate disease.

• PSA → prostate specific antigen.

• ACP → acid phosphatase.

(1) Prostate specific antigen (PSA)

• specific for prostate tissue.

• Normal value : 1 - 5 $\mu\text{g/L}$

• value above 10 mg/L indicative of prostate cancer.

• Bound and free forms present.

• 4 - 10 $\mu\text{g/L}$ - Benign prostatic hypertrophy.

• > 10 $\mu\text{g/L}$ - Prostate cancer

1/12/2023.

2) Acid phosphatase (ACP)

- Hydrolyze phosphoric acid ester. $0.5 - 12.1$ $\mu\text{g/L}$
- pH: 4-6 [acidic].
- site of secretion: prostate, RBC, WBC, platelets.
- Normal serum value - 2.5 - 12 IU/L.
- Elevated in bone metastasis of prostate cancer.
- Tumour marker | increased in carcinoma.
- Blood for ACP should be collected before rectal examination.
- As prostate massage may increase the value.

Markers of Pancreatic Disease.

- Amylase.
- Lipase.

(1) AMYLASE

- Serum amylase: 50 - 120 IU/L.
- produced by pancreas, salivary glands.

• Amylase; highly ↑ {1000 times}

• acute pancreatitis:

• Rises in 5-12 hours, lasts for 2-4 days.

Moderately ↑

• chronic pancreatitis.

• mumps (parotitis).

• pancreatic duct obstruction.

(2) LIPASE.

• 50-175 IU/L

• advantage over Amylase:

• Elevated for 7-14 days

• Not increased in mumps.
{ more specific }

• Highly increased. (up to 5 times)

• Acute pancreatitis.

moderately ↑ Lipase.

• Carcinoma of pancreas

• Biliary disease.

• peptic ulcer

Enzyme profile in muscle disease.

- CK - MM
- aldolase (ALD) - earliest enzyme to rise.
- LDH
- AST - not specific.

CK-MM
aldolase
AST
LDH

Enzyme profile in bone disease.

- markers of osteoblast activity - ALP.
increased in pagets, rickets, osteoblastoma.
- marker of osteoclast activity -
TRAP - tartrate resistance acid phosphatase (d.b.)
te

Other enzyme patterns in diseases.

- Cholinesterase - OP poisoning.
- G6PD - drug induced hemolytic anemia.
- Ceruloplasmin - wilson's disease.
- Neuron specific enolase - Neuroendocrine tumours.

Enolase / Neuron specific enolase.

- Glycolytic enzyme.
- NSE is a tumour marker of for tumours of neuroendocrine origin.
{small cell lung cancer, neuroblastoma}.

Use of Enzymes.

- Therapeutic agents
- Diagnostic agents.

Therapeutic use of enzyme.

- 1) streptokinase
{ from streptococcus }
 - 2) Urokinase. { from urine. }
- } lyse intravascular clots in MI.
- 3) Asparaginase - anticancer drug.
- 4) pepsin
 - 5) pancreatin
{ trypsin, lipase }.
- } given to patients with digestive digestion

6) streptococcus obovate (DNase) - applied locally.

7) papain - Anti Inflammation.

8) α-1-antitrypsin - AAT deficiency / emphysema.

30 ml
200 h.

Enzymes as diagnostic agents.

• Enzymes are useful in clinical lab to estimate blood analytes.

1) Glucose oxidase - glucose.

2) urease - urea.

3) uricase - uric acid.

4) Hemicellulase - glucose.

5) cholesterol oxidase - cholesterol.

6) lipase - triglyceride.

7) peroxidase - Glucose, cholesterol.

8) Horse radish peroxidase } ELISA

Alkaline phosphatase

9) restriction endonuclease - RFLP, Southern blotting

10) Reverse transcriptase - PCR (RT-PCR).