

## CARDIAC BIOMARKERS.

Other names:

- markers of MI or enzyme profile in MI or cardiac disease. *! always would normal levels in diseases!!*
- a biomarker helps in detecting any disfunction of an organ.
- Cardiac biomarkers are used to detect cardiac diseases.
- cardiac biomarkers are;

✓ Creatine Kinase (CK-MB)

✓ aspartate amino transferase (AST)

✓ Lactate dehydrogenase (LDH)

✓ Cardiac Troponins (TnI and TnT)

✓ Brain Natriuretic peptide (BNP)

✓ myoglobin.

• Biomarkers for early detection of acute MI are,

• Cardiac troponins

• CK-MB

• myoglobin (sensitive, but not specific)

- N
- predictors of risk in cardiac diseases include:
    - the atherogenic lipoproteins and.
    - hs CRP (inflammatory marker).

## Creatine Kinase (CK)

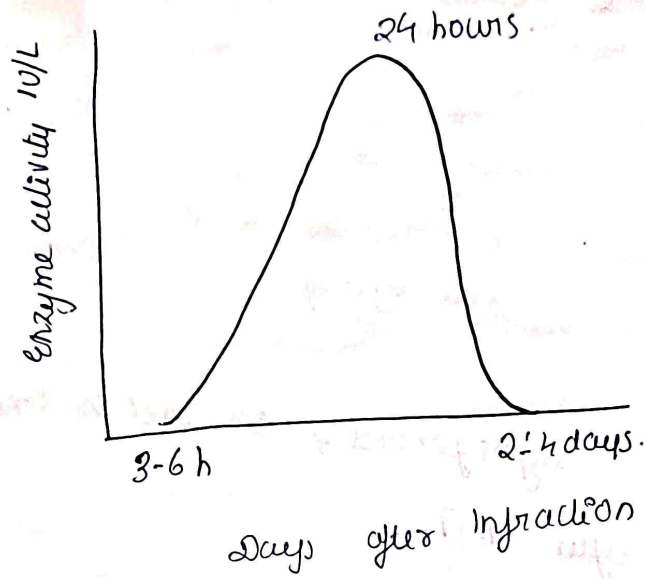
- large amount of CK is present in heart, skeletal muscle and moderate amount in brain.

Normal level in serum.

Male = 15 - 100 IU/L

Female = 10 - 80 IU/L

- CK level increased in muscular dystrophies and myocardial infarction.
- CK MB is high in MI.
- CK level starts to rise within 3-6 hours of infarction { first enzyme to rise }
- peak level reaches by 24 hour.
- value returns to normal by 2-4 days.

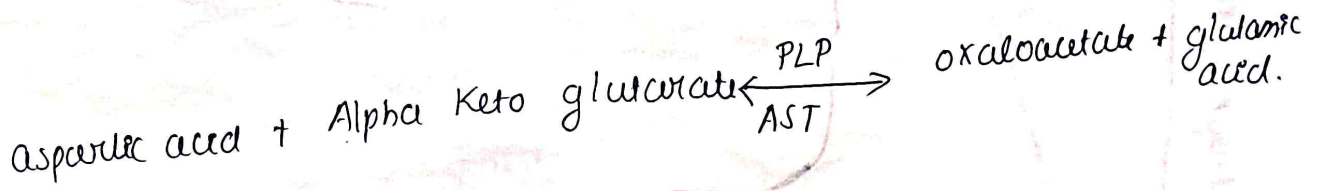


~~3-6~~  
24  
2-4

- CK has an advantage over LDH. why? 1 mark.  
The CK level is not increased in hemolysis or in congestive cardiac failure.

Aspartate Amino transferase (AST).

- also called SGOT (serum glutamate oxaloacetate transaminase).



- requires PLP as coenzyme.

Normal level = ~~8-20~~ IU/L  
in serum. 20-40 IU/L.

## 2 Isoenzyme forms.

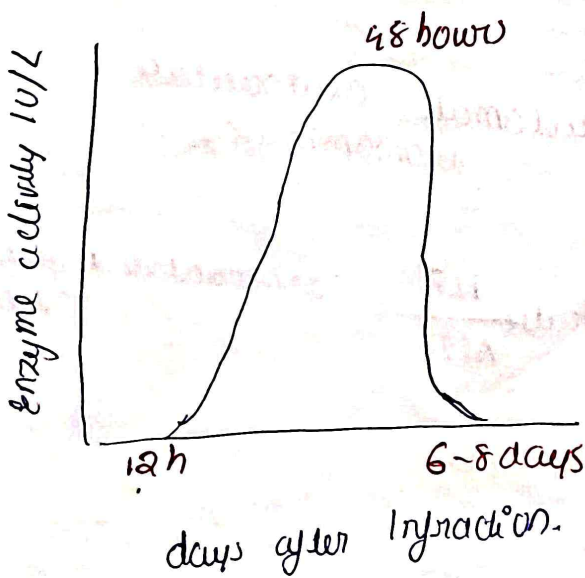
### Mitochondrial

- elevated in severe cell injury

### Cytoplasmic

- Elevated in mild cell injury.

- The level of AST is significantly elevated in MI.
- Rise start at 12 hrs after MI.
- peak value reaches by 48 hours.
- value returns to normal by 6-8 days.
- AST level moderately elevated in liver disease.
- % not specific.



#

CK has an advantage over LDH?

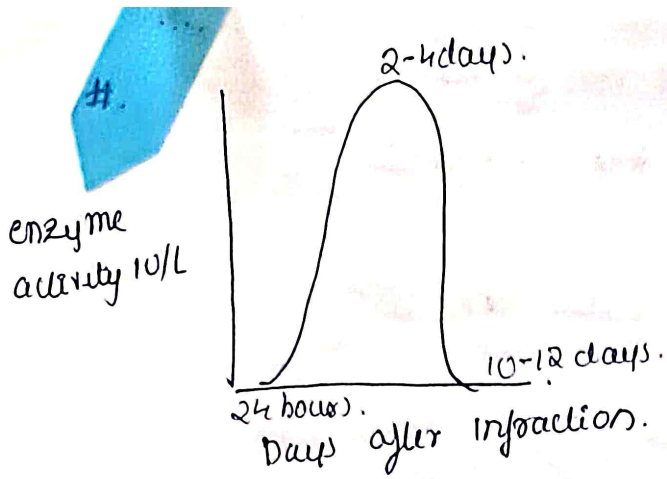
→ the CK level is not increased in hemolysis & in congestive cardiac failure.

## Lactate Dehydrogenase. (LDH)

- Normal level = 100-200 IU/L.
- LDH conc is more inside RBC than plasma, so minor amount of hemolysis will give false +ve test.
- Increase in total LDH level seen in hemolytic anemia, hepatocellular damage, muscular dystrophy, carcinomas etc.

## LDH in MI.

- LDH<sub>1</sub> (H<sub>4</sub> isoenzyme) level is increased 5-10 times in MI
- rise starts at 24 hours after the onset of coronary artery block.
- peak values are observed by 4-5 days.
- value returns to normal by 10-12 days.



- Imp
- If question is 'cardiac biomarkers' → only write all.
  - If MI biomarkers, write only upto CK, not troponin!
  - If you write, they'll cross everything!!

## TROPONINS.

- Troponins are not enzymes
- Troponin is a complex of 3 regulatory proteins that is integral to muscle contraction in skeletal & cardiac muscle but not in smooth muscle.

Troponin has three subunits TnC, TnT & TnI.

→ Troponin C binds to calcium ions.

→ Troponin T binds to tropomyosin.

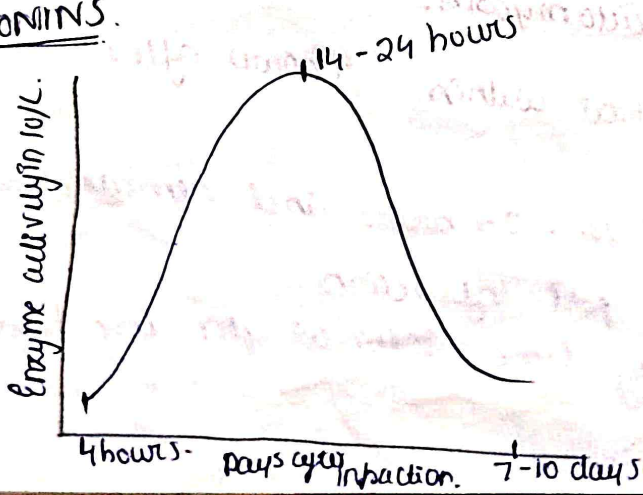
→ Troponin I binds to actomyosin.

- Troponin I is released into blood within 4 hours after onset of cardiac symptoms.
- peak value observed at 14 - 24 hours and remains elevated for 7-10 days post infarction.
- It is a useful marker at any time interval after the heart attack.

- Troponin T increases within 6 hours of MI
- peak value by 48 hours and then remains elevated upto 7-14 days.
- degree of elevation of troponin value can give prognostic information.

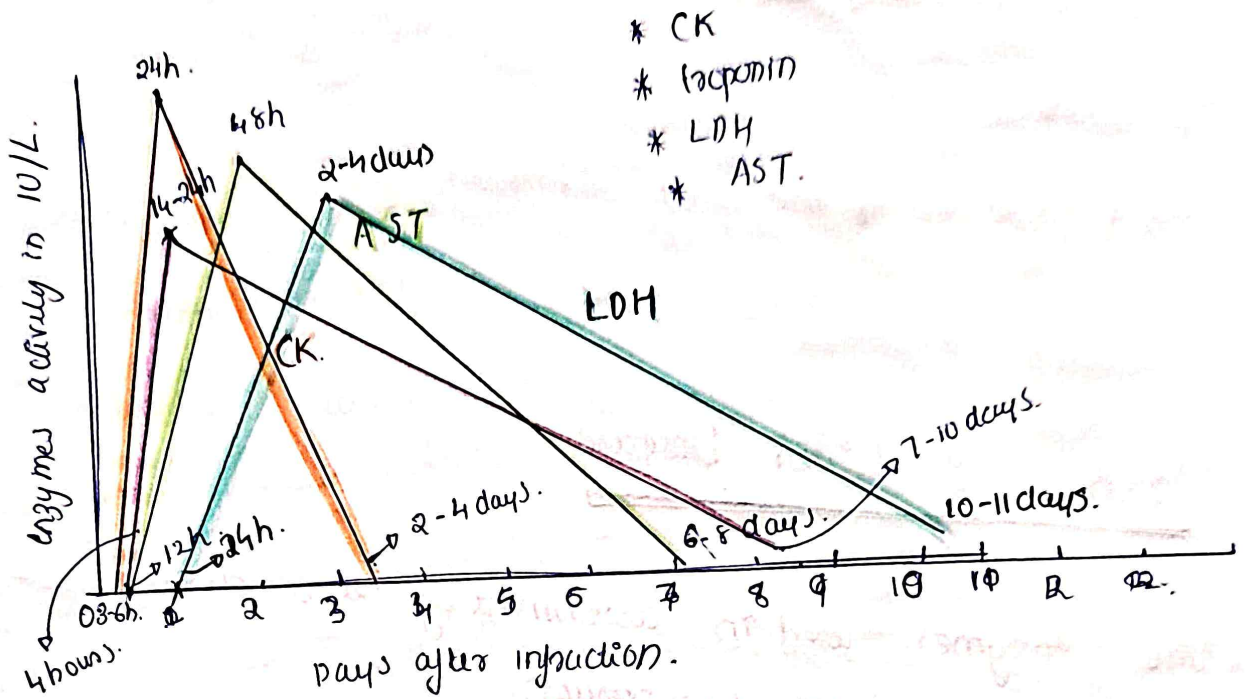
Marker	Onset	Peak	Duration	Remarks.
Troponins.	4-6 hours.	24-48h 1-2 days	8-14 d	preferred marker. useful marker
CK-MB.	3-6 h	18-24 hrs	36-48h	Non-specific.
myoglobin	1-4 h	6-7 h	2 h	Not used nowadays.
AST	6-12 h.	24-48h	6-8 d.	
LDH.	24 h	4-5 day	10-12 days.	

### TROPONINS.



1-4  
6-7  
24.

Time course of elevation of



- \* CK
- \* Troponin
- \* LDH
- \* AST

Brain Natriuretic peptide (BNP)

- Natriuretic peptide family - ANP, BNP, CNP.
- ANP - produced in atria.
- BNP - produced in ventricles, brain.
- High conc of ANP and BNP seen in congestive cardiac failure.

Others markers of MI.

- myoglobin.
- IMA { Ischaemia & modified albumin }.