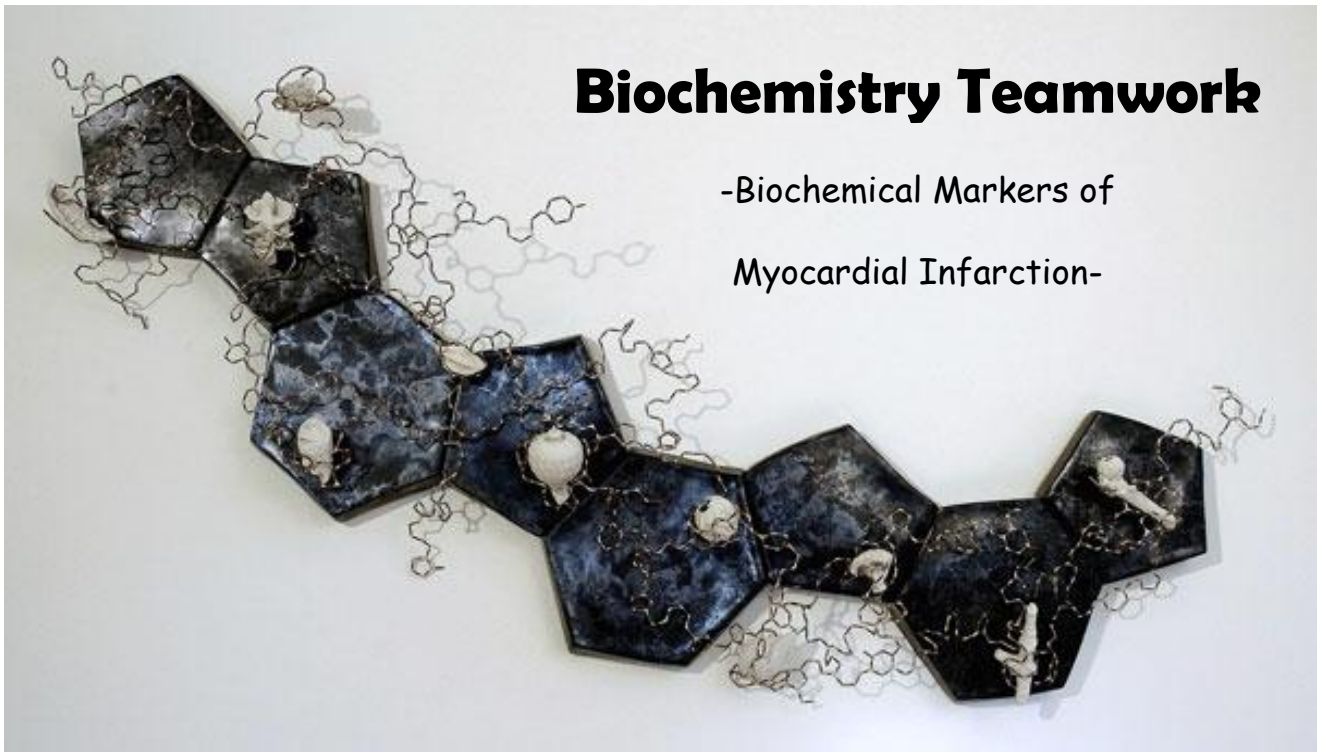

Team Leaders	
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Team Members	
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Alanood Asiri	Abdullah Al-Mazyad
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Hadeel Helmi	
AlHanouf Alomran	
Afnan AlRashoud	

Red-colored texts = important

Green-colored texts = The Doctor's explanations & notes

Myocardial infarction (MI):

Myocardial infarction is due to:

Restricted blood supply (oxygen) to heart tissue (ischemia) ⟶ damage to heart tissue (infarction) ⟶ the release of enzymes and other proteins into the blood (markers).

Markers of diagnostic value in MI:

Cardiac troponins I and T

Creatine Kinase (CK-MB)

Myoglobin

} These three are the most important markers

Lactate dehydrogenase (LDH)

Aspartate aminotransferase (AST)

Time-course of enzyme changes:

- Plasma enzymes follow a pattern of activities after a MI

- The initial lag phase lasts for about 3 hours [which means the enzymes need 3 hours to start]

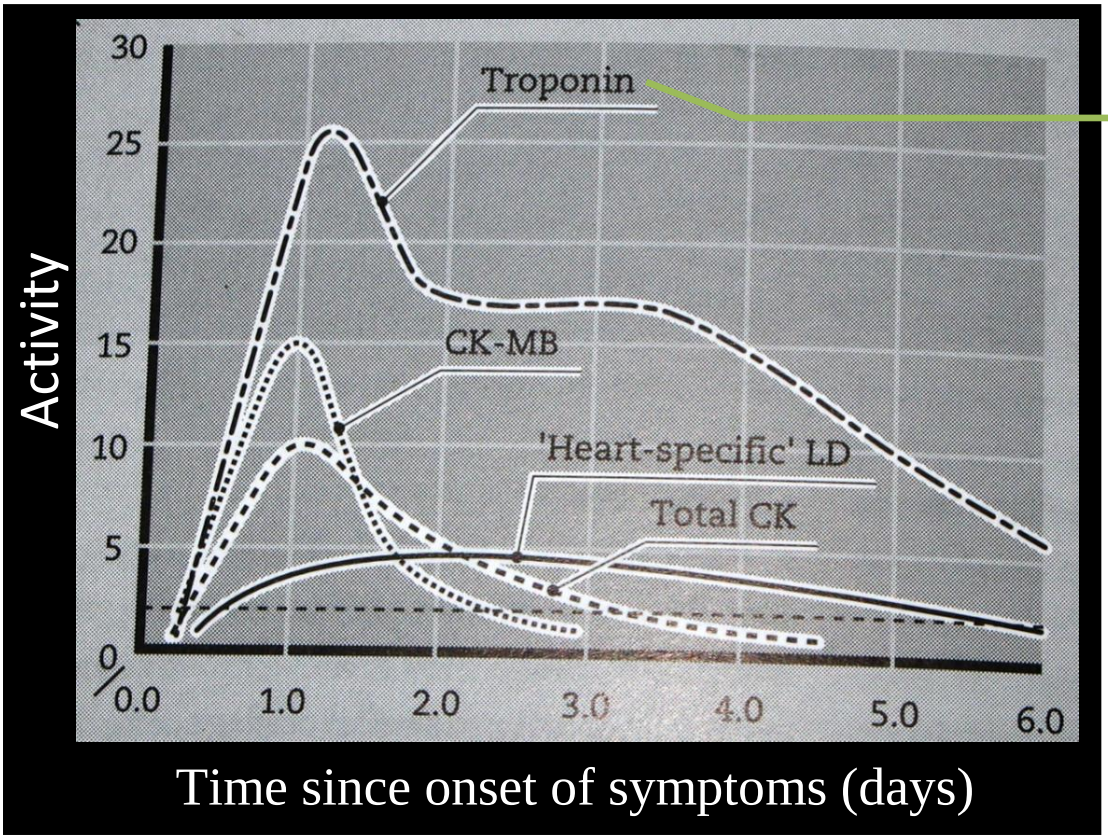
- Enzymes rise rapidly to peak levels in 18-36 hours [notice that almost all of the enzymes need 18-36 hours to reach their peaks]

- The levels return to normal based on enzyme half-life

- Rapid rise and fall indicates diagnostic value

[diagnostic value → infarction]

Marker activity after MI



Troponin is biphasic (it has two elevations):

1. The first elevation is by the soluble troponin released in the blood.

2. The next elevation is represented by the bound troponin.

Blood samples collected after MI:

[When should we take blood samples ?]

1- Baseline (upon admission)

2- Between 12 to 24 hours after the onset of symptoms

Troponins:

- Troponins are structural proteins in cardiac myocytes and in skeletal muscle.

- Involved in the interaction between actin and myosin for contraction.

- cTn (cardiac troponin) is mainly bound to proteins, with small amount soluble in the cytosol

97% of troponin is bound with structures

3% of troponin is soluble in the cytosol

* In case of cell damage, the soluble troponins are released first, and that's why the first peak (elevation) in case of ischemia or infarction is represented by the soluble troponins.

- Two main cardiac troponins (cTn):

1. cTnI: inhibitory protein
2. cTnT: binds to tropomyosin

- cTn are structurally different from muscle troponins

- Highly specific markers for detecting MI

- Appear in plasma in 3-4 h after MI

- Remain elevated for up to 10 days

- After a MI, cytosolic troponins (soluble) are released rapidly into the blood (first few hours)

- Structurally bound troponins are released later for several days

Troponin is intracellular which means it is not normally present in the blood that's why it is specific.

Dr. Rana said to only memorize the numbers circled in red.

Plasma Enzyme Changes

Enzyme	Detectable (hours)	Peak value (hours)	Duration (days)
CK-MB	3-10	12-24	1.5-3
Total CK	5-12	18-30	2-5
AST	6-12	20-30	2-6
LDH (heart specific)	8-16	30-48	5-14
Cardiac troponins	3-4	~ 48	Upto 10

Creatine Kinase (CK):

Three main CK isoenzymes comprising two polypeptide chains B (Brain) or M (Muscle)

Isoenzyme: enzyme which have the same action but different structure

Type	Composition	Comment
Skeletal Muscle	98% CK-MM 2% CK-MB	Elevated in muscle disease
Cardiac muscle	70-80% CK-MM 20-30% CK-MB	Cardiac muscle has highest amount of CK-MB
Brain	CK-BB	
Plasma	Mainly CK-MM	

- CK-MB is more sensitive and specific for MI than total CK [because it's more specific for the heart]

- It rises and falls transiently after MI

- **It is required in the following conditions:**

1. When very early evidence of infarction
2. Post-operative and traumatized patients suspected for MI
3. Patients suspected of having a second infarct [because it disappears after the first infarction so if there's another infarction we'll have another elevation]

* Note: Total CK is NOT specific

Myoglobin:

- Myoglobin is a sensitive marker of cardiac damage

- It rises very rapidly after the MI at about the same rate as CK-MB

- Myoglobin is non-specific because it is also elevated in muscle disease

Lactate dehydrogenase (LDH):

- LDH increases within 6-12 h of MI

- Reaches a max. Level in 48 h

- Remains elevated for 5-6 days after MI

- A non-specific marker of tissue injury:

High levels are found in liver, lung, kidney and other diseases.

Aspartate aminotransferase (AST):

-AST and ALT are mainly liver enzymes

-AST is also present in the heart

-A non-specific marker of MI

-It is elevated in liver and other diseases

Questions

1. Which marker lasts more in the blood after MI?

a) CK-MB

b) Total CK

c) Troponin

2. Which MI marker is more specific?

a) Total CK

b) Troponin

c) Myoglobin

d) LDH

3. When does troponin start appearing in the plasma?

a) 10 days after MI

b) 3-10 hours after MI

c) 6-12 hours after MI

d) 3-4 hours after MI

4. Which of the following starts first to rise ?

a) Troponin

b) Myoglobin

c) CK-MB

d) LDH

Answers: 1c, 2b, 3d,