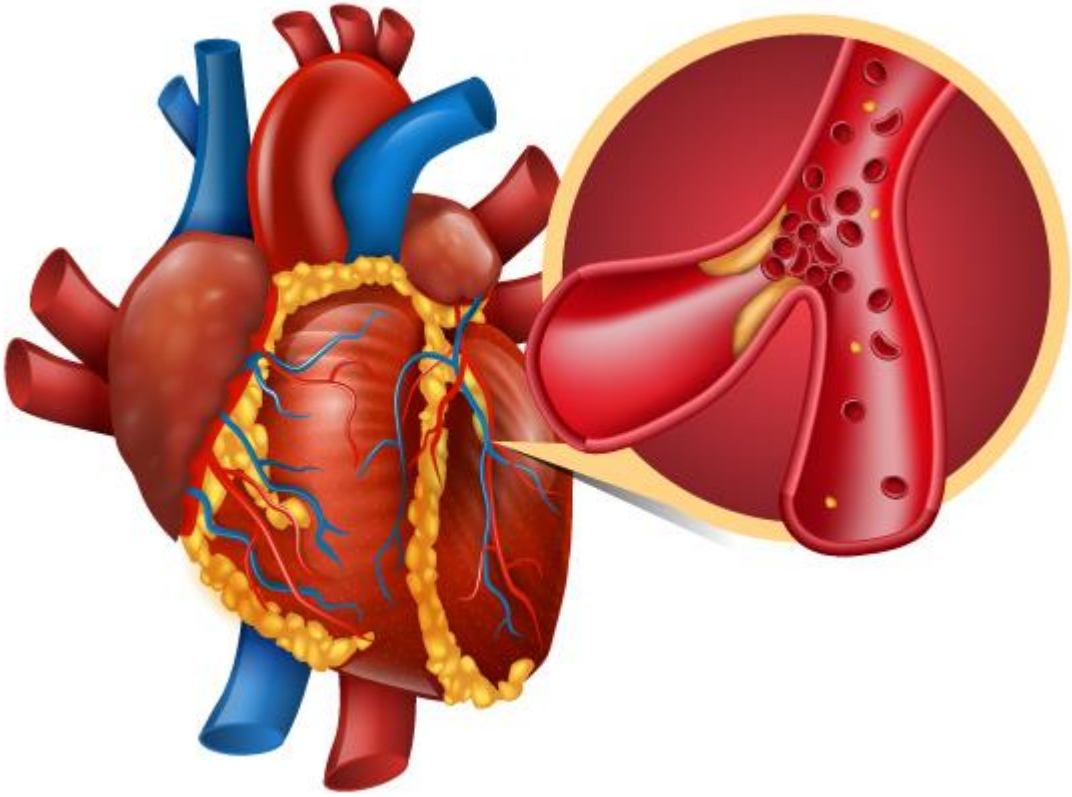
Cardiac Markers

What is **Myocardial Infarction?**

- **commonly known as a heart attack, occurs when blood flow stops to a part of the heart causing death of part of heart muscle.**



Diagnosis of **Myocardial Infarction**

SHOULD depend on THREE items

(as recommended by ***WHO***)

1- Clinical Manifestations

2- ECG

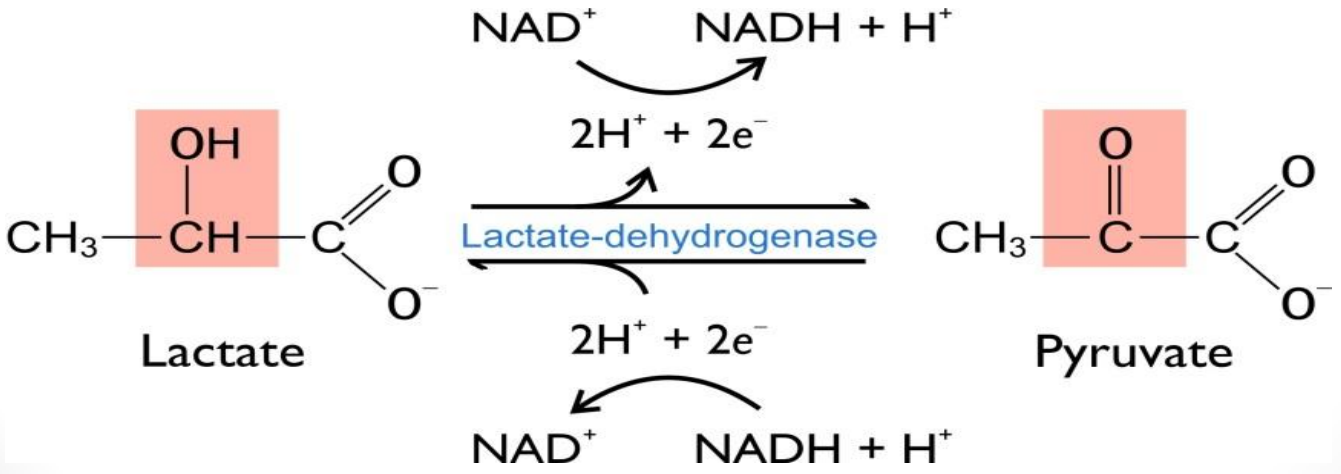
3- Biochemical Markers

Cardiac markers

- biomarkers measure to evaluate heart function.
- Most of the early markers identified were enzymes and as a result, the term "cardiac enzymes"
- is sometimes used. However, not all of the markers currently used are enzymes .

LDH(Lactate dehydrogenase)

- Present in almost all body tissues but with small amounts in blood
- When cells are destroyed ,LDH will release in blood stream
- LDH is used as general marker of injury to cells



Isoenzymes of LDH

Lactate dehydrogenase (LDH):

- **Tetrameric enzyme formed by combination of 2 subunits: H (Heart) and M (Muscle):**

Type	Subunit	Tissue of origin
LDH-1	H4	Heart muscle
LDH-2	H3M1	RBCs
LDH-3	H2M2	Brain
LDH-4	H1M3	Liver
LDH-5	M4	Muscles

- **Total LDH is increased in hepatocellular damage, leukemia and hemolytic anemia In Myocardial infarction total LDH as well as LDH-1 increased.**

Non Cardiac disease

- **Elevated levels of LDH may be seen in the following conditions**

➢ **Hemolytic Anemia and pernicious anemia**

➢ **Liver disease (high elevation in liver carcinoma and toxic hepatitis while moderete elevation in viral hepatitis and obstructive jaundice)**

➢ **Muscular dystrophy**

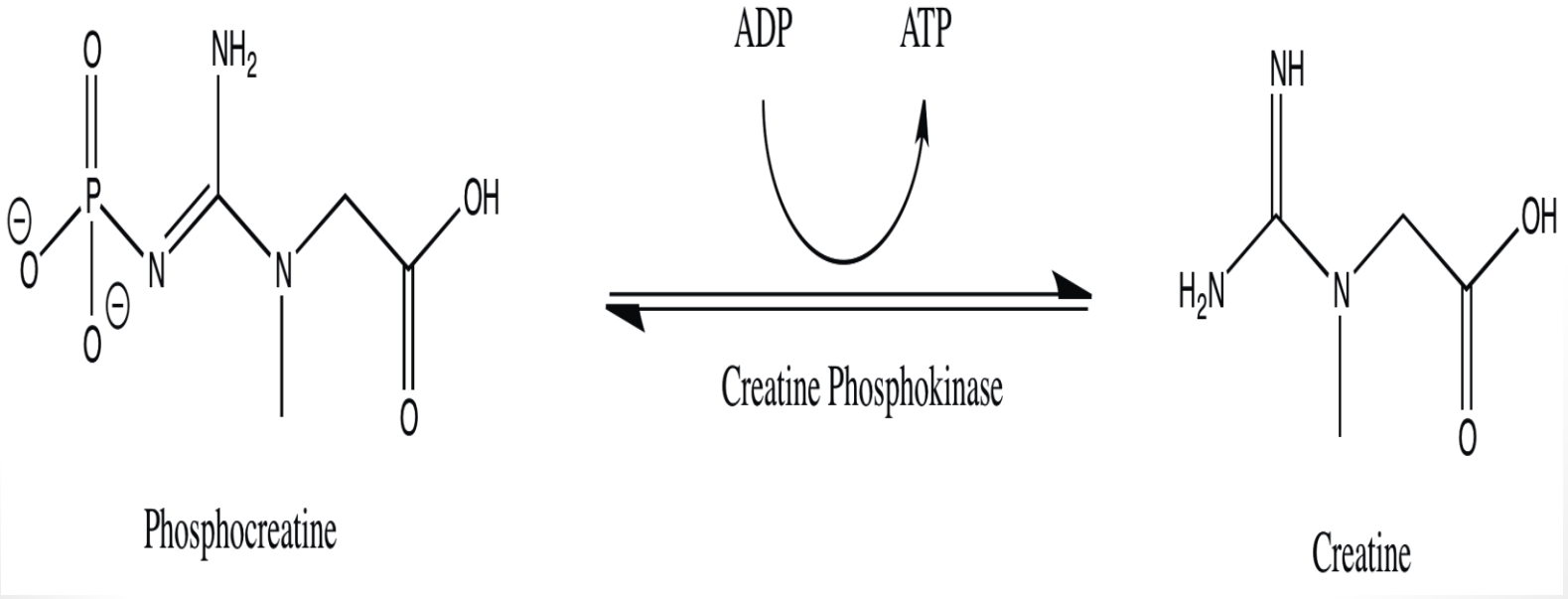
➢ **Leukemia and Lymphoma**

❖ **Strenuous exercise ,hemolysis of blood can give false result**


C
CREATINE
P
PHOSPHO
K
KINASE

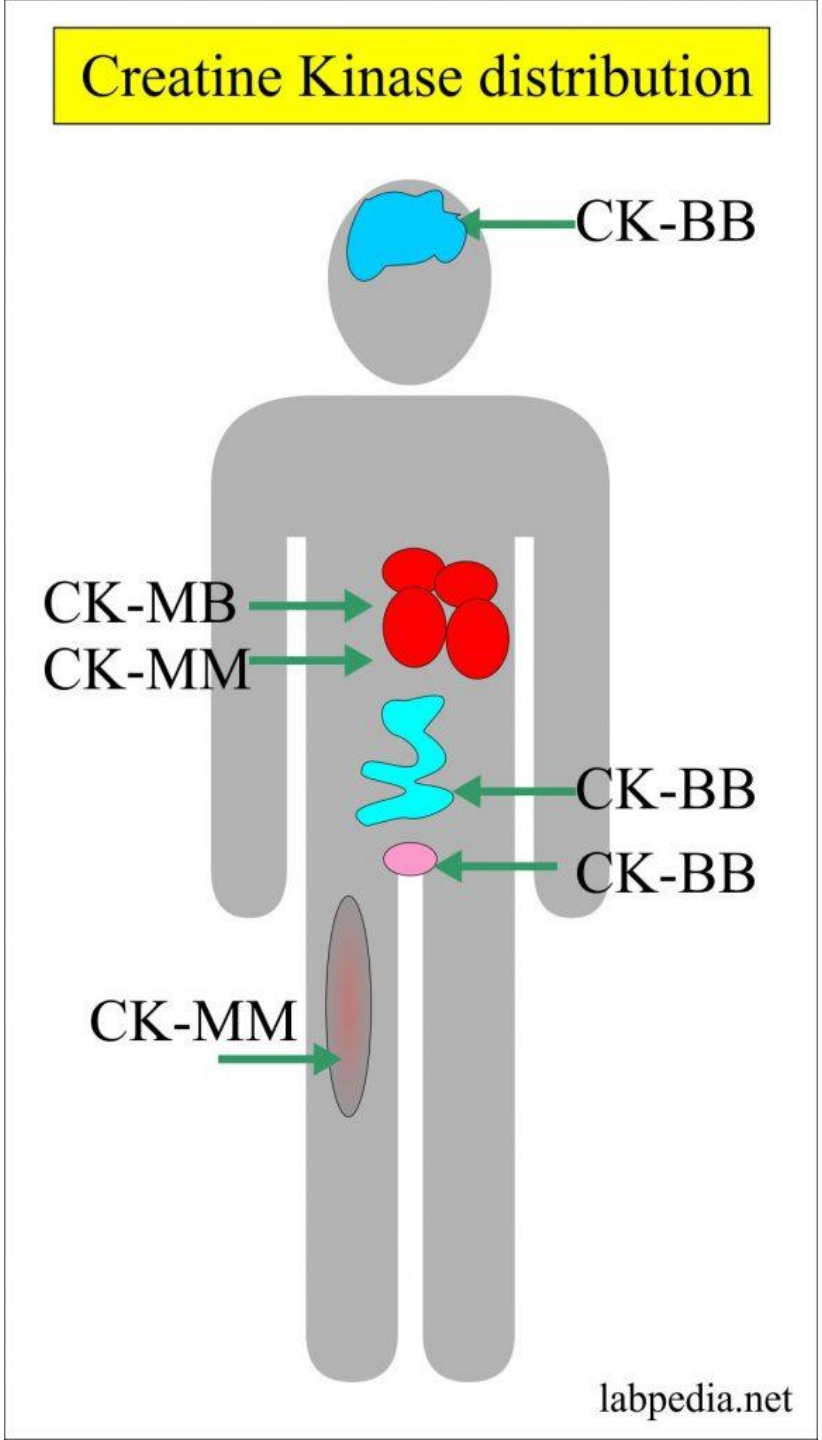
CPK (Creatine Phospho kinase)

Creatine phosphokinase enzyme reaction



CK Isoenzymes

- Ck is a dimeric enzyme (2 subunits) :M ,B
  - CK-MM
  - CK-BB
  - CK-MB
- Skeletal muscle expresses CK-MM (98%) and
- The myocardium (heart muscle), in contrast, expresses CK-MM at 70% and CK-MB at 25–30%.


Creatine Kinase distribution
CK-BB
CK-MB
CK-MM
CK-BB
CK-BB
CK-MM
labpedia.net

CK-MB

- serum CK-MB mainly comes from myocardial tissue so it is the first cardiac enzyme to be elevated after MI
- In the first 2 to 4 hours after a heart attack, the concentration of CK-MB in blood begins to rise. It reaches its highest level in 12 to 24 hours and returns to normal within 1-3 days .

Myoglobin

- Myoglobin is an oxygen binding protein of cardiac and skeletal muscle .
- It is a sensitive index of myocardial damage

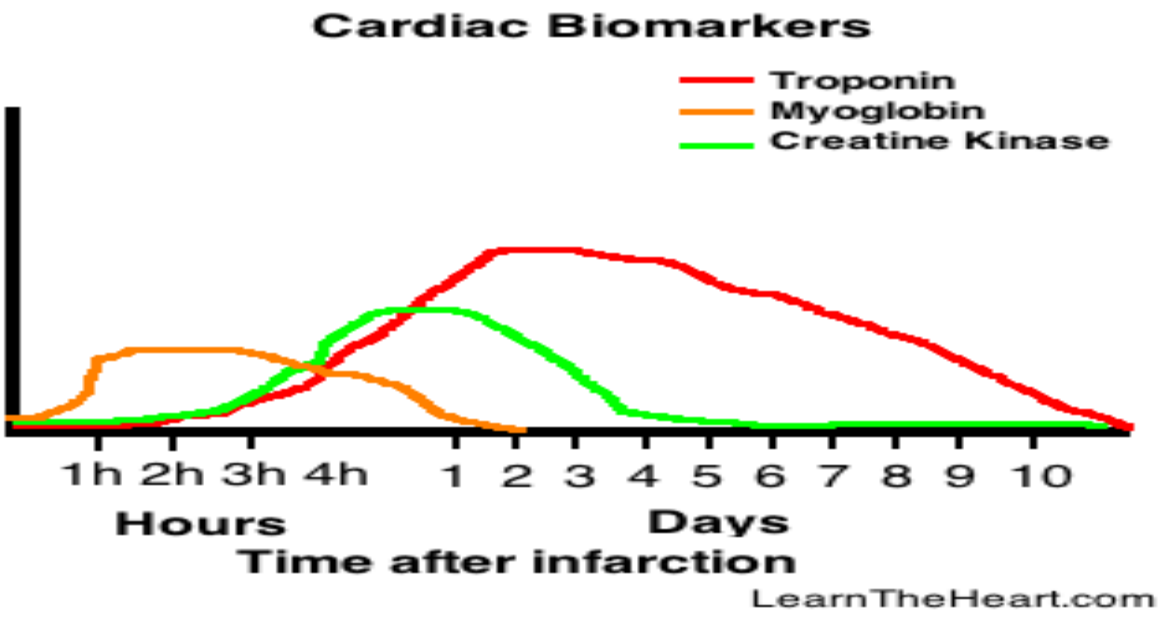
- It Appears in blood earlier than other CK-MB (within 1-4 hours) due to its low molecular weight and cytoplasmic location
- There is no difference in the myoglobin found in heart versus skeletal muscle (not specific)
- It is elevated due to
  - Muscle disease/injury
  - Acute and chronic renal failure
  - AMI

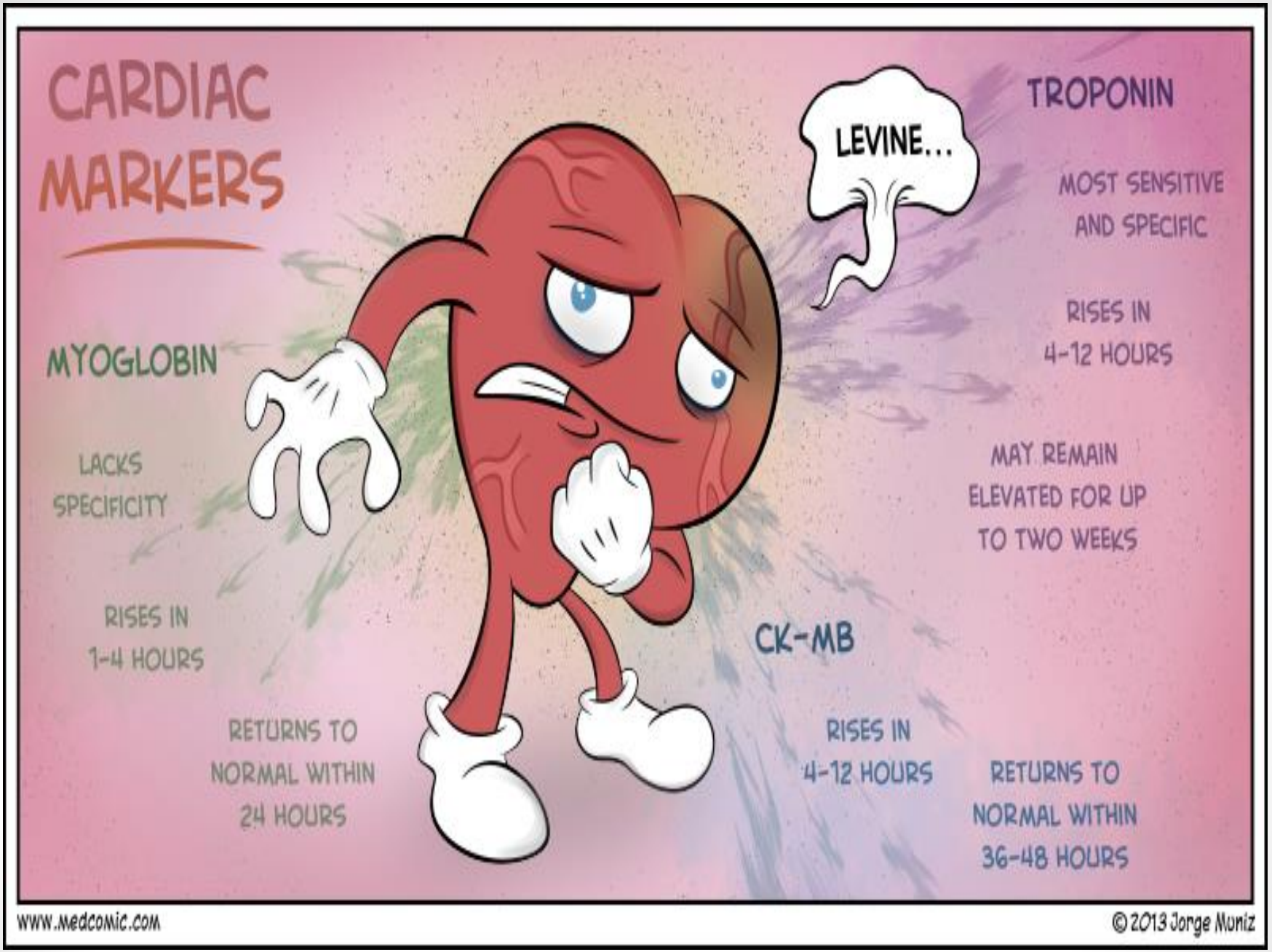
Myoglobin

- **the level of myoglobin in the blood starts to rise within 2-3 hours of a heart attack or other muscle injury, reaches its highest levels within 8-12 hours, and generally falls back to normal within one day. An increase in myoglobin is detectable sooner than troponin, but it is not as specific for heart damage and it will not stay elevated as long as troponin.**
- **However elevated myoglobin has low specificity for the diagnosis of myocardial infarction and therefore is not the preferred test**

Troponin

- Troponin is a regulatory complex of 3 protein subunits
- Troponin C : No cardiac specifity (calcium binding)
- Troponin T : Tropomysin
- Troponin I : Inhibitory
- Certain subtypes of troponin (cardiac I and T) are very sensitive and specific indicators of damage to the heart muscle (myocardium).


Cardiac Biomarkers
Troponin
Myoglobin
Creatine Kinase
1h 2h 3h 4h 1 2 3 4 5 6 7 8 9 10
Hours
Days
Time after infarction
LearnTheHeart.com


CARDIAC MARKERS
LEVINE...
TROPONIN
MOST SENSITIVE AND SPECIFIC
RISES IN 4-12 HOURS
MAY REMAIN ELEVATED FOR UP TO TWO WEEKS
MYOGLOBIN
LACKS SPECIFICITY
RISES IN 1-4 HOURS
RETURNS TO NORMAL WITHIN 24 HOURS
CK-MB
RISES IN 4-12 HOURS
RETURNS TO NORMAL WITHIN 36-48 HOURS
www.medcomic.com
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Sex	Male	Age	62 Years	19/07/2020	تاريخ التحليل
				19/07/2020	تاريخ النتيجه

Cardiac Enzymes

			Reference range
CK-MB	6.8	U/L	0 - 25
Cardiac Troponin I Ultra	0.004		< 0.002 µg/l

Comment

Negative Less than : 0.002
Result between (0.002) to (0.1) to be comfirmed by asecond measurment after 2 hours
Positive More than : 0.1