Cardiac markers & other protein markers

Definition and Efficacy

- **Cardiac biomarkers are endogenous substances released into the bloodstream when the heart muscle is damaged or stressed. Measurement of these biomarkers is used to help diagnose, assess risk, and manage heart disease.**

Why Cardiac Markers Are Used

A- Diagnosis:

- **They help confirm or rule out a myocardial infarction (heart attack) and other cardiac conditions.**

B- Monitoring:

- **Blood levels can be evaluated over time to monitor for ongoing or new heart muscle damage.**

C- Treatment Guidance:

- **The results guide clinical decisions and help determine the most appropriate treatment strategy**

Classification

1- Markers of myocardial infarction

2- Markers of myocardial ischemia

3-Markers of myocardial stress (natriuretic peptides)

4- other biomarkers: Aspartate transaminase (AST) was the first cardiac biomarker to be used in clinical practice. Also, Lactate Dehydrogenase was used as cardiac biomarker

1- Markers of myocardial infarction

1-Cardiac troponin T and troponin I

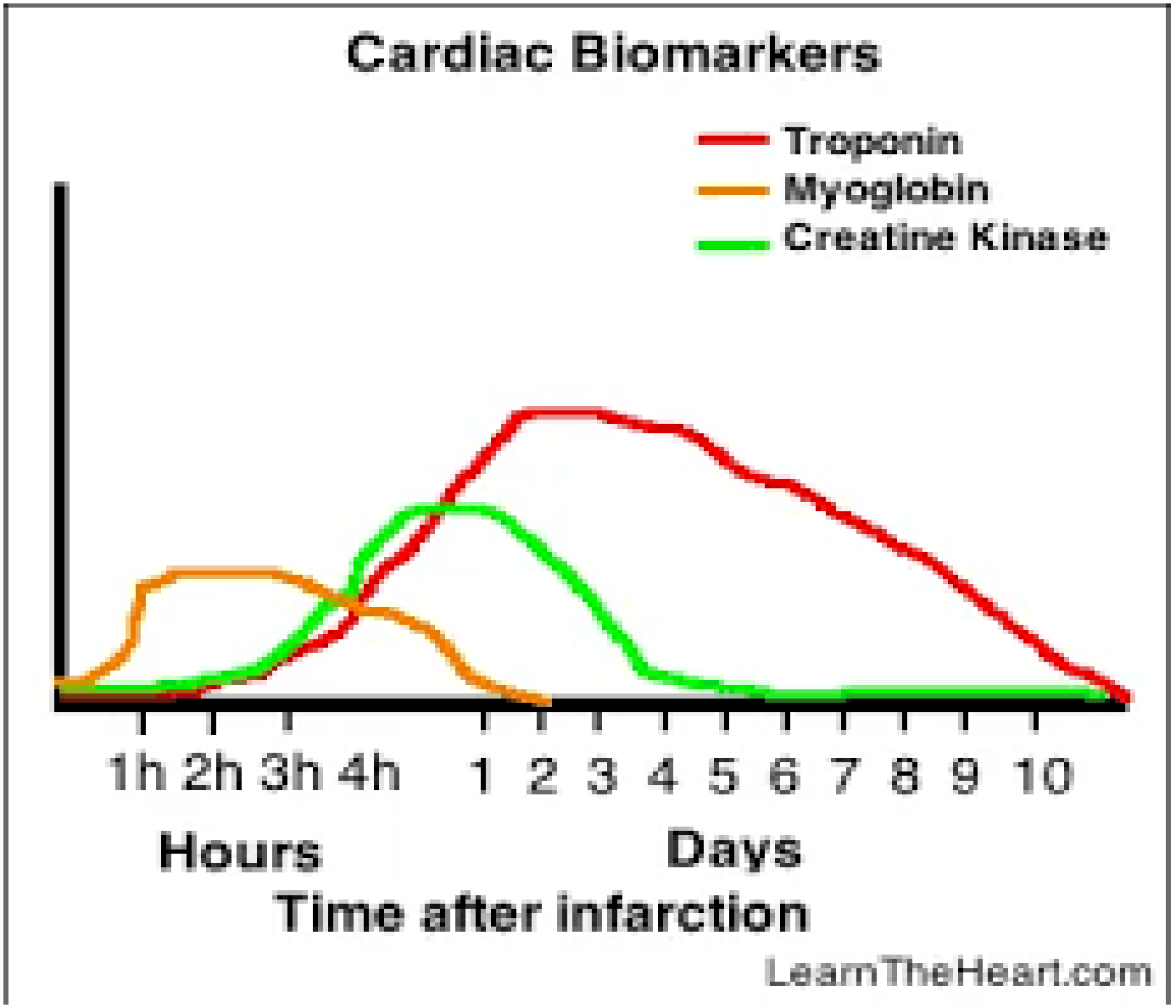
cardiac regulatory proteins that control the calcium mediated interaction between actin and myosin. Cardiac troponin I is found only in cardiac tissue while cardiac troponin T is expressed to a very small degree in skeletal muscle. Troponin has been shown to be more specific and more sensitive to cardiac injury , as troponin is not released from damaged skeletal muscle.

2- creatine kinase

A cytosolic protein involved with mitochondrial phosphate transport. CK exists in three different dimer configurations (MM, MB, BB). Prior to the use of troponin, CK-MB was the mainstay cardiac enzyme for the diagnosis of myocardial infarction.

3- Myoglobin

Myoglobin is an iron- and oxygen-binding protein found in the cardiac and skeletal muscle tissue . Myoglobin is typically released in the circulation as early as 1 h after MI due to its low molecular (17 KDa) weight and cytoplasmic location. This was of some benefit when CK-MB was the primary assay available; however, as troponin assays have become more sensitive, they have replaced myoglobin for early detection of myocardial injury. High sensitivity cardiac troponin is released earlier from damaged myocardial tissue and to be detectable in serum earlier than myoglobin.


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
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2- Markers of myocardial ischemia (ischemia modified albumin)

- **Ischemia-modified albumin (IMA), first discovered in the early 1990s, is a form of human serum albumin modified by reactive oxygen species (ROS) generated by hypoxia, free-radical injury or membrane disruption, whereby the amino (N)-terminal end of albumin is unable to bind to metals (iron and cupper)**

3-Markers of myocardial stress (natriuretic peptides)

1-Atrial natriuretic peptide (ANP) is a hormone released from myocardial cells in the atria and in some cases the ventricles in response to volume expansion and increased wall stress.

2-B-type natriuretic peptide (BNP) is a natriuretic hormone initially identified in the brain but released primarily from the heart, particularly the ventricles.

The release of both ANP and BNP is increased in heart failure (HF), as ventricular myocytes are stimulated to secrete both ANP and BNP in response to increased strain

4- other biomarkers

- **Aspartate transaminase (AST) was the first cardiac biomarker to be used in clinical practice. Also, Lactate Dehydrogenase was used as cardiac biomarker**

Quiz

- **1- Which one of following biomarkers is used to detect ischemia ?**
- A) ischemia modified albumin
- B) Total CK
- C) CK-MB
- D) BNP

- **2- Which one of following biomarkers is used to detect CHF ?**
- A) ischemia modified albumin
- B) Total CK
- C) CK-MB
- D) BNP


Good Luck!