



Cardiac Enzymes

Cardiac enzymes are biomarkers that are released into the blood when the heart muscle is damaged, such as during a myocardial infarction (MI), commonly known as a heart attack. These enzymes are essential in diagnosing and assessing the severity of a heart attack. This is an overview of the key cardiac enzymes, their normal values, and their typical timelines in the context of an MI:

1. Troponin (T and I types)

- Normal Values: Troponin T < 0.1 ng/mL; Troponin I < 0.03 ng/mL.
- Appearance after MI: Rise within 3-4 hours.
- Peak: Typically peaks around 24 hours.
- Duration: Can remain elevated for 1-2 weeks.
- Significance: Troponin is highly specific to heart muscle damage and is considered the most reliable marker for MI.

2. Creatine Kinase-MB (CK-MB)

- Normal Values: 0-3% of total CK (Creatine Kinase), or CK-MB < 7.2 ng/mL.
- Appearance after MI: Rises within 4-8 hours.
- Peak: Peaks around 12-24 hours.
- Duration: Returns to normal within 48-72 hours.
- Significance: CK-MB is specific to cardiac tissue, but less so than troponin.

3. Myoglobin

- Normal Values: < 90 ng/mL.
- Appearance after MI: Rises within 1-4 hours.
- Peak: Peaks within 6-7 hours.
- Duration: Returns to normal within 24 hours.
- Significance: Myoglobin is a very early marker but is not specific to the heart.

4. Lactate Dehydrogenase (LDH)

- Normal Values: LDH 140-280 U/L.
- Appearance after MI: Rises within 12-24 hours.
- Peak: Peaks around 48-72 hours.
- Duration: May remain elevated for 7-14 days.
- Significance: Less frequently used now, it is not specific for cardiac damage.

These time frames and levels are typical, but they can vary based on individual factors and the severity of the heart attack. It's important to understand that the interpretation of these enzyme levels should be done in the context of the clinical picture and other diagnostic modalities, as various factors can influence these levels. Regular updates and advancements in cardiac



biomarkers and their interpretation may also occur, so it's always good to refer to the latest clinical guidelines for the most current information.

In the context of cardiac health, there are two main types of troponin that are important: Troponin I (cTnI) and Troponin T (cTnT). These are specific to cardiac muscle and are used as biomarkers to diagnose myocardial infarction (heart attack) and other heart injuries. Here's how they differ:

1. Cardiac Troponin I (cTnI)

- Specificity: cTnI is found only in cardiac muscle, making it highly specific for cardiac damage. It is not present in skeletal muscle, which makes it a very reliable indicator of heart muscle injury.
- Clinical Use: Elevated levels of cTnI are a strong indicator of myocardial infarction. It's used in conjunction with other clinical findings and tests to diagnose heart attacks.
- Time Frame: Like cTnT, cTnI levels rise within a few hours after the onset of a heart attack, peak at about 24 hours, and can remain elevated for up to 1-2 weeks.

2. Cardiac Troponin T (cTnT)

- Specificity: cTnT is also specific to cardiac muscle, but very small amounts can be found in skeletal muscle. This means that in certain conditions (like severe skeletal muscle injury or renal failure), cTnT levels can be slightly elevated, albeit usually not to the extent seen in cardiac damage.
- Clinical Use: cTnT is used similarly to cTnI in diagnosing myocardial infarction. It's a key marker for detecting heart muscle injury.
- Time Frame: cTnT levels rise a few hours after a heart attack, peak around 24 hours, and can stay elevated for up to 2 weeks.

Differences in Measurement:

- Different assays (laboratory tests) are used for measuring cTnI and cTnT. Laboratories may use different methods or kits, and not all kits can measure both types of troponin. This can influence which type of troponin a hospital or clinic might predominantly use for diagnostic purposes.

Sensitivity and Diagnostic Accuracy:

- Both cTnI and cTnT are highly sensitive and specific for myocardial injury. However, there may be minor differences in their sensitivities based on the assay used. These differences are generally not significant enough to impact their clinical utility in diagnosing myocardial infarction.

In summary, while there are slight differences between cTnI and cTnT, both are highly effective biomarkers for diagnosing heart muscle injury, and the choice between them often depends on the available testing methods and hospital protocols.