English

INSTANT-VIEW® CARDIAC 3-in-1 (TNI, CKMB, MYO)
Whole Blood/Serum Cassette Test

CE

One Step Assay
Rapid Visual Results
For Qualitative In Vitro Diagnostic Use

INTENDED USE

The Cardiac 3-in-1 Whole Blood/Serum Test is an immunoassay for the rapid qualitative detection of cardiac troponin I (TNI), creatine kinase: MB isoenzyme (CKMB) and myoglobin in human whole blood or serum at or above the following cutoff concentrations.

Marker	Cutoff
Cardiac Troponin I	1.5 ng/mL
CKMB	5 ng/mL
Myoglobin	100 ng/mL

Measurements of these markers can be useful for the early detection of acute myocardial infarction (AMI) by health professionals.

The Cardiac 3-in-1 Test only provides qualitative results. A quantitative assay method must be used to determine the concentrations of the markers. This test is for professional in-vitro diagnostic use only. As with other rapid diagnostic tests, clinical consideration and professional judgment should be applied when making a diagnostic decision based on these test results. Test results that are inconsistent with clinical symptoms must be interpreted with caution.

SUMMARY AND EXPLANATION

TNI is more specific than other markers for myocardial injury. It may rise above its normal level about 4-6 hours after the onset of AMI and reaches a peak after 12-24 hours. TNI may remain elevated for five to seven days. The early release and long duration of TNI make the test particularly suitable for the detection of myocardial infarction. Several investigations have shown that TNI is superior to other cardiac markers because it demonstrates greater sensitivity and specificity for AMI. Although cardiac troponin I is useful for both detection and risk stratification of patients with chest pain and AMI, cardiac marker testing in the emergency department (ED) will not identify most ED patients that substantially develop adverse events. Thus, patients with initially negative markers still require an evaluation and testing, as dictated by their clinical presentation.

CKMB is well documented as a marker for acute myocardial infarction. CKMB levels rise two-fold within six hours after onset of chest pain and peak within 12 to 24 hours. Because its sensitivity changes after the onset of chest pain, in most cases a single measurement cannot be safely used for the admission/discharge decision. Such use of single measurement of CKMB would result in an unacceptable rate of false negatives results with respect to diagnosis of AMI and prediction of cardiovascular complications.

Myoglobin is normally found in both cardiac and skeletal muscle. Due to its low molecular weight, myoglobin is released into serum more rapidly than CKMB and troponin I. Serum concentration of myoglobin increases to twice its normal value as early as 1 hour after myocardial infarction, reaches the upper limit of normal in approximately 2-3 hours and peaks in approximately 4 to 8 hours after onset of symptoms. The main advantage of myoglobin is its early detection in patients with AMI. The disadvantage is that myoglobin has poor specificity for AMI on patients with concurrent trauma or renal failure.

PRINCIPLE OF THE PROCEDURE

This assay is a one-step sandwich immunoassay. The test strip in the device includes 1) a colored conjugate pad containing colloidal gold conjugated to anti-cardiac marker antibodies and 2) a nitrocellulose membrane containing three (3) test lines (T-lines) and a control line (C line). The T lines are coated with anti-cardiac marker antibodies; and the C line is coated with goat anti-mouse IgG antibodies.

When a specimen is added to the sample pad, it moves through the conjugate pad. The cardiac markers in the specimen bind to the gold conjugates in the conjugate pad, forming antibody-antigen complexes. The complex moves along the membrane by capillary action and reacts with anti-cardiac marker antibodies coated on the test region. If a marker is present at or above the detectable level, a colored band is formed in its test region (T line). If the concentration of a marker is below the detectable level, the test line will not appear.

The colored gold conjugate should bind to the C line and form a colored band regardless of the presence of the cardiac markers. The C line serves as an internal qualitative control of the test system to indicate that an adequate volume of specimen has been applied and the liquid flow occurred.

MATERIALS PROVIDED

- 25 test devices, each sealed in a pouch with a disposable pipette and desiccant.
- One package insert (instructions for use)

MATERIALS REQUIRED BUT NOT PROVIDED

- Controls: Cardiac marker positive and negative
- Specimen collection containers
- Timer

STORAGE

Store the kit at 2-30°C (36-86°F). Kit contents are stable for 2 years or until the expiration date printed on the label, whichever comes first.

Exposing the kit to the freezing temperatures or those over 30°C (86°F) may reduce the shelf life or damage the device.

SPECIMEN COLLECTION AND STORAGE

Serum:

1. Follow standard laboratory procedures to collect serum specimens.
2. Since cardiac proteins are relatively unstable, it is recommended that fresh samples be tested as soon as possible.
3. Serum specimens can be stored at 9-30°C (48-86°F) for 8 hours, at 2°-8°C (36-46°F) for one week, and at -20°C (-4°F) or lower for prolonged storage. Repeatedly frozen and thawed specimens are not recommended for this assay.
4. Any sediment in serum specimens should be removed by centrifugation. Avoid using turbid specimens, which may be contaminated by microorganisms.

Whole Blood:

1. Follow standard laboratory procedures to collect whole blood specimens. Collect blood in a tube containing EDTA as the anticoagulant.
2. Fresh specimens are recommended since cardiac proteins are relatively unstable. Whole blood samples should be tested within four (4) hours.
3. Do not freeze a whole blood specimen; otherwise the red blood cells will break, which may cause hemolysis. If the specimens are to be stored, the red blood cells should be removed.
4. Heat activation of samples may lead to hemolysis or protein denaturation and therefore should be avoided.

WARNINGS AND PRECAUTONS

1. For *in vitro* diagnostic use only.
2. CAUTION: All human blood products, including serum samples, should be considered potentially infectious. It is recommended that the reagents and patient specimens be handled per the OSHA Standard on Blood-borne Pathogens or other appropriate national biohazard safety guidelines or regulations.
3. Do not use kit beyond the expiration date indicated on the product.
4. The device should remain in its sealed pouch until ready for use.
5. Wear disposable gloves while handling specimens and thoroughly wash hands afterwards.
6. Use separate, clean tips for different specimens. Do not pipette by mouth.
7. Do not smoke, eat or drink in areas, where specimens or kit reagents are handled.
8. Observe established procedures for proper disposal of specimens and used test devices.

PROCEDURE

1. Refrigerated specimens or other test materials, including devices, **must be equilibrated to room temperature (15-30°C) before testing.**
2. Remove the device from the pouch and place it on a flat surface. Label the device with specimen identification.
3. Add four (4) drops of specimen (about 160-200 µL) into the sample well.
4. Read the test result 10-15 minutes after adding the specimen.

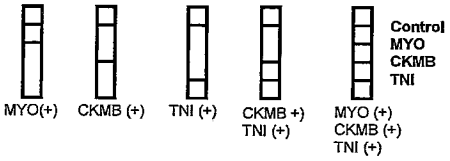
IMPORTANT: The T lines should always be interpreted independently of the C line. Do not compare the color intensity of one test line to another.

INTERPRETATION OF RESULTS

Positive:

If both the C line and one or more of the Test lines (TNI, CKMB, MYO) appear on the test strip, the test indicates a positive result for that particular marker.

Note: A faint test line should be considered positive.

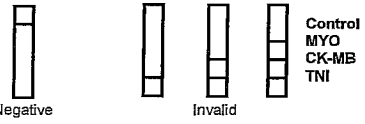


Negative:

If only the C line appears, the result indicates that the markers are below the detectable limit and the result is negative.

Invalid:

The control line should always appear. If no C-line is present at the end of the 15-minute test window, the test is invalid. In this case, repeat the test with a new test device.



QUALITY CONTROL

- **Built-in Control Features**
  This test contains a built-in quality control feature, the C line. The appearance of the colored C line indicates that an adequate volume of specimen has been applied and the flow occurred.
- **External Quality Control**
  External quality controls are recommended when the lot is changed, or if the test result is suspected.

LIMITATIONS OF THE PROCEDURE

1. The test only provides a qualitative test result. A positive result from the patient suspected of AMI may be used as an indicator of myocardial damage and requires further confirmation.
2. The test result should be interpreted in conjunction with other clinical information available to physicians. If the test result is inconsistent with clinical symptoms and patient history, it should be interpreted with caution. Serial sampling of patients suspected of AMI is recommended due to the delay onset of symptoms and the release of cardiac proteins into the bloodstream.
3. A number of conditions such as polymyositis, dermatomyositis, systemic lupus erythematosus, shock, several renal failure or muscle damage caused by trauma, ischemia and inflammation can produce elevated levels of myoglobinurements of the three markers can be useful for the early detection of ac. Recent cardioversion or an anginal episode may increase myoglobin level.
4. Human serum samples containing unusually high titers of certain antibodies, such as human anti-mouse or human anti-rat antibodies (HAMA or HARA), may influence the test results.
5. Serum samples demonstrating gross lipemia, gross hemolysis, or turbidity should not be used with this test.
6. The test should be read at 10-15 minutes. The result should not be read before 10 minutes or after 15 minutes.

EXPECTED VALUES

1. The test is designed to yield a positive result for free cardiac troponin I concentrations at or greater than 1.5 ng/mL (5 ng/mL ternary complex troponin I), CKMB at or greater than 5 ng/mL and myoglobin at or greater than 100 ng/mL .
2. The time required for both cardiac troponin I and CKMB to reach the upper limit of their normal levels in blood has been found to be 4-6 hours following the onset of symptoms, with maximum concentration being reached after 12-24 hours. Therefore, a negative result within the first hours of the onset of symptoms does not rule out acute myocardial infarction with certainty. If AMI is suspected, repeat the test at appropriate intervals.
3. Serum myoglobin level can rise to 200 ng/mL or higher in one hour and return to normal in 12 hours after the onset of AMI. Elevated levels of myoglobin have also been observed in patients with other diseases as indicated in limitations of the procedure.

PERFORMANCE CHARACTERISTICS

1. **Analytical Sensitivity**
   The analytical sensitivity of this device is 1.5 ng/mL for TNI, 5 ng/mL for CKMB and 100 ng/mL for myoglobin.
2. **Accuracy**
   The accuracy of this device was evaluated for each marker. The test results are summarized below.

Troponin I	Concentration (ng/mL)	
	Negative (0-1.4)	Positive (≥ 1.5)
Number of Specimens	150	150
Negative	146	3
Positive	4	147
Agreement	97.3%	98%

CKMB	Concentration (ng/mL)	
	Negative (0-4)	Positive (≥ 5)
Number of Specimens	130	60
Negative	126	1
Positive	4	59
Agreement	96.9%	98.3%

Myoglobin	Concentration (ng/mL)	
	Negative (0-99)	Positive (≥ 100)
Number of Specimens	237	48
Negative	235	2
Positive	2	46
Agreement	99.1%	95.8%

3. **Interference and Cross-Reactivity**
   The following substances were added into the cardiac marker negative and cutoff level controls. No interference was found with any of the substances up to the concentrations indicated below:

Analyte	Test Level
Bilirubin	0.6 mg/mL
Hemoglobin	20 mg/mL
Human albumin	80 mg/mL
Human cardiac troponin T	2.5 µg/mL
Human skeletal muscle troponin I	0.3 µg/mL
Human CKMM	1.0 µg/mL
Human CKBB	0.7 µg/mL
Human albumin	80 mg/mL
Triglyceride	13 mg/mL

There is a possibility that other substances and /or factors not listed above may interfere with the test results. (e.g., technical or procedural errors).

REFERENCES

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	Temperature limitation		Use by YYYY-MM
LOT	Batch/Lot code	IVD	*In vitro* diagnostic medical device
	Manufacturer	REF	Catalog number
Σ	Contains sufficient for < n > tests		Consult instructions for use
	Do not reuse	CE	CE Mark
	Caution, consult accompanying documents		

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