Myoglobin/CK-MB/Troponin I Combo Rapid Test
Package Insert

REF VCMC-436	English

INTENDED USE

The VivaDiag™ Myoglobin/CK-MB/Troponin I Combo Rapid Test is a lateral flow chromatographic immunoassay for the qualitative detection of human Myoglobin, CK-MB and cardiac Troponin I in whole blood, serum or plasma. The test is intended for use as an aid in the diagnosis of myocardial infarction (MI). For *in vitro* diagnostic use only.

SUMMARY

Myoglobin (MYO), Creatine Kinase MB (CK-MB) and cardiac Troponin I (cTnI) are proteins released into the bloodstream after cardiac injury. Myoglobin is a hemeprotein normally found in skeletal and cardiac muscle with a molecular weight of 17.8 kDa. It constitutes about 2 percent of total muscle protein and is responsible for transporting oxygen within muscle cells. If muscle cells are damaged, Myoglobin is released into blood rapidly due to its relatively small size. The level of Myoglobin increases measurably above baseline within 2-4 hours post-infarct, peaking at 9-12 hours and returning to baseline within 24-36 hours. CK-MB is an enzyme with a molecular weight of 87.0 kDa which is also present in the cardiac muscle. Creatine Kinase is a dimeric molecule formed from two subunits designated as “M” and “B”, which combine to form three different isoenzymes CK-MM, CK-BB and CK MB. CK MB is the isoenzyme of Creatine Kinase mostly involved in the metabolism of cardiac muscle tissue. The release of CK-MB into blood following an MI can be detected within 3-8 hours after the onset of symptoms. It peaks within 9 to 30 hours and returns to baseline levels within 48 to 72 hours. Cardiac Troponin I is a protein with a molecular weight of 22.5 kDa found in cardiac muscle. Troponin I is part of three subunit complex comprised of Troponin T and Troponin C. Along with tropomyosin, this structural complex forms the main component that regulates the calcium sensitive ATPase activity of actomyosin in striated skeletal and cardiac muscle. After cardiac injury occurs, Troponin I is released into blood 4-6 hours after the onset of pain. The release pattern of Troponin I is similar to that of CK-MB, however while CK-MB levels return to normal after 72 hours, Troponin I remains elevated for 6-10 days, thus providing a longer window of detection for cardiac injury.

PRINCIPLE

The Myoglobin/CK-MB/Troponin I Combo Rapid Test is a lateral flow chromatographic immunoassay. The test device consists of: 1) a coloured conjugate pad containing antibodies to Myoglobin, to CK-MB and to cTnI conjugated with colloid gold and rabbit IgG-gold conjugates, 2) a nitrocellulose membrane strip containing three test lines T1, T2 and T3 and a control line C. The T1 line is pre-coated with antibodies to Myoglobin for the detection of Myoglobin, the T2 line is pre-coated with antibodies to CK-MB for the detection of CK-MB, the T3 line is pre-coated with antibodies to cTnI for the detection of cTnI and the C line is pre-coated with goat anti-rabbit IgG.

During testing, the specimen reacts with antibodies to Myoglobin, to CK-MB and to cTnI conjugated to coloured particles and precoated on the sample pad of the test cassette. The mixture then migrates along the membrane by capillary action and interacts with components on the membrane. If there is a sufficient amount of certain markers in the specimen, a coloured line will develop in the corresponding test line region of the membrane. The presence of the coloured test line indicates a positive result for the corresponding marker, while its absence indicates a negative result. The appearance of a coloured line in the control line region serves as a procedural control indicating that the proper volume of specimen has been added and that membrane wicking has occurred. A coloured C line of the immunocomplex of goat anti-rabbit IgG/ rabbit IgG-gold conjugate must always appear regardless of the colour development of either of the test lines. Otherwise, the test result is invalid and the specimen should be retested with another test device.

WARNINGS AND PRECAUTIONS

- For professional *In vitro* diagnostic use only.
- Do not use after expiration date.
- The test must remain in the sealed pouch until use.
- Do not eat, drink or smoke in the area where the specimens or kits are handled.
- Do not use if pouch is damaged.
- Handle all specimens as if they contain infectious agents. Observe established precautions against microbiological hazards throughout the procedure and follow the standard procedures for proper disposal of specimens.
- Wear protective clothing such as laboratory coats, disposable gloves and eye protection when specimens are being tested.
- Humidity and temperature can adversely affect results.
- The used test should be discarded according to local regulations.

COMPOSITION

Materials provided and available for purchase

1. Test Device (dropper) in foil pouch
2. Buffer
3. Package insert

Materials required but not provided:

1. Specimen collection container
2. Centrifuge (for serum/plasma samples)
3. Timer
4. Personal protective equipment, such as protective gloves, medical masks, lab coats, etc.
5. Appropriate biohazardous waste containers and disinfectants.

STORAGE AND STABILITY

- Store the test kit in a cool, dry place between 2-30°C. Keep away from light. Exposure to temperature and / or humidity outside the specified conditions may cause inaccurate results.
- Use the test kit at temperatures between 15-30°C. Do not freeze the kit or expose the kit over 30°C.
- Use the test kit between 10-90% humidity.
- Do not use the test kit beyond the expiration date (printed on the foil pouch and box).

Note: *All expiration dates are printed in Year-Month-Day format. 2022-06-18 indicates June18, 2022.*

SPECIMEN COLLECTION AND HANDLING

The Myoglobin/CK-MB/Troponin I Combo Rapid Test can be performed using whole blood, serum or plasma.

Serum, plasma and whole blood samples must be collected in a clean and dry container. EDTA, sodium citrate, heparin can be used as the anticoagulants. Recommend to detect immediately after collecting blood If blood coagulation occurs serum samples suggested to use

Serum and plasma

- Serum and plasma samples maybe stored at 2-8°C for 5 days prior to assay, and at -20°C for a long time.
- Frozen and refrigerated samples should be equilibrated to room temperature before detection and thoroughly mixed.
- Avoid repeated freeze-thaw, Samples that exhibiting, visible precipitates, stink or muddy should not be used.

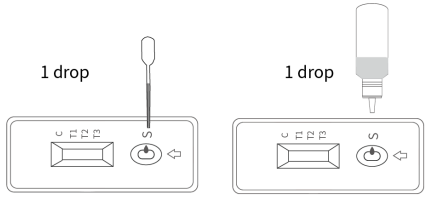
Whole Blood

- Whole blood samples with anticoagulants, may be stored at 2-8°C for 24 hours and should be used immediately without anticoagulants. **DO NOT FREEZE.** Mix the sample well by gentle inversion of the tube immediately before testing.

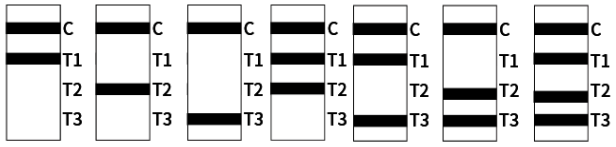
TEST PROCEDURE

Please read the instructions carefully before testing. Allow equipment and samples to equilibrate to room temperature (15°C to 30°C) prior to testing.

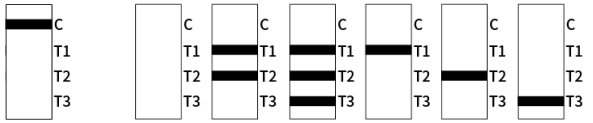
1. Take out a test device from sealed foil pouch and put it on a clean and level surface.
2. Using the dropper, vertically transfer 1 drop of serum/plasma (approx. 35-45 µL) or 1 drop of whole blood (approx. 40-50 µL) into the specimen well (S) of the test, then add 1 drop of buffer (approx. 30-50 µL) and start the timer. avoiding the formation of bubbles.
3. Wait for the red line(s) to appear. Read the test result at **15 minutes**. Don't read the result after 20 minutes.



INTERPRETATION OF TEST RESULTS



Positive



Negative **Invalid**

Positive*:

A colored line in the control line region (C) and the presence of one or more colored lines in the test line regions indicates a positive result. This indicates that the concentration of Myoglobin, CK-MB and/or Troponin I is above the minimum detection level.

T1 for Myoglobin,T2 for CK-MB, T3 for Troponin I

Note: *The intensity of the color in the test line region (T) may vary depending on the concentration of Myoglobin and/or CK-MB and/or Troponin I present in the specimen. Therefore, any shade of color in the test line regions should be considered positive.*

Negative: One colored line appears in the control line region (C). No apparent colored line appears in the test line region (T).

Invalid: Control line fails to appear. Insufficient specimen volume or incorrect procedural techniques are the most likely reasons for control line failure. Review the procedure and repeat the test with a new test. If the problem persists, discontinue using the test kit immediately and contact your local distributor.

QUALITY CONTROL

A procedural control is included in the test. A colored line appearing in the control line region (C) is considered an internal procedural control. It confirms sufficient specimen volume, adequate membrane wicking and correct procedural technique. Control standards are not supplied with this kit; however, it is recommended that positive and negative controls be tested as a good laboratory practice to confirm the test procedure and to verify proper test performance.

LIMITATIONS

- The Myoglobin/CK-MB/Troponin I Combo Rapid Test is for in vitro diagnostic use only. This test should be used for the detection of Myoglobin, CK-MB, and Troponin I in whole blood, serum or plasma specimens only. Neither the quantitative value nor the rate of increase in Myoglobin, CK-MB and Troponin I can be determined by this qualitative test.
- The Myoglobin/CK-MB/Troponin I Combo Rapid Test will only indicate the qualitative level of Myoglobin, CK-MB and Troponin I in the specimen and should not be used as the sole criteria for the diagnosis of myocardial infarction.
- The Myoglobin/CK-MB/Troponin I Combo Rapid Test cannot detect less than 100 ng/mL Myoglobin, 5 ng/mL CK-MB and 1 ng/mL Troponin I in specimens. A negative result at any time does not preclude the possibility of myocardial infarction.
- As with all diagnostic tests, all results must be interpreted together with other clinical information available to the physician.
- Unusually high titers of heterophile antibodies or rheumatoid factor (RF) may affect the results. Even if test results are positive, further clinical evaluation should be considered with other clinical information available to the physician.
- There is a slight possibility that some whole blood specimens with very high viscosity or which have been stored for more than 2 days may not run properly on the test device. Repeat the test with a serum or plasma specimen from the same patient using a new test device.

PERFORMANCE

1. Limit of detection

The VivaDiag™ Myoglobin/CK-MB/Troponin I Combo Rapid Test cannot detect less than 100 ng/mL Myoglobin, 5 ng/mL CK-MB and 1 ng/mL Troponin I in specimens.

2. Accuracy

The VivaDiag™ Myoglobin/CK-MB/Troponin I Combo Rapid Test compared to EIA using 770 specimens was shown as below:

Myoglobin Rapid Test vs EIA

The VivaDiag™ Myoglobin/CK-MB/Troponin I Combo Rapid Test	EIA		
	Positive	Negative	Total
Positive	104	15	119
Negative	0	651	651
Total	104	666	770
Sensitivity	99.9% (104/104,95% CI,97.2%~100.0%)		
Specificity	97.7% (651/666,95% CI,96.3%~98.7%)		
Accuracy	98.1% (755/770,95% CI,96.8%~98.9%)		

CK-MB Rapid Test vs EIA

The VivaDiag™ Myoglobin/CK-MB/Troponin I Combo Rapid Test	EIA		
	Positive	Negative	Total
Positive	77	3	80
Negative	0	690	690
Total	77	693	770
Sensitivity	99.9% (77/77,95% CI, 96.2%~100.0%)		

Specificity	99.6% (690/693,95% CI, 98.7%~99.9%)
Accuracy	99.6% (767/770,95% CI, 98.9%~99.9%)

Cardiac Troponin I Rapid Test vs EIA

The VivaDiag™ Myoglobin/CK-MB/Troponin I Combo Rapid Test	EIA		
	Positive	Negative	Total
Positive	158	7	165
Negative	2	603	605
Total	160	610	770
Sensitivity	98.8% (158/160,95% CI, 95.6%~99.8%)		
Specificity	98.9% (603/610,95% CI, 97.7%~99.5%)		
Accuracy	98.8% (761/770,95% CI, 97.8%~99.5%)		

3. Cross-reactivity

Cross reaction among 1000 ng/ml cardiac troponin C, 1000 ng/ml creatine kinase isoenzyme MM, 100 ng/ml creatine kinase isozyme BB, 1000 ng/ml skeletal muscle type troponin I are not observed.

4. Interference

None of the substances at the concentration tested interfered in the assay

Interfering substance	concentration	Interfering substance	concentration
Acetaminophen	20 mg/dL	Ascorbic Acid	20 mg/dL
Bilirubin	1,000 mg/dL	Caffeine	20mg/dL
Albumin	10,500 mg/dL	Oxalic Acid	600 mg/dL
Acetylsalicylic Acid	20 mg/dL	Creatin	200 mg/dL
Cholesterol	800 mg/dL	Gentisic Acid	20 mg/dL
Hemoglobin	1,000 mg/dL	Triglycerides	1,600 mg/dL

5. HOOK effect

No hook effect appears in 100 ng/ml cTnI, 4000 ng/ml Myo, 300 ng/ml CK-MB samples.

REFERENCES

1. Adams JE, et al. Circulation, Vol. 88, 101-106 (1993).
2. Adams JE, et al. N. Eng. J. Med. Vol. 330, 670-674 (1994).
3. Bodor GS, et al. Clin. Chem. Vol. 41, 1710-1715 (1995).
4. Brogan GX, et al. Academic Emerg. Med. Vol. 4, 6-12 (1997).
5. Tucker JF, et al. Academic Emerg. Med. Vol. 4, 13-21(1997).

INDEX OF SYMBOLS

	Consult instructions for use		Use by	Σ	Contains sufficient for <n> tests
IVD	For *in vitro* diagnostic use only	LOT	Lot number	REF	Catalog number
2°C 30°C	Storage temperature limitations		Manufacturer		Do not reuse
EC REP	Authorized Representative				

VivaChek™
VivaChek Biotech (Hangzhou) Co., Ltd.
Level 2, Block 2, 146 East Chaofeng Rd.,
Yuhang Economy Development Zone,
Hangzhou, 311100, China
Email: info@vivachek.com
www.vivachek.com

EC REP
Lotus NL B.V.
Koningin Julianaplein 10, 1e Verd,
2595AA, The Hague, Netherlands.
Tel: +31644168999
Email: peter@lotusnl.com

CE
IVD

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