lifeSign

MI

Troponin I

Point-of-care cardiac tests for the simultaneous qualitative detection of Troponin I in blood, plasma and serum for the rapid diagnosis of myocardial infarction

CE

EC REP

MT Promedt Consulting GmbH
Altenhofstrasse 80
66386 St. Ingbert
Germany
+49-68 94-58 10 20

MF Manufactured for:

lifeSign

A PBM Group Company
85 Orchard Road
Skillman,NJ 08558
800-526-2125, 732-246-3366
www.lifesignmed.com

Manufactured by

PBM

Princeton BioMeditech Corp.
4242 U.S. Hwy 1
Monmouth Junction, NJ 08852

594 -4/24/12
P-56311-B

LifeSign MI® Troponin I Test

Intended Use: For the rapid qualitative detection of cardiac troponin I (cTnI) in human whole blood, serum and plasma as an aid in the diagnosis of myocardial infarction in emergency room, critical care, point-of-care, and hospital settings.

The LifeSign MI® Troponin I Assay provides a qualitative analytical test result. The qualitative nature of this assay does not provide information about change - either the rise or fall - in the concentration of cTnI with single testing. A quantitative method should be used, if desired, to determine the concentration of cTnI at any given time. Only with serial testing could a temporal change in the level of cTnI be concluded. Clinical consideration and professional judgement should be applied when interpreting the results of the LifeSign MI® Troponin I Assay, especially when single testing results are used.

Summary and Explanation: The troponin complex is formed of three subunits, troponin T (TnT), troponin C (TnC) and Troponin I (TnI). The three troponin subunits have distinct functions with TnC as the Ca^{++}-binding, TnT as the tropomyosin binding, and TnI as the inhibitory subunits.[1] The troponin complex, together with tropomyosin, form the main component that regulates the Ca^{++}-sensitive ATPase activity of actomyosin in striated muscle (skeletal and cardiac).[2] Different isoforms of TnI exist in the skeletal and cardiac muscles (sTnI and cTnI, respectively) with distinct structural heterogeneity between these isoforms that allow the production of isoform-specific antibodies.[3] These isoform-specific antibodies have been utilized to assemble various detection methods that are isoform-specific. Recent reports have investigated the utility of determining the serum levels of the different isoforms of TnI.[4]

Detection of cTnI in the serum was investigated as an aid in the determination of myocardial damage in patients with acute myocardial infarction (AMI).[5] Several clinical reports have demonstrated the diagnostic value of determining the serum level of cTnI in identifying patients with AMI. The temporal relation of release of cTnI into the serum has been investigated and compared to the other established cardiac markers such as CK-MB, myoglobin and TnT.[6,7] Cumulative data from several reports documented that in patients with AMI, cTnI is released into the circulation with levels exceeding the upper reference limit of normal 4-6 hours after the onset of symptoms and peak levels are reached after 12-24 hours.8 This early release profile is similar to CK-MB. However, CK-MB levels return to normal values after 72 hours, while levels of cTnI remains elevated for up to 5-7 days. Due to the distinct structure of cTnI and the availability of highly-specific detection methods for cTnI, the utility of this marker for the diagnosis of AMI in complex clinical conditions that involve skeletal muscle damage have been investigated. The high specificity of cTnI measurements for the identification of myocardial damage has been demonstrated in conditions such as perioperative period, after marathon runs, and blunt chest trauma.[8,9,10] The release of cTnI into blood has been documented in clinical conditions that involve myocardial damage, other than AMI, such as unstable angina, congestive heart failure, and ischaemic damage due to coronary artery by-pass surgery.[11,12] Measurements of cTnI have been investigated and documented to be valuable in identifying patients with AMI presenting to the ED with

chest pain.[5,13]

Principle: The LifeSign MI® Troponin I Test employs solid-phase chromatographic immunoassay technology to qualitatively detect the presence of cTnI above an established cutoff level in human blood, serum and plasma samples. After a specimen has been dispensed into the sample well, plasma or serum is transferred into a region containing monoclonal anti-cTnI antibody-dye conjugates and rabbit polyclonal anti-cTnI antibodies. These antibodies bind to cTnI in the sample to form complexes, which migrate through the reaction strip. The antigen/antibody dye complexes are then captured by immobilized avidin in the TnI area. Additional protein-dye conjugates not bound in the Test (TnI) area are later captured in the Control (C) area.

Visible purplish horizontal bands will appear in the TnI and C areas if the level of cTnI is above the established cutoff level. A visible purplish band in the C area indicates the assay is working properly. If a band is present only in the C area, the result is read as negative, indicating that the level of cTnI is below the cutoff level. If no band is present in the C area, the test should be considered invalid and another test must be run, regardless of the presence or absence of a band in the TnI area.

Reagents

The LifeSign MI® Troponin I Test consists of a membrane strip coated with avidin in the TnI area and polyclonal anti-mouse antibody in the C area, a dye pad impregnated with biotinylated rabbit polyclonal anti-cTnI antibodies and complementary monoclonal anti-cTnI antibody-dye conjugates in a protein matrix containing 0.05% sodium azide and a red blood cell separating filter. Store at 2-30°C.

Specimen Collection and Preparation

Either whole blood, plasma or serum may be used as samples for this procedure. For the whole blood or plasma procedure, collect blood in a tube containing heparin as the anticoagulant. If serum samples are to be used, collect blood in a tube without anticoagulant and allow to clot. Since cardiac proteins are relatively unstable, it is recommended that fresh samples be used as soon as possible to collect critical patient information. Heat inactivation of samples may lead to hemolysis or protein denaturation and therefore should be avoided. Whole blood samples should be tested within 4 hours of collection. If specimens are to be stored, the red blood cells should be removed. Whole blood samples should not be frozen. Plasma or serum samples may be refrigerated for 24 hours at 2-8 °C. If plasma or serum samples are to be stored for more than 24 hours, they should be stored frozen at -20 °C or below.

Materials Provided:

Each Kit contains the following:

LifeSign MI® Troponin I Test sealed in a foil pouch with dessicant and dropper
Result sticker
Directions for use

Materials Required But Not Provided:

1. Vacutainer® (Becton Dickinson, Rutherford, NJ, USA) tube, or equivalent, containing heparin as an anticoagulant
2. Timer
3. Micropipettor and disposable pipet tips - necessary only if not using the dropper provided

Procedural Notes

- Do not use beyond the expiration date stamped on the product.
- If using a micropipettor, use separate clean tips for each specimen. Do not pipette by mouth.
- Wear disposable gloves while handling specimens and thoroughly wash hands afterwards. All patient samples should be handled as if they are potentially infectious. Observe established procedures for proper disposal of specimens and used test device.
- If serum or plasma samples have been stored in a refrigerator, allow them to return to room temperature before testing.
- The LifeSign MI® Troponin I Test should remain in its sealed pouch until ready to perform the test(s).

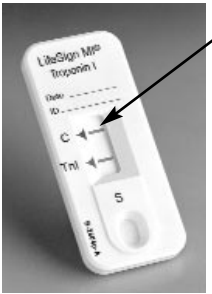
Procedure Outline

1. Open the foil pouch, remove the LifeSign MI® Troponin I Test, and lay the test on a level surface. Label the test with the patient's name or control number.
2. Using the dropper provided, add 3 drops (120µl) of **whole blood, plasma or serum** into the Sample well.
3. Read the test result at 15 minutes.

LifeSign MI® Troponin I Test Procedure and Results

1. Add 3 drops (120 µL) of whole blood, serum or plasma sample.

2. Read at 15 minutes.



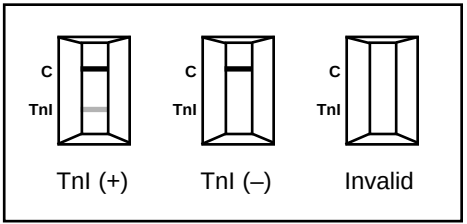
Troponin I (+)

CONTROL (VALIDATION) BAND (C)

The Control/Validation band serves two purposes:

1. Functional test of the dye conjugates: and
2. Proof of sample migration.

If no control band appears, the test is NOT VALID. Repeat the test using a new LifeSign MI® Troponin I Test, and follow the procedure carefully.



Interpretation of Results

The color intensity of the TnI and C bands may increase beyond 15 minutes. As the membrane in the reading window dries up, changes in the intensity of the bands and background may interfere with reading the test results. For best results, the test should be read at 15 minutes.

1. Positive (+)

The presence of two colored bands, one in the TnI area and the other in the C area, indicates a positive result.

Notes:

- A positive test result can be read as soon as a distinct purplish colored band appears in both the TnI and C areas.
- Positive test results from strong positive samples may appear within 5 minutes.
- The TnI band will appear before the C band in most strong positive cases. The TnI band may be darker than the C band.
- The TnI band may appear after the C band in weak positive cases, and the TnI band may be weaker than the C band.

The LifeSign MI® Troponin I Test has been optimized to have a minimal prozone effect. Therefore, a sample containing a very high concentration of cardiac troponin I might produce a somewhat weaker signal than expected but would still produce a positive result. The test does not require any sample dilution, but it is recommended that the sample be diluted with a separate negative sample and retested to confirm the result in case a prozone effect is suspected.

2. Negative (-)

A single colored band in the C area, with an absence of a distinct colored band in the TnI area, indicates that the concentration of cardiac troponin I is below the established cutoff value.

3. Invalid

A distinct colored band in the C area should always appear. If no purplish band is present in the C area within 15 minutes, the test is invalid, and the sample should be retested using a new Card Test.

Limitations: The results of the LifeSign MI® Troponin I Test are to be used in conjunction with other clinical information such as clinical signs and symptoms and other test results to diagnose cardiac ischaemia. A positive assay result from a patient suspected of AMI may be used as an indicator of myocardial damage and requires further confirmation. Serial sampling of patients suspected of AMI is also recommended due to the delay between the onset of symptoms and the release of protein markers into the bloodstream.

Samples containing an unusually high titer of certain antibodies, such as human anti-mouse or human anti-rabbit antibodies, may affect the performance of the test.

Hematocrit values in the range of 20-60% did not significantly affect the LifeSign MI® Troponin I Test results.

User Quality Control: A quality control test using positive and negative controls should be performed at regular intervals, as a part of good laboratory practice and before using a new lot of LifeSign MI® Troponin I Test, to confirm the tests produce the expected QC results. The positive control should be selected to produce a moderate positive result in both TnI and C areas. The negative control should yield a negative result (Control band present only). QC specimens should also be run whenever the validity of results is questioned. Upon confirmation of the expected results, the kit is ready to use with patient specimens. For information about obtaining controls, contact LifeSign MI® Troponin I Test local distributor for assistance.

The presence of a band in the C area acts as an internal procedural control for the valid performance of the test. In the absence of a band in the C area, the test results are invalid, and the test must be repeated. If the problem persists, contact LifeSign MI® Technical Services for assistance. The Control band is not an internal reference for cTnI band intensity and cannot be used for comparison with patient results.

Expected Values: The LifeSign MI® Troponin I Test has been calibrated against Dade's Stratus® Cardiac Troponin-I Fluorometric Enzyme Immunoassay. This commercial assay kit uses a diagnostic cutoff value of 1.5 ng/mL. The LifeSign MI® Troponin I Test is designed to yield a positive result for cTnI concentrations at or more than 1.5 ng/mL. The time required for blood cTnI level to reach the upper limit of normal has been found to be 4-6 hours following the onset of symptoms, with maximum concentration being reached after 12-24 hours.[14] The cTnI level remains elevated for 5 to 7 days in some cases. Therefore, a negative result within the first hours of the onset of symptoms does not rule out AMI with certainty. If suspected, repeat the test at appropriate intervals. Examination of cTnI levels has been shown to help diagnose in certain clinical symptoms that occur post-operatively, after traumatic injury, in patients with renal failure, in patients with seizures, and in those with skeletal muscle myopathies.[15]

Performance Characteristics

Interfering Substances: Levels of the following substances do not appear to interfere with the LifeSign MI® Troponin I Test:

Human Albumin	16 g/dL
Bilirubin (unconjugated)	60 mg/dL
Free Hemoglobin	4 g/dL
Triglycerides	1,300 mg/dL

The following drugs were evaluated for potential positive and negative interferences by in vitro addition of these drugs to (1) cTnI-negative plasma sample, or (2) a pool of plasma sample containing 3 ng/mL cTnI (2x cutoff level). These drugs were tested at approximately twice the recommended therapeutic level. No interference was observed for any of these drugs:

Acetaminophen	Acetylsalicylic acid	Allopurinol	Ambroxol
Ampicillin	Ascorbic acid	Atenolol	Caffeine
Captopril	Chloramphenicol	Chlordiazepoxide	Cinnarizine
Cyclosporine	Diclofenac	Digoxin	Dipyridamole
Dopamine	Erythromycin	Furosemide	Glibenclamide
Hydrochlorothiazide	Indomethacin	Isosorbide dinitrate	L-Thyroxine
Methaqualone	D,L-∝-Methyldopa	Nicotinic acid	Nifedipine
Nitrofurantoin	Noraminopyrine	Nystatine	Oxazepam
Oxytertacycline	Phenobarbital	Phenytoin	Probenecid
Procainamide	D,L-Propronolol	Quinidine	Sulfmethoxazol
Theophylline	Trimethoprim	Verapamil	

Cross-Reactivity Studies: Related human proteins were added to normal human plasma to test for their potential reactivity in the LifeSign MI® Troponin I Test. A negative result was obtained with the proteins at the following concentrations:

Cardiac Tropomyosin:	8,000 ng/ml
Cardiac Myosin Heavy Chain:	20,000 ng/ml
Cardiac Troponin T:	2,000 ng/ml
Cardiac Troponin C:	1,000 ng/ml
Fast-Twitch Skeletal Troponin I:	10,000 ng/ml

Recovery Study: Normal human whole blood was supplemented with partially-purified human cTnI to yield final concentrations of 1.7, 3.4 and 15.9 ng/mL. The cTnI concentrations were measured by a commercial quantitative cTnI assay after removing the red blood cells. The samples were tested using the LifeSign MI® Troponin I Test in 6 replicates. As shown in the following data table, there were 100% agreements between the expected and the observed results at each cTnI concentration.

cTnI Added (ng/mL)	LifeSign MI® Troponin I Test	
	Number of Positive Results/Total	% Agreement with Expected Results
0	0/6	100
1.7	6/6	100
3.4	6/6	100
15.9	6/6	100

Proficiency Testing: Four different hospitals were provided with masked whole blood samples. One group of blood samples had been supplemented with partially purified human cTnI of 2.5 ng/mL, a second group received 10 ng/mL cTnI and a third group was not supplemented with cTnI as a control. Each site received 5 replicates of each sample for a total of 15 samples per site. As shown in the data table that follows, 100% agreement was observed in both between-site and within-run proficiencies at the three levels of cTnI concentrations employed.

Sites	LifeSign MI® Troponin I Test (Number of Positive Results/Total)			
	No Supplement (Normal Control)	Supplement with 2.5 ng/mL	Supplement with 10 ng/mL	% Agreement of Within Run Proficiency
Site 1	0/5	5/5	5/5	100
Site 2	0/5	5/5	5/5	100
Site 3	0/5	5/5	5/5	100
Site 4	0/5	5/5	5/5	100
% Agreement Between Sites	100	100	100	

Correlation of Assay Results Between Whole Blood and Plasma: Fifty-eight (58) whole blood clinical samples were tested on the LifeSign MI® Troponin I Test. The plasma from these samples was isolated and tested at the same time. The agreement between the two procedures was 100% (58/58).

		Whole Blood Assay Result		Total
		Positive	Negative	
Plasma Assay Result	Positive	16	0	16
	Negative	0	42	42
Total		16	42	58

Assay Imprecision at or near the Cutoff: Data used to generate the clinical correlation study results below were employed to examine the assay precision around the cutoff value of 1.5 ng/mL. At an average concentration of 1.7 ng/mL for a pooled human plasma, between-run standard deviation (SD) of 0.1 ng/mL was calculated over the 31 runs using the quantitative assay. One Hundred Forty-five (145) clinical samples having the cTnI value of 0.5 to 2.5 ng/mL by the quantitative assay were grouped at every 0.5 ng/mL cTnI interval, and the LifeSign MI® Troponin I Test results were recorded accordingly as follows:

Clinical Sample Group (ng/mL cTnI level)	Number of Samples	LifeSign MI® Troponin I Test Results	
		Number of Positive Result	Number of Negative Results
0.5 - 1.0	64	8	56
1.0 - 1.5	33	12	21
1.5 - 2.0	29	20	9
2.0 - 2.5	19	16	3

Method Comparison: Clinical samples (N=756) were collected at different time intervals from a total of 328 patients and tested on the LifeSign MI® Troponin I Test and with a commercially available quantitative cTnI assay. The results of the quantitative methodology were compared to the LifeSign MI® Troponin I Test using the cutoff at 1.5 ng/mL for clinical significance as specified in the package insert for the predicate quantitative assay. A comparative analysis of the data yielded the following results:

		Quantitative Assay Result		Total
		Positive	Negative	
LifeSign MI® Troponin I Rapid Test	Positive	338	25	363
	Negative	19	374	393
Total		357	399	756

		95% Confidence Levels	
		Minimum	Maximum
Comparative Specificity	93.7% (374/399)	90.9%	95.9%
Comparative Sensitivity	94.7% (338/357)	91.8%	96.8%
Overall Agreement	94.2% (712/756)		

Clinical Correlation: The results of LifeSign MI® Troponin I testing were correlated to the clinical condition. Clinical samples collected in a large clinical trial were tested on the LifeSign MI® Troponin I Test. The levels of cTnI were determined quantitatively by using a commercially available quantitative method. The clinical samples were drawn at different time points after presentation to the hospitals. A total of 756 samples were collected from 328 patients. These samples were used for both method comparison as well as clinical correlation. Clinical data were not available for 5 patients, and therefore, the clinical correlation analysis included a total of 323 patients. Patients were grouped into three diagnostic groups: (1) patients with non-coronary artery disease, (2a)

patients with AMI, (2b) patients with other acute ischemic cardiac conditions such as unstable angina pectoris and congestive heart failure, and (3) patients with other types of disease. This last group included patients with cardiac conditions including atrial fibrillation, stable angina and bradycardia and non-cardiac conditions such as renal failure. The results of LifeSign MI® Troponin I testing were correlated with the diagnostic grouping by several methods as described below.

A. Testing Results Stratified by Patients: The results of LifeSign MI® Troponin I Test were correlated to patients in the different diagnostic groups. Any patient with one or more samples testing positive by LifeSign MI® Troponin I Test was considered positive. Any patient with one or more samples with levels of cTnI above 1.5 ng/mL, by using a commercially available quantitative method, were considered positive. The correlation was as follows:

Diagnostic Group	Total Number Patients	Commercial Quantitative Troponin I Assay		LLifeSign MI® Troponin I Rapid Test	
		Number of Patients with Positive Results	% of Patients with Positive Results	Number of Patients with Positive Results	% of Patients with Positive Results
(1) No Coronary Artery Disease	187	5	2.7	6	3.2
(2a) Acute Myocardial Infarction	39	39	100	39	100
(2b) Other Ischemic Cardiac Conditions	66	41	62.1	42	63.6
(3) Other Disease Conditions	31	10	32.3	13	41.9
Total	323				

The above data demonstrate that all patients with AMI (category 2a) were identified by LifeSign MI® Troponin I Test on serial testing and that 96.8% of the patients with no coronary artery disease (category 1) showed negative results by the LifeSign MI® Troponin I Test, indicating the clinical effectiveness of the LifeSign MI® Troponin I Test in diagnosing AMI. Also, the data indicates that a large proportion of patients with ischemic conditions, other than AMI, tested

positive for cTnI (by LifeSign MI® Troponin I and the quantitative assay). These cardiac conditions included patients with unstable angina, congestive heart failure, and myocardial ischemia due to respiratory failure.

B. Testing Results Stratification per Sample: Testing results of the LifeSign MI® Troponin I Test in the various groups were stratified on the same basis. A sample is considered positive if tested positive by the LifeSign MI® Troponin I Test. The testing results of samples in the different diagnostic groups were as follows:

Diagnostic Group	Total Number Samples	Commercial Quantitative Troponin I Assay		LifeSign MI® Troponin I Rapid Test	
		Number of Positive Results	% Positive Results	Number of Positive Results	% Positive Results
(1) No Coronary Artery Disease	202	5	2.5	7	3.5
(2a) Acute Myocardial Infarction	162	142	87.6	143	88.3
(2b) Other Ischemic Cardiac Conditions	298	180	60.4	179	60.1
(3) Other Disease Conditions	82	29	35.4	33	40.2
Total	744				

The above data demonstrate high equivalency between the two devices, regardless of the diagnostic group.

C. Clinical Sensitivity by Time Interval in the Diagnosis of AMI: The clinical sensitivity of the LifeSign MI® Troponin I Test in identifying patients with AMI was examined according to sampling time in relation to onset of symptoms. The results of the LifeSign MI® Troponin I Test were also compared to the quantitative results of cTnI testing using the same diagnostic cutoff value of 1.5 ng/mL. The results were as follows:

Clinical Sensitivity as a Function of Time						
Onset of Pain = Time (hrs)	**0-4**	**4-12**	**12-24**	**24-48**	**48-72**	**>72**
Total Patients (n)	6	16	21	22	16	16
Total Samples (n)	6	20	27	37	19	48
LifeSign MI® Troponin I	**33.3%**	**80%**	**88.9%**	**97.3%**	**94.7%**	**87.5%**
Samples Positive (n)	2	16	24	36	18	42
95% CI	4.3-77.7	56.3-94.2	70.8-97.7	85.8-99.9	74-99.9	74.7-95.3
Quantitative Assay	**33.3%**	**80%**	**92.6%**	**94.6%**	**89.5%**	**87.5%**
Samples> 1.5 ng/mL (n)	2	16	25	35	17	42
95% CI	4.3-77.7	56.3-94.2	75.7-99.1	81.8-99.3	66.9-98.7	74.7-95.3

In calculating the LifeSign MI® Troponin I Test sensitivity at different time points, results of testing of 157 samples collected from 39 AMI patients were used. The sample collection time was not available in 5 samples, and therefore, these samples were excluded from the calculations.

Both the LifeSign MI® Troponin I Test and quantitative assay showed equivalent clinical effectiveness along the time intervals examined. The data table above indicates that the LifeSign MI® Troponin I Test provides a useful diagnostic tool from 4 hours after the onset of chest pain.

D. Clinical Specificity by Time Interval: The specificity of the LifeSign MI® Troponin I Test was determined using the patients with no coronary artery disease for comparison. The results of LifeSign MI® Troponin I Test were also compared to the quantitative results of cTnI testing using the same diagnostic cutoff value of 1.5 ng/mL. The results were as follows:

Clinical Specificity as a Function of Time						
Onset of Pain = Time (hrs)	**0-4**	**4-12**	**12-24**	**24-48**	**48-72**	**>72**
Total Patients (n)	90	6	6	5	9	63
Total Samples (n)	90	6	6	5	9	75
LifeSign MI® Troponin I	**100%**	**100%**	**100%**	**100%**	**88.9%**	**93.3%**
Samples Negative (n)	90	6	6	5	8	70
95% CI	96-100	54.1-100	54.1-100	47.8-100	51.8-99.7	85.1-97.8
Quantitative Assay	**100%**	**100%**	**100%**	**100%**	**88.9%**	**97.3%**
Samples< 1.5 ng/mL (n)	90	6	6	5	8	73
95% CI	96-100	54.1-100	54.1-100	47.8-100	51.8-99.7	90.7-99.7

In calculating the LifeSign MI® Troponin I Test specificity at different time points, results of testing 191 samples collected from 187 patients with no coronary artery disease were used. The sample collection time was not available in 11 patients, and therefore, these samples were excluded from the calculations.

The data table indicates that the LifeSign MI® Troponin I Test was found very specific in this diagnostic group and may provide a useful diagnostic tool to exclude any patients belonging to this patient category.

References

1. Mehegan, J.P. & Tobacman, L.S., Cooperative interaction between troponin molecules bound to the cardiac thin filament. J. Biol. Chem. 266: 966 (1991).
2. Ebashi, S., Ca^{2+} and the contractile proteins. J. Mol. Cell Cardiol. 16: 129 (1984).
3. Bodor, S. G. et al., Development of monoclonal antibody for an assay of cardiac troponin I and preliminary results in suspected cases of myocardial infarction. Clin. Chem. 38: 2203 (1992).
4. Takahashi, M. et al., Use of immunoassay for measurement of skeletal troponin I utilizing isoform-specific monoclonal antibodies. Clinical Chemistry 29: 301 (1996).
5. Adams, J.E., et al., Biochemical markers of myocardial injury. Is MB creatin kinase the choice for the 1990's? Circulation 88:750 (1993).
6. Apple, F.S. et al., Cardiac troponin, CK-MB, and myoglobin for the early detection of myocardial infarction and monitoring of reperfusion following thrombolytic therapy. Clinica Chimica Acta 237: 59 (1995).
7. Adams, J.E. et al., Improved detection of cardiac contusion with troponin I. Circulation 88, Abstract No. 0805 (1993).
8. Adams, J.E. et al., Diagnosis of perioperative myocardial infarction with measurement of cardiac troponin-I. N. Eng. J. Med. 330: 670 (1994).
9. Machler, H. et al., Perioperative myocardial cell damage in patients with unstable angina undergoing coronary artery bypass graft surgery. Anesthesiology 81: 1324 (1994).
10. Stanton, E. et al., Detection of postoperative MI by measuring the serum level of troponin I. Canadian J. Caridol, 10, Abstract No. 216 (1994).
11. Hossein-Nia, M. et al., Cardiac troponin I release in heart transplantation. Ann. Thorac. Surg. 61: 277 (1996).
12. Bertinchant, J.P. et al., Clinical and angiographic findings in troponin I positive and troponin I negative patients admited with unstable angina. European Heart J. 16, Abstract No. 1488 (1995).
13. Wu, A. et al., Prognostic value of cardiac troponin I in patients with chest pain. Clin. Chem. 42: 651 91996).
14. Hanfner, S. et al, Cardiac troponins in serum in chronic renal failure. Clin. Chem. 40: 1790 (1994).
15. Adams, J.E. et al., Comparable detection of acute myocardial infarction by creatin kinase MB isoenzyme and cardiac troponin I. Clin. Chem. 40: 1291 (1994).

Manufactured by: PBM
Princeton BioMeditech Corp.
Princeton, NJ 08543-7139
USA
Tel.: +1 732 274 1000
Fax: +1 732 274 1010

110702BL