

**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION  
DECISION SUMMARY  
DEVICE ONLY TEMPLATE**

**A. 510(k) Number:**

k041619

**B. Purpose for Submission:**

The application was submitted to expand the intended use of the device to include whole blood samples.

**C. Analyte:**

Troponin I

**D. Type of Test:**

Qualitative lateral flow immunoassay (unitized)

**E. Applicant:**

Biocheck Inc.

**F. Proprietary and Established Names:**

Biocheck Whole Blood/Plasma/Serum cTnI Rapid Test (also called Biocheck Cardiac-1 Rapid Test)

**G. Regulatory Information:**

1. Regulation section:  
21CFR862.1215
2. Classification:  
Class II
3. Product Code:  
MMI
4. Panel:  
75 Chemistry

**H. Intended Use:**

1. Intended use(s):  
The Biocheck Whole Blood/Plasma/Serum cTnI Rapid Test is intended for the qualitative determination of cardiac troponin I in human whole blood, plasma or serum. Measurement of troponin I values are useful in the evaluation of acute myocardial infarction.
2. Indication(s) for use:  
See intended use.
3. Special condition for use statement(s):  
The test result obtained from the BioCheck Rapid Test should be interpreted in conjunction with other clinical information, such as clinical signs and

symptoms and other test results available to the physician, e.g. additional clinical testing, ECG, symptoms, and clinical observations.

For prescription use only.

4. Special instrument Requirements:

No instrument is required.

**I. Device Description:**

The test is a unitized device that contains all assay reagents on a membrane strip, in a plastic housing. The test strip consists of a sample pad containing rabbit anti-rbc, colloidal gold-antibody conjugate pad containing gold-murine anti-troponin I monoclonal antibody, and a membrane containing anti-troponin I murine monoclonal antibodies in the test region.

**J. Substantial Equivalence Information:**

1. Predicate device name(s):

Biocheck Serum Troponin I Rapid Test

2. Predicate K number(s):

k023505

3. Comparison with predicate:

Both assays are for qualitative measurement of troponin I. The predicate device is for use with serum samples only. This device is for use with serum, whole blood or plasma samples. The new device contains a sample pad with reagents (rabbit anti-human red blood cell) for separation of whole blood.

**K. Standard/Guidance Document Referenced (if applicable):**

None were referenced.

**L. Test Principle:**

The device is a colloidal gold/antibody conjugate-based immunoassay. Sample is dispensed into the sample well and red cells in the whole blood react with anti-red blood cells, immobilized in the sample pad, causing red blood cells to bind to the sample pad, and allowing plasma to travel forward. Troponin I (TnI) present in the specimen is bound by a gold-murine anti-TnI monoclonal antibody conjugate forming a gold-antibody-TnI complex. This complex migrates across the membrane by capillary action and reacts with murine monoclonal antibodies immobilized in the test region to produce a pink color band. The test cutoff is set at approximately 1.5 ng/mL free TnI. If TnI is not present in the specimen, there is no line in the test line area. A procedural control line validates proper sample volume and flow.

**M. Performance Characteristics (if/when applicable):**

Performance of the device without the modified sample pad, using serum samples was evaluated during review of K023505. In the current 510(k), testing was expanded to validate that (a) there was no change in performance due to addition of the new sample pad containing components for whole blood separation and (b) results using whole blood samples are similar to results obtained with serum samples or plasma samples.

1. Analytical performance:*a. Precision/Reproducibility:*

Reproducibility was evaluated at 4 external sites using both serum and whole blood masked samples. Whole blood and serum samples were spiked with purified TnI complex to concentrations of 0, 1.5 and 3.0 ng/mL free TnI. Target concentrations were validated based on a commercially available ELISA cTnI kit. The results shown below were obtained for both serum and whole blood samples.

Site	cTnI- negative # positive results	cTnI 1.5 ng/mL # positive results	cTnI 3.0 ng/mL # positive results
1	0/5	5/5	5/5
2	0/5	5/5	5/5
3	0/5	5/5	5/5
4	0/5	5/5	5/5

*b. Linearity/assay reportable range:* A complete linearity study is not applicable since this is a qualitative assay. Samples spiked as low as 1.5 ng/mL and as high 10,000 ng/ml free troponin I tested positive.

Recovery was evaluated by spiking both, normal human whole blood specimens, using commercially available cTnI complex. Target concentrations were determined based on replicate analysis with a commercially available quantitative cTnI assay. Results are shown below. Results of the clinical correlation study (see method comparison section) indicate that samples containing TnI below 1.0 ng/mL, may also occasionally test positive.

<b>TnI (ng/mL)</b>	<b># Positive Results</b>
0	0/6
0.5	0/6
1.0	5/6
1.5	6/6
3.0	6/6

*c. Traceability (controls, calibrators, or method):*

Controls are sold separately.

The device is calibrated to read positive at the same TnI concentration as the predicate device. Also, see recovery section above.

*d. Detection limit*

Results of recovery and precision studies support that the test yields positive results at concentrations of 1.5 ng/mL free TnI. In some cases, samples at concentrations of 1.0 ng/mL also tested positive. Results of near-cutoff clinical samples in the method comparison study are also consistent with the assay generally yielding positive results at concentrations of 1.5 ng/mL free TnI.

*e. Analytical specificity:*

Whole blood samples spiked with interferent were tested. Five replicates tested for each interferent. Interferents were added to whole blood samples containing either 0 or 2.5 ng/mL TnI. The following interferents, tested at the levels indicated, did not affect TnI determination under these conditions.

Analyte	Test Level
Biotin	200 ng/mL
Bilirubin	20 mg/dL
Hemoglobin	1200 mg/dL
Rabbit skeletal muscle Troponin C	2.5 µg/mL
Human cardiac Troponin T	2.5 µg/mL
Human muscle Troponin T	2.5 µg/mL
Human muscle Troponin I	2.5 µg/mL
Cholesterol	800 mg/dL
Triglyceride	1250 mg/dL

Analyte	Test Level	Analyte	Test Level
Acetaminophen	30 µg/mL	Digitonin	10 µg/mL
Acetylsalicylic acid	200 µg/mL	Digoxin	10 µg/mL
Adenine	10 µg/mL	Dopamine	10 µg/mL
Albumin (bovine)	50 mg/mL	Erythromycin	20 µg/mL
Allopurinol	20 µg/mL	Gentisic acid	10 µg/mL
Ambroxol	10 µg/mL	Isoproterenol	10 µg/mL
Ampicillin	20 µg/mL	Isosorbide dinitrate	50 µg/mL
Ascorbic acid	20 µg/mL	Nifedipine	200 µg/ml
Atenolol	10 µg/mL	Nystatin	10 µg/mL
Atropine	10 µg/mL	Oxazepam	10 µg/mL
Caffeine	20 µg/mL	Oxytetracycline	10 µg/mL
Captopril	10 µg/mL	Propranolol	10 µg/mL

Chloramphenicol	25 µg/mL	Theophylline	20 µg/mL
Cinnarizine	10 µg/mL	L-thyroxine	10 µg/mL
Cyclo-phosphamide	125 µg/mL	Urea	400 µg/mL
Cyclosporine	10 µg/mL	Uric acid	100 µg/mL

*f. Assay cut-off:*

See precision and recovery studies above.

2. Comparison studies:

*a. Method comparison with predicate device:*

The following method comparison studies were conducted at the manufacturer's site.

Study 1 – Method comparison and whole blood/plasma matrix comparison:

Sixty eight matched whole blood and plasma specimens from individual patients were obtained from a clinical site and tested for TnI by the Biocheck cTnI Rapid Test and by the Biocheck cTnI ELISA. These samples were also characterized as from MI or non-MI patients, based on standard cardiology criteria (e.g., ECG changes, ST elevation, ST depression and T wave inversion). There were no specific selection or exclusion criteria for these samples, other than that these samples had been tested for TnI.

Based on the ELISA, the samples ranged from 0-47 ng/mL and included multiple samples with TnI concentrations near the claimed cutoff of 1.5 ng/mL.

All 68 samples yielded similar results for whole blood and plasma using the Biocheck cTnI rapid test. Comparison of the Biocheck Rapid Test with the ELISA showed 100% agreement for these samples.

Twenty three out of the 24 MI-positive samples had Biocheck test results in agreement with diagnosis. The discrepant sample had an ELISA values of <0.5 ng/mL. The 44 MI-negative samples had Biocheck test results in agreement with diagnosis.

Study 2: Method comparison of serum samples

Results of 245 serum samples (obtained from 4 sites) were tested to compare results of the Biocheck cTnI Rapid Test to the Biocheck cTnI ELISA. No specific sample selection criteria or exclusions were applied, other than that samples were those tested for cTnI. The samples ranged from less than 0.5 to > 75 ng/mL and included samples near and below the cutoff. Results are tabulated below.

<b>BioCheck cTnI Rapid Test</b>	<b>BioCheck, Inc. Troponin I ELISA Test</b>	
	<b>≥ 1.5 ng/mL</b>	<b>&lt; 1.5 ng/mL</b>
+	73	5
–	2	165
Total	75	170

The discrepant results represented in the table included samples with concentrations between 0.2 and 3.1 ng/mL.

*b. Matrix comparison:*

The precision study (above) was conducted with both whole blood and serum samples. Results were the same for both matrices.

Both plasma and whole blood samples were included in one of the method comparison studies. There was agreement between serum and plasma for all samples tested.

Twenty matched serum and plasma specimens were spiked with TnI at concentrations ranging from 2-50 ng/mL. Target concentrations were determined based on the Biocheck ELISA cTnI test. There was agreement between serum and plasma for all samples tested.

3. Clinical studies:

*a. Clinical sensitivity:*

Comparison with clinical diagnosis was included in study 1 (68 samples) described in the method comparison section, above.

*b. Clinical specificity:*

See information in method comparison study above.

*c. Other clinical supportive data (when a and b are not applicable):*

4. Clinical cut-off:

The assay cutoff, set at 1.5 ng/mL free TnI, is the same as that of the predicate device.

5. Expected values/Reference range:

N/A. This is a qualitative assay with a cut-off of 1.5 ng/mL.

**N. Conclusion:**

The information submitted in this premarket notification is complete and supports a substantial equivalence decision.