

**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY**

A. 510(k) Number:

k050975

B. Purpose for Submission:

New 510(k)

C. Measurand:

Troponin I, Creatinine Kinase MB (CK-MB) and Myoglobin

D. Type of Test:

Qualitative visually read single-use immunochromatographic assay

E. Applicant:

Nano-Ditech Corporation

F. Proprietary and Established Names:

In Vitro Nano-Check™ AMI 3 IN 1, Cardiac Marker Test cTnI, CK-MB, and Myoglobin

G. Regulatory Information:

1. Regulation section:

21 CFR 862.1215, Creatine phosphokinase/creatinine kinase or isoenzymes test system
(troponin)

21 CFR 862.1215, Creatine phosphokinase/creatinine kinase or isoenzymes test system
(CK-MB)

21 CFR 866.5680, Myoglobin immunological test system

2. Classification:

All analytes are Class II

3. Product code:

MMI, JHT, and DDR, respectively.

4. Panel:

75 (Chemistry), 75, and 81 (Hematology), respectively.

H. Intended Use:

1. Intended use(s):

See indications for use.

2. Indication(s) for use:

The Nano-Check AMI 3 IN 1 Test is a rapid immunoassay for the qualitative determination of Cardiac Troponin I (cTnI), Creatine Kinase MB (CK-MB), and Myoglobin in human serum and plasma specimens at cutoff concentrations of 0.5 ng/mL, 5.0 ng/mL, and 80 ng/mL, respectively, as an aid in the diagnosis of Acute Myocardial Infarction (AMI).

The Nano-Check AMI 3 IN 1 Test is a qualitative assay, which can not monitor the rise and fall of cTnI, CK-MB, and Myoglobin in single testing. Single testing is not recommended for AMI monitoring. Test results should be interpreted by the physician in conjunction with other laboratory test results and patient clinical findings.

3. Special conditions for use statement(s):

The device is for in vitro diagnostic prescription use.

The sponsor has not evaluated this device in point-of-care settings, and they indicate the product will not be marketed to point-of-care settings.

The test system utilizes heparinized plasma.

4. Special instrument requirements:

Not applicable. The device is a visually read single-use device.

I. Device Description:

The Nano-Check™ AMI 3 IN 1 Test is a one-step single-use lateral flow immunochromatographic assay. It is a visually read in a plastic cassette housing. A membrane strip inside the plastic housing contains immobilized antibodies for each test and at the control line. A disposable sample dropper is provided.

No human source materials are present in the device.

J. Substantial Equivalence Information:

1. Predicate device name(s):

Spectral Cardiac Status CK-MB/Myoglobin/Troponin I 3-in-1 Test

2. Predicate 510(k) number(s):

k030057

3. Comparison with predicate:

The Indications for Use, cut-off concentrations, and technology of the two devices are the same. Details of the differences appear below, i.e., the antibody types and acceptable matrices.

Item	Device	Predicates
	Nano-Check™ AMI 3 IN 1, Cardiac Marker Test, cTnI, CK-MB, and Myoglobin	Spectral Cardiac STATus™ CK-MB-Myoglobin/Troponin I 3-in-1 test
Differences		
Capture molecule in test line	cTnI: Streptavidin Myo: Monoclonal mouse anti-Myo antibody CKMB: Monoclonal mouse anti-CKMB antibody	cTnI: Streptavidin Myo: Polyclonal rabbit anti-myocardial infarction antibodies CKMB: Polyclonal goat anti-CKMM antibodies
Conjugate molecule	cTnI: Dye coupled with monoclonal mouse anti-cTnI antibody and biotinylated monoclonal mouse anti-cTnI antibody Myo: Dye coupled with monoclonal mouse anti-Myo antibody CKMB: Dye coupled with monoclonal mouse anti-CKMM	cTnI: Dye coupled with monoclonal anti-cTnI antibody and biotinylated polyclonal rabbit anti-cTnI antibodies Myo: Dye coupled with anti-Myo antibody CKMB: Dye coupled with monoclonal mouse anti-CKMB
Sample type	Serum or Plasma (heparin as anticoagulant)	Whole blood, serum or plasma (heparin as anticoagulant)

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

The sponsor did not reference any standards or guidance documents.

L. Test Principle:

The test is an immunochromatography assay for the qualitative determination of three cardiac markers simultaneously in serum and heparinized plasma. The membrane strip contains three test lines and one control line; immobilized monoclonal mouse antibody against CK-MB, monoclonal mouse antibody against Myoglobin, streptavidin for biotinylated cTnI antibody, and goat anti-mouse antibody for control line. A dye pad is placed at the end of the membrane containing biotinylated cTnI antibody and gold colloidal particles coupled with CK-MM, cTnI and Myoglobin antibodies. When a sample is applied into the sample well, the cardiac makers present in the sample bind to the specific antibodies coupled with gold particles. cTnI in a sample binds to both cTnI specific dye coupled antibody and biotinylated antibody. The immune complexes move along the nitrocellulose membrane through the test lines and bind to their corresponding capture antibodies immobilized on the test line. Unbound immune complexes pass through the test line and are captured by goat anti mouse antibody in the control line.

If the concentration of any of these three markers in the sample is above the cutoff level, red bands appear at the corresponding test lines and the control line. If the concentration of the markers in the sample is lower than the cutoff level, only the control line can be seen in the test window. The control line is present to validate that an adequate volume of sample has

been added.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. *Precision/Reproducibility:*

Two Clinical sites and one in-house operator were provided with blindly labeled serum samples. All operators had experience with in vitro device testing. Samples were prepared by diluting patient serum samples with normal serum to the desired concentrations. Normal human serum samples were also evaluated. Each sample was tested using 5 devices at each testing site.

AMI 3 IN 1 Precision Results

		Sample 1 Concentration (ng/mL)	Sample 2 Concentration (ng/mL)	Sample 3 Concentration (ng/mL)
		cTnI 0	cTnI 1.03	cTnI 2.05
		CK-MB 0	CK-MB 12.6	CK-MB 5.0
		Myo 0	Myo 119.9	Myo 166.3
		Negative / Positive	Negative / Positive	Negative / Positive
cTnI	Site I	5 / 0	0 / 5	0 / 5
	Site 2	5 / 0	0 / 5	0 / 5
	Site 3	5 / 0	0 / 5	0 / 5
CK-MB	Site I	5 / 0	0 / 5	0 / 5
	Site 2	5 / 0	0 / 5	0 / 5
	Site 3	5 / 0	0 / 5	0 / 5
Myo	Site I	5 / 0	0 / 5	0 / 5
	Site 2	5 / 0	0 / 5	0 / 5
	Site 3	5 / 0	0 / 5	0 / 5

Assay Cutoff and Precision Studies:

Similarly, patient plasma containing cTnI, CK-MB or Myoglobin were diluted in normal human serum to concentrations at or near the cutoff levels. Analyte concentrations in the diluted samples were confirmed by the Beckman Coulter Access quantitative test system. Fifteen devices were tested for each samples at the concentrations listed.

Assay Cutoff and Precision Studies

	Concentration (ng/ml)	Test Result	
		Negative	Positive
cTnI	0.31	7	8
	0.57	0	15
	1.07	0	15
CK-MB	2.4	15	0
	4.9	0	15
	10.2	0	15
Myoglobin	56.5	14	1
	80.4	0	15
	141.3	0	15

b. Linearity/assay reportable range:

Not applicable. The assay is intended for qualitative use.

c. Traceability, Stability, Expected values (controls, calibrators, or methods):

The test kit has an internal control to ensure that an adequate volume of sample is added. External Quality Controls are available from commercial sources. Specific controls are not identified in the labeling.

The sponsor does not indicate any degree of traceability for the device. However, the device is calibrated during the manufacturing process to working standards prepared to known concentrations of the analytes.

d. Detection limit:

Performance around the claimed cutoff concentration of the assay is characterized by the precision section, above.

e. Analytical specificity:

Potentially interfering endogenous substances were spiked into normal serums and into serums containing either cTnI, CK-MB or Myoglobin at concentrations approximately 1.5 times the cutoff concentration of the assay. The substances did not interfere with the expected results, i.e., spiked and unspiked sample results were the same.

AMI 3 IN 1 Endogenous Interference Studies

	Substances	Concentration
Endogenous substances	Bilirubin	50 mg/dl
	Hemoglobin	4000 mg/dl
	Human Serum Albumin	10 g/dL
	Triglycerides	1,250 mg/dl

The device was tested for interference by potentially cross-reacting endogenous proteins. Proteins were added to normal human serum up to following concentrations, did not alter the expected negative result.

Potential Interference Study Results

	Substances	Concentration
Cross-reacting endogenous proteins	Cardiac myosin light chain	1,000 ng/ml
	Cardiac Troponin T	1,000 ng/ml
	Cardiac Troponin C	1,000 ng/ml
	Skeletal Troponin I	1,000 ng/ml
	CKMM	5,000 ng/ml

The sponsor did not evaluate the effects HAMA and other similar antibodies on their assay, although they describe potential interference described in the literature.

f. Assay cut-off:

See precision studies above for analytical characterization of the claimed cutoff concentrations.

2. Comparison studies:

a. Method comparison with predicate device:

Plasma samples were collected from 206 emergency room patients who were admitted because examination results suggested a cardiac event. Additionally, 50 samples were collected from outpatients who were not suspected of having a cardiac event. The 256 clinical samples were tested using the Nano-Ditech™ AMI 3 IN 1 Test and the Beckman Coulter Access test system. Results are summarized, below.

AMI 3 IN 1 TnI Results Compared to Quantitative Results (ng/mL)

	Access Result 0.023-0.3	Access Result 0.3-0.47	Access Result 0.52-0.55	Access Result 0.55- >100
Nano-Check Negative	95	5	2	0
Nano-Check Positive	0	7	3	144

AMI 3 IN 1 CK-MB Results Compared to Quantitative Results (ng/mL)

	Access Result 0.7-4.4	Access Result 4.5-4.9	Access Result 5-5.2	Access Result 5.2- >300
Nano-Check Negative	84	4	1	0
Nano-Check Positive	0	8	4	155

AMI 3 IN 1 Myoglobin Results Compared to Quantitative Results (ng/mL)

	Access Result 10.2-61	Access Result 61.5-79.1	Access Result 80.4-85.3	Access Result 0.55- >100
Nano-Check Negative	56	15	2	0
Nano-Check Positive	0	7	5	171

b. Matrix comparison:

Paired serum and plasma samples were collected. Sample results are grouped below, according to the concentration of the targeted analyte.

Matrix Correlation Study Results

	Concentration Range of Samples (ng/mL)	Serum Positive / Negative	Plasma Positive / Negative
TnI	1.2-1.8	10 / 0	10 / 0
	0.5-1.0	10 / 0	10 / 0
	0.3-0.5	9 / 1	7 / 3
CK-MB	11-20	10 / 0	10 / 0
	5-10	10 / 0	10 / 0
	3.8-4.4	8 / 2	7 / 3
Myo	123-248	10 / 0	10 / 0
	85-118	10 / 0	10 / 0
	64-80	8 / 2	9 / 1

3. Clinical studies:

a. Clinical Sensitivity:

Clinical studies are not typically submitted for this device type and matrix. Clinical studies were not performed by the predicate device.

b. Clinical specificity:

Clinical studies are not typically submitted for this device type and matrix.

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

4. Clinical cut-off:

Clinical performance of this device at the chosen cutoff concentration is characterized in the method comparison studies presented, above.

5. Expected values/Reference range:

Results of the Nano-Check Cardiac 3 IN 1 Test are interpreted according to the predetermined cutoff values of 0.5 ng/ml for cTnI, 5 ng/ml for CK-MB and 80 ng/ml for Myoglobin. These cutoff levels were determined by comparison to the quantitative Access assay system of Beckman Coulter, Access AccuTnI, Access CK-MB Assay and Access Myoglobin Assay.

The cutoff values of the Nano-Check device were determined by comparison to the Beckman Coulter quantitative assay, Access assays. Specimens containing cTnI, CK-MB and Myoglobin, at the concentration of equal or above established cutoff levels will give positive results using the Nano-Check test.

N. Other Supportive Instrument Performance Characteristics Data Not Covered In The “Performance Characteristics” Section above:

None

O. Proposed Labeling:

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

P. Conclusion:

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