

Product name

B-type Natriuretic Protein Kit (Microfluidic Fluorescent Immunoassay)

Abbreviated name: LYOFIA BNP

Ref. No. --- Package size

LMCMBN25C --- 25 Tests, LMCMBN25 --- 25 Tests (N-QC)

Package size

100 Tests, 50 Tests, 25 Tests, 10 Tests, 5 Tests, 100 Tests (N-QC), 50 Tests (N-QC), 25 Tests (N-QC), 10 Tests (N-QC), 5 Tests (N-QC).

Intended use

This device is intended to be used for the *in vitro* quantitative determination of B-type Natriuretic Protein (BNP) in human whole blood, serum or plasma. And it is for professional use only, not for self-testing of untrained individuals, nor for near-patient testing.

Summary

The 134-amino acid pre-proBNP produced after stimulation of cardiomyocytes is further converted into a 108-amino acid proBNP. The latter is cleaved under the action of endoproteinase into N-terminal proBNP (NT-proBNP) containing 76 amino acids, which is biologically inactive, and B-type natriuretic peptide (BNP) containing 32 amino acids, which is active. Since BNP is mainly synthesized by left ventricular cardiomyocytes and then secreted into the blood, it can be used as an effective marker of heart failure and can independently predict the increased ventricular pressure. It is of great value in the auxiliary diagnosis, treatment evaluation and monitoring for congestive heart failure, dyspnea complications caused by congestive heart failure, the essential hypertension, left ventricular dysfunction and other cardiovascular-related diseases.

The current clinical methods for detecting BNP include double antibody sandwich immunoluminescence assay, colloidal gold immunochromatography and so on.

Principle

This product adopts the microfluidic fluorescence immunoluminescence method. The luminescent material relies on the external light source to obtain energy, then it is excited to make luminescence. And the immunological principle used is double antibody sandwich method. In addition, the microstructure in the strip inside the test cassette can make the reaction system to be uniformly mixed inside the test cassette, thereby improving the accuracy and precision of the detection result.

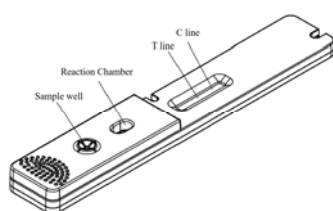


Figure 1: Schematic diagram of the test cassette

As shown in Figure 1, below the sample well is the lyophilized spheres placement tank. The lyophilized spheres are contained in the tank. The main component of the lyophilized sphere is the nanosphere (containing luminescent material) which is coupled with BNP monoclonal antibody I and Chicken IgY antibody. The main component of T line is BNP monoclonal antibody II, and the main component of C line is Goat anti-chicken IgY antibody.

The sample added from the sample well enters the flow microchannel through the microchannel valve and the microchannel mixer valve, so that the lyophilized spheres and the specimen in the lyophilized spheres placement tank are quickly dissolved and mixed evenly. The sample mixture flows along the microfluidic channel to the reaction chamber for reaction. The antigen in the specimen reacts with BNP monoclonal antibody I to

form an antigen-antibody-nanosphere complex. The antigen-antibody-nanosphere complex will flow forward along the nitrocellulose membrane through the sample pad and can be captured by the BNP monoclonal antibody II immobilized on the T line of the nitrocellulose membrane to form a double-antibody sandwich complex. In addition, the Chicken IgY antibody in the reaction system can be captured by the Goat anti-chicken IgY antibody immobilized on the C line. The more antigen in the sample, the more complexes will accumulate on the T line. The intensity of the fluorescent signal reflects the amount of captured antigen.

The fluorescence immunoassay analyzer used with the kit emits emission light, irradiates the T line and the C line, and excites the nanospheres to emit light, and then the specific signal values of the T line and the C line can be obtained.

The content of BNP in the sample can be determined using the calibration curve served in the Reagent information carrier.

Components and ingredients

Components and ingredients					
No.	Main components and ingredients				
1	Test Cassette	Upper layer microfluidic chip	Fluorescent lyophilized spheres	BNP monoclonal antibody I	
				Chicken IgY antibody	
				Bovine serum albumin	
			Blocking lyophilized spheres	Mouse IgG	
		Card shell (containing test strip)	Sample pad & Whole blood pad		
			Nitrocellulose membrane	BNP monoclonal antibody II	
				Goat anti-chicken IgY antibody	
			Absorbent paper		
			PVC base plate		
2	Sample Diluent	Tris buffer			
		Proclin300			
3	Reagent information carrier	A calibration curve is stored. The detection system is traceable to enterprise reference materials.			
4	Control	Level 1	BNP antigen		
		Level 2	BNP antigen		

Note:

- Sample Diluent (see the packaging label for the quantity);
- The kit whose packaging specifications describes "(N-QC)" do not contain quality control products;
- See the "target value list" for the target value range of the quality controls;
- The components from different lots of kits cannot be interchanged or mixed.

Storage and stability

Store the product at 2~30°C, it has a validity period of 18 months. Once the aluminum foil pouch of the test cassette is opened, the cassette has a validity period of 24 hours. After the control solution is reconstituted, seal and store it at 2~8°C with a validity period of 4 hours. Do not use the test kit beyond the expiration date as indicated on label.

Applicable analyzer

Fluorescence immunoassay analyzer manufactured by Hunan Kangxin Biotechnology Co., Ltd., model LYOFIA-I, LYOFIA8.

Specimen requirements

1. This product is suitable for serum, plasma and whole blood samples. EDTA is the recommended anticoagulants for plasma and whole blood samples, and it is recommended to use plastic tubes as blood sample collection tubes. The other anticoagulants have not been validated, they may affect the test results.

2. It is recommended that finishing the testing of samples within 4 hours. If the samples cannot be used at once, store them at 2~8°C and finish the testing within 24hours, or store serum or plasma for up to 1 months at -20±5°C. Whole blood samples should not be frozen.

B-type Natriuretic Protein Kit (Microfluidic Fluorescent Immunoassay)

3. The samples to be tested should be free of precipitation. If precipitation occurs, centrifugation must be performed first. Do not use heat-inactivated samples.

4. Equilibrate the samples to ambient temperature before measurement. Cryopreserved samples should be completely thawed, rewarmed, and evenly mixed before use. Multiple freeze-thaw cycles should be avoided. Do not use samples with significant hemolysis or blood clots.

Assay procedure

1 Assay preparation

1.1 Please follow this instruction for use and refer to the instruction manual of the fluorescence immunoassay analyzer.

1.2 Turn on the fluorescence immunoassay analyzer, check whether the analyzer can work normally, and prepare other related consumables.

1.3 Equilibrate the aluminum foil pouch to ambient temperature before opening.

1.4 Equilibrate the sample diluent and specimens to ambient temperature.

2 Calibration

Insert the reagent information carrier into the interface for the reagent information carrier on the analyzer LYOFIA-I or LYOFIA8, import the calibration curve stored in the reagent information carrier into the analyzer, and check whether the batch number of the reagent information carrier and the kit are consistent. Refer to the analyzer manual for specific operations.

3 Sample testing

3.1 Take out the test cassette has been equilibrated to ambient temperature and place it horizontally on a flat surface.

3.2 Dilute the sample with the sample diluent at the ratio of 1:3 (recommended procedure: pipette 65 μ L of sample into a centrifuge tube with 195 μ L of sample diluent). After mixing, take 65 μ L of the liquid and quickly add it into the sample well of the upper layer microfluidic chip (the small hole pointed by the arrow on the upper layer microfluidic chip). It is recommended to aspirate and dispense rapidly 3 times in the cassette hole.

3.3 Incubation and testing according to applicable instruments, as follows:

3.3.1 If the measuring instrument is LYOFIA-I, please insert the test card into the incubator immediately after adding the sample and then to let it stand for 10 minutes for reaction. Remove the test cassette after the end of the reaction, and insert it into the right position of the fluorescence immunoassay analyzer LYOFIA-I, click the "Test" for testing, and the analyzer will automatically scan the test cassette.

3.3.2 If the measuring instrument is LYOFIA8, please insert the test card into the test slot immediately after adding the sample, LYOFIA8 will automatically scan the test cassette, time the reaction and automatically detect after the reaction is over.

3.4 The fluorescence immunoassay analyzer automatically detects the results and calculates the content of BNP in the sample.

3.5 Take out the test cassette used and dispose it as medical waste.

4 Results Analysis

The measured fluorescence signal value can directly read the content of BNP in the sample from the calibration curve stored in the reagent information carrier of the corresponding batch. The default detection result is in pg/mL.

5 Quality Control

Each laboratory shall establish its own quality control system and rules according to relevant requirements.

To conduct quality control, you must use the quality controls of the same batch of the kit. The quality control product is lyophilized. After returning to ambient temperature, reconstitute it with purified water (show the target list for the water volume required), let it stand for at least 15 minutes, shake it horizontally and mix well, and then test the reconstituted control solution as a sample.

Reference interval

< 100 pg/mL

Refer to CLSI C28-A2 "Defining, Establishing, and Verifying Reference Intervals in the Clinical laboratory - Guidelines for

Approval, Second Edition".

It is recommended that each laboratory establish its own reference interval because BNP level determined is varied depending upon geographical, individuals difference, or testing methods.

Result interpretation

1. The test results shall be only considered as a clinical reference rather than the unique basis for confirming or excluding a case. For diagnostic purposes, results should always be used in combination with clinical examination, medical history and other results of inspection.

2. Various cardiovascular diseases [heart failure, acute coronary syndrome, cardiomyopathy such as left ventricular hypertrophy, heart valve disease, pericardial disease, atrial fibrillation (AF), myocarditis, cardiac surgery, electrical cardioversion, myocardial toxicity injury etc.] and non-cardiovascular diseases (advanced age, anemia, renal insufficiency, sleep apnea, severe pneumonia, pulmonary hypertension, pulmonary embolism, severe systemic disease, sepsis, severe burns, and stroke, etc.) can lead to elevated BNP levels, especially atrial fibrillation, advanced age, and renal insufficiency.

3. B-type natriuretic peptide (BNP) is a substrate of enkephalinase, for patients receiving angiotensin receptor enkephalinase inhibitor (ARNi) (eg: sacubitril valsartan), BNP will be high in concentration due to reduced degradation, so this product should not be used.

Limitation

1. Possible causes of abnormal test results: Heterophilic antibodies, some non-specific components in blood with similar antigenic determinants can capture fluorescence-labeled antibodies.

2. Bacterial contamination of the sample or repeated freeze-thaw may affect the results.

3. Samples with BNP content close to or exceeding upper limit of linear range can be diluted with sample diluent, and the maximum dilution ratio is 1:1. The upper limit of the reportable range after dilution is 10000 pg/mL.

4. Different brands and materials of blood collection tubes may affect the test results.

Performance characteristics

1. Limit of detection: Not higher than 5 pg/mL.

2. Linearity: Linear interval is [5, 5000] pg/mL; and the correlation coefficient |r| is not less than 0.9900.

3. Precision

3.1 Repeatability imprecision: The coefficient of variation (CV) is not more than 10%.

3.2 Within-laboratory imprecision: The coefficient of variation (CV) is not more than 10%.

3.3 Inter-lot imprecision: The coefficient of variation (CV) is not more than 15%.

4. Analytical specificity: Refer to the method of EP7-A2 "Interference Testing in Clinical Chemistry" to conduct the evaluation. If the relative deviation of the measurand value of the sample spiked with the interfering substance and that of the sample in absence of the interfering substance is not higher than 10%, the substance of no more than the corresponding study concentration may be considered no interference effect. Please see Table 1 for the upper limit of no interference of 5 endogenous interfering substances to the assay, and see Table 2 for the upper limit of no cross-reactivity of 4 cross-reactivity substances to the assay, also see Table 3 for the upper limit of no interference of 5 cardiovascular drugs commonly used.

Table 1: List of upper limit of no interference of 5 endogenous interfering substances to the assay

Substance	Upper limit of no interference to the assay
Triglycerides	10 mg/mL
Bilirubin	0.3 mg/mL
Hemoglobin	6 mg/mL
Rheumatoid factor	50 IU/mL
Heterophilic antibodies	1: 10

Table 2: List of upper limit of no cross-reactivity of 4 cross-reactivity substances to the assay

Substance	Upper limit of no cross-reactivity to the assay
Atrial natriuretic peptide (ANP)	3 µg/mL
C-type natriuretic polypeptide (CNP)	2 µg/mL
Angiotensin	0.6 ng/mL
Epinephrine	1.0 ng/mL

Table 3: List of upper limit of no interference of 5 cardiovascular drugs commonly used

Substance	Upper limit of no interference to the assay
Atenolol	10000 ng/mL
Spironolactone	600 ng/mL
Valsartan	3000 ng/mL
Benazepril	20000 ng/mL
Triamterene	8500 ng/mL

5. HOOK effect: BNP samples with concentrations higher than 12500 pg/mL may have HOOK effect.











Precautions and warnings






1. This product is an *in vitro* diagnostic reagent for single use and must not be reused.
2. The treatment, use, storage of the specimens and kits' each component, and the disposal of solid and liquid wastes generated during the assay process should be handled in accordance with the corresponding measures of local biosafety guidelines or regulations.
3. Strictly follow operation procedure, and the correct result only be obtained under careful operation. Any modification to the operation procedure may affect the accuracy of the test results.
4. This product is sensitive to humidity, do not use if the foil pouch is damaged.
5. Do not insert the test cassette whose surface is wet with other liquids into the analyzer to avoid contamination and damage to the analyzer.
6. Keep away from vibration and electromagnetic environment when using the test cassette and fluorescence immunoassay analyzer.
7. Please see the outer label of the package of the kit for the production date and expiration date.

⚠ This product contains chemical ingredients. Contacting with skin or mucosa should be avoided. If the product is spilled into eyes, mouth or skin accidentally, rinse with running water and seek for doctor advice if necessary.

⚠ This product contains animal-derived substances. Although it has passed the biosafety test, it does not rule out the risk of other potential infections. Please consider the kit and samples as potential sources of infection, and wear disposable gloves or take other measures to reduce the risk of infection during the detection process.

Symbols for use in the labeling


Symbols	Definition
	KEEP AWAY FROM SUNLIGHT
	TEMPERATURE LIMIT
	IN VITRO DIAGNOSTIC MEDICAL DEVICE
	CONSULT INSTRUCTIONS FOR USE
	BATCH CODE
	CATALOG NUMBER
	USE-BY DATE
	DATE OF MANUFACTURE
	MANUFACTURER
	SUFFICIENT FOR TESTS

	DO NOT RE-USE
	CAUTION
	KEEP DRY
	DO NOT USE IF PACKAGE IS DAMAGED
	AUTHORIZED REPRESENTATIVE IN THE EUROPEAN COMMUNITY

Bibliography

- [1] Shen Xiaoli, Lin Caijing, Lai Li, et al. Research and application of cardiac markers in the early diagnosis of acute and severe heart disease [Z]. Fujian Provincial Hospital. 2014.
- [2] Heart Failure Group of Cardiovascular Branch of Chinese Medical Association, Heart Failure Professional Committee of Chinese Medical Doctor Association, Editorial Committee of Chinese Journal of Cardiovascular Disease. Chinese Heart Failure Diagnosis and Treatment Guidelines 2018 [J]. Chinese Heart Failure and Cardiomyopathy Journal (Chinese and English), 2018, 2(4): 196-225. DOI: 10.3760/cma.j.issn.2096-3076.2018.12.002.



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Revision history

Version	Revision date	Change description
V01	2022-01-30	Initial