MAYO CLINIC LABORATORIES

# Test Definition: BNP

B-Type Natriuretic Peptide, Plasma

## Overview

### Useful For

Aiding in the diagnosis of congestive heart failure (CHF)

The role of B-type natriuretic peptide in monitoring CHF therapy is under investigation.

### Method Name

Immunoenzymatic Assay

### NY State Available

Yes

## Specimen

### Specimen Type

Plasma EDTA

### Necessary Information

Include patient's age and sex.

### Specimen Required

**Supplies**: Sarstedt Aliquot Tube, 5 mL (T914)
**Collection Container/Tube:** Lavender top (EDTA)
**Submission Container/Tube:** Plastic vial
**Specimen Volume:** 1 mL
**Collection Instructions:** Centrifuge and aliquot plasma into plastic vial. Freeze immediately or within 7 hours of collection.

### Forms

If not ordering electronically, complete, print, and send a Cardiovascular Test Request Form (T724) with the specimen.

### Specimen Minimum Volume

0.4 mL

### Reject Due To

| | |
|---|---|
| Gross hemolysis | Reject |

### Specimen Stability Information

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| Specimen Type | Temperature | Time | Special Container |
|---|---|---|---|
| Plasma EDTA | Frozen | 365 days | |

## Clinical & Interpretive

### Clinical Information

B-type natriuretic peptide (BNP, formerly brain natriuretic peptide) is a 32-amino acid-ringed peptide secreted by the heart to regulate blood pressure, and fluid balance.(1) BNP is stored in, and secreted predominantly from, membrane granules in the heart ventricles and is continuously released from the heart in response to both ventricle volume expansion and pressure overload.(2)

The natriuretic peptide system and the renin-angiotensin system counteract each other in arterial pressure regulation. When arterial pressure decreases, the kidneys release renin, which activates angiotensinogen resulting in increased peripheral resistance of the arterioles, thus increasing arterial pressure.

The natriuretic peptides counteract the effects of renin secretion, causing a reduction of blood pressure and extracellular fluid volume.(3) Both BNP and atrial natriuretic peptide are activated by atrial and ventricular distension due to increased intracardiac pressure. These peptides have both natriuretic and diuretic properties: they raise sodium and water excretion by increasing the glomerular filtration rate and inhibiting sodium reabsorption by the kidney.

The New York Heart Association (NYHA) developed a functional classification system for congestive heart failure (CHF) consisting of 4 stages based on the severity of the symptoms. Various studies have demonstrated that circulating BNP concentrations increase with the severity of CHF based on the NYHA classification.(4-6)

### Reference Values

Males
< or =45 years: < or =35 pg/mL
46 years: < or =36 pg/mL
47 years: < or =37 pg/mL
48 years: < or =38 pg/mL
49 years: < or =39 pg/mL
50 years: < or =40 pg/mL
51 years: < or =41 pg/mL
52 years: < or =42 pg/mL
53 years: < or =43 pg/mL
54 years: < or =45 pg/mL
55 years: < or =46 pg/mL
56 years: < or =47 pg/mL
57 years: < or =48 pg/mL
58 years: < or =49 pg/mL
59 years: < or =51 pg/mL
60 years: < or =52 pg/mL
61 years: < or =53 pg/mL
62 years: < or =55 pg/mL

63 years: < or =56 pg/mL
64 years: < or =57 pg/mL
65 years: < or =59 pg/mL
66 years: < or =60 pg/mL
67 years: < or =62 pg/mL
68 years: < or =64 pg/mL
69 years: < or =65 pg/mL
70 years: < or =67 pg/mL
71 years: < or =69 pg/mL
72 years: < or =70 pg/mL
73 years: < or =72 pg/mL
74 years: < or =74 pg/mL
75 years: < or =76 pg/mL
76 years: < or =78 pg/mL
77 years: < or =80 pg/mL
78 years: < or =82 pg/mL
79 years: < or =84 pg/mL
80 years: < or =86 pg/mL
81 years: < or =88 pg/mL
82 years: < or =91 pg/mL
> or =83 years: < or =93 pg/mL

Females
< or =45 years: < or =64 pg/mL
46 years: < or =66 pg/mL
47 years: < or =67 pg/mL
48 years: < or =69 pg/mL
49 years: < or =71 pg/mL
50 years: < or =73 pg/mL
51 years: < or =74 pg/mL
52 years: < or =76 pg/mL
53 years: < or =78 pg/mL
54 years: < or =80 pg/mL
55 years: < or =82 pg/mL
56 years: < or =84 pg/mL
57 years: < or =87 pg/mL
58 years: < or =89 pg/mL
59 years: < or =91 pg/mL
60 years: < or =93 pg/mL
61 years: < or =96 pg/mL
62 years: < or =98 pg/mL
63 years: < or =101 pg/mL
64 years: < or =103 pg/mL
65 years: < or =106 pg/mL
66 years: < or =109 pg/mL

67 years: < or =112 pg/mL
68 years: < or =114 pg/mL
69 years: < or =117 pg/mL
70 years: < or =120 pg/mL
71 years: < or =123 pg/mL
72 years: < or =127 pg/mL
73 years: < or =130 pg/mL
74 years: < or =133 pg/mL
75 years: < or =137 pg/mL
76 years: < or =140 pg/mL
77 years: < or =144 pg/mL
78 years: < or =147 pg/mL
79 years: < or =151 pg/mL
80 years: < or =155 pg/mL
81 years: < or =159 pg/mL
82 years: < or =163 pg/mL
> or =83 years: < or =167 pg/mL

## Interpretation

>Normal to <200 pg/mL: likely compensated congestive heart failure (CHF)
> or =200 to < or =400 pg/mL: likely moderate CHF
>400 pg/mL: likely moderate-to-severe CHF

B-type natriuretic peptide (BNP) levels are loosely correlated with New York Heart Association (NYHA) functional class (see Table).

| Interpretive Levels for CHF | | |
|---|---|---|
| **Functional Class** | **5th to 95th Percentile** | **Median** |
| I | 15 to 499 pg/mL | 95 pg/mL |
| II | 10 to 1080 pg/mL | 222 pg/mL |
| III | 38 to >1300 pg/mL | 459 pg/mL |
| IV | 147 to >1300 pg/mL | 1,006 pg/mL |
| All CHF | 22 to >1300 pg/mL | 360 pg/mL |

Elevation in BNP can occur due to right heart failure with cor pulmonale (200-500 pg/mL), pulmonary hypertension (300-500 pg/mL), and acute pulmonary embolism (150-500 pg/mL). Elevations also occur in patients with acute coronary syndromes.

## Cautions

Lack of elevations have been reported if congestive heart failure is very acute (first hour) or with ventricular inflow obstruction (hypertrophic obstructive cardiomyopathy, mitral stenosis, atrial myxoma).

Some patients who have been exposed to animal antigens, either in the environment or as part of treatment or imaging procedures, may have circulating anti-animal antibodies present. These antibodies may interfere with the assay reagents to produce unreliable results.

### Clinical Reference

1. Krishnaswamy P, Lubien E, Clopton P, et al. Utility of B-natriuretic peptide as a rapid, point-of-care test for screening patients undergoing echocardiography to determine left ventricular dysfunction. Am J Med. 2001;111(4):274-279
2. McNairy M, Gardetto N, Clopton P, et al. Stability of B-type natriuretic peptide levels during exercise in patients with congestive heart failure: implications for outpatient monitoring with B-type natriuretic peptide. Am Heart J. 2002;143(3):406-411
3. Apple FS, Goetze JP, Jaffe AS: Cardiac function. In: Rifai N, Horvath AR, Wittwer CT, eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. Elsevier; 2018:1201-1255
4. Dietzen DJ: Amino acids, peptides, and proteins. In: Rifai N, Horvath AR, Wittwer CT, eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. Elsevier; 2018:373-403

## Performance

### Method Description

The Access brain natriuretic peptide (BNP) test is a two-site immunoenzymatic (“sandwich”) assay. A sample is added to a reaction vessel with mouse monoclonal anti-human BNP antibody-alkaline phosphatase conjugate and paramagnetic particles coated with mouse Omniclonal anti-human BNP antibody. BNP in human plasma binds to the immobilized anti-BNP on the solid phase, while the mouse anti-BNP conjugate reacts specifically with bound BNP. After incubation in a reaction vessel, materials bound to the solid phase are held in a magnetic field while unbound materials are washed away. A chemiluminescent substrate is added to the reaction vessel and light generated by the reaction is measured with a luminometer. The light production is directly proportional to the concentration of BNP in the sample. The amount of analyte in the sample is determined from a stored, multi-point calibration curve. (Package insert: Access BNP B-type natriuretic peptide [BNP]. Beckman Coulter; 02/2022)

### PDF Report

No

### Day(s) Performed

Monday, Wednesday, Friday

### Report Available

2 to 3 days

### Specimen Retention Time

7 days

### Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Main Campus

## Fees & Codes

### Fees

- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

## Test Classification

This test has been cleared, approved, or is exempt by the US Food and Drug Administration and is used per manufacturer's instructions. Performance characteristics were verified by Mayo Clinic in a manner consistent with CLIA requirements.

## CPT Code Information

83880

## LOINC® Information

| Test ID | Test Order Name | Order LOINC® Value |
|---|---|---|
| BNP | B-Type Natriuretic Peptide (BNP) | 30934-4 |

| Result ID | Test Result Name | Result LOINC® Value |
|---|---|---|
| BNP | B-Type Natriuretic Peptide (BNP) | 30934-4 |