Overview

Useful For
Aids in the diagnosis of congestive heart failure (CHF)

The role of brain natriuretic peptide in monitoring CHF therapy is under investigation

Method Name
Immunoenzymatic Assay

NY State Available
Yes

Specimen

Specimen Type
Plasma EDTA

Specimen Required
Collection Container/Tube: Lavender top (EDTA)

Submission Container/Tube: Plastic vial

Specimen Volume: 1 mL

Collection Instructions: Centrifuge, remove plasma from cells, and freeze immediately or within 7 hours from time of collection.

Additional Information: Include patient's age and sex.

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

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action</th>
</tr>
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<tbody>
<tr>
<td>Hemolysis</td>
<td>Mild OK; Gross reject</td>
</tr>
<tr>
<td>Lipemia</td>
<td>NA</td>
</tr>
<tr>
<td>Icterus</td>
<td>NA</td>
</tr>
<tr>
<td>Other</td>
<td>NA</td>
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</table>

Specimen Stability Information
### Clinical and Interpretive

#### Clinical Information

B-type natriuretic peptide (brain natriuretic peptide; BNP) is a 32-amino acid-ring 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 in extracellular fluid volume.(3) Both BNP and atrial natriuretic peptide (ANP) 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
<table>
<thead>
<tr>
<th>Age</th>
<th>BNP Value</th>
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<tbody>
<tr>
<td>56 yrs</td>
<td>≤ 47 pg/mL</td>
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<tr>
<td>57 yrs</td>
<td>≤ 48 pg/mL</td>
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<tr>
<td>58 yrs</td>
<td>≤ 49 pg/mL</td>
</tr>
<tr>
<td>59 yrs</td>
<td>≤ 51 pg/mL</td>
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<tr>
<td>60 yrs</td>
<td>≤ 52 pg/mL</td>
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<tr>
<td>61 yrs</td>
<td>≤ 53 pg/mL</td>
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<tr>
<td>62 yrs</td>
<td>≤ 55 pg/mL</td>
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<tr>
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<td>78 yrs</td>
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<tr>
<td>79 yrs</td>
<td>≤ 84 pg/mL</td>
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<tr>
<td>80 yrs</td>
<td>≤ 86 pg/mL</td>
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<tr>
<td>81 yrs</td>
<td>≤ 88 pg/mL</td>
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</tbody>
</table>
Test Definition: BNP
B-Type Natriuretic Peptide (BNP)

82 years: ≤91 pg/mL
> or =83 years: ≤93 pg/mL

Females
< or =45 years: ≤64 pg/mL
46 years: ≤66 pg/mL
47 years: ≤67 pg/mL
48 years: ≤69 pg/mL
49 years: ≤71 pg/mL
50 years: ≤73 pg/mL
51 years: ≤74 pg/mL
52 years: ≤76 pg/mL
53 years: ≤78 pg/mL
54 years: ≤80 pg/mL
55 years: ≤82 pg/mL
56 years: ≤84 pg/mL
57 years: ≤87 pg/mL
58 years: ≤89 pg/mL
59 years: ≤91 pg/mL
60 years: ≤93 pg/mL
61 years: ≤96 pg/mL
62 years: ≤98 pg/mL
63 years: ≤101 pg/mL
64 years: ≤103 pg/mL
65 years: ≤106 pg/mL
66 years: ≤109 pg/mL
67 years: ≤112 pg/mL
Test Definition: BNP
B-Type Natriuretic Peptide (BNP)

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 <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

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

<table>
<thead>
<tr>
<th>Functional Class</th>
<th>5th to 95th Percentile</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>15 to 499 pg/mL</td>
<td>95 pg/mL</td>
</tr>
<tr>
<td>II</td>
<td>10 to 1,080 pg/mL</td>
<td>222 pg/mL</td>
</tr>
<tr>
<td>III</td>
<td>38 to &gt;1,300 pg/mL</td>
<td>459 pg/mL</td>
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</table>
Test Definition: BNP
B-Type Natriuretic Peptide (BNP)

<table>
<thead>
<tr>
<th>IV</th>
<th>147 to &gt;1,300 pg/mL</th>
<th>1,006 pg/mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>All CHF</td>
<td>22 to &gt;1,300 pg/mL</td>
<td>360 pg/mL</td>
</tr>
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</table>

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 antianimal antibodies present. These antibodies may interfere with the assay reagents to produce unreliable results.

Clinical Reference

Performance
Method Description
The instrument used is a Beckman Coulter Dxl 800. The brain natriuretic peptide (BNP) test is a 2-site immunoenzymatic sandwich assay. A sample is added to a reaction vessel with mouse monoclonal antihuman BNP antibody-alkaline phosphatase-conjugate and paramagnetic particles coated with mouse monoclonal antihuman 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, separation in a magnetic field and washing remove materials not bound to the solid phase. The chemiluminescent substrate Lumi-Phos 530 is added to the reaction vessel and light generated by the reaction is measured. 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: Biosite Incorporated, France, 2003)

PDF Report
No

Day(s) and Time(s) Test Performed
Monday through Friday; 6 a.m.-4 p.m.

Analytic Time
2 days
Test Definition: BNP
B-Type Natriuretic Peptide (BNP)

Maximum Laboratory Time
3 days

Specimen Retention Time
1 day

Performing Laboratory Location
Rochester

Fees and 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 Regional Manager. For assistance, contact Customer Service.

Test Classification
This test has been cleared or approved by the U.S. 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

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<th>Test Order Name</th>
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<td>BNP</td>
<td>B-Type Natriuretic Peptide (BNP)</td>
<td>30934-4</td>
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<table>
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