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Ask the DOCTOR

A Special Test to Diagnose Heart Failure

By William Davis, MD

Q: "I'm 68 years old and was experiencing shortness of breath. My cardiologist ordered a BNP blood test. I've never heard of it. What is this test, and what is it used for?"

A: Your cardiologist ordered the BNP blood test to determine whether your symptoms of dyspnea (difficulty breathing) could be caused by heart failure.

WHAT IS BNP?

BNP is shorthand for brain (or B-type) natriuretic peptide. The name is somewhat misleading, as BNP has nothing to do with the human brain. BNP is a naturally occurring signaling hormone in the blood, and is produced by human heart muscle. Because the molecule was first discovered in the brain tissue of pigs, however, the "brain" term has persisted.



Quite simply, anything that increases mechanical stress in the heart or irritates heart muscle will trigger the heart's pressure receptors to release BNP into the blood. Increased BNP causes the body's arteries to dilate (by relaxing blood vessel linings), while reducing blood pressure, blocking adrenalin release, and triggering the kidneys to release sodium and water into the urine. Urinary excretion of sodium, or "natriuresis," is a protective response that relieves increased blood pressure.

BNP thus acts as a safety mechanism to counteract the effects of increased heart muscle stress.¹ For this same reason, an enterprising company markets a genetically recombinant form of BNP as an intravenous drug (known as nesiritide, or Natrecor®) to treat heart failure.

CAUSES OF ELEVATED BNP

Doctors usually test BNP blood levels to evaluate complaints of breathlessness, chest x-ray abnormalities, edema (excess fluid accumulation, particularly in the legs and ankles), and heart muscle dysfunction, in an effort to determine whether increased heart pressure from heart failure is present.



As you might expect, this can lead to more questions than answers. If just about anything that triggers stress in the heart can cause increased BNP, detecting an elevated BNP level will not tell us why it is high. An increased BNP level does not always signify heart failure, and a physician may need to investigate further to determine its cause.

Common reasons for increased BNP levels include:

high blood pressure
lung infections, such as pneumonia
asthma attacks
medications that cause water or sodium retention (such as Actos® and Avandia®, which are commonly prescribed for pre-diabetes and diabetes)

- abnormal physiological processes that can likewise cause water or sodium retention, such as kidney dysfunction
- recent heart attack
- sleep apnea (periodic failure to breathe during sleep)
- heart failure (a weak heart muscle unable to pump its full blood volume).²

Increased BNP release by the heart is the body's way of counteracting these conditions. Administering BNP (as with the drug nesiritide) further raises BNP levels, exaggerating its effects—especially the accelerated clearance of excess water by the kidneys.

INTERPRETING BNP TEST RESULTS



Since many factors can elevate BNP, interpreting blood levels of BNP can be complex. Most experts now agree that it is appropriate to use two cut-off values in assessing BNP levels—a lower value that reliably excludes heart failure, and a higher value that accurately confirms heart failure. A BNP value of less than **100 pg/mL** essentially rules out heart failure, whereas values greater than 400 pg/mL indicate a **95% likelihood** of heart failure. Values between 100 pg/mL and **400 pg/mL** warrant further investigation. A suggested “normal” range for BNP is **0.5-30 pg/mL**.^{3,4}

Higher BNP levels thus indicate that a more serious disease process is at work, and are less likely to be caused by high blood pressure, lung conditions, and other processes. In effect, the heart experiences higher pressure because of the backup of residual volume in the heart, and BNP blood levels increase. The higher the BNP, the more severe the heart failure, with levels sometimes reaching into the thousands.⁵

BNP levels in this higher range can signal danger, so your doctor will need to decide whether prompt action is required. The physician will assess whether some other factor may underlie an increased BNP level, such as kidney disease, uncontrolled high blood pressure, or lung issues; or whether increased BNP signals real danger from heart failure and related problems in the near future. Your doctor's judgment is crucial in determining why BNP is elevated and understanding what is responsible for an increase in the heart's internal pressure, as well as an appropriate course of action to address the imbalance.

High blood pressure is perhaps the most common source of confusion in assessing BNP. If elevated blood pressure is present for a long period (usually several years), the heart muscle grows in thickness (a condition called left ventricular hypertrophy), and internal heart pressure increases (increased left ventricular end-diastolic pressure). This can result in breathlessness, chest pain, and a very convincing—but false—picture of heart failure.

High blood pressure also causes exaggerated sensitivity to anything that causes fluid retention, such as excessive salt intake or certain medications. For example, it is not uncommon for someone with high blood pressure (and accompanying increased heart muscle thickness and pressure) to retain excess water, become breathless, and show increased BNP levels after eating an excessively salty meal. Because the heart is not weak, but actually muscular and strong, this is not truly heart failure—rather just increased heart pressure and tension.

Your doctor can distinguish true heart failure—represented by weakness of the heart muscle—from increased heart pressure and muscle thickness caused by chronically high blood pressure, usually with the help of an echocardiogram, a simple test that effectively distinguishes between the two situations.⁶



Interestingly, the nutritional supplement coenzyme Q10 (at 200 mg daily) has been shown to at least partially reverse excessive heart muscle thickening and high heart pressure.^{7,8} Other nutrients that may help improve cardiac function include D-ribose, propionyl-L-carnitine, and lipoic acid.⁹

In summary, breathlessness is an important potential symptom of disease, and one of its most important causes for your doctor to consider is heart failure. Measuring BNP levels may be helpful, and high BNP levels can be diagnostic of heart failure. The BNP level can never be used in isolation, however. To understand its true implications and meaning, BNP level must always be considered within the larger picture of one's overall health status.

Your physician may find the BNP test useful not only for diagnosing potential heart failure, but also in screening for asymptomatic left ventricular dysfunction of the heart, determining level of cardiovascular risk, and monitoring treatment for heart failure.

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