

## The Center for Better Bones

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### The Medical Work-Up for Osteoporosis

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One of the basic principles of the Better Bones Program® is that all osteoporosis, all excessive bone loss, or all real increased risk of low-trauma fracture has a cause. There are a number of medical problems that can cause, or contribute to, bone loss. To better understand any undetected causes of bone loss, it is important to obtain a medical work-up for osteoporosis. A medical osteoporosis work-up can be ordered by your physician. At the Center for Better Bones, in addition to the standard DEXA bone density test, we like to see the following tests included in an osteoporosis work-up. We suggest that our clients discuss these tests with their doctors to see which ones are appropriate for them.

#### **Vitamin D 25(OH)D blood test**

This test determines your blood level of vitamin D. The results of this test allow us to know the amount of vitamin D supplementation needed to reach a therapeutic blood level of vitamin D, which is important for adequate calcium absorption and basic bone support. You can read more about the importance of vitamin D to bone on my website [www.betterbones.com](http://www.betterbones.com).

#### **Ionized calcium test**

This is a simple blood test to measure the level of free calcium—that is, the metabolically active portion of calcium not bound to proteins in the blood. This test is not meant to assess the appropriateness of your calcium intake as much as it is meant as an indirect test of parathyroid functioning. It can also indirectly tell us some things about vitamin D status.

#### **Intact parathyroid hormone blood test (iPTH)**

High parathyroid hormone levels are associated with excessive bone loss as the parathyroid gland becomes overactive and draws calcium from bone. The medical reasons for this over activity need to be addressed to halt the excessive bone loss. Also a normal parathyroid reading in the face of vitamin D deficiency can indicate magnesium inadequacy, as I discuss in a [recent blog](#) on my website.

#### **24-hour urine calcium excretion test**

This test looks at how much calcium is being excreted in the urine. For this test, you collect all your urine over 24 hours in a large container for laboratory analysis to measure the amount of calcium in the total volume of urine. Excessive urinary calcium excretion is a common cause of bone loss and osteoporosis. It is best to stop all high-dose calcium supplementation (>100 mg) one week before urine collection.

#### **Thyroid hormone function test (TSH)**

This is a measure of thyroid function, which can screen for under- or overactive thyroid conditions. Thyroid hormone levels that are too high or too low can contribute to osteoporosis, as can a dose of thyroid medication that is too high.

### **Vertebral deformity assessment**

Just as the bone density test, this is another x-ray test for bone. This test, however, images each vertebral body of the spine and looks to see if there are deformities or fractures. The Vertebral Deformity Assessment can be done on newer bone density testing machines, with special software that takes a “lateral” view of the spine. This new spine x-ray can also be done and interpreted by knowledgeable radiologists using other x-ray technology.

### **Free cortisol test (blood or saliva)**

Cortisol is a corticosteroid hormone produced by the adrenal cortex, which is part of the adrenal glands. It is usually referred to as a “stress hormone” as it is involved in response to anxiety and stress. Abnormally high cortisol levels are damaging to bone and as such represent a major risk factor for osteoporosis and low-trauma fractures.

### **DHEA test (blood or saliva)**

Dehydroepiandrosterone (DHEA) is a hormone produced by both the adrenal glands and the ovaries. DHEA helps to neutralize the effects of cortisol. DHEA helps to protect and increase bone density. Stress reduction activities like yoga and meditation can help maintain youthful DHEA levels as we age. Low levels of DHEA are a risk factor for osteoporosis.

### **C-reactive protein test (high sensitivity if possible)**

C-reactive protein is a plasma protein that is held to be a marker of general inflammation within the body. It is a known risk factor for heart disease because heart disease is largely an inflammatory disorder. Osteoporosis is also inflammatory in nature and this test is helpful in detecting unwanted inflammation, which may contribute to bone health problems.

### **Homocysteine test (plasma or serum)**

Homocysteine is a non-dietary amino acid, a product of the metabolism of a dietary amino acid, methionine. In the absence of adequate B vitamins, homocysteine can accumulate in the body. High levels of this substance damage collagen and represent powerful risk factors for both cardiovascular disease and for osteoporotic fractures.

### **Celiac disease and gluten sensitivity tests**

Full-blown celiac disease, or even just a sensitivity to gluten, can lead to inflammation of the gut. This inflammation is related to a complex inflammatory cascade which can increase bone loss. Also, those with celiac disease suffer from weak digestion and malabsorption of many nutrients including vitamins A, K, and D. These deficiencies in turn damage bone. If there is any suggestion of gluten sensitivity or celiac disease, appropriate testing should be considered. For a detailed update on gluten sensitivity as a cause of bone loss, see *The Whole-Body Approach to Osteoporosis* by R. Keith McCormick, New Harbinger Publications, 2008.

### **Sex hormone tests**

*Post-menopausal females: progesterone, estrogen.* Female sex hormones drop naturally at menopause among all women; thus at the Center for Better Bones we do not generally suggest testing of these hormones. Those interested in this type of hormone testing, or those taking hormone replacement medications, can be tested for hormone levels by their physician.

*Pre-menopausal females (reproductive years hormone testing): progesterone, estrogen.* For women from their teens to menopause, proper levels of sex hormones are very important to bone health. Low levels of both estrogen and progesterone can limit development of optimum peak bone mass. Irregular, or frequently missed, periods should be studied by a knowledgeable physician. According to noted

progesterone researcher, endocrinologist Dr. Jerilynn Prior, some 25% of young women in the US and Canada fail to develop optimum peak bone mass due to undetected ovulatory disturbances which result in low progesterone levels. Testing of estrogen and progesterone can be helpful in pre-menopausal women with a bone health concern.

*Males: testosterone and, at times, estrogen.* A common cause of osteoporosis in men is low testosterone; thus a medical work-up for osteoporosis in men almost always includes a test for testosterone. Interestingly enough, estrogen also plays a role in male bone health and at times the physicians will test for estrogen in men with osteoporosis.

### **Bone breakdown tests**

Bone breakdown tests (called bone resorption tests) measure the degradation products of bone collagen in the urine or blood. As more bone is broken down, more of these collagen bone protein fragments show up in the urine and blood. Here at the Center for Better Bones we suggest the use of the NTx test (urine or serum) or the serum CTx test as markers of bone breakdown.

***The urine NTx test for bone breakdown:*** This simple urine test looks at the amount of cross-linked N-telopeptides of bone type-I collagen (NTx) in the urine. As there can be a great deal of day-to-day variation in urine bone breakdown markers, at the Center for Better Bones we have developed a two-day collection procedure for greater accuracy. [Instructions for this collection method](#) can be found on my website and for further details on bone resorption testing, see [my article on assessing bone breakdown and loss](#).

***The serum CTx bone breakdown test:*** The CTx tests for the C-terminal telopeptide of type-I collagen, which is a peptide fragment derived from the carboxy terminal end of the bone protein matrix. CTx is a blood test used to monitor the rate of bone breakdown and effectiveness of anti-resorptive natural or drug bone therapies. The serum CTx test should be done first thing in the morning before eating anything (in a fasting state). Twelve hours before this blood test, do not take multivitamins or dietary supplements containing biotin or vitamin B7 that are commonly found in hair, skin, and nail supplements and multivitamins.

### **Bone formation tests**

Bone formation tests assess the rate of the development of new collagen and new bone. Three common tests are the PINP test, the Osteocalcin test, and the BAP test.

***The PINP test for bone formation:*** The PINP is the preferred marker of bone formation test. PINP (pro-collagen type-1 N-terminal propeptide) is formed by the bone-building cells and reflects the rate of collagen and bone formation. PINP is the most sensitive marker of bone formation and particularly useful for monitoring bone formation therapies. It is recommended that this test be performed at baseline before starting a natural or pharmacological osteoporosis therapy and again 3 to 6 months later. Serum or plasma blood sample is acceptable. The test should be done first thing in the morning before eating anything (fasting state).

***The osteocalcin test:*** Osteocalcin is the most important non-collagen protein in bone matrix. Osteocalcin is produced by the osteoblasts and is widely accepted as a marker of bone osteoblastic activity. Osteocalcin, incorporated into the bone matrix, is released into circulation from the matrix during bone resorption, hence is considered a marker of bone turnover rather than the specific marker of bone formation. The osteocalcin test is a blood test that should be done first thing in the morning in a fasting state. Twelve hours before this blood test, do not take multivitamins or dietary supplements containing biotin or vitamin B7 that are commonly found in hair, skin, and nail supplements and multivitamins.

***The BSAP test:*** Bone-specific alkaline phosphatase (BSAP) is a glycoprotein found on the cell surfaces of the bone-building osteoblastic cells. As is an indicator of osteoblastic activity, BSAP is a marker of bone formation. Bone-specific alkaline phosphatase provides useful information on bone remodeling in osteoporosis and Paget's disease. BSAP is generally the first marker of bone formation to change with bone formation.