

Technical Bulletin **BoneBuilder**

Daily Manufacturing, Inc.
Prepared by: Jim Daily III, Ph.D.
For Internal Employee
Education

Introduction: Maintaining healthy bone status is one of the major challenges with advancing age. Unfortunately, there is no single simple intervention that can assure healthy bones, but it is possible to establish a bone-healthy lifestyle that will maximize a person's chances of maintaining healthy bones for a lifetime. Such a lifestyle would include adequate rest, exercise, prudent exposure to sunlight, and optimal nutrition. Although all of the nutrients required for healthy bones may be obtained from foods and sun exposure, few people have diets that provide optimal amounts of most nutrients and few people spend adequate time outdoors to maintain optimal vitamin D status. **Daily BoneBuilder** is formulated to provide the basic nutritional factors required for building healthy bones. The nutrients provided are: calcium, magnesium, vitamin D, vitamin K, vitamin C, silicon, boron, and betaine HCl. **Daily BoneBuilder** supplies generous amounts of each nutrient in 4 tablets per day. **BoneBuilder** is most effective when combined with an exercise program, outdoor activities in the sun and diet that includes natural phytoestrogens.

Dosage: Daily BoneBuilder should be taken with meals with the dose of 4 tablets divided between two or more meals. Because of the generous dosage of nutrients included in BoneBuilder, the tablets are relatively large. The tablets can be easily broken in half or dissolved in juice in a few minutes with stirring.

Active Ingredients: **Calcium:** provided as carbonate, citrate, phosphate, and lactate. This combination provides calcium in a combination that gives it an overall neutral effect in the body. **Vitamin D3:** this is the most active form of vitamin D and is provided as a supplement and not a substitute for sunlight. **Vitamin K1:** a very safe and effective form of vitamin K which has demonstrated benefits for bone health. **Silicon:** a mineral that is found in bone and has been shown to be beneficial for optimal bone health. **Boron:** another mineral with demonstrated benefits for bone health. **Betaine HCl:** an acidifier that helps with the absorption of the minerals.

Inactive Ingredients: Inactive ingredients (excipients) present in **Daily BoneBuilder** are used to keep the active ingredients in an easy-to-use, accurately measured and readily dissolved dosage form.

Croscarmellose sodium: a type of cellulose that rapidly absorbs a large amount of water and swells. Used to make the tablet break apart and dissolve, thereby increasing absorption and utilization of the active nutrients.

Stearic acid: Vegetable oil product that helps maintain even flow and uniform dosage in the capsules.

Description: **Daily BoneBuilder** is a medium size to large uncoated white tablet. The Betaine HCl in the formula gives it a somewhat unusual odor described by some people as "fish like". Each bottle contains 120 tablets (a 30 day supply). Daily BoneBuilder is packaged in a white HDPE bottle with an inner freshness seal and an outer tamper-evident band. The lot number and expiration date are printed on the bottom of the bottle.

Precautions: **Daily BoneBuilder** is a very safe supplement for almost anyone. The tablets are large and people who have difficulty swallowing large tablets should either not use the product or break the tablets and put them in a juice or other beverage and allow them to dissolve (a little stirring helps). People who are on anti-coagulant medication should consult with their physician before using **BoneBuilder** to see if the vitamin K is contra-indicated in their situation.

Maintaining Healthy Bones with BoneBuilder

Although the mineral portion of bone is a non-living material, it is still a dynamic part of the human body and is constantly undergoing degradation by cells called osteoclasts and rebuilding by osteoblasts. Healthy bones can only be maintained when the activities of the two cells are balanced. Over 60 years ago Fuller Albright described osteoporosis as a disease in which there is “too little bone in the bone, but what bone is there is normal”¹. Essentially, osteoporosis is an imbalance between normal bone resorption and formation, which should ideally balance each other precisely in adults who have finished growing. It is unclear if most osteoporosis is a result of overly aggressive bone resorption or insufficient bone formation. Either way, replacing degraded bone more rapidly will help prevent bone loss. Although many factors, nutritional and non-nutritional, are important for maintaining healthy bones, **BoneBuilder** is designed to assure that the important nutrient requirements are met.

Calcium

Calcium is the nutrient most people think of for bones, and it is the most important. Bones are largely made of tri-calcium phosphate (hydroxyapatite). Bone mass rapidly increases during the first 20 years of life, the time period when calcium intake is the most important for bone health.² From age 20-40 bone mass remains relatively stable given a reasonably good nutritional status, and after 40 bone mass begins to decline, and the loss accelerates rapidly after age 50. The human body contains 1000-1500 g of calcium (99% of which is in bone), and the goal should be to maintain that amount. Therefore new bone calcium must equal calcium loss from bone. A threshold of calcium intake must be attained to assure that homeostasis is maintained. Too little calcium and the losses exceed the calcium retained; with excessive calcium intake, calcium is lost in the urine. Matkovic and Heaney estimated calcium thresholds from 34 calcium balance studies and found it to be approximately 1500 mg/day for adolescents and 1100 mg/day for adults.³ Of course, all of the calcium requirement does not need to come from supplements since a typical diet contains about 700 mg of calcium; even a low calcium diet usually contains 400-500 mg of calcium. Since no one type of calcium is ideal for everyone, **Daily BoneBuilder** contains a balance of acidic, neutral, and alkaline calciums to have an overall neutral effect.

Magnesium

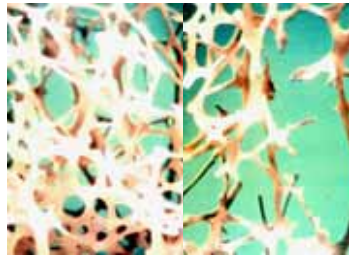
The human body contains approximately 25 grams of magnesium, about 2/3 of which is associated with bone. Magnesium is located more on the bone surface not a part of the hydroxyapatite crystal, and is not structurally important as are calcium and phosphorus². Magnesium does not appear to be important for calcium absorption either, but studies have shown that magnesium deficiency is clearly associated with low bone mineral density. Although the relationship of magnesium with bone is poorly understood, it should not be taken lightly. Magnesium deficiency is common with poor quality diets, since its best sources are whole grains, vegetables, seeds, and nuts.

Vitamin K

Vitamin K has only recently been recognized to be important for bone health. Vitamin K is an important cofactor for the biosynthesis of a category of proteins, including osteocalcin, that are important for attracting calcium ions to the bones. These proteins are not properly synthesized in people with vitamin K deficiency². It appears that most people get adequate vitamin K, but deficiency does occur and the extra vitamin K in **BoneBuilder** helps assure an adequate supply.

Vitamin C

Vitamin C is not important for bone formation, but is extremely critical for the formation and maintenance of cartilage that supports bone. Furthermore, it helps to solubilize the calcium and magnesium in **BoneBuilder**, making them more absorbable.



Normal bone (left) and osteoporotic bone (right).
From National Institutes of Health

Silicon

Silicon is a minor component of bone but impaired formation of bone in silicon deprived experimental animals is well documented. It appears that silicon is important for the early stages of bone growth and is a major determinant of bone mineral density in humans⁴. Only small amounts of dietary silica are needed, probably in the range of 20-50 mg/day, although the data is currently insufficient to establish any reliable guidelines.

Boron

Boron deficiency has also been shown to result in bone loss^{5,6}. The mechanism of boron action is not known, there is some evidence that boron may mimic the effects of estrogen in stimulating bone growth. Boron requirements are quite small, probably less than 5 mg/day.

Betaine HCL

Calcium and magnesium must be dissolved to an ionic state for optimal absorption. Betaine HCL is an excellent acidulant and is included to help with the mineral absorption. Betaine is also an excellent source of carbon to be used in the biosynthesis of many substances in the body, including the support tissue around bone.

References

1. Albright F, et al. (1941) Postmenopausal osteoporosis; its clinical features. *JAMA* 116: 2465.
2. Illich JZ and Kerstetter JE. (2000) Nutrition in bone health revisited: A story beyond calcium. *J. Am. Col. Nutr.* 19: 7150737.
3. Matkovic V and Heaney RP. (1995) Calcium balance during human growth: evidence for threshold behavior. *Am. J. Clin. Nutr.* 55: 992-996.
4. Jugdaohsingh R et al. (2003) Silicone intake is a major determinant of bone mineral density in men and premenopausal women of the Framingham offspring cohort. *Bone* 32: S192.
5. www.PDRhealth.com/boron
6. Nielsen FH, Gallagher SK, Johnson LK, Nielsen EJ. Boron enhances and mimics some effects of estrogen therapy in postmenopausal women. *J Trace Elem Exp Med.* 1992; 5: 237-246.