

“Maximum **BONE** Aid”

“The *Super Skeletal Constructor*”

Many of us recall our favorite superhero characters with the indestructible skeletal frames and have wondered, "Oh the things I could do with that kind of robust body." Well, although body types with superhuman durability is obviously out of our reach, super bone strength doesn't necessarily have to be a comic book fantasy. What if there was a way to take all the best minerals, vitamins, plant extracts, etc. that the earth has to offer to achieve this "perfect bones" concept. Well, Viva Vitamins' Maximum Bone Aid has a plan for this.

BONE (Anatomy & Physiology)

Osseous tissue, the primary tissue of bone, is a relatively hard and lightweight composite material. It is formed mostly of calcium phosphate and calcium hydroxide in an intricately-woven crystalline latticework termed *calcium hydroxylapatite* (this is the osseous tissue that gives bones their rigidity). Bone is comprised of two types of cells that provide the formation and maintenance during the lifespan of the bone tissue: Osteoblasts and Osteoclasts. Osteoblasts are the mononucleated bone-forming cells which descend from osteoprogenitor cells. They spend the majority of their time on the surface of osteoid seams and it is there that they make a unique sludgy protein solution called osteoid, which subsequently mineralizes to become bone. The Osteoid fluid is primarily composed of Type I collagen. Osteoclasts on the other hand, primarily hang out in resorption pits on bone surfaces and are chiefly responsible for bone resorption (remodeling of bone to reduce its volume). These guys are much larger than Osteoblasts and are multinucleated. Because osteoclasts are derived from a monocyte stem-cell lineage, they are equipped with phagocytic like mechanisms similar to circulating macrophages. Interestingly, Osteoblasts dig their own grave when they mature, trapping themselves

indefinitely within the bone matrix that they themselves have made. It is here, where they now take on the name Osteocytes and now act as mechano-sensory receptors—regulating the bone's response to stress and mechanical load. When bones are pulled and tugged on during our lives, these Osteocytes spring into action, sending out signals to let the other osteocell family members know what to do.

What Does Maximum Bone-Aid Provide?

The first ingredient in Maximum Bone-Aid is what the formula prides itself on. It contains the actual composition of bone itself: protein (osteoid amino acid profile), calcium and phosphorous (aka, hydroxylapatite). One of the best ways to help restore bone is to give it what it needs; the stuff it's already made of (Straub, D.A. 2007). Magnesium is strategically placed into this formula for the specific reason of helping calcium get to where it's supposed to go. Magnesium is actively involved in calcium absorption in the intestines by being a major player in the vitamin D biosynthetic pathway (Toyran N, Severcan F, 2000). But not too much magnesium. Being a divalent cation just like calcium, they both compete for absorption within the gastric lumen. It's because of this that Viva Vitamins have put in just the right balance of calcium

and magnesium to maximize bioavailability and minimize antagonism. Speaking of vitamin D, cholecalciferol (D₃) is one of the major players in the Maximum Bone-Aid formula. Vitamin D is directly involved in the bioregulation of calcium and phosphorus in our blood by promoting their absorption from the intestines, and by promoting re-absorption of calcium in the kidneys. This enables normal mineralization of bone and prevents hypocalcemic tetany. It is also needed for bone growth and bone remodeling by both osteoblasts and osteoclasts (van den Berg H, January 1997). Zinc is one of the, if not *the* most important factors in the initiation of collagen biosynthesis. Much has been studied on the deficiencies of zinc and bone loss (Barry C. Starcher et al., 1980). Of the other minerals involved, Maximum Bone-Aid has included: *manganese*, which is a cofactor for one of the critical enzymes involved in the stepwise formation of glycosaminoglycan oligomers (chondroitin sulfate), *copper*, which is also a cofactor for the enzyme lysyl oxidase, forming cross-links between collagen in connective tissue, *boron*, which is involved in the activation of parathormone (parathyroid hormone) increasing serum calcium concentrations, and *selenium*, which is one of the key minerals involved in the secretion of growth hormones responsible for bone maturation (Ferket PR et al., 2009). Ascorbic acid (vitamin C) is a must have in any bone building formula. This sugar acid is also a critical player in building soft bone matrix. It has the unique ability to initiate DNA transcription of type II collagen, prolyl 4-hydroxylase (the enzyme it is actually the coenzyme of in crosslinking collagen fibers), and *aggrecan*, a glycoprotein comprising a major structural component of soft-bone precursor cartilage (Amy G. Clark et al., 2001). There are three vitamin-K dependent proteins that are essential in bone formation and maintenance:

osteocalcin, matrix Gla protein (MGP), and protein S. (Booth SL., 1997). Without vitamin K, bone formation would be extremely difficult. Glucosamine and chondroitin sulfate are a dynamic duo when in combination in the stimulatory effect of the formation of bone matrix by osteoblasts (Anastassiades T et al., 1984). MSM (dimethylsulfone) is an organic sulfur compound thought to be the new up-and-coming ultimate bone/joint protector. Especially in conjunction with glucosamine sulfate, MSM does wonders for osteoarthritic sufferers (Usha PR et al., 2004). Ipriflavone is an interesting little synthetic isoflavone which is used to inhibit resorption, maintain bone density and prevent osteoporosis in postmenopausal women. It has been shown to slow down osteoclast activity pretty substantially, allowing osteoblasts to build up bone mass (Civitelli R, 1997). Studies with animals indicate that silicon supplementation (one of the main ingredients in horsetail extract) reduces the number of osteoclast cells, thus partially preventing bone resorption and bone loss (Hott M, et al., 1993). Interestingly enough, it was shown in vitro that silicon compounds stimulate DNA synthesis in osteoblast-like cells (Keeting et al., 1992). All these unique nutrients and more can be found in carefully balanced amounts in Viva Vitamins' Maximum Bone Aid.

Purpose:

Not all of us have an indestructible, stress-resistant skeletal frame that lives forever. For many of us, our bones are becoming less and less dense as we age. Some of us more than others. Viva Vitamins provides a variety of vitamins, minerals and phyto-nutrients in their new scientifically formulated masterpiece Maximum Bone-Aid for anyone trying to nurture broken or fractured bones, slow down the progression of or prevent osteoporosis, or just as an overall preventative maintenance for bone health. Remember, as we age, our

bones are not quite the dynamic, sturdy infrastructure they used to be. Let's thank our lucky stars Maximum Bone Aid can help provide the tools that our bones need to allow our skeletal machinery to do what it's designed to do.

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