

Bone Collage

By Allison Tannis, BSc, MSc

Perhaps the best thing I learned in grade school was that without bones, we'd be globs of goop, like the big green blob in famous movies like Ghost Busters. That image would make me giggle uncontrollably in class. To bad my teacher didn't value my appreciation for bones.

Bones are the structure, frame and solidity of the human body. They create blood cells, give us height, are the scaffolding for our muscles and, maintain our blood pH level. Truly bones play a large part in the healthy, proper functioning of our bodies. Since, osteoporosis was recently classified by the World Health Organization as the second leading health care problem in the world, Canadians are starting to recognize the importance of bone nutrition, both late and early in life.

There is an amazing collage of nutrients that can be considered as bone products. Calcium is the first that comes to mind for most Canadians. There are many forms of calcium, including calcium citrate, coral calcium, calcium carbonate and, hydroxyapatite. However, pulling the best from this bunch is not as easy as one might think.

The most recent media wave suggested that coral calcium is the most absorbable form of calcium available. Coral calcium contains a naturally high percentage of calcium to magnesium (i.e. about 2 to 1). This is why it is thought to be a beneficial supplement, as this high ratio likely maximizes the amount absorbed in the body. This was based on a single study (*J Nutr Sci Vitaminol 1999, 45:509-17*), which is not sufficient to draw conclusions from.

Of the more historical calcium supplements, calcium carbonate is the most well known because it is more concentrated and, therefore, requires that a smaller number of pills be taken. However, calcium citrate is thought to have a more appealing pH for absorption in the body and, has been shown in a recent study to be better at reducing bone re-absorption than calcium carbonate. (*Osteoporos Int. 2004 - to be published Jan 13*)

Hydroxyapatite is a form of calcium found naturally in bone tissue and, is therefore not suitable for vegans. Little research has been done to compare hydroxyapatite to calcium carbonate or citrate; however, it is thought to be an absorbable source as it contains naturally occurring minerals and vitamins, such as vitamin C, D and K.

All in all, the scientific jury is still out on which calcium supplement is superior. However, science is supportive that calcium absorption involves many factors.

In the 1920s, vitamin D deficiency was found to lead to malabsorption of calcium. This and, more recent research (*Curr Opin Rheumatol 2003 Jul, 15: 476-478; J Nutr Sci Vitaminol 1999, 45:509-17; Joint Bone Spine 2003, 70: 157-160*) suggests that vitamin D is an important part of calcium absorption. Perhaps more importantly, vitamin D and calcium supplements have been found to be as well absorbed as milk. (*Am J Clin Nutr 1996, 63:354-357*)

Calcium absorption also involves other minerals such as magnesium, and likely involves hormones such as calcitriol, parathyroid hormone, calcitonin and estrogen. This may be why menopausal women have an increased risk of developing osteoporosis, as they lack the estrogen needed for proper absorption of calcium. Of note, the Osteoporosis Society of Canada recommends a daily calcium intake of 1000mg per day for adults age 19-50, and 1500mg for those age 50+. (www.osteoporosis.ca)

Joints are another important part of our bones. In fact, joints are probably the only parts of our bones that most of us ever think about, as they can be painful. Inflammation of the joints is

known as arthritis. If you live long enough, you can almost count on developing arthritis. Luckily, there are some nutrients that have been found to help with joint disease.

Glucosamine is a widely consumed dietary supplement for joints. Glucosamine is an amino-polysaccharide, a building block of cartilage. Countless studies have shown the ability of glucosamine to improve the symptoms of osteoarthritis (OA) of the knee and hip. (*Lancet* 1999; 354:1640; *Clinical Therapeutics* 1980, 3(4):260-272; *Lancet* 2001, 357(9252)) In fact, glucosamine may be as effective as NSAIDs (e.g. aspirin) at alleviating OA symptoms. (*Osteoarth Cart* 1994, 2:61-69; *Arneirp-Forsch/Drug Res.* 1998, 48:469-474) Clinical trials suggest that 1500mg of glucosamine per day is ideal. However, about 8 weeks of supplementation is required before symptom relief is seen.

There are two forms of glucosamine available on Canadian shelves: glucosamine HCL and glucosamine sulphate. It is suggested that the sulphated form is most effective because sulfate is needed in the synthesis of cartilage compounds. (*Pharmacist* 1998, 66-75)

Caution should be taken by diabetics, as glucosamine is metabolized by the hexosamine pathway and, excess pressure on this pathway may cause insulin resistance. Preliminary trials have not yet shown this effect in humans (*University of Guelph -study not yet published*). However, insulin resistance has been seen in rodent studies. (*Diabetes* 1993, 42:1333-1346; *Diabetes* 2000, 49:926-935; *Endocrinology* 1999, 140:3971-3980)

Chondroitin is another well known joint supplement. Chondroitin is a glycosaminoglycan. It binds with collagen to form the basis of connective tissue found in joints. It is thought that chondroitin attracts fluid into the joint, therefore preventing cartilage from becoming malnourished. Clinical trials on chondroitin are not as convincing as those for glucosamine; however, chondroitin does appear to improve joint health. (*J Rheumatol* 2000, 27:205-211)

A lesser known supplement for joints, more specifically osteoarthritis, is SAME (S-adenosylmethionine) as a supplement for osteoarthritis. SAME is found in all human tissue, and is used in over 35 different biochemical reactions in the body. SAME may support joint health through transulfuration, a process that creates glucosamine and chondroitin sulfates. This enhances joint cartilage lubrication.

A randomized, double-blind cross over trial that involved 61 participants was conducted at the University of California Irvine Medical Center. The participants were given 600mg of SAME, twice daily for eight weeks. Researchers concluded that SAME was as effective in reducing pain as Celebrex. (*Study not yet published*) Larger-scale, multi-year studies on SAME are underway and will hopefully provide some more conclusive information.

There are some other dietary nutrients that should be mentioned when discussing the collage of bone health products. Soy isoflavones have been shown in animal and human studies to be effective in preventing hip fractures in women who have low bone mineral content. (*Am J Clin Nutr* 2003, 78(3):593S-609S; *J Clin Endo Meta* 2003, 88)

More importantly, manage calcium loss from bones. Meat causes an acidic shift in your blood's pH which is naturally neutralized by extracting calcium from your bones. Allow fruits and vegetables to neutralize an acidic meal instead. By eating right, from an early age, and considering bone supplements one can ensure that their beloved bones stay strong and healthy – as becoming a goey blob is only cool in the movies.

Allison Tannis, BSc., MSc. is a nutritional educator and author of *Vitality: Quest for a healthy diet*. Visit www.allisontannis.com for more information, articles and upcoming appearances.