Osteo SAP

Science-based osteominerals, vitamins, and amino acids in non-GMO vegetable capsules

Osteoporosis is a multifactorial disease with roots in genetics, endocrine function, exercise, and nutritional habits. *Osteo* means "bone" and *porosis,* "thinning" or "becoming more porous", together literally meaning "thinning of bone." Adequate nutrition is critical in osteoporosis prevention and treatment. Many nutritional factors have been examined for associations with osteoporosis and bone mass. Calcium is essential for bone development and stability, and low calcium assimilation is believed to contribute to the development of osteoporosis. Vitamin D is essential for the maintenance of calcium levels and increases its uptake in the intestine. Boron is involved in calcium, magnesium, and phosphorus metabolism, contributing to the prevention of bone loss associated with osteoporosis. Vitamin K_2 from a vegetable source activates osteocalcin, the major noncollagen protein in bone and a specific marker of bone formation.

Copper, manganese, and zinc make up an essential trio in bone metabolism as cofactors for specific enzymes. Calcium, magnesium, phosphorus, trace minerals, and protein are components of bone tissue and are all found in microcrystalline hydroxyapatite (MCHA) in their natural ratios.

ACTIVE INGREDIENTS

Each non-GMO vegetable capsule contains:

Calcium hydroxyapatite (freeze-dried MCHA)	583.33 mg
Providing:	
Calcium (from calcium hydroxyapatite*)	145.83 mg
Phosphorus (from calcium hydroxyapatite*)	72.83 mg
Protein (from calcium hydroxyapatite*)	145.83 mg
Magnesium (from magnesium bisglycinate)	72.83 mg
Zinc (from zinc picolinate)	1.67 mg
Manganese (from manganese citrate)	500 mcg
Vitamin C (ascorbic acid)	8.33 mg
Vitamin D (cholecalciferol) [166.67 IU]	4.17 mcg
Boron (from boron citrate)	500 mcg
Horsetail (*Equisetum arvense*), 7% silica	4.17 mg
L-Taurine (2-aminoethanesulfonic acid)	8.33 mg
Glutamic acid hydrochloride	8.33 mg
Copper (from copper gluconate)	170 mcg (167 mcg for boron-free)
Vitamin K_2 (menaquinone-7)	16.67 mcg

* From New Zealand beef. Guaranteed free of bovine spongiform encephalopathy (BSE) and recombinant bovine growth hormone (rBGH).

Other ingredients: Vegetable magnesium stearate and silicon dioxide in a vegetable capsule composed of vegetable carbohydrate gum and purified water.

This product is non-GMO.

Contains no: Gluten, soy, wheat, eggs, dairy, yeast, citrus, preservatives, artificial flavour or colour, or sugar.

Osteo SAP contains 145.83 mg of elemental calcium and 72.83 mg of elemental magnesium, a 2:1 ratio intended to provide bone support for individuals with risk factors for bone loss.

Osteo SAP contains 180 vegetable capsules per bottle.

DIRECTIONS FOR USE

Adults: Take 2 capsules three times daily with food or as directed by your healthcare practitioner. If you are taking other medications, take this product a few hours before or after them.

INDICATIONS

Independent use of **Osteo SAP** three times daily is expected to contribute to the uptake and maintenance of calcium and magnesium for the prevention of osteoporosis.

FEATURES

Osteo SAP:

- Supplies a compatible and complementary blend of New Zealand bovine microcrystalline hydroxyapatite (MCHA) calcium, minerals, vitamins, and amino acids to enhance bone-building osteoblasts, cells from which bones are formed.
- Contains the ideal elemental 2:1 ratio of calcium and magnesium with other cofactors to enhance calcium uptake for the prevention of osteoporosis.
- Supplies the most readily absorbable form of calcium phosphate (MCHA), the form found in human bones, and clinically proven to restore bone loss. It is free from pesticides, hormones, antibiotics and animal feed.

PURITY AND CLEANLINESS

All ingredients listed for all **Osteo SAP** lot numbers have been tested by a third-party laboratory for identity, potency, and purity.

Scientific Advisory Panel (SAP): adding nutraceutical research to achieve optimum health

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WHAT IS OSTEOPOROSIS?

Osteoporosis is a disease characterized by low bone mass, structural deterioration, diminished bone strength, and increased risk of fracture.[1, 2] Osteoporosis can be specifically related to bone mineral density (BMD) as there is a continuous inverse association between BMD and risk of fracture.

In older adulthood, BMD and the risk for osteoporosis are characterized by the peak bone mass attained in adolescence and the rate of bone loss in later years. On average, women have lower BMD than men. Furthermore, heredity, age, ethnicity and a large number of environmental factors influence BMD and risk of osteoporotic fracture. In North America, 1 in 2 women and 1 in 4 men aged over 50 will fracture at some point in their lifetime.[2]

Currently, 1.5 million osteoporotic fractures of the hip, spine, wrist, and other sites occur each year, predominantly in postmenopausal white women. Moreover, hip and spine fractures often play a severe role in disability, dependence and increased risk of death.[1]

NUTRITION THERAPY IN THE PREVENTION OF OSTEOPOROSIS

Calcium — In adults, calcium accounts for 1 to 2% of human body weight with over 99% of total calcium found in bones and teeth. In bone, calcium is mainly present in the form of hydroxyapatite ($Ca_{10}(PO_4)_6(OH)_2$), with calcium making up 40% of bone mineral and bone mineral contributing to 40% of bone weight.[1, 3]

Bone is a dynamic tissue that is constantly undergoing osteoclastic bone resorption and osteoblastic bone formation. Calcium is necessary for bone health and is an important determinant of peak bone mass, thus helping to prevent osteoporosis.[1, 2]

Prospective studies indicate that increasing dietary calcium intake from 900 to 1500 mg daily may reduce the rate of bone loss in premenopausal women. Furthermore, controlled trials of supplementation with ≥ 500 mg of calcium (ideally in addition to 700 IU of vitamin D) daily for over a year in men and postmenopausal women demonstrate a reduction in rates of bone loss from the spine, hip, and total body. Discontinuation of supplemental calcium and vitamin D has been associated with a loss of BMD. Currently, Health Canada and the FDA have approved a health claim for dietary calcium and vitamin D, and a reduced risk of osteoporosis.

Phosphorus — Phosphorus is an essential mineral involved in bone mineralization, bone structure and most metabolic processes in the body.[1] Approximately 80% of phosphorus in the body is found in bones and teeth as calcium phosphate crystals or hydroxyapatite. Furthermore, although calcium makes up 40% of bone mineral, phosphate accounts for nearly 60%. Thus, phosphorus is fully as important for bone building as is calcium.

Phosphorus is crucial for calcium absorption and utilization. Imbalance of the phosphorus/calcium ratio can interfere with calcium absorption, contributing to osteoporosis risk. Dietary phosphorus deficiency can limit osteoblast-mediated bone formation and enhance osteoclast-mediated bone resorption.[1, 2]

Protein — Protein is critical for a healthy skeleton, and dietary protein plays an important role in bone health and the prevention of osteoporosis. A human study found that protein supplementation for 6 months in patients with recent hip fractures significantly lowered the rate of bone loss from the hip over a 1-year period.[1] Additionally, the protective effect of dietary protein on bone loss seems to show most benefit in individuals with higher calcium intakes.[1] The Framingham Osteoporosis Study revealed that elderly women and men with relatively lower protein intake had increased bone loss, supporting the importance of dietary protein in bone health maintenance in the elderly.[4]

Magnesium — Approximately half of the body's store of magnesium is found in bone tissue.[1] Magnesium influences bone matrix and mineral metabolism, and magnesium depletion leads to cessation of bone growth, decreased osteoblastic and osteoclastic activity, osteopenia, and bone fragility.[5]

Magnesium prevents bone fragility by directly affecting hydroxyapatite crystal formation and stabilizing amorphous calcium phosphate. Furthermore, magnesium regulates active calcium transport and metabolism. Magnesium deficiency can be a risk factor for postmenopausal osteoporosis.[3] In a 2-year study of menopausal women, magnesium therapy prevented fractures and led to a significant increase in bone density.[5]

Manganese, Zinc, and Copper — These three trace minerals are cofactors for enzymes essential to bone-tissue synthesis and maintenance.[1, 6] During a 2-year trial of postmenopausal women, the effect of these three trace minerals on bone loss at the spine, alone or in combination with calcium, was studied and revealed no decline in spine BMD as compared to a 3.5% loss of BMD in the control group.[1]

Vitamin C — The formation or cross-linking of matrix proteins and collagen fibrils, necessary to build and maintain bones, cartilage and joints, is dependent on vitamin C as well as copper, zinc, and manganese.[1] Interference with cross-linking results in structurally weak bone. Thus, vitamin C is essential for proper calcification of bones (the process giving strength and hardness to bones).

Epidemiological studies have observed a positive association between vitamin C intakes and bone mass, where low intakes of vitamin C were associated with increased rate of BMD loss. Similarly, another study revealed that higher vitamin C intake was inversely associated with fractures.[2]

Vitamin K — Vitamin K is a fat-soluble vitamin that is involved in blood coagulation, is required for bone metabolism, and assists in reducing urinary calcium excretion.[1, 2]

Vitamin K_1 (phylloquinone) is present in green leafy vegetables and other plants, whereas vitamin K_2 (menaquinone) is present in liver, meats, and foods prepared by fermentation, such as cheeses.[1, 2]

Vitamin K is a cofactor in the formation of the γ-carboxylation of glutamyl residues in the bone protein osteocalcin, matrix γ-carboxyglutamyl protein, and protein S. Deficiency of each of these vitamin K-dependent proteins is associated with osteopenia.[1, 6]

Studies have found that a high concentration of undercarboxylated osteocalcin and low dietary phylloquinone intake, resulting in low concentration of serum vitamin K, are associated with lower BMD and increased risk of hip fracture.[1, 2]

Vitamin D_3 – Vitamin D is obtained from the diet in the forms of ergocalciferol (vitamin D_2) and cholecalciferol (vitamin D_3) as well as from cutaneous synthesis after exposure to sunlight.[1, 2] Vitamin D_3 is modified in the liver and kidney to make 1,25-dihydroxycholecalciferol (calcitriol), the most active metabolite of vitamin D.

The function of vitamin D is to maintain serum calcium and phosphorus concentrations through regulating calcium absorption from the intestine or calcium resorption from bone, and vitamin D is necessary for maintenance of healthy bone.

The role of vitamin D insufficiency in osteoporosis is strongly recognized. For men and women over 50 years of age, evidence suggests that the plasma level of 25(OH)D or calcidiol (clinical indicator of vitamin-D status) needed to minimize fracture risk is ≥ 80 nmol/L and that an intake of 800–1000 IU/d of vitamin D_3 is needed to bring the population average to this level.[1] A higher intake of vitamin D_2 would be needed to reach the same level.

Boron — Boron is a trace element that affects calcium, phosphorus and magnesium absorption and metabolism.[1] An increase in boron intake results in a decrease in urinary excretion of calcium, phosphorus, and magnesium, as well as in a simultaneous increase in serum estradiol levels.

Although the mechanism is unknown, it is proposed that boron is necessary for formation of certain steroid hormones or hydroxylation of 25(OH)D. Thus, dietary boron deficiency may lead to an increase in osteoporosis risk. Furthermore, research suggests a positive effect on bone health with 3 mg/d of boron supplementation.[2]

Silicon — Silicon has been shown to be important in the formation and strengthening of bone, and horsetail is a rich source of silicon. With dietary silicon depletion, both extracellular matrix (collagen) and bone mineral (hydroxyapatite) are compromised.[7] The average daily intake of silicon in the Western world is ~20–50 mg/d, and the major sources of dietary silicon are cereals/grains and some fruits and vegetables.

In a recent epidemiological study, silicon intake positively correlated with BMD at 4 hip sites in men and premenopausal women but not in postmenopausal women. The study concluded that higher silicon intake (>40 mg/d) in men and younger women may positively affect skeletal health, particularly cortical bone health.

Preliminary human study suggests benefit of silicon intake, but further research is needed before specific recommendations can be made.

Glutamic Acid and L-Taurine — Hydrochloric acid (HCl) is produced in the stomach and is needed in ionization and absorption of some forms of calcium. Numerous studies observe a reduction in gastric HCl secretion with advancing age, which can be associated with a reduction in available calcium for absorption.[8] Glutamic acid is a source of HCl to assist in the breakdown and uptake of calcium. L-Taurine is a nonessential sulfonic amino acid that also aids in the absorption of minerals such as magnesium.

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