Milk calcium, vitamin D with zinc, magnesium and phosphorus in bone health

ADVANTAGES OF MILK MINERAL CONCENTRATE
Recently, researchers have been investigating a source of calcium called “milk calcium,” a concentrated source of calcium and other minerals derived from milk. Besides calcium, it includes minerals important for bone growth such as phosphorus, magnesium, potassium, sodium, iron, and zinc.

Phosphorus is needed for effective calcium absorption and bone repair. Milk calcium provides the 2:1 calcium to phosphorus ratio that is optimal for enhancing bone density, according to recent research.

Research published in the Journal of the American College of Nutrition showed that as calcium intake increases without an increase in phosphorus, total phosphorus absorption falls and the risk for phosphorus deficiency increases. In a follow-up study published in The Lancet, researchers found that an increase in bone mass in prepubertal girls whose diets were supplemented with milk calcium lasted several years after the study even without further supplementation.

CALCIUM INTAKE IN ELDERLY PATIENTS WITH HIP FRACTURES
Calcium supplementation and pharmacotherapy are recommended in the preventive management of osteoporosis. Many previous studies report of underdiagnosis and undertreatment of osteoporosis among elderly patients with hip fractures.

Experts found that the dietary calcium intake of these elderly patients with hip fractures is insufficient. They would benefit from dietary education and calcium supplements to prevent deterioration in bone density and subsequent osteoporotic fractures.

CALCIUM OR CALCIUM/ VITAMIN D₃: A META-ANALYSIS IN PEOPLE AGED 50 YEARS OR OLDER
Experts did a meta-analysis to include all the randomized trials in which calcium, or calcium in combination with vitamin D₃, was used to prevent fracture and osteoporotic bone loss.

They found that in trials that reported fracture as an outcome (17 trials, n=52 625), treatment was associated with a 12% risk reduction in fractures of all types (risk ratio 0.88, 95% CI 0.83-0.95; p=0.0004). In trials that reported bone-mineral density as an outcome (23 trials, n=41 419), the treatment was associated with a reduced rate of bone loss of 0.54% (0.35-0.73; p<0.0001) at the hip and 1.19% (0.76-1.61%; p<0.0001) in the spine. The fracture risk reduction was significantly greater (24%) in trials in which the compliance rate was high (p<0.0001). The treatment effect was better with calcium doses of 1200 mg or more than with doses less than 1200 mg (0.80 vs 0.94; p=0.006), and with vitamin D₃ doses of 800 IU or more than with doses less than 800 IU (0.84 vs 0.87; p=0.03).

VITAMIN D STATUS FOR PREVENTION AND TREATMENT OF BONE HEALTH
Vitamin D₃ (cholecalciferol) sufficiency is essential for maximizing bone health. Vitamin D₃ enhances intestinal absorption of calcium and phosphorus. The major source of vitamin D₃ for both children and adults is exposure of the skin to sunlight.

Season, latitude, skin pigmentation, sunscreen use, clothing and aging can dramatically influence the synthesis of vitamin D₃ in the skin. Serum 25-hydroxyvitamin D₃ [25(OH)D₃; calcifediol] is the best measure of vitamin D₃ status. Vitamin D₃ deficiency [as defined by...
a serum 25(OH)D level of <50 nmol/L (<20 ng/mL) is pandemic. This deficiency is very prevalent in osteoporotic patients.

Conversion into the active metabolite 1,25-dihydroxyvitamin D₃ (1,25(OH)₂D₃) from the precursor is effected by cytochrome P450 enzymes in the liver (CYP27A1 and CYP2R1) and the kidney (CYP27B1). CYP27A1 has been shown to be transcriptionally regulated by nuclear receptors (PPARalpha, gamma, HNF-4alpha and SHP) which are ligand-dependent transcription factors. CYP27B1 is tightly regulated by the plasma levels of calcium, phosphate, parathyroid hormone (PTH) and 1,25(OH)₂D₃ itself. In vitamin D₃ target organs, inactivation of vitamin D₃ is attributed to CYP24A1 which is transcriptionally induced by 1,25(OH)₂D₃ whose action is mediated by binding to its cognate nuclear receptor, the vitamin D receptor (VDR).

Vitamin D₃ deficiency causes muscle weakness, increasing the risk of falls and fractures, and should be aggressively treated with pharmacological doses of vitamin D₃. Vitamin D₃ sufficiency can be sustained by sensible sun exposure or ingesting at least 800-1000 IU vitamin D₃ daily. Patients being treated for osteoporosis should be adequately supplemented with calcium and vitamin D₃ to maximise the benefit of treatment.

Vitamin D₃ insufficiency is highly prevalent among postmenopausal women with osteoporosis and in the elderly. Supplements of vitamin D₃ (cholecalciferol), and to a lesser extent vitamin D2 (ergocalciferol), may decrease falls and fracture risk by 25%. Despite some recent negative studies, the actual question is not to know whether vitamin D₃ is necessary, but rather how much vitamin D₃ is sufficient to prevent secondary hyperparathyroidism, falls and fractures. Moreover, the risk of osteoporosis and of fragility fractures may be influenced by genetic variation in the vitamin D receptor (VDR).³⁵

CHOLECALCIFEROL IN FALLS AND FRACTURE: A META-ANALYSIS

Experts evaluated the effect of supplementation with vitamin D₃ (cholecalciferol), and to a lesser extent vitamin D₂ (ergocalciferol), on the risk of fall and fracture, primarily in postmenopausal women, using a systematic literature review of MEDLINE, EMBASE, BIOSIS and the Cochrane Database of Systematic Reviews for the period January 1985 to June 2005.

The primary meta-analyses examined the effect of vitamin D₃ on the risk of fall or fracture, primarily in postmenopausal women, using a systematic literature review of MEDLINE, EMBASE, BIOSIS and the Cochrane Database of Systematic Reviews for the period January 1985 to June 2005.

The pooled relative risk (RR) for vitamin D₃ preventing falls was 0.88 (95%CI 0.78-1.00). For fractures, the pooled RR for vitamin D₃ preventing non-vertebral fractures was 0.96 (95%CI 0.84-1.09) and the pooled RR for vitamin D₃ preventing vertebral fractures was 1.22 (95%CI 0.64-2.31).

In a subgroup analysis of post-menopausal women, the pooled RR for vitamin D₃ preventing falls was 0.92 (95%CI 0.75-1.12) and in preventing non-vertebral fractures the pooled RR was 0.81 (95%CI 0.48-1.34). There is a trend towards a reduction in the risk of fall among patients treated with vitamin D₃ alone compared with placebo, suggesting that vitamin D₃ should be an integral part of effective osteoporosis management.⁶

EFFECTS OF ZINC ON BONE NODULES

Zinc is an important mineral that is required for normal bone development. The objective of this study was to determine the effects of zinc on the differentiation of SaOS-2 human osteoblastlike cells and the formation of mineralized bone nodules. Cells were cultured for 8 days and then transferred to zinc-free medium and treated with varying concentrations (0-50 microM) of zinc. Alkaline phosphatase (ALP) activity was used as a measure of osteoblast differentiation, and bone nodules were detected by von Kossa staining.

After 4 days, 6 days and 8 days of treatment, zinc increased ALP activity at 1 and 10 microM, but decreased activity at 50 microM. After 9 days of treatment, zinc increased both the number and area of mineralized bone nodules at low concentrations (1 and 10 microM), but decreased both at higher concentrations (25 and 50 microM). These findings demonstrate that zinc has biphasic effects on the differentiation and mineralization of human osteoblast-like cells.⁷

MAGNESIUM AND BONE METABOLISM

About half the total magnesium (Mg) of the body is existed in bone. Bone is one of the main Mg pools in the body. Epidemiologic studies have demonstrated a positive correlation between Mg intake and bone mineral density. It is also reported that Mg deficiency induced a decrease in osteoblasts number, an increase in osteoclasts number and a decrease in bone strength in rats. In contrast, dietary Mg supplementation improved bone formation, bone resorption and bone strength in ovariectomized rats. Mg deficiency is known as a risk factor for osteoporosis, since Mg is essential mineral for normal bone growth. However, the detail of effects of Mg on bone metabolism remains unclear.⁸

DIET, NUTRITION AND BONE HEALTH

Osteoporosis is a major public health problem, affecting millions of individuals. Nutrition is an important “modifiable” factor in the development and maintenance of bone mass and in the prevention of osteoporosis. Diet should be nutritionally balanced with caloric intake adequate to requirement of individual. This should be a moderate intake of protein (1 g/kg/day), normal in fat and carbohydrates should provide 55-60% of the caloric intake. A moderate intake of proteins is associated with normal calcium metabolism and presumably doesn’t alter bone turnover.

An adequate intake of alkali-rich foods may help promote a favourable effect of dietary protein on the skeleton. Lactose intolerance may determine calcium malabsorption or may decrease calcium intake by elimination of milk and dairy products.

Diet should be characterized by food containing high amount of calcium, potassium, magnesium and low amount of sodium. If it is impossible to reach the requirement with only diet, there is need to

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<td>CADMILK FORTE</td>
<td>Elemental Calcium 400 mg, Elemental Phosphorus 200 mg (From milk Mineral Concentrate), Magnesium Hydroxide IP eq to Elemental Magnesium 100 mg, Zinc Sulphate IP eq to Elemental Zinc 4 mg, Vitamin D3 IP 200 IU</td>
<td>10 Tablets</td>
<td>Once or twice daily</td>
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supplement with calcium and vitamin D. Calcium and vitamin D are the mainstays of nutritional intervention for the prevention and treatment of osteoporosis. However, conditions that alter nutritional status as well as other nutrients should be considered when diagnosing and treating osteoporosis and osteopenia. Inadequate intake of nutrients important to bone increases the risk for bone loss and subsequent osteoporosis.

The improvement of calcium intake in prepubertal age translates to gain in bone mass and, with genetic factor, to achieve Peak Bone Mass (PBM). Individuals with higher PBM achieved in early adulthood will be at lower risk for developing osteoporosis later in life.

After achieving the PBM, it is important to maintain the bone mass gained and reduce the loss. This is possible adopting a correct behaviour eating associated to regular physical activity and correct life style.

The process of bone formation requires an adequate and constant supply of nutrients, such as calcium, protein, magnesium, phosphorus, vitamin D, potassium, and fluoride. Other nutritional considerations include nutrients such as vitamin B-12 and vitamin K that may reduce fracture risk by increasing bone mineral density as well as the improvement of bone microarchitecture.

Diet high in fruits and vegetables contribute nutrients such as magnesium associated with bone health and may also produce an alkaline environment, reducing calcium excretion and thus improving bone density.6-11

In a study the serum concentrations of magnesium, zinc and copper were measured in postmenopausal women with osteoporosis (n = 40), osteopenia (n = 40) or normal bone mineral density (n = 40) as classified on the basis of the T-score of the femur neck and dual energy X-ray absorptiometry results.

Mean concentrations of magnesium and zinc were significantly lower in osteoporotic women than in both osteopenic women and normal women. In addition, magnesium and zinc concentrations in osteopenic women were significantly lower than in normal women. There were no statistically significant differences observed between the osteopenic, osteoporotic and control groups with respect to copper levels. The clinical significance of these changes needs further elucidation, but trace element supplementation, especially with magnesium and zinc and perhaps copper, may have beneficial effects on bone density.12

**PREVENTION OF OSTEOPOROSIS BY MILK PRODUCTS**

Milk calcium concentrate from milk provides calcium and phosphorus and is an ideal supplementation for osteoporosis and calcium deficiencies. Being from milk source this is a 100% vegetarian supplement and additions of minerals and Vitamin D makes this product "Cadmilk Forte", a supplement of choice.

**REFERENCES**


**HIGHLIGHTS**

- **Milk calcium** is a concentrated source of calcium. Besides calcium, it includes minerals important for bone growth such as phosphorus needed for effective calcium absorption and bone repair. Milk calcium provides a 2:1 calcium to phosphorus ratio which is optimal for enhancing bone density, according to recent research.

- **Phosphorus** deficiency may make calcium supplementation less effective and could lead to increased bone loss, according to the study. Other trials have shown that milk calcium’s higher bioavailability has a longer-lasting effect on bone mass.

- **Evidence** supports the use of calcium, or calcium in combination with vitamin D₃ supplementation, in the preventive treatment of osteoporosis in people aged 50 years or older.

- **Vitamin D₃** deficiency causes osteopenia, osteoporosis and osteomalacia, increasing the risk of fracture. Unlike osteoporosis, which is a painless disease, osteomalacia causes aching bone pain that is often misdiagnosed as fibromyalgia or chronic pain syndrome or is simply dismissed as depression.

- **Zinc** has biphasic effects on the differentiation and mineralization of human osteoblast-like cells. Magnesium deficiency is known as a risk factor for osteoporosis, since Mg is an essential mineral for normal bone growth. Trace element supplementation, especially with magnesium and zinc and perhaps copper, may have beneficial effects on bone density.
ALL CALCIUM ARE NOT THE SAME
MILK CALCIUM HAS THE TOP FAME

**CadMilk-Forte**
Natural Calcium with the Goodness of Milk.

- Meets the increased demand during growing phase.
- Helps build bones with greater bone density.
- In osteoporosis, helps to prevent bone loss & stabilizes bone density.
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- Contains vitamin D which increases calcium absorption.
- Does not interfere with iron absorption in Pregnancy & Lactation.
- Excellent Bioavailability
- Totally Hygienic.
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