

## Boosting Bone Density Naturally

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A flavonoid called icariin may join calcium and vitamin D as key weapons in the fight against osteoporosis.

In North America, osteoporosis is estimated to affect one in four women and one in four men over the age of 50, with complications from osteoporotic fractures accounting for more deaths each year than the combined mortality from breast and ovarian cancer in the Canadian female population. Many patients are seeking natural answers to the prevention and management of osteoporosis (and osteopenia), and many research investigations have been undertaken in recent years.

In addition to exercise, the best results have occurred from the use of supplements using various forms of calcium (e.g., carbonate, citrate, citrate-malate) and vitamin D, as well as supplementation with ipriflavone. Most recently, we have seen that the unique flavonoid icariin, derived from the horny goat weed plant, has an ability to increase bone density at the hip and lumbar spine in postmenopausal women. Health practitioners should be aware that horny goat weed with standardized icariin will likely soon replace ipriflavone in most bone supplements due to new legislation making ipriflavone available only by prescription in many countries.

### Searching for a Natural Way to Increase Bone Density

Many studies have suggested that calcium and/or vitamin D supplementation slows down bone loss after age 50 and decreases osteoporotic fractures. The search remained to identify ideal amounts of calcium and vitamin D that could *increase* bone density. One study demonstrated that supplementation with calcium carbonate (1,550 mg/day) and vitamin D (1,400 IU/day) increased bone density in postmenopausal women and men over age 50 who had previously sustained bone fractures. This was the first study to demonstrate that the combination of calcium with vitamin D (in the absence of exercise) could increase bone density in individuals who were at high risk for osteoporotic fractures. Note that those who exercised showed the greatest increase in bone density. Thus, it appears prudent for individuals 50 and older (and possibly starting at a younger age) to supplement with calcium and vitamin D, along with participating in regular exercise, as a natural means to prevent and reverse bone loss.

### Ipriflavone: Two Sides to the Story

Prior to this, the only other natural agent shown to improve bone density was a supplement known as ipriflavone. This is a semi-synthetic agent produced chemically from either genistein or diadzein (the common flavonoids found in soybeans). There is little naturally occurring ipriflavone in plants and food. It is primarily a man-made agent that has been shown to improve bone density in postmenopausal women. There is considerable evidence to show that it inhibits osteoclasts and appears to stimulate osteoblasts to build more bone. The liver metabolizes ipriflavone into 7-hydroxy-ipriflavone and 7-(1-carboxy-ethoxy)-isoflavone. Ipriflavone and its derivatives are then bound to albumin and distributed to tissues throughout the body.

The downside to ipriflavone is that it can produce lymphocytopenia (which is reversible prior to

discontinuation) and it acts in a similar manner as the flavonoid in grapefruit juice (naringin), inhibiting certain detoxification enzymes in the liver and thus potentiating the effects of caffeine and drugs such as celecoxib (Celebrex), cyclobenzaprine (Flexeril), NSAIDs, and warfarin (Coumadin). It may also potentiate the effects of bisphosphonates for the treatment of osteoporosis, calcitonin, estrogen and selective estrogen receptor modulators (SERMs).

Ipriflavone is classified as a drug in Japan, Argentina and many parts of Europe, where it is available by prescription only and used for the prevention and treatment of osteoporosis and osteopenia. The Canadian government has also changed the status of ipriflavone from a supplement to a drug. This means that ipriflavone must be removed from all supplements sold in Canada. The U.S. government is closely monitoring the results of ipriflavone research studies and may classify it as a drug in the near future, in which case it will not be available without a prescription from a medical doctor.

#### Icariin As an All-Natural Alternative: Research Findings Are Promising

Icariin is a flavonoid glycoside compound derived from several species of plants in the epimedium family, which are commonly known as horny goat weed or *yin yang huo*. A number of experimental and human studies have shown that icariin can inhibit osteoclastic activity of bone as well as stimulate osteoblast activity, which has been linked to a possible therapeutic role in the treatment of osteoporosis.

One study showed that icariin could increase bone density in postmenopausal women. Researchers in China recruited 85 healthy, late postmenopausal women, and randomly assigned them to receive either a daily dose of epimedium (60 mg icariin, 15 mg daidzein, and 3 mg genistein) or placebo. All women received a daily calcium supplement (300 mg). After two years of supplementation, bone mineral density at the hip (femoral neck) and lower spine (lumbar) had increased by 1.6 and 1.3 percent, respectively, in the epimedium group, and decreased by 1.8 percent and 2.4 percent, respectively, in the placebo group. The researchers stated, "The difference in lumbar spine between the two groups was significant at both 12 and 24 months, whereas the difference in the femoral neck was marginal at 12 months and significant at 24 months."

The women supplemented with epimedium showed a 39 percent decrease in levels of deoxyuridinoline (a urinary marker of bone resorption) after two years, whereas urinary levels of deoxyuridinoline were unchanged in women in the placebo group. In addition, no increase in endometrial (lining of the uterus) thickness was observed in either group, nor were there any other changes consistent with risk of endometrial cancer. By comparison, there are concerns that ipriflavone may increase risk of uterine cancer by acting as a selective estrogen receptor modulator on uterine tissue. This was the first human study to show that supplementation with epimedium can increase bone density in the hip and lumbar spine in postmenopausal women. It is important to note that the dosage of icariin was 60 mg/day. This appears to be the critical daily dosage at which increase in bone density is likely to occur.

#### A Comprehensive Approach

At present, the pharmaceutical approach to the prevention and treatment of osteoporosis remains problematic. Many women report untoward side effects from the use of bisphosphonate drugs, and compliance is often very poor. The same is true for other osteoporosis drugs with respect to adverse side effects, complications, contraindications and drug-drug interactions.

Complementary health care practitioners are in a position to counsel patients on preserving and improving their bone density, and the critical importance of doing so, with respect to morbidity

mortality and quality of life. In addition to regular weight-bearing exercise, supplementation with calcium and vitamin D, as well as ipriflavone and icariin flavonoid, are the only evidence-based natural agents shown to increase bone density in postmenopausal women and other high-risk individuals.

Of course, bones also require other nutrients. Vitamin C, zinc, copper, manganese and B vitamins can easily be provided by a high-potency multivitamin and mineral supplement, and adequate vitamin K is provided by gut bacteria and green leafy vegetables. In addition, the newest generation of bone-support supplements provide additional amounts of calcium, vitamin D, magnesium, boron, silica and icariin at levels that enable individuals to achieve intake levels consistent with the those reported in this research review.

### Resources

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