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# Phytoestrogens and Bone Health

Many postmenopausal women are looking for alternatives to hormone therapy, especially in light of research findings in 2003 from the Women's Health Initiative. With major funding from the National Institutes of Health, this initiative studied the risks of combined estrogen and progestin therapy, among other health issues of critical importance to postmenopausal women. Of particular interest are phytoestrogens, which have been gaining popularity because they are marketed as "natural," because of the alleged health benefits they provide, and because they are available in a wide range of foods and supplements. This fact sheet provides an overview of phytoestrogens and discusses their potential role in osteoporosis prevention and treatment.

## What Are Phytoestrogens?

Phytoestrogens are naturally occurring plant compounds that are similar in some ways to estradiol, the most potent naturally occurring estrogen. However, phytoestrogens tend to have weaker effects than most estrogens, are not stored in the body, and can be easily broken down and eliminated.

Observational studies have found a lower prevalence of breast cancer, heart disease, and hip fracture rates among people living in places like Southeast Asia, where diets are typically high in phytoestrogens. As a result of these studies, a great deal of interest has been generated in the United States about the health benefits of phytoestrogens. According to the Food and Drug Administration, the sale of soy foods, a major source of phytoestrogens, has increased dramatically in the past decade.

## **Dietary Sources of Phytoestrogens**

Phytoestrogens consist of more than 20 compounds and can be found in more than 300 plants, such as herbs, grains, and fruits. The three main classes of dietary phytoestrogens are isoflavones, lignans, and coumestans:

- **Isoflavones** (genistein, daidzein, glycitein, and equol) are primarily found in soy beans and soy products, chickpeas, and other legumes.
- **Lignans** (enterolactone and enterodiol) are found in oilseeds (primarily flaxseed), cereal bran, legumes, and alcohol (beer and bourbon).
- **Coumestans** (coumestrol) can be found in alfalfa and clover.

Most food sources containing these compounds typically include more than one class of phytoestrogens.

## **The Skeletal Effects of Phytoestrogens**

Much of the evidence concerning the potential role of phytoestrogens in bone health is based on animal studies. In fact, soybean protein, soy isoflavones, genistein, daidzein, and coumestrol have all been shown to have a protective effect on bone in animals whose ovaries – female reproductive organs that produce estrogen and progesterone – had been surgically removed.

In humans, however, the evidence is conflicting. Studies show that compared to Caucasian populations, those in Hong Kong, China, and Japan – where dietary phytoestrogen intakes are high – experience lower rates of hip fracture. Yet, according to the Surgeon General's Report on Bone Health and Osteoporosis, spine fractures are almost as common in Asian women as they are in white women. In addition, reports suggest that Japanese women have a greater risk of sustaining a vertebral fracture than Caucasian women.

Several studies have explored the effects of soy isoflavones on bone health, but results have been mixed, ranging from a modest impact to no effect. Most of these studies have serious limitations, including their short duration and small sample size, making it difficult to fully evaluate the impact of these compounds on bone health.

## **Ipriflavone Supplements**

Ipriflavone, a synthetic isoflavone, has shown some promise in its ability to preserve bone in postmenopausal women. Ipriflavone has also been shown to have a protective effect on bone density in premenopausal women taking the treatment

called GnRH, which is for endometriosis. One of the side effects of this treatment is bone loss.

However, a definitive 3-year study of more than 400 postmenopausal women concluded that ipriflavone did not prevent bone loss. Additionally, the compound was linked to lymphocytopenia (a reduction in lymphocytes) in a significant number of study participants. Lymphocytes are a type of white blood cell that helps the body fight infection.

## **Risks and Benefits Are Unclear**

Some studies suggest that, unlike estrogen, phytoestrogens do not appear to increase the risk of breast or uterine cancer. This suggests that they may act more like SERMS (selective estrogen receptor modulators such as raloxifene and tamoxifen) than actual estrogens. However, in other studies, high isoflavone levels have been linked to an increased risk of breast cancer.

Clearly, additional research is needed to further evaluate the effects of phytoestrogens before any judgments regarding their safety and usefulness can be made.

Current research sponsored by the National Institutes of Health should provide important evidence concerning the safety of phytoestrogens and their potential role in the skeletal health of women after menopause.

## **Key Points**

Based on information available at this time, it is reasonable to make the following conclusions concerning phytoestrogens and bone health in postmenopausal women:

- Due to a lack of evidence and concerns about safety, supplementation with synthetic isoflavones (ipriflavone) is not recommended.
- Moderate amounts of foods containing phytoestrogens can be included in the diet.
- Postmenopausal women are encouraged to discuss their phytoestrogen consumption with their physicians.
- Available evidence concerning phytoestrogens and bone health is conflicting and incomplete. Research is currently underway to help clarify the health effects of these compounds.

## **Resources**

**For additional information on osteoporosis**, visit the National Institutes of Health Osteoporosis and Related Bone Diseases National Resource Center Web site at [www.niams.nih.gov/bone](http://www.niams.nih.gov/bone) or call 1-800-624-2663.

**For additional information on phytoestrogens**, visit the National Center for Complementary and Alternative Medicine Web site at [www.nccam.nih.gov](http://www.nccam.nih.gov) or call 1-888-644-6226 (toll-free call).

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### **For Your Information**

This publication contains information about medications used to treat the health condition discussed here. When this fact sheet was printed, we included the most up-to-date (accurate) information available. Occasionally, new information on medication is released.

For updates and for any questions about any medications you are taking, please contact the U.S. Food and Drug Administration at 1-888-INFO-FDA (1-888-463-6332, a toll-free call) or visit their Web site at [www.fda.gov](http://www.fda.gov).