

# Intake of Fermented Soybeans, Natto, Is Associated with Reduced Bone Loss in Postmenopausal Women: Japanese Population-Based Osteoporosis (JPOS) Study

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Publication: Journal of Nutrition. 136:1323-1328, May 2006

Osteoporosis is an important disease, which mainly affects women after menopause. Nutrition plays an important role in the prevention of osteoporosis. Intake of calcium, magnesium, vitamin D and protein play an important role. Recently there is evidence that also vitamin K may play a protective role. Vitamin K exists in two forms: *phylloquinone* (found in plants) and *menaquinone-7* (produced by bacteria). Natto, a typical Japanese fermented soy product may help to prevent osteoporosis. Natto contains large amounts of menaquinone-7: about 350 microgram per 40g. Epidemiological studies have already illustrated that Japanese women have lower rates of hip fractures than Western women. Other studies have already shown that intake of *menaquinone*, at rather high dosage, resulted in less bone mass density reduction.

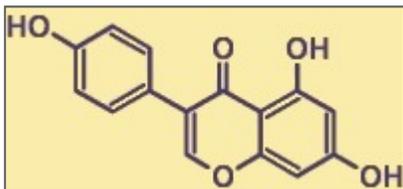
The aim of the study was to investigate the relationship between natto intake and bone mineral density in healthy Japanese women. The body mass index of 994 women was measured at the spine, hip and forearm at baseline and after a period of 3 years. The researchers found that the body mass index of postmenopausal women increased with increasing dietary intake of natto. More specifically they found that ***natto intake resulted in reduced bone loss*** at the femoral neck and the distal third of the radius. No significant association was found between intake of other soy products and evolution of bone mass index. Natto is also rich in *isoflavones*, which may prevent osteoporosis through its estrogenic action. Natto contains higher levels of *isoflavone aglycones* than unfermented soy products such as tofu, which contains mainly *isoflavone glycosides*.

The study concluded that ***natto intake may help to prevent osteoporosis of postmenopausal women*** through the action of *menaquinone-7* or *bioavailable isoflavones*. More studies are required to eliminate the possible effect of protein and energy intake, and to determine whether the main protective effects of natto come from *menaquinone-7* or *isoflavones*.

## Isoflavones

The consumption of natto has many health benefits, including ***protection against breast cancer, prostate cancer, menopausal symptoms, heart disease and osteoporosis***. Many of the health benefits of soy are derived from its isoflavones. However some critics claim that isoflavones can increase the incidence of epithelial hyperplasia and cause goitre and hyperthyroidism. Isoflavones remain the subject of many scientific studies, as illustrated by

the more than 1700 scientific publications mentioning isoflavones in their title or abstract. Most of these studies show that isoflavones may have some health benefit.



The chemical structure of isoflavones is very similar to that of our own estrogen. Because of this similarity in structure, they can interfere with the action of our own estrogen. Depending on the type of estrogen receptor on the cells, isoflavones may reduce or increase the activity of estrogen. Isoflavones can compete with estrogen for the same receptor sites thereby decreasing the health risks of excess estrogen. They can also increase the estrogen activity. If during menopause the body's natural level of estrogen drops, isoflavones can compensate this by binding to the same receptor, thereby easing menopause symptoms as a result. The best way to consume isoflavones is in the form natto. Fermented soy (natto) contains many types of isoflavones, but the most beneficial are *genistein* and *daidzein*. The highest amounts of soy isoflavones can be found in soy natto and tempeh. Another natural source of isoflavones is red clover.

## Health benefits of isoflavones

Research in several areas of healthcare has shown that consumption of isoflavones may play a role in lowering risk for disease. They can fight disease on several fronts. The following potential health benefits are attributed to isoflavones:

- **Ease menopause symptoms** — Benefits of natto go beyond reducing long-term cancer risk. Recent studies have found that natto isoflavones can reduce menopause symptoms such as hot flashes and increase bone density in women. Indeed, many menopausal and post-menopausal health problems may result from a lack of isoflavones in the typical Western diet. Although study results are not entirely consistent, isoflavones from natto or red clover may be helpful for symptoms of menopause. A study carried out by "Health Test" in 2004 investigated the prescription behavior of 27 doctors of women with menopause symptoms. It showed that isoflavones were recommended twice (44%) as often as hormonal treatment (22%). The prescribed supplements were mainly based on the following plants: soy, black cohosh and hops.
- **Reduce heart disease risk** — Soy (natto) isoflavones also appear to reduce cardiovascular disease risk via several distinct mechanisms. Isoflavones inhibit the growth of cells that form artery clogging plaque. These arteries usually form blood clots which can lead to a heart attack. A review of 38 controlled studies on soy and heart disease concluded that natto is definitely effective for improving cholesterol profile. There is some evidence that isoflavones are the active ingredients in soy responsible for improving cholesterol profile.

- **Protect against prostate problems** — Isoflavones may be beneficial for men's health because they may protect against enlargement of the male prostate gland. Studies show isoflavones slowed prostate cancer growth and caused prostate cancer cells to die. Isoflavones act against cancer cells in a way similar to many common cancer-treating drugs.
- **Isoflavones improve bone health** — Soy Isoflavones help in the preservation of the bone substance and fight osteoporosis. This is the reason why people in China and Japan very rarely have osteoporosis, despite their low consumption of dairy products, whereas in Europe and North America the contrary happens. Unlike estrogen, which helps prevent the destruction of bone, evidence suggests that isoflavones may also assist in creating new bone. Other studies are not entirely consistent, but evidence suggests that *genistein* and other soy isoflavones can help prevent osteoporosis.
- **Reduce cancer risk** — Isoflavones seem to protect against tumors because they act against cancer cells in a way similar to many common cancer-treating drugs. Population-based studies show a strong association between consumption of isoflavones and a reduced risk of breast and endometrial cancer. Women who ate the most soy products, natto and other foods rich in isoflavones reduced their risk of endometrial cancer by 54%.

### **Isoflavones are natural plant hormones**

Isoflavones can be found in many foods but the best known source is the fermented soy bean natto (*Glycine max*). The soy isoflavones are responsible for most of the soy health benefits. The Soy bean is a plant cultivated as foodstuff whose health properties have recently been discovered. Thorough studies have revealed that the consumption of the soy beans have favorable effects on people's health. Another source of isoflavones is red clover. As opposed to soy beans, red clover is normally not eaten but the isoflavones are extracted in industrial processes and used to make isoflavones supplements.

### **Isoflavones are natural antioxidants**

A recent study has demonstrated that isoflavones have potent antioxidant properties, comparable to that of the well known antioxidant vitamin E. The antioxidant powers of isoflavones can reduce the long-term risk of cancer by preventing free radical damage to DNA. *Genistein* is the most potent antioxidant among the soy isoflavones, followed by *daidzein*.

## **Isoflavones and girls**

The consumption of isoflavones during the puberty, when the female breast develops, appears to protect the woman later in life against cancer. Studies show that women who ate weekly more than 3 portions of soy during adolescence showed a 40% reduced risk of breast cancer compared to those who did not consume soy. That's why it's important for girls to consume soy products or isoflavones supplements.

## **Isoflavones and menstrual cycle**

Isoflavones could increase the length of the menstrual cycle and moderate alter steroid hormone levels. A British study found that women who were given 60 grams of soy a day had longer menstrual cycles. Asian women, who ingest more soy on a daily basis, generally have longer menstrual cycles than Western women. Research suggests that the low Japanese breast cancer mortality rate may, in part, be due to consumption of food containing soy isoflavones. Levels of steroid hormones and menstrual cycle duration are known risk factors for breast cancer. An increased menstrual cycle is beneficial because this results in less time that the breast cells are exposed to higher estrogen levels.

## **Isoflavones and menopause**

During menopause the level of estrogen drops and causes common symptoms of menopause: hot flashes, insomnia, heavy sweating, mood swings, vaginal dryness and headaches.

## **Influence of soy based formula on women's health**

A cohort study by B.L. Strom of the University of Iowa showed that exposure of babies to soy-based formula does not appear to result in health or reproductive problems later in life. The interviewed 811 men and women between 20 and 34 year who participated as baby in a controlled feeding study decades before. They found no statistically significant differences between the two groups in either women or men for 30 parameters. They only noticed a slightly longer menstrual bleeding duration and a greater discomfort with menstruation among women who were nursed as baby with soy based formula.

## **Isoflavones and breast cancer risk**

Are soy isoflavones healthy or risky for breast cancer patients and survivors? Conflicting data from in-vivo and in-vitro studies have raised concern about isoflavones and the promotion or propagation of estrogen-sensitive cancers. But recent case-control study and epidemiological studies show an inverse correlation between isoflavones intake and breast cancer risk. Not enough studies have been done to determine whether or not high concentrations of isoflavones from supplements may encourage the growth of breast cancer. If you're taking soy supplements to treat menopausal symptoms, speak with your health professional about quantity of isoflavones that may be safe for you.

## **More literature about women's health and isoflavones**

*Soy, isoflavones, and breast cancer risk in Japan.* Journal of the National Cancer Institute, Vol. 95, No. 12, 906-913, June 18, 2003

*Alternative treatments for menopause symptoms. Systematic review of scientific and lay literature.* Can Fam Physician. 1998 Jun;44:1299-308

*Chemoprevention of Breast Cancer, Proteomic Discovery of Genistein Action in the Rat Mammary Gland.* Journal of Nutrition, 135:2953S-2959S, December 2005

## **Sources of isoflavones**

There are several natural sources of isoflavones but the most important ones are soy (natto) and red clover.

### **Red clover**

Red clover is a perennial plant with trifoliolate leaves and pink to red flowers. The plant derives its name in part from its flowers, which are fragrant and can range in color from white to a dark red. Red clover is a member of the legume family and has been used worldwide as a source of hay for cattle, horses and sheep and by humans as a source of protein in the leaves and young sprouts. Red clover is also medicinal plant for human use.

The beneficial effect of red clover isoflavones are very similar to that found with soy isoflavones. Isoflavones from red clover will reduce menopausal symptoms. Red clover isoflavones help maintain the density of the bones in both menopausal and pre-menopausal women. Red clover isoflavones have not shown a cholesterol reducing effect, probably because soy proteins take an important role for the cholesterol reducing effect.

### **Soy (natto) isoflavones**

Isoflavones are present in relatively large amounts in virtually all soy products, with the exception of soy-protein concentrate. Whole soy contains about 200 mg isoflavones per 100g. Soybeans contain three types of isoflavones in four chemical structures.