

# SUPPLEMENT Industry Executive™

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## Multi-Systemic Benefits of Soy © SIE

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Soy foods and certain soy constituents, particularly isoflavones, are becoming of increasing interest as nutritional agents. Research studies have shown that soy may have a positive effect on everything from menopausal symptoms to cancer, osteoporosis and heart disease. In 1999, the U.S. Food and Drug Administration (FDA) announced that eating 25 grams of soy protein a day lowers the risk of coronary heart disease, and ruled that any food containing at least 6.25 grams of soy protein per serving can carry a "healthy heart" label.

Chinese and Japanese, who for thousands of years used soybeans as a source of nutrition, have recognized the medicinal values of soybeans. Samuel Bowen introduced the soy plant from China to the American colonies in 1765. Large-scale production of soybeans in the U.S. began during the 1850s. In 1999, farmers planted soybeans on 72 million acres, amounting to 27 percent of the total crop area in the U.S. Soybeans are an economically important crop, valued at approximately \$15 billion annually, which serves as a source of protein for animals and humans.

Consumption of soy foods is increasing because of beneficial effects on health, which include lowering of plasma cholesterol and reducing the risk of heart disease, as well as prevention of cancer.

Soybeans and their products are consumed by humans in a variety of forms, including whole soybeans, tofu, and soymilk. Soy protein can be isolated from the whole bean for consumption through processing.

Soy is also rich in bioactive isoflavones, of which daidzein, genistein and glycitein are the main components. These sugar free (aglycon) isoflavones occur in soybeans in the glycosidic (glycone) form, meaning it is bound to a sugar molecule, and is referred to as daidzin, genistin, and glycitin. Isolated soy protein contains up to 50 percent of isoflavones found in unprocessed beans. The amount of the isoflavone genistein in

most soy products ranges from 1 to 2 mg per g protein.

These phytoestrogenic isoflavones mimic estrogen and hence they are capable of alleviating postmenopausal symptoms. The anti-estrogenic effects of these isoflavones are ascribed to their ability to bind estrogen receptor sites thereby making the receptors unavailable for binding by the natural, more potent estrogens of the body.

### **Bioavailability**

In one human study, ingestion of 40 g of isoflavone-rich vegetables for a period of five days significantly raised (1,000 times) the amount of isoflavones in the urine. Research also showed that the bioavailability of isoflavones depends on the efficiency of gut microflora to metabolize the glycosidic isoflavones. These isoflavones are first cleaved in the gut, and then absorbed into the blood.

Although most soy isoflavone products are sold in the glycon form, there are some unique products that supply isoflavones in the aglycon form. Hydrolyzing the isoflavone glycone frees up the bioavailable isoflavone from the sugar moiety.

Clinical studies examining the efficacy of isoflavones supplements must be carefully designed so as to rule out effects attributable to isoflavones in the diet, which may lead to false conclusions.

### **Cancer Prevention**

Epidemiological studies have indicated that high dietary intake of soybeans by Chinese and Japanese is associated with lower incidence of cancers, particularly cancers of the breast and prostate. The consumption of soy has also been indicated in the prevention of colorectal, lung, and gastric cancers.

The incidence rates of breast and prostate cancers are high in Western countries, such as the U.S., where consumption of soy foods is low as compared to Eastern countries. Asians consume about 10 to 35 g of soy foods daily per capita, which translates to a daily dose of 25 to 100 mg isoflavones. Conversely, Americans and Western populations ingest only a few milligrams or less of isoflavones per day. A recent survey showed the average intake of total isoflavones to be 15 mg per day, which is broken down to 7 mg genistein, 6 mg daidzein, and 2 mg glycitein.

The isoflavones genistein, daidzein, and glycitein in soy products have been shown to exhibit anticancer effects. Genistein has been recognized as the most potent of these compounds in inhibiting various processes in the development

of cancer including cell proliferation and transformation. For example, genistein has been found to inhibit the process of angiogenesis (the process of growth of new blood vessels into tissue) involved in the development of tumors. Genistein has also been shown to decrease the amount of reactive oxygen species produced by tumor cells.

Because of the similar chemical structure of these isoflavones and the hormone estradiol, it was hypothesized that these compounds may be related to the risk of breast cancer. However, a recent study showed that individuals with the highest levels of daidzein, glycitein and total isoflavonoids in their urine samples had about half the cancer risk than those with the lowest isoflavones levels. The study concluded that high intake of soy foods may reduce the risk of breast cancer.

Clinical studies also appear to support these epidemiological observations. In a case-control study, women with newly diagnosed early breast cancer with a high intake of isoflavones had a substantial reduction in breast cancer risk.

A recent review published in Journal of Nutrition also reported that isoflavone supplements do not affect breast tissue density in pre-menopausal women and may decrease density in postmenopausal women. These effects are opposite to those of hormone replacement therapy. The study suggested that breast cancer patients might benefit from soy products.

In a recent study, pre-menopausal women between the ages of 25 and 55 years, free of breast cancer, were randomly assigned to receive either a dietary supplement of isoflavones (40 mg per day) or a placebo for 12 weeks. The hormone estradiol and its metabolite estrone (anticipated to be a carcinogen) decreased significantly in the isoflavone-group as compared to the placebo. The study suggested that increased isoflavone intake affects estrogen metabolism, thereby demonstrating a potential to reduce the risk for breast cancer.

### **Cardiovascular Support**

Elevated plasma levels of low-density lipoprotein (LDL) and triglycerides present a risk for cardiovascular disease. Consumption of plant proteins, such as soy, often results in significant lowering of LDL and total cholesterol levels. Research showed that rats fed soy-based diets had lower serum cholesterol levels than those on a casein diet (animal protein). It was hypothesized that the cholesterol-lowering effect of soy protein is due to its ability to modulate LDL receptor levels in the liver.

Studies have also demonstrated the ability of soy to lower total

cholesterol and low-density lipoprotein (bad cholesterol) levels in humans. On the basis of a food-frequency questionnaire given to 4899 Japanese men and women, researchers noted decreasing plasma levels of cholesterol with increasing consumption of soy products.

Researchers also investigated the role of soy isoflavones on the risk of cardiovascular disease and menopausal symptoms in women consuming soy-based diets, and noted significant improvement in lipid and lipoprotein levels, and blood pressure symptoms.

A double-blind study suggests that even partial replacement of animal protein with a soy protein was effective in lowering of plasma cholesterol in 21 severely hyper-cholesterolemic patients.

Soy isoflavones have been suggested to have a role in coronary heart disease prevention. Consumption of a high-isoflavone soy diet (128.7 mg/day) by pre-menopausal women for three menstrual cycles lowered LDL cholesterol by 7.6 to 10 percent.

The health benefit of soy products in the cardiovascular area stems from their ability to lower total cholesterol and LDL-cholesterol, to reduce their susceptibility to oxidation, and to inhibit platelet aggregation.

### **Bone Health**

Soy isoflavones have also been found to promote healthy bones. Although calcium is the primary dietary factor that dictates the course of osteoporosis, other variables, including estrogen deficiency, exercise and protein composition of the diet, come into play to influence the overall maintenance of healthy bones. Diminished level of estrogens due to menopause, lack of exercise, and excessive protein intake all exert deleterious effects on bone integrity. To reduce these negative effects, the use of soy protein in combination with calcium has been suggested as an advantages way of promoting calcium uptake and bone strength.

Analysis of data from a study of women aged 42 to 52 years revealed that pre-menopausal Japanese women whose dietary soy isoflavones intakes were high had high spine and femoral neck body mineral density.

### **Women's Health Issues**

Currently, there is an interest among postmenopausal women to treat problems associated with menopause, such as hot flashes, with natural products as opposed to synthetic estrogen

drugs. Indeed, clinical research showed isoflavones reduced the incidence of hot flashes in menopausal women. These compounds may be designated as healthy alternatives to hormone replacement therapy.

A Japanese study on 284 women aged 40 to 59 years showed that consumption of fermented soy products significantly reduced hot flashes as compared to the control group.

In a double-blind, randomized study, postmenopausal women given 400 mg per day of a standardized soy extract (Soyselect), corresponding to 50 mg per day of isoflavones for six weeks showed a significant reduction in the number of hot flashes per week. The study concluded that Soyselect is safe and efficacious in relieving hot flashes in women who seek alternatives to hormone replacement therapy.

Apparently, too much of a good thing could be harmful, so one needs to have a balanced intake of soy products and soy supplements. A study published in the April issue of the Journal of the American College of Nutrition presented evidence that the brains of elderly people who ate tofu at least twice a week for 30 years were aging faster than normal. The estrogen-like substances in soy may also dampen the function of the thyroid. A study found that after consuming 40 mg of isoflavones for a few weeks, women experienced fatigue, and overall body aches. Some women gained weight and reported heavier menstrual periods.

### **Summary**

Soy products have long proven to be effective in Asian cultures, and are now becoming popular, both for men and women's health benefits. Soy proteins and isoflavones have been shown in various studies to combat cancer, osteoporosis, menopausal symptoms, gastrointestinal disorders, and cardiovascular diseases. SIE

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