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The Great Soybean Controversy: Part I – Effects on Heart Disease and Cancer

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Soy foods are a mainstay of Asian cuisines. The soybean has been cultivated in China for at least 3000 years and its most popular food varieties – tofu, soymilk and tempeh – have grown increasingly popular in the West in recent years. Soy foods offer an exceptional source of protein, are low in saturated fat (in contrast to the meat and dairy they often replace) and are also a good source of many other nutrients, including iron, calcium, dietary fiber, vitamins B1, B2, B6, E and folic acid.

Since 1995, when three *New England Journal of Medicine* articles provided landmark research supporting cardiovascular benefits of soy,[1-3] including significant decreases in total cholesterol, LDL cholesterol and triglycerides, there has been a groundswell of new research on soy, as well as an Internet-based backlash against the humble bean. Soy has been praised as a miracle food and lambasted as a poison.

Evidence and Context

Here at Cleveland Chiropractic College, we strongly believe that when such controversies erupt, the proper response is to examine studies in the peer-reviewed scientific literature, which by now contains a substantial body of evidence evaluating the health effects of soy. But because individual research articles may be flawed or misleading, it is even more important to read research summaries from trustworthy sources that take a broad view of the entire body of research and apply it to day-to-day practice. Students and practitioners need to see the forest as well as the individual trees; they need appropriate context and an appreciation of complexity. In the long run, this is far better than aiming for quick-and-easy, all-or-nothing conclusions. When it comes to human nutrition and to health-related goals in general, attempting to make one single food or nutrient, or any single type of treatment, the be-all and end-all is usually a false path.

A Food, Not a Drug

When evaluating the helpfulness of any food, it is important to see it first and foremost as *one part of the overall diet* and not as a silver-bullet answer to the symptoms or signs of a particular disease. That is, it should be seen as a food and not a drug. From this perspective, soy can be appreciated a source of valuable nutrients and a potential replacement for less healthy foods. It should not been viewed as a single-agent cure for high cholesterol, coronary heart disease, prostate cancer, or any of the other health issues to which it has been linked.

Cardiovascular Effects

Since 1999, the U.S. Food and Drug Administration has permitted foods containing soy protein to advertise their heart-healthy qualities. As noted by the FDA at the time, "This final rule is based on the FDA's conclusion that foods containing soy protein included in a diet low in saturated fat and cholesterol may reduce the risk of CHD [coronary heart disease] by lowering blood cholesterol levels … Foods that may be eligible for the health claim include soy beverages, tofu, tempeh, soy-based meat alternatives, and possibly some baked goods."

Foods containing soy qualified (and still qualify) for this nutrition claim because the FDA concluded that sufficient research justified the claim. However, as further research has emerged in the intervening years, the evidence for these specific cardiovascular claims has weakened. In 2006, a panel representing the American Heart Association (AHA)

Nutrition Committee published a report[4] summarizing new research which concluded that, "isolated soy protein with isoflavones compared with milk or other proteins decreased LDL cholesterol concentrations in most studies; the average effect was approximately 3%. This reduction is very small … no benefit is evident on HDL cholesterol, triglycerides, lipoprotein(a), or blood pressure. Thus, the direct cardiovascular health benefit of soy protein or of isoflavone supplements is minimal at best."

The AHA panel nonetheless spoke quite positively about soy as a food, noting that "many soy products should be beneficial to cardiovascular and overall health because of their high content of polyunsaturated fats, fiber, vitamins, and minerals and low content of saturated fat." However, they advised against use of soy isoflavone supplements.

Cancer

When evaluating the possible relationship of soy and cancer, it is best to make two key distinctions. First, possible preventive effects for people who have never had cancer should be distinguished from potential effects on people who have (or previously had) cancer. Second, it is probably best to discuss each type of cancer separately rather than make across-the-board generalizations about all cancers. Breast cancer may differ in significant ways from prostate or colon cancer, in terms of prevention and the dietary management of diagnosed cancers.

Prostate Cancer Prevention

Bottom line: There is strong evidence that soy helps prevent prostate cancer.

An informed consensus has emerged among the scientists who closely study the issue – soy appears to be protective against prostate cancer. A 2009 meta-analysis[5] by Yan and Spitznagel, published in the *American Journal of Clinical Nutrition,* concluded that consumption of soy foods was associated with a lowered risk for prostate cancer. Lin Yan, PhD, the study's lead author and a research nutritionist for the United States Department of Agriculture in North Dakota, stated in a recent lecture that, based on current research and knowledge of traditional patterns of use in Asian societies, up to three servings per day of soy foods is beneficial.

Prostate Cancer Treatment

Bottom line: There is preliminary evidence that soy may play a supportive role in the treatment of prostate cancer, as part of a comprehensive lifestyle changes program.

Dean Ornish, MD, the cardiologist and University of California, San Francisco Medical School professor best known for his groundbreaking research proving that heart disease could be reversed[6, 7] through a combination of diet, exercise, stress management, and social support, has been deeply involved in prostate cancer research in recent years. Dr. Ornish's group has given early-stage prostate cancer patients a whole foods, low-fat, soy-supplemented vegan diet consisting predominantly of fruits, vegetables, whole grains (complex carbohydrates), legumes and soy products (1 daily serving of tofu plus a fortified soy protein powdered beverage), low in simple carbohydrates and with approximately 10% of calories from fat.

The results? After one year, none of the men in the experimental group needed to undergo conventional treatments compared to six in the control group. Prostate Specific Antigen (PSA) levels decreased 4% in the experimental group compared to a 6% increase in the control group, and prostate cancer cell growth was inhibited almost eight times as much in the experimental group compared to the control group.[8] Other promising but preliminary findings in this

ongoing prostate cancer research include positive changes in prostate gene expression[9] and increased telomerase activity.[10]

Ornish noted in a recent talk that research focused on dietary and lifestyle approaches for prostate cancer is possible because many men with slow growing, less aggressive prostate cancers choose not to pursue treatments such as surgery, radiation or chemotherapy. This is not true for breast cancer. The number of American women with breast cancer who elect not to undergo aggressive treatment is so small that research on dietary and lifestyle approaches (in the absence of surgery, radiation or chemotherapy) is currently impossible.

For further information on Dr. Ornish's work on prostate cancer and heart disease, visit the Preventive Medicine Institute website at www.pmri.org.

Breast Cancer Prevention

Bottom Line: There is strong evidence that eating soy regularly in childhood and adolescence (when breast tissues are forming) significantly lowers the risk of developing breast cancer later in life. It is not clear that beginning to eat soy foods in adulthood positively or negatively influences the risk of breast cancer.

By far the hottest current controversy on soy concerns its relationship to breast cancer. This remains controversial because studies have shown inconsistent results.

To begin with the least controversial area, there is strong evidence that when soy is eaten regularly by girls in childhood and adolescence, it is protective against the development of breast cancer later in life. As little as one soy food serving per day may reduce eventual incidence of breast cancer by 25-45%. These conclusions are based on four epidemiological studies.[11-14] Women who start eating soy later in life do not appear to attain anything approaching the breast cancer prevention benefit seen in women who have eaten soy their entire lives, including childhood and adolescence.

In 2006, an American Cancer Society panel headed by Lawrence Kushi, ScD, published guidelines on nutrition and physical activity for cancer prevention.[15] Their conclusions on soy:
Soy-derived foods are an excellent source of protein and a good alternative to meat. Soy contains several phytochemicals, some of which have weak estrogenic activity and appear to protect against hormone-dependent cancers in animal studies. Presently, there are limited data to support a potential beneficial effect of soy supplements on reducing cancer risk.[16] Furthermore, adverse effects of high doses of soy supplements on the risk of estrogen-responsive cancers, such as breast or endometrial cancer, are possible.[17]

The role of specific foods or nutrients in cancer prevention was also discussed by Messina and Wu in a 2009 article[18] on soy and breast cancer in the *American Journal of Clinical Nutrition*. They noted that "identifying dietary factors that affect breast cancer risk has proven to be particularly frustrating, because there are conflicting data on the role of dietary fat, fiber, and fruit and vegetables." The same is true for soy. The fact that intensive research in this area is ongoing makes it likely that the fog will clear in the coming years. For now, eating a varied whole foods diet and not eating vast amounts of any one food seems to be the best advice.

Breast Cancer Treatment

Bottom line: There is not yet a bottom line conclusion on this subject.

Because the phytoestrogens in soy are chemically related (though not identical) to (1) true (endogenous) estrogens made by the human body; (2) true estrogens eaten in the meat and milk of hormone-supplemented animals, and; (3) true estrogens taken as medicines (hormone replacement therapy, birth control pills), controversy has surrounded the use of soy or soy supplements by women with current or past breast cancer.

There is a major unresolved theoretical question. Do soy phytoestrogens helpfully block estrogen receptor sites in women so that true estrogens are unable to dock at these sites? Or do soy phytoestrogens harmfully dock at estrogen receptor sites and mimic the effects of actual estrogens, thus aggravating hormone-sensitive cancers such as breast cancer? If you are a past or present breast cancer patient, or a doctor treating such a patient, this is an extremely significant issue.

A 2006 American Cancer Society report[19] on nutrition and physical activity during and after cancer treatment, published by a team led by Colleen Doyle, MS, RD, director of nutrition and physical activity at the American Cancer Society, addressed the soy issue directly:

> Soy contains high levels of plant isoflavones that exert a variety of anticancer activities in laboratory studies. Perhaps because soy has the potential to produce both estrogenic and antiestrogenic effects, studies on soy and breast carcinogenesis have produced conflicting results. For the breast cancer survivor, current epidemiologic and laboratory evidence suggests there are unlikely to be harmful effects when soy is provided in the diet consistent with amounts in a typical Asian diet; whether such levels of soy intake may result in beneficial effects is also unclear. This amount would be provided by as many as three servings per day of soy foods, such as tofu and soy milk. However, because higher doses of soy may have estrogenic effects and because higher levels of estrogens clearly increase the risk for breast cancer progression, it is prudent for breast cancer survivors to avoid the high doses of soy and soy isoflavones that are provided by more concentrated sources such as soy powders and isoflavone supplements.

As mentioned earlier, research on this subject is continuing. A large 2009 California study[20] by Guha and colleagues followed women with breast cancer undergoing treatment with the widely-utilized chemotherapeutic agent, tamoxifen. These investigators found that the patients whose diets included the highest amounts of the soy isoflavone, daidzein, had approximately a *60% reduction in breast cancer recurrence* compared to those with the lowest levels. They concluded:

> Soy isoflavones consumed at levels comparable to those in Asian populations may reduce the risk of cancer recurrence in women receiving tamoxifen therapy and moreover, appears not to interfere with tamoxifen efficacy. Further confirmation is required in other large prospective studies before recommendations regarding soy intake can be issued to breast cancer survivors.

At a bare minimum, this study debunks the claim that soy has been proven to be harmful for women with breast cancer. It may be helpful. We don't yet know for certain. At this point, whether a breast cancer patient should eat soy, and in what amounts, is a personal decision to be undertaken with care.

In our next issue: Soy Controversies in the Media

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