

Estrogens, Phytoestrogens, Xenoestrogens and the Risk of Breast Cancer

by
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Questions and concerns have arisen regarding the risks and the benefits of soy products. Cooked soybeans (*edamame*), soy milk, tofu and other soy protein concentrates have long been held as beneficial for the prevention of heart disease^{1,2} as well as cancer^{3,4}. However, in recent years a growing cadre of soy critics have published books, written articles in prominent health publications, and uploaded their anti-soy ammunition on the internet. Hence, we find the soybean in a new and mostly undeserved crossfire of controversy. One of the major soy issues pertains to soy's estrogen-like effect.

Understanding how the metabolism of the bodies natural estrogens: estrone (E1), estradiol (E2), and estriol (E3) are affected by plant products which have estrogen-like activity, called appropriately phytoestrogens and environmental chemicals which also are reported to have an estrogen-like action on the body will help to explain the risks and benefits surrounding the soy controversy.

It is widely believed that long term estrogen exposure is a most critical breast cancer risk factor. Breast cancer risk in women increases with early menstruation, late menopause, long-term use of birth control pills, and estrogen replacement therapy.⁵ When women grow taller, gain weight, have fewer children, and have them later in life, they increase their lifetime exposure to estrogen and its associated risks for breast cancer.

Estrogen Metabolism

The primary estrogens estradiol (E2), which then converts into estrone (E1), are both eventually be broken down, primarily by the liver, and excreted from the body through bile or urine. The three types of metabolites called are 2-hydroxyestrone (C-2), 4-alpha-hydroxyestrone (C-4) or 16-alpha-hydroxyestrone (C-16).^{*} Some of these metabolites have stronger estrogenic effects and some weaker. Thus the type of metabolite produced as these estrogens break down either increase or decrease a woman's risk of woman's risk of breast, uterine, and other cancers.⁶

Considerable research has shown that the most abundant metabolites of estradiol and estrone are those that take the pathway of C-2 or C-16. Metabolites called C-4 also exist, but in lesser amounts. If a woman's normal estrogens are metabolized into the C-2 pathway, they lose much of their tendency to rapid cell division and produce a 'weaker' estrogenic effect, hence the term 'good' estrogen metabolites.⁷ Studies show that when

C-2 metabolites increase, the person resists breast or uterine cancer, and that when C-2 metabolites decrease, cancer incidence increases.⁸

Contrariwise, the C-4 and C-16 estrogen metabolites are different from the C-2 variety, because these metabolites have *more* estrogenic activity than their mother compound. Research strongly suggests that women who metabolize a larger proportion of their estrogens down the C-16 pathway, have elevated breast cancer risk.⁹ Further, C-16 metabolites may be directly toxic to the genetic material in the cells as well as carcinogenic!

Predicting Cancer Risks

In one recent study of 10,786 premenopausal women at the State University of New York at Buffalo, researchers found that those who went on to develop breast cancer had significantly less (C-2) and more (C-16) metabolites than women who did not. Following women for 5.5 years, they found that participants with increased levels of (C-2) had a 40 percent decrease in the occurrence of breast cancer.¹⁰ Other studies have confirmed the C-2 pathway metabolism predicts the reduction of breast and/or uterine cancer risk in American women.¹¹

Nutrition and Estrogen

In Asian countries where soy is a dietary mainstay, epidemiological studies have indicated that soy protein is quite protective in breast cancer, both in Chinese and Japanese women.¹² While soy protein is a complex mixture of nutrients and phytochemicals, it appears that part of its benefit is related to the isoflavones genistein and daidzein. Studies suggest that they change the way estrogens are metabolized, therefore improving the C-2:C-16 ratio. Both premenopausal women and postmenopausal women have been studied in this regard, demonstrating that isoflavones increase the beneficial C2 and decreasing the C16, therefore increasing the C-2:C-16 ratio.¹³

Lignans found in fiber-rich foods such as seeds (particularly flax seeds), grains, legumes and vegetables, contain phytochemicals that, which appear to have similar effects as isoflavones. Researchers have also demonstrated in cell-culture studies that lignans inhibit the rapid cell division noted in breast cancer growth. Flax also has been shown to increase the ratio of C-2:C-16. This suggests that flax may also have a beneficial effect on estrogen metabolism and thereby help to reduce the risk of breast cancer.^{14 15}

Cruciferous vegetables, such as broccoli, Brussels sprouts, cabbage, cauliflower, kale, kohlrabi, mustard greens, rutabaga and turnips have also been shown to lower the rate of breast cancer.¹⁶ And, it is not surprising to find that diets high in these vegetables can increase the C-2:C-16 estrogen ratio. Cruciferous plants are particularly rich in indoles.

A special form, called indole-3-carbinol (I3C)¹⁷ seems to promote the formation of C2 and improve the C-2:C-16 ratio, now a well-documented key to breast cancer prevention.

Xenoestrogens and the Environment

A principle reason for concern about environmental chemicals and toxins pertains to the epidemic proportion breast cancer has reached, not only in the U.S.A. but in countries around the world. Breast cancer risk rates in North America have now risen from one chance in twenty in 1950 to the current rate of one in eight. Today, breast cancer is the most prevalent type of cancer in women, and is the leading cause of death among women between the ages of 40-55. Every year 182,000 American women will be diagnosed with breast cancer; while 46,000 women die of the disease annually.

In 1990, two environmental specialists – Elihu Richter and Jerry Westin – from Hebrew University’s Hadassah School of Medicine discovered a surprising glitch in otherwise depressing breast cancer statistics.²¹ They found that in the decade between 1976 and 1986, Israel was unique among 28 countries surveyed in that it actually registered a significant drop in breast cancer mortality. This was in spite of increasing risk factors in the Israeli population, high fat intake, delayed pregnancy, alcohol intake, and previous Israeli breast cancer rates that paralleled the international epidemic. This 8 to 20 percent drop was accounted for by the ban of three organochlorine pesticides. Prior to 1978, alpha-benzene hexachloride (BHC), gamma benzene hexachloride (lindane), and DDT were used heavily in Israeli cowsheds. As a result, the three pesticides heavily contaminated milk and milk products, at rates between 100 and 1,000 times greater than in the U.S.A. National public outcry resulted in legislation prohibiting these three pesticides.

Organochlorine pesticides are ‘complete’ carcinogens, which both initiate and promote tumor growth, and whose presence (or absence) can change cancer statistics quite rapidly. Such pesticides as DDT, dioxin, and atrazine are called ‘organochlorines’ because they are organic compounds containing chlorine bonded to carbon. Organochlorines are also produced in the manufacture of many herbicides, petrochemicals such as polychlorinated biphenyls (PCBs), PVC plastics and even certain paper products. In animals, including humans, organochlorines are stored in fat tissue and accumulate in the body for years. Many studies have shown the relationship between exposure to organochlorines and breast cancer.^{22 23 24 25}

Organochlorines are not only overtly toxic, some also possess estrogenic activity. In other words, these pesticides and chemicals mimic estrogen. Called xenoestrogens (literally ‘foreign estrogens’) these chemicals move into the nucleus of a receptor cell and disrupt the cell’s growth and division.²⁶ These synthetic xenoestrogens block the C-2 pathway of estrogen metabolism and promote the more threatening C-16 metabolic pathway. Some reports have even suggested that xenoestrogenic material is able to leach out of polycarbonate plastics, used in much of the food storage and cosmetic packaging industry.

Therefore, it would seem that to reduce the risk of breast cancer risk there is much evidence calling for an increase of these beneficial plant foods, including soy, flax, nuts and seeds, whole grains and legumes in conjunction with a natural plant-based diet.²⁷ What we are up against is the challenge of preserving health in the face of growing environmental destruction. The value of a plant-based diet and natural lifestyle shows that our Creator's original plan for human life on planet Earth was an all-wise provision for our health and longevity. It is still the best dietary choice we can make today.

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