The Effects of Soy Consumption on Breast Cancer Prognosis

A review of the literature

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Abstract

Isoflavones from soy have both estrogenic and antiestrogenic action, and *in vitro* and animal studies have shown possible interference with hormone blockade agents used in breast cancer aftercare. Epidemiological data, however, suggests that soy consumption is not associated with increased risk in any population of women with a history of breast cancer. Further, there appears to be a linear relationship between decreased risk of recurrence and/or mortality and increasing soy consumption. This review includes all of the studies designed to assess soy intake and risk of mortality and/or breast cancer recurrence.

Introduction

Women with a history of breast cancer are highly motivated to take active measures to prevent recurrence. With 1 in 8 women in the United States diagnosed with breast cancer in her lifetime[1] and 2.7 million survivors as of January 2009,[2] there is growing need to identify evidence-based measures that lower risk of recurrence.

Research suggests that women can affect their risk through modification of high-risk habits such as smoking and drinking alcohol, as well as with increased exercise and dietary changes.[3] This includes adopting a more plant-based diet. For many years breast cancer survivors have been told to avoid soy beans and related products due to the foods' phytoestrogen content. The assumption was that phytoestrogens, which have been found to have both estrogenic and antiestrogenic effects, may stimulate growth of occult disease. In the absence of evidence to the contrary, this was prudent advice. However, in the last few years, there have been several prospective cohort studies (for a total of nearly 10,000 women) that have found that ingestion of whole soy foods does not increase the risk of recurrence of breast cancer. Contrary to expected findings, increasing soy consumption is associated with lowering the risk of recurrence and/or all-cause mortality. Further, in a subpopulation of postmenopausal women taking tamoxifen, there may be an additive benefit of soy consumption on both recurrence risk and mortality. Despite this newer evidence, there remains a bias toward the avoidance of soy in women with a history of breast cancer.[4]

Phytoestrogens are often grouped together as a singular entity, but 4 distinct chemical classifications exist for phytoestrogens: isoflavones (eg, genistein, diadzein, glycetein, formononetin), coumestans (eg, coumestrol), lignans (eg, secoisolariciresol), and prenylflavonoids (eg, prenylnaringenin).[5] Prototypical plants for each of these categories are soy (isoflavones), clover (coumestans), flax seeds (lignans), and hops (prenylflavonoids). This review is limited in scope to the effects of isoflavone consumption in women with a history of breast cancer. Conclusions drawn from cohorts of women consuming soy or isoflavones should not be extrapolated to other phytoestrogen classes.

Isoflavones occur as glycoside conjugates in foods, called genistin, diadzin, and glycetin, or their aglycone forms as genistein, diadzein, and glycetein. While isoflavones occur in many types of legumes, soy has the highest concentration. The typical composition for soybeans is 40% diadzin/diadzein, 50% genistin/genestein and 10% glycetin/glycitein.[6] Once ingested, glycoside conjugate forms undergo deconjugation by B-glucosidases in the jejunum of humans and are subsequently absorbed as aglycone derivatives, genistein, diadzein, and glycetein.[7] Diadzein can be further degraded by bacteria in the gut to equol, which has greater affinity for estrogen receptors than either genistein or diadzein. This biotransformation appears to be unique to mammals and is dependent on intestinal flora and genetic polymorphisms.[8] Appreciation of this metabolic variability is relatively recent and the difference between “equol producers” and “non producers” has been proposed to confound some of the human data on the effects of soy on human health and disease.[9]

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This metabolic variability may explain the conflicting epidemiological studies on soy consumption and incident breast cancers.[10] Regardless, the lower incident rates of initial diagnosis of breast cancer in Asian countries and the subsequent increase in risk that occurs when Asians move to Western countries has long been thought to be at least partly due to changes in diet.[11] Further, increases in breast cancer correlate with the increased acceptance of a Western diet in Japan.[12] A pooled analysis of soy intake in Asian countries found wide variability between countries and even regions within countries.[13] The same publication found that <10% of Asians consume >25 g/day of whole soy protein (equivalent to 100 mg of isoflavones/day), with older Japanese adults consuming 6–11 g/day (equivalent to 25–50 mg isoflavones/day). In contrast, Western cultures consume less than 3 mg of isoflavones daily.[14,15]

Understanding the difference in cellular actions between isoflavones and endogenous estrogens (eg, 17-beta estradiol) is essential to appreciating the plausibility of differing effects on breast cancer risk. There are 2 estrogen receptors (ERs), dubbed alpha (ERa) and beta (ERb). ERa is associated with proliferation and progression of disease, and ERb is associated with protective effects. Isoflavones, in general, possess a higher affinity for ERb,[16] while 17-beta estradiol has a high affinity for ERa. The estrogen blockade drug tamoxifen binds specifically to ERa to block proliferation.

Adding to the complexity of our understanding of the molecular biology, the binding of ERs to one another (forming homodimers, ERa-ERa or ERb-ERb) or to each other (forming heterodimer, ERa-ERb) is necessary for binding to the DNA and eliciting genetic expression. While the proliferative or antiproliferative effects of homodimer formation are attributable to ERa-ERa or ERb-ERb respectively, the cellular effects of ERa-ERb heterodimers is less well understood.[17] Therefore, isoflavone actions on breast cancer cells may vary depending on the expression of estrogen receptor alpha (ERa) versus estrogen receptor beta (ERb), as well as the presence or absence of estradiol.[18]

Due to this complex nature of ERs, soy is considered both estrogenic as well as antiestrogenic.[19] This duality is not unique to soy; compounds such as tamoxifen are also capable of such duality. Soy and tamoxifen, along with many other compounds, are more accurately called selective estrogen receptor modulators, or SERMS. The net estrogenic or antiestrogenic effects of SERMS is dependent on many factors, including type of ER present (ERa versus ERb). This is important to note because the following epidemiological data is stronger and more instructive than any *in vitro* evidence of estrogenic or antiestrogenic effects. In other words, the systemic actions of SERMS is best determined through studies of the whole organism (humans) and outcome.

One measure of estrogenic action, breast density, is relevant to soy's effects on breast tissue specifically. High estrogen levels are associated with greater breast density. However, in repeated trials, soy and/or isolated isoflavones have not elicited any increase in breast density, [20–23] despite evidence of distribution of isoflavone metabolites into the breast adipose and glandular tissue.[24]

Independent of any hormonal effects, isoflavones in general—and genestein in particular—have evidence for direct antiproliferative effects. Genistein has been shown to have proapoptotic effects,[28–30] inhibition of signal transduction via tyrosine kinase,[31] and promotion of cell cycle arrest.[32] Further, genistein can block angiogenic and metastatic mechanisms of breast cancer cells *in vitro*.[33] This data, however, is inconsistent and some *in vitro* data indicates genistein may increase proliferation of breast cancer cells.[34]

Soy Consumption and Risk of Recurrence: Review of Epidemiological Studies

One of the reasons for the confusion regarding whether soy consumption is recommended or not is that all of the data on human consumption of soy in women with a history of breast cancer has been published in the last few years. Before 2009 there were no published studies on the effects of soy intake on breast cancer recurrence or mortality in humans, save a small cohort that did not take into account the use of tamoxifen or ER status.[35] Proof of safety in tamoxifen users was particularly concerning given the *in vitro* and *in vivo* evidence of possible interference with antiestrogenic effects.[36–39] Conversely, 1 rodent study showed synergistic effects, and an ensuing study found diadzein potentiated tamoxifen's effect while genistein

interfered with it.[40]

Evidence suggests there is no increased risk of recurrence for any subpopulations of breast cancer survivors.

As the following studies show, evidence suggests there is no increased risk of recurrence for any subpopulations of breast cancer survivors (eg, pre- or postmenopausal, estrogen receptor positive or negative, those on or off hormonal treatments). Further, soy consumption lessened risk of all-cause mortality with increasing levels of consumption. The following is a detailed review of all the published studies available on soy consumption and breast cancer recurrence.

LACE Cohort (US Population)

In 2009, the 1st study on soy isoflavone intake and breast cancer recurrence was published. The Life After Cancer Epidemiology (LACE) study prospectively followed a cohort of 1,954 breast cancer survivors who had been diagnosed between 1997 and 2000.[41] During the median 6.31 years of follow-up, 282 incident recurrences were ascertained. Food intake was assessed through a mailed questionnaire, and the most common soy products were soy sauce, diet shakes/drinks, tofu, diet bars, and soy protein isolate powder. Trends for reduced risk of recurrence were found with each increasing quintile of intake of diadzein and glycetin versus no soy intake in postmenopausal women (*P*=0.08 for daidzein, *P*=0.06 for glycetin). This trend of risk reduction was also true for tamoxifen users (*P*=0.10 for daidzein, *P*=0.05 for glycetin). In postmenopausal tamoxifen users there was a statistically significant 60% reduction in recurrence when comparing the highest versus the lowest quintiles of diadzein intake (>1,453 µg/day vs <7.7 µg/day; HR: 0.48; 95% CI: 0.21–0.79; *P*=0.008). Post menopausal women on tamoxifen derived benefit from as little as 1.5 mg/ day or more of diadzein. Of note, the highest quintiles of intake in this study (>9.6 mg/day for daidzein and >13.0 mg/day for genistein) correlate to the lowest levels of intake in Japanese populations.[42] Mortality was not evaluated in this study.

Shanghai cohort (Chinese population)

A 2nd study was published in December 2009 in the *Journal of the American Medical Association (JAMA)*.[43] The Shanghai Breast Cancer Survival Study (SBCSS) was a large, population-based study of 5,042 women with a history of breast cancer. The study was designed to evaluate the association of soy food consumption with total mortality and cancer recurrence in breast cancer survivors. Women (20–75 years old) were recruited from March 2002–April 2006 and followed through June 2009, for a median follow-up of 3.9 years. All participants were permanent residents of Shanghai, China. Soy intake, as soy protein or isoflavone content, was inversely associated with mortality and recurrence. This inverse relationship was linear up to 11 grams of soy protein per day, with benefit leveling off at higher doses. Those in the highest quartile of soy isoflavone intake (> 6.27 mg/day) had nearly 30% less mortality (HR: 0.71; 95% CI: 0.54–0.92) and 32% less recurrence (HR: 0.71; 95% CI: 0.54–0.87) than those in the lowest quartile(<2.0 mg/day). The effects were independent of ER or PR status or menopausal status. Comparing the highest versus the lowest quartiles of soy protein intake, multivariate-adjusted 4-year mortality rates were 10.3% versus 7.4%, and 4-year recurrence rates were 11.2% versus 8.0%. For the highest quartile of soy protein intake (>15.31 g/day), tamoxifen use did not appear to confer any added reduction in risk of recurrence versus non-use. The HR for recurrence in the highest quartile of soy protein intake was 0.65 (95% CI: 0.36–1.17) for nonusers of tamoxifen versus a HR of 0.66 (95% CI: 0.40–1.09) for tamoxifen users in the same quartile of soy intake. Surprisingly, the risk reduction of nonusers of tamoxifen in the highest quartile was greater than women who used tamoxifen and were in the lowest quartile of soy protein intake (HR: 0.93; 95% CI: 0.58–1.51). The authors conclude that “high soy food intake and tamoxifen use may have a comparable effect on breast cancer outcomes.”

WHEL Cohort (US Population)

The effects of soy consumption on prognosis was examined in a secondary analysis of the Womens' Healthy Eating and Living (WHEL) study and found to have no adverse associations on prognosis.[44] The WHEL study was a prospective dietary intervention trial of 3,088 breast cancer survivors (18–70 years of age) diagnosed between 1991 and 2000. All participants completed treatment for breast cancer within the 4 years before enrollment in the study. Median follow-up was 7.3 years from the time of study enrollment. Isoflavone intake was assessed through a food frequency questionnaire at the time of enrollment. Women were divided into 4 groups, with the highest isoflavone intake representing those of typical Asian populations (6.3–86.9 mg/d). Stratification of the data was done for post/perimenopausal women; premenopausal women; tamoxifen (ever, never, and past) usage categories, and ER+/PR+ versus ER-/PR- disease. There was no increase in risk of recurrence within any of these strata. Analysis of the data showed that in women with the highest levels of isoflavone intake (>16.3 mg/day) there was a nonsignificant 54% reduction in risk of all-cause mortality. Further, this reduction in mortality increased with increasing levels of isoflavone intake (*P*=0.02). These effects were not estrogen receptor–dependent.

In keeping with the Shanghai study and the LACE study, this trend was stronger for those women who had ever used tamoxifen (*P*=0.05), suggesting there may be synergistic effects of soy and tamoxifen. The authors concluded that these results, combined with the 2 earlier cohorts showing no increase in recurrence, "provide the necessary epidemiologic evidence that clinicians no longer need to advise against soy consumption for women with a diagnosis of breast cancer."

Kang, et al. (Chinese population)

In November 2010, a publication assessed soy consumption and risk of breast cancer recurrence and overall mortality.[45] Participants were 524 Chinese women (29–72 years old), all of whom underwent surgery between August 2002 and July 2003 and had stage I-III disease. All participants were either on tamoxifen (n=438) or anastrozole (n=86). Median follow-up was 5.1 years, with the study ending in July 2008. Overall recurrence risk and mortality in premenopausal women was not linked to soy intake. Postmenopausal women had a significantly lower risk of recurrence in the highest versus the lowest quintiles of isoflavone intake (HR: 0.67; 95% CI: 0.54–0.85; *P*= 0.02). Postmenopausal women on anastrozole had a significant reduction in the risk of recurrence in the highest versus the lowest quintiles (HR: 0.65; 95% CI: 0.47–0.85; *P*=0.005).

After Breast Cancer Pooling Project

The After Breast Cancer Pooling Project used the LACE, Shanghai Breast Cancer Survival Study, and the WHEL cohort mentioned above to form a meta-analysis of isoflavone intake and breast cancer recurrence.[46] The analysis included 9,514 survivors of invasive breast cancer from 1991 to 2006. Mean follow-up was 7.4 years, in which there were 1,171 deaths (888 from breast cancer) and 1,348 breast cancer recurrences. Analysis of data confirmed that soy consumption was inversely associated with recurrence in both US cohorts and the Chinese cohort. This correlation was found when all data were pooled as well as when each cohort was analyzed separately. Further, in the pooled analysis, consumption of >10 mg/day of isoflavones was associated with a nonsignificant reduction in all-cause mortality (HR: 0.87; 95% CI: 0.70, 1.10) and breast cancer–specific mortality (HR: 0.83; 95% CI: 0.64, 1.07). Pooled analysis also showed that ingestion of >10 mg/day of isoflavone is associated with a statistically significant 25% decrease in recurrence of disease (HR: 0.75; 95% CI: 0.61, 0.92).

Zhang, et al. (Chinese population)

A short research communication published by Zhang and colleagues in 2012 corroborated the above cohorts.[47] In it, 616 women with a history of breast cancer were enrolled from January 2004 through January 2006 at the Hospital of Inner Mongolia Medical College of China. Soy food intake was assessed through a validated food frequency questionnaire. Soy protein and total soy isoflavone (diadzein, genistein, and glycitein) was assessed. Median follow-up was 52.1 months (range=9–60 months). Although there are no *P* values published, the HRs were calculated. There was a reduction of mortality from breast cancer of 36% in those consuming 17.32–28.83 mg/day of total isoflavones (HR: 0.64; 95% CI: 0.45–0.93) versus those consuming <7.56 mg/day (HR: 1.0). Interestingly, there was little improvement in those consuming more than 28.83 mg/day, with a HR of 0.62 (95% CI: 0.42–0.90), which is a 38% reduction in mortality. Total soy protein intake also appeared to confer benefit. Overall, 5-year survival rates were 62.5% for those consuming less

than 2.12 g/day of soy protein versus 98.6% for those consuming more than 13.03 g/day. While there appeared to be benefit for both ER+ and ER- women, the benefit was greater for those who were ER+: HR (95% CI) for ER+ women consuming more than 28.83 mg/day isoflavones was 0.59 (0.40–0.93) versus 0.78 (0.47–0.98) for those who were ER-. As the authors note, this is a small prospective study that should be followed up with a similar design in a larger population.

Discussion

The epidemiological data uniformly suggest there is no adverse association of soy protein or isoflavone intake on the prognosis of women with a history of breast cancer. The apparent benefits of soy consumption are not specific to any subpopulation, and a linear trend toward lowering the risk of recurrence and/or all-cause mortality is consistent across all cohorts regardless of ethnicity. No cohort suggested any interference with the effects of tamoxifen, with a trend toward an additive effect in the WHEL study and a statistically significant risk reduction on recurrence in the LACE cohort.

While all of the studies stratified for tamoxifen use, only 1 of the cohorts stratified for anastrozole use in postmenopausal patients. This was the smallest cohort with only 524 participants, a mere 86 of whom were on anastrozole. Despite this low power, the risk reduction of combining soy with anastrozole reached statistical significance when comparing the highest versus the lowest intakes (HR: 0.65; 95% CI: 0.47–0.85; *P*=0.005). This intriguing result needs to be repeated in a larger population to verify the association.

These results are intriguing and run contrary to *in vitro* and rodent studies that suggested proliferative effects of isoflavones on mammary tumors, and possible blockage of tamoxifen's antiestrogenic effects. There are several plausible reasons for this. Perhaps the simplest explanation is that the metabolism of isoflavones in rodents is not equivalent to humans. A recent experiment has suggested this may be the case.

In a study published by the esteemed isoflavone researcher KD Setchell in 2011, the metabolism of genistein in rodents and humans was compared.[48] Using rodent strains that have been used as models in isoflavone research (including Sprague-Dawly rats, and C57BL/6, nude, and transgenic AngptL4B6 mice), a study was designed to assess circulating levels of unconjugated versus conjugated genistein levels. Each rodent strain was given either soy-containing chow and/or a genistein supplement. Human comparison groups included "1) healthy adults who consumed single servings of soy nuts, soy milk, and tempeh; 2) healthy adults subchronically given soy milk; 3) healthy women orally administered 50 mg genistein; 4) healthy women orally administered 20 mg pure S-(-)equol; and 5) 6-mo-old infants fed soy infant formula and later, at age 3 y, a soy germ isoflavone supplement." This study found a vast difference in metabolism between rodent models and all of the human comparison groups. Humans conjugate nearly all of the ingested isoflavones (<1% unconjugated genistein in a steady state and <2% at peak concentrations.) Rodents, however had much higher circulating levels of unconjugated genistein, ranging from 4.0% (+/- 0.6%) up to 30.1% (+/- 4.3%) and this varied tremendously by strain of animal. The authors note that these levels of unconjugated genistein represent up to 150 times the amount found in humans. Thus, extrapolation of isoflavone data from rodent studies to humans is not warranted and may be misleading. More to the point, such extrapolation has mired the perspective of many practitioners into an assumption that is proving difficult to dispel, even in the face of evidence to the contrary.

It is important to note that a plant-based diet is widely accepted as the best dietary means of reducing risk of developing a variety of cancers. It is possible that soy intake was a surrogate for a broader plant-based diet in the above cohorts. In the WHEL study and the Shanghai study, total isoflavone intake was calculated given the dietary information provided and included intake of isoflavones from foods other than soy. Granted, soy is by far the most concentrated isoflavone foodstuff, but many other whole foods also contain isoflavones. In fact, in the United States 45% of isoflavones are ingested from beans and peas, 25% from tea and coffee, 10% from nuts, and 5% from grains.[49] Isoflavone intake may be a surrogate for the broader chemopreventative class of flavonoids and ultimately phytochemicals in general.

The epidemiological cohorts discussed here cannot be extrapolated to include those with stage IV breast cancer. The WHEL and LACE studies excluded those with stage IV disease specifically and the Shanghai

study had only 485 participants in the stage III–IV category, rendering a low powered assessment that was not stratified by stage III versus IV. Thus, soy consumption in late-stage disease has no data on its safety. Further, there is some indication that it may be detrimental. One *in vitro* experiment demonstrated that isoflavones isolated from soy milk were capable of inducing mRNA patterns of expression that mimicked those gotten from 17-B estradiol when only the alpha receptor was available. However, isoflavones mitigated the effects of the alpha receptor when the beta receptor was present. At least in theory, this may be a consideration for late-stage breast cancer patients, where beta receptor expression can be limited or absent.[50]

In addition, both the LACE and the Shanghai cohorts found that there may be a detrimental effect at the highest doses assessed, although this associated risk did not reach statistical significance in either study. The LACE study found that women who had never used tamoxifen and were in the 95th percentile of isoflavone intake had a borderline significant increased risk of recurrence. The Shanghai study found that the linear dose relationship between soy intake and decreased recurrence and mortality appears valid up to 11 g/day of soy (approximately 40 mg isoflavones) after which there is a nonsignificant increase in risk. This dosage is corroborated by the After Breast Cancer Pooling Project, which concluded that 10 g/day of soy protein reduced the risk of both mortality and recurrence. Interestingly, this is very near the level of consumption found in elderly Japanese.[13]

Conclusion

Before 2009, there was little prospective evidence that suggested soy consumption in women with a history of breast cancer was safe. Conflicting information on the estrogenic and antiestrogenic properties of isoflavones *in vitro* or in rodents led to the widespread advice to avoid soy due to possible risk.[37,38, 51, 52] Human epidemiological data from 3 large cohorts, including the Shanghai Study, LACE, and WHEL has provided a total of more than 9,500 breast cancer survivors comparing various levels of soy consumption. Analysis within these cohorts and a pooled analysis of the data render consistent results suggesting that soy consumption is not harmful for women with a history of breast cancer. Regardless of ethnicity, all cohorts suggested a lessening of mortality and/or breast cancer recurrence with increasing levels of soy intake up to 10 g daily. This data should give clinicians and patients alike a newfound comfort in the safety of whole soy foods.

Table: Summary of Study Findings

Study Name and/ or Author	Year	Participants and relevant stratification	Highest intake groups	Some Foods Contributing to Intake	Outcomes (p value)
Life After Cancer Epidemiology (LACE) Guha, et al.	2009	1,954 women in U.S.; Stages I(>1cm)-IIIA; premenopausal and peri/post menopausal; ER+/PR+, ER+PR-, ER-PR+, ER-/PR-; tamoxifen use: never, current and past; diadzein, genistein and glycetin evaluated separately and together	Diadzein >1.453 mg/day	Soy sauce, powders and drinks, tofu, diet bars, soy milk (several others that had nominal contribution)	A significant reduced risk of breast cancer recurrence in postmenopausal tamoxifen users in the highest quintile of diadzein intake(*P*=0.008). A trend for reduced recurrence for postmenopausal women with increasing amounts of soy isoflavones diadzein (*P*=0.08) and glycetin (*P*=0.06). Overall and disease related mortality was not evaluated.
Shanghai Breast Cancer Survival Study (SBCS)	2009	5,033 women in Shanghai, China; Stages 0–IV, and “unknown”; premenopausal and peri/post menopausal;	Soy protein >15.31 g/d Isoflavones >62.68 mg/d	Tofu, soy milk, fresh soy beans, “other soy products”	Inverse association with recurrence (*P*=0.35) and all-cause mortality (*P*=0.36) up to doses of 11 g/day of soy protein,

Shu, et al.		ER+ or ER- , and PR+ or PR-; tamoxifen use: yes or no; soy protein; total isoflavones			or 40 mg/day isoflavones.This trend was independent of ER status or tamoxifen usage. Those in the highest quartile of soy protein intake not taking tamoxifen had less recurrence than tamoxifen users consuming the least amount of soy.
Kang, et al.	2010	254 women in China; Stages I-III; pre and post menopausal; ER+/PR+, ER+/PR-,ER-/PR+; all participants were on tamoxifen (n=438) or anastrozole(n=86)	Total isoflavones >42.50 mg/d	Soy milk, tofu, soy flour	The risk of recurrence in ER+/PR+ post-menopausal women in the highest quartile of isoflavone intake was significantly lower than the lowest quintile (*P*=0.02). Women taking anastrazole and in the highest quartile of intake had a significantly lower risk of recurrence than those taking anastrazole and in the lowest quartile (*P*=0.005).
Womens Healthy Eating and Lifestyle (WHEL) Caan, et al.	2011	3,088 women; stages I–III; premenopausal and peri-/postmenopausal; ER+/PR+ and ER-/PR- disease; tamoxifen current, never, and past users; total isoflavones	Total isoflavones= 16.33–86.9 mg/day	Tofu, soy milk and “additional foods”	Overall mortality decreased with increasing isoflavone intake (*P*=0.02); Trend toward lower mortality in those consuming isoflavones and ever using tamoxifen was strong (*P*=0.05); non-significant trend for reduced recurrence with increasing intake (*P*=0.47)
Zhang, et al	2012	616 women; stages 0–II and III–IV; peri-/postmenopausal and premenopausal; ER+ or ER-; tamoxifen use either yes or no	Soy protein intake >13.03 g/d Total isoflavone >28.83 mg/day	Tofu, processed soy products, soy milk, bean curd, whole soybeans	An average intake of soy isoflavones above 17.3 mg/day reduces breast cancer mortality by 36%–38%. (no *P* value given). This benefit was independent of ER status.

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Great article, additionally largest causes of breast cancer after HRT, BCPs and smoking are air pollution,and PAH's (yard chemicals, agricultural chemicals, personal product chemicals ie. hair dyes), patients need to know to use avoidance of these chemicals as a primary lifestyle prevention method.
Jennifer

Joe
11/27/2012 9:40:59 PM
Steve,

First thing I thought when I read this was, what about the fact that over 90% of soy is Genetically Modified Organisms?

And the other fact that you brought up about fermented and non fermented soy.

All this data, and nothing that mentions that fact about soy's possible risks?

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