

# Flaxseeds and Lignans

## Evidence suggests great benefits as treatment for breast cancer

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Flaxseed lignans offer a simple, effective and inexpensive way to decrease the risk of and aid in the treatment of breast cancer. Unfortunately, women with breast cancer are frequently advised to avoid flaxseeds. It seems this notion comes from research looking at soy isoflavones and has been wrongfully attributed to another form of phytoestrogen, flaxseed lignans. It is important to recognize that this notion is misplaced and overwhelmingly contradicted by the scientific evidence to date.

### Research Results

Research suggesting the avoidance of flaxseed lignans is minimal and poor at best. Two *in vitro* studies found that isolated enterolactone could both stimulate and inhibit the growth hormone-dependent breast cancer cells (Welshons et al., 1987; Mousavi and Adlercreutz, 1992). Interestingly, higher levels of enterolactone had cytotoxic effects on breast cancer cells while leaving healthy cells unharmed. These cancer-destroying effects could not be reversed by increasing amounts of estradiol, suggesting that enterolactone's inhibitory effects were not antiestrogenic.

Recently researchers found that rats exposed to defatted flaxseed diets in the womb developed slightly more mammary cancers than the offspring of rats consuming a regular diet (Khan et al., 2007; Yu et al., 2006). Yet, similar studies using unprocessed flaxseeds found favorable mammary changes (Ward et al., 2000; Tou and Thompson, 1999) and a significant reduction of mammary tumors in rat offspring (Chen et al., 2003).

Apart from a few ambiguous reports, the majority of the scientific literature consistently tells a similar story. Numerous studies have looked at human breast cancers implanted into animals (Zhang et al., 2007; Chen et al., 2007a, b; Bergman et al., 2007; Power et al., 2006; Wang et al., 2005; Chen et al., 2004; Chen et al., 2002; Dabrosin et al., 2002; Chen and Thompson, 2003), or chemically induced breast cancers (Saarinen et al., 2002). Without exception, all of these studies

have shown that flaxseed lignans powerfully inhibit tumor growth and metastasis in both estrogen receptor positive and receptor negative breast cancers. Since hormone-independent breast cancers are also strongly inhibited, it appears the ways in which flaxseeds fight against cancer are greater than the competitive binding of weak phytoestrogens to estrogen receptors.

### Tamoxifen

Clinicians unfamiliar with the substantial number of studies looking at the effects of flaxseed lignans on breast cancer often assume they will interfere with the effectiveness of the estrogen antagonist drug tamoxifen. As such, breast cancer patients who take this medication are commonly asked to avoid flaxseeds. However, several studies have looked at this issue and all of them have found the exact opposite to be true. Indeed, flaxseed lignans powerfully enhance the effectiveness of tamoxifen (Chen et al., 2007a, 2007b; Chen et al., 2004; Chen and Thompson, 2003). In one study, human breast cancer cells were implanted into pre- and postmenopausal mouse models. In the low estrogen group, tumor size was ultimately unchanged with tamoxifen treatment. When tamoxifen and flaxseed treatments were combined, however, there was a 54% reduction in tumor size. Incredibly, the mice treated with a 10% flaxseed diet alone had a 74% reduction in breast tumor size! Another conclusion might be that tamoxifen reduces the effectiveness of flaxseeds.

A side effect of tamoxifen in low-estrogen mice was a 39% increase in uterine size. You might recall that tamoxifen increases the risk of uterine cancer in women by almost eight-fold (Ferguson et al., 2005). Amazingly, not only did flaxseed lignans enhance the effectiveness of tamoxifen, but they also significantly reduced the uterine growth induced by the drug. There was no abnormal uterine growth in animals treated with flax alone. In the high-dose estrogen animals, both treatments significantly inhibited tumor growth. However, growth inhibition increased from 41% for tamoxifen treatment alone



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to 50% inhibition when combined with flaxseeds (Chen et al., 2004).

### Other Studies

Soy isoflavones have been shown to increase the growth of breast tumors in post-menopausal animal models. This has resulted in the widespread avoidance of soy among women with postmenopausal breast cancer. Interestingly, in several studies, flaxseed lignans have been shown to halt the growth-stimulating effects of soy on human breast cancers implanted in mice (Power et al., 2006; Power and Thompson, 2007; Saarinen et al., 2006; Power et al., 2006). The authors of one study suggest, "This may indicate that if soy is consumed with lignan-rich foods, it may continue to induce its other beneficial health effects, without inducing adverse effect on

postmenopausal breast cancer" (Power and Thompson, 2007).

An impressive study looked at women recently diagnosed with breast cancer (Thompson et al., 2005). Each day for the three weeks before their breast surgery, the patients consumed a muffin containing 25g of flaxseed (four tablespoons) or a regular muffin. Compared with women eating plain muffins, the breast tumors of the women consuming flaxseed lignans daily showed a 31% increase in apoptosis, a 34% decrease in tumor proliferation and a 71% decrease in HER-2/neu expression. The last of these is associated with aggressive cancer growth, a higher likelihood of metastasis, greater chance of cancer recurrence and decreased survival. These are astounding results – seen in only three weeks – using a simple dietary change.

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Several other studies have shown that flaxseed lignans significantly and beneficially alter the way the liver metabolizes estrogens. Women consuming ground flaxseeds daily dramatically increased their 2-OH/16-OH estrone ratios (Haggan et al., 2000; Haggans et al., 1999; Brooks et al., 2004). This change is widely associated with a decreased risk of breast cancer (Kabat et al., 2006).

A number of studies are looking at the incidence of breast cancer in women and their intake of dietary flaxseed lignans. While some studies find no association (Verheus, 2007; Kilkkinen et al., 2004), the

## Flaxseed lignans powerfully enhance the effectiveness of tamoxifen

majority show up to a 62% reduction in the risk of breast cancer among women consuming the greatest amount of flaxseed lignans (Touillaud et al., 2007; Piller et al., 2006; Olsen et al., 2004; McCann et al., 2004; Linseisen et al., 2004; Boccardo et al., 2004; Ingram et al., 1997; Pietinen et al., 2001).

Women who carry a variant of the CYP17 gene have higher levels of sex hormones and an increased risk for breast cancer. Studies have found that women with these high-risk genes who consume the greatest quantity of dietary flax lignans dramatically reduce their risk of breast cancer by up to 70% (Piller et al., 2006; McCann et al., 2002).

The evidence thus far is clear and overwhelmingly without contradiction: Women with a history of breast cancer will very likely gain substantial anti-cancer benefits by increasing their consumption of flaxseed lignans. ▀

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