Flaxseeds

By Donald Yance

A standard part of my protocols are the medicinal smoothie, of which I often recommend 1-2 tablespoon of freshly ground flax to be added. Flaxseeds are a rich source of fiber and mucilage, which help clean the colon of waste products and toxins. Flaxseeds, particularly ground flaxseeds, are high in a substance called lignans. Lignans are known for their ability to ward off viral, bacterial and fungal infections. They are also potent anti-cancer substances. Plant lignans, from sources such as flax seed, whole grain cereals, berries, vegetables and fruits, are metabolised in the colon by microflora into enterodiol and enterolactone. There has been a lot of research recently that has focussed on plant lignans as reducing the risk of prostate, breast, colon, as well as other cancers.
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Flaxseeds are a rich source of alpha linolenic acid, which provides the body with essential omega 3 fatty acids. Flaxseed is excellent for people who suffer with bowel problems such as constipation or diarrhea. The flaxseed moves through the digestive tract quickly and, because it is a fiber, results in normal, softer stools. It is important to drink water directly after consuming flaxseed, since the substance can absorb about a dozen times it's weight in liquid. Flaxseeds are also rich in other minerals, vitamins and protein, but the most important compound in flax are the plant lignans.

Flaxseeds, the richest source of lignans are cancer preventative
Flaxseeds, which are the richest known source of plant lignans, have been shown to have chemoprotective effects in animal and cell studies. Flax seeds and lignan consumption in general have also been associated with reduced cancer risk in epidemiological studies. Some of its effects may be mediated through its influence on endogenous hormone production and metabolism. Two competing pathways in estrogen metabolism involve production of the 2-hydroxylated and 16 alpha-hydroxylated metabolites. Because of the proposed differences in biological activities of these metabolites, the balance of the two pathways has been used as a biomarker for breast cancer risk. One study looked at endogenous hormone concentrations examined the effects of flaxseed consumption on urinary estrogen metabolite excretion in postmenopausal women. Twenty-eight postmenopausal women were studied for three seven-week feeding periods in a randomized crossover design. During the feeding periods, subjects consumed their usual diets plus ground flaxseed (0, 5, or 10 g/day). Urinary excretion of the estrogen metabolites 2-hydroxyestrogen (2OHEstrogen) and 16 alpha-hydroxyestrone (16 alpha-OHE1) as well as their ratio, 2/16 alpha-OHE1, was measured by enzyme immunoassay. Flaxseed supplementation significantly increased urinary 2-OHEstrogen excretion ($p < 0.0005$) and the urinary 2/16 alpha-OHE1 ratio ($p < 0.05$) in a linear, dose-response fashion. There were no significant differences in urinary 16 alpha-OHE1 excretion. These results suggest that flaxseed may have chemoprotective effects in postmenopausal women.
(Haggans CJ, Hutchins AM, Olson BA, Thomas W, Martini MC, Slavin JL. Effect of flaxseed consumption on urinary estrogen metabolites in postmenopausal women. Nutr Cancer. 1999;33(2):188-95)
Tsakok AD., Correspondence re: A. M. Hutchins et al., Flaxseed influences urinary lignan excretion in a dose-dependent manner in post-menopausal women, Cancer Epidemiol Biomarkers Prev. 2000
Ziegler J., Just the flax, ma'am: researchers testing linseed. J Natl Cancer Inst. 1994 Dec 7;86(23):1746-8)

Another randomized study on flax conducted consisted of three 7-week feeding periods during which 31 healthy postmenopausal women, ages 52-82 years, consumed their habitual diets plus 0, 5, or 10 grams of ground flaxseed per day. Urine samples collected for 2 consecutive days during the last week of each feeding period were analyzed for lignan content (enterodiol, enterolactone, and matairesinol) by isotope dilution gas chromatography/mass spectrometry. Compared with the 0-gram flaxseed diet, consumption of 5 or 10 grams of flaxseed significantly increased excretion of enterodiol by 1,009 and 2,867 nmol/day, respectively; significantly increased excretion of enterolactone by 21,242 and 52,826 nmol/day, respectively; and significantly increased excretion of total lignans (enterodiol + enterolactone + matairesinol) by 24,333 and 60,640 nmol/day, respectively.
(Hutchins AM, Martini MC, Olson BA, Thomas W, Slavin JL. Flaxseed influences urinary lignan excretion in a dose-dependent manner in postmenopausal women. Cancer Epidemiol Biomarkers Prev. 2000 Oct;9(10):1113-8)

Other studies have also found that urinary lignan excretion increases with flaxseed consumption. (Frische EJ, Hutchins AM, Martini MC, Thomas W, Slavin JL Effect of flaxseed and wheat bran on serum hormones and lignan excretion in premenopausal women. J Am Coll Nutr. 2003 Dec;22(6):550-4)

This study examined the effects of consumption of flaxseed on fecal lignan excretion and evaluated the effect of high lignan consumption on fecal excretion of isoflavonoids. Thirteen women were studied for two diet periods of three menstrual cycles each in a cross-over design. During the control period, they consumed their usual diets; during the treatment period they consumed their usual diets supplemented with 10 g/day ground flaxseed. Feces were collected on days 7-11 of the last menstrual cycle in each diet period. Five-day fecal composites were analyzed for lignans and isoflavonoids by isotope dilution gas chromatography-mass spectrometry. Fecal excretion of the lignans enterodiol, enterolactone, and matairesinol increased significantly with flax consumption, from 80.0 +/- 80.0 (SD) to 2560 +/- 3100; 640 +/- 480 to 10,300 +/- 7580; and 7.33 +/- 10.0 to 11.9 +/- 8.06 nmol/day, respectively. There were no differences in fecal excretion of the isoflavonoids, daidzein, equol, genistein, and O-demethylangolensin. **(**Kurzer MS, Lampe JW, Martini MC, Adlercreutz H, Fecal lignan and isoflavonoid excretion in premenopausal women consuming flaxseed powder. Cancer Epidemiol Biomarkers Prev. 1995 Jun;4(4):353-8)

In this study the effects of flaxseeds consumption was studied on the serum concentrations of endogenous hormones and binding proteins (estrone, estrone sulfate, 17 beta-estradiol, sex hormone-binding globulin, progesterone, prolactin, dehydroepiandrosterone sulfate, dehydroepiandrosterone, androstenedione, testosterone, and free testosterone) in postmenopausal women. This randomized, crossover trial consisted of three seven-week feeding periods, during which 28 postmenopausal women, aged 52-82 yr, consumed their habitual diets plus 0, 5, or 10 g of ground flaxseed. Serum samples collected during the last week of each feeding period were analyzed for serum hormones using standard diagnostic kits. The flaxseed diets significantly reduced serum concentrations of 17 beta-estradiol by 3.26 pg/ml (12.06 pmol/l) and estrone sulfate by 0.09 ng/ml (0.42 nmol/l) and increased prolactin by 1.92 micrograms/l (0.05 IU/ml). Serum concentrations of androstenedione, estrone, sex hormone-binding globulin, progesterone, testosterone, free testosterone, dehydroepiandrosterone, and dehydroepiandrosterone sulfate were not altered with flaxseed feeding. In this group of postmenopausal women, consuming flaxseed in addition to their habitual diets influenced their endogenous hormone metabolism by decreasing serum 17 beta-estradiol and estrone sulfate and increasing serum prolactin concentrations. 17 beta-estradial and estrone sulfate are strong estrogens and high levels correlate with breast cancer.
(Hutchins AM, Martini MC, Olson BA, Thomas W, Slavin JL. Flaxseed consumption influences endogenous hormone concentrations in postmenopausal women. Nutr Cancer. 2001;39(1):58-65)

Flax seed inhibits metastasis and decreases angiogenesis in breast cancer
Angiogenesis is important in tumor growth, progression and metastatic dissemination. Vascular endothelial growth factor (VEGF) is one key factor in promotion of breast cancer angiogenesis. VEGFs are bioactive in the extracellular space where they become available to the endothelial cells. Phytoestrogens such as lignans have been shown to alter breast cancer incidence and be cancer-protective in rats. This study demonstrated that supplementation of 10% flaxseed, to mice with established human breast tumors reduced tumor growth and metastasis. Flaxseed, also decreased extracellular levels of VEGF, which appears to be one mechanistic explanation to the decreased tumor growth and metastasis.
(Dabrosin C, Chen J, Wang L, Thompson LU. Flaxseed inhibits metastasis and decreases extracellular vascular endothelial growth factor in human breast cancer xenografts. Cancer Lett. 2002 Nov 8;185(1):31-7)

Another cancer-inhibiting mechanism of flaxseeds is its ability to increase the excretion of beta-glucuronidase. Elevated levels of this enzyme are associated with breast and colon cancer. The intake of flaxseeds in a recent animal study reduced bacterial beta-glucuronidase
(Jenab M, Rickard SE, Orcheson LJ, Thompson LU. Flaxseed and lignans increase cecal beta-glucuronidase activity in rats. Nutr Cancer. 1999;33(2):154-8)

Flaxseed consumption enhances the breast cancer inhibiting effects of tamoxifen
This study determined the effect of 10% dietary flaxseed (FS) and tamoxifen (TAM), alone and in combination, on the growth of estrogen-dependent human breast cancer (MCF-7) in mice with or without 17beta-estradiol (E2) supplementation. At low E2 level, FS regressed the pretreatment tumor size by 74%. TAM regressed tumor initially but later induced an increase so that the tumor size was finally similar to the pretreatment size. A tumor regression >53% was induced by FS+TAM than by TAM alone. At high E2 level, FS, TAM, and FS+TAM inhibited the tumor growth by 22, 41, and 50%, respectively, compared with the positive control. Decreased tumor size was attributable to reduced tumor cell proliferation and increased apoptosis. CONCLUSIONS: FS inhibited the growth of human estrogen-dependent breast cancer and strengthened the tumor-inhibitory effect of TAM at both low and high E2 levels.
(Chen J, Hui E, Ip T, Thompson LU. Dietary flaxseed enhances the inhibitory effect of tamoxifen on the growth of estrogen-dependent human breast cancer (mcf-7) in nude mice. Clin Cancer Res. 2004 Nov 15;10(22):7703-11)

Flax seeds have also been found to be beneficial for cardiovascular health. Studies indicate that flax lowers lipids, including cholesterol and triglycerides. They also have shown to prevent obesity, a strong risk factor for breast and other cancers.
(Ratnayake WM, Gilani GS. Protective effects of flax meal against hypercholesterolemia and hypertriglyceridemia in rats. J Am Coll Nutr. 2003 Aug;22(4):326-7; author reply 327-9.
Bhathena SJ, Ali AA, Haudenschild C, Latham P, Ranich T, Mohamed AI, Hansen CT, Velasquez MT. Dietary flaxseed meal is more protective than soy protein concentrate against hypertriglyceridemia and steatosis of the liver in an animal model of obesity. J Am Coll Nutr. 2003 Apr;22(2):157-64.)

Suppress VEGF

Vascular endothelial growth factor (VEGF) is a potent stimulator of angiogenesis, which is crucial in cancer progression. We have previously shown that estradiol (E2) increases VEGF in breast cancer. Phytoestrogens are potential compounds in breast cancer prevention and treatment by poorly understood mechanisms. The main phytoestrogens in Western diet are lignans, and flaxseed is a rich source of the mammalian lignans enterodiol and enterolactone. EXPERIMENTAL DESIGN: In the present study, ovariectomized mice were treated with continuous release of E2. MCF-7 tumors were established and mice were fed with basal diet or 10% flaxseed, and two groups that were fed basal diet received daily injections with enterodiol or enterolactone (15 mg/kg body weight). RESULTS: We show that flaxseed, enterodiol, and enterolactone counteracted E2-induced growth and angiogenesis in solid tumors. Extracellular VEGF in vivo, sampled using microdialysis, in all intervention groups was significantly decreased compared with tumors in the basal diet group. Our in vivo findings were confirmed in vitro. By adding enterodiol or enterolactone, E2-induced VEGF secretion in MCF-7 cells decreased significantly without agonistic effects. The increased VEGF secretion by E2 in MCF-7 cells increased the expression of VEGF receptor-2 in umbilical vein endothelial cells, suggesting a proangiogenic effect by E2 by two different mechanisms, both of which were inhibited by the addition of lignans. CONCLUSIONS: Our results suggest that flaxseed and its lignans have potent antiestrogenic effects on estrogen receptor-positive breast cancer and may prove to be beneficial in breast cancer prevention strategies in the future.

Bergman Jungestrom M, Thompson LU, Dabrosin C. Flaxseed and Its Lignans Inhibit Estradiol-Induced Growth, Angiogenesis, and Secretion of Vascular Endothelial Growth Factor in Human Breast Cancer Xenografts In vivo. Clin Cancer Res. 2007 Feb 1;13(3):1061-7.