

WHAT ARE LIGNANS?



Lignans are a group of phytonutrients (plant nutrients) which are found in seeds, grains and vegetables. Flax seed is, by far, nature's richest source of plant lignans. Other sources of lignans such as rye, buckwheat, millet, soya, and barley, contain 2 to 6 micrograms of lignans per gram (mcg/g) of grain. **Flax seed yields 800 mcg/g.** While the essential fatty acids are in the oil of the flax seed, the lignans are in the fiber hull of the seed. The oil has little or no lignans.

The lignan found in flaxseed is called *secoisolariciresinol diglucoside* (SDG). This phytonutrient is classed as a polyphenol.

Flaxseed lignan was discovered in 1956. The first interest in biological activity of SDG arose in the early 1980's when investigators reported that the level of lignans in the body were lower in patients with breast cancer than in tumor free patients. It was also noted that vegetarians had higher concentrations of lignan substances than non-vegetarians.

There are two general types of lignans: 1) those found in plants and 2) those found in animals and humans or "mammalian lignans." When the plant lignan SDG (from flaxseed) is ingested, it is converted in the colon by bacteria to the mammalian lignans *enterodiols* (ED) and *enterolactone* (EL). Many studies have shown the important health benefits that exist due to this conversion of flax lignan in the body.

Flax Today

The essential fatty acids in flax oil are the best known constituent in flaxseed for providing health benefits. They have been proven to help prevent heart disease, improve skin and hair, aid in the cell production, aid in fat and weight reduction as well as other health benefits. Flax oil has become one of the most beneficial and sought after health products in the marketplace.

While most of the attention surrounding flax seed has been its source of essential fatty acids, recent studies and research have revealed that the substance called "lignan" within flaxseed may surpass flax oil in its health benefits.

Medicinal Value of Lignans

Lignans have numerous biological properties that make them unique and very useful in promoting health and combating various diseases. Up until recent times, SDG existed in such small concentrations that no one was aware of its miraculous qualities. While the oil of flaxseed is a big percentage of the seed, the SDG lignan methods have brought to light the tremendous health benefits associated with lignans.

Since the 1980's lignans have come under scientific scrutiny after studies indicated that they may interfere with the development of breast, prostate, colon, and other cancer. Research has shown that people who excrete high amounts of lignans in their urine have notably lower cancer rates.

These lignan compounds have shown such extraordinary potential that they have been studied by the National Cancer Institute for their cancer preventative properties.

The SDG lignan not only has anti-cancer properties. It is a potent antioxidant and has also been shown to enhance immune system functioning.

Lignans provide certain health benefits in part because they are considered to be "phytoestrogens." These are plant chemicals that mimic the hormone estrogen. **Studies indicate that people who eat more lignan-containing foods have lower incidence of breast and colon cancer, due to the phytoestrogen effect.** The mounting scientific evidence shows how important it is to consume a lignan-rich diet.

Lignan Products

Since 1995, several health products have come into the marketplace with the word "lignan" on the label. Several flax oil products claim to contain lignans. They have names like "high Lignan Flax Seed Oil." When these products were tested it was found they contained practically no lignans at all. That is to be expected since the lignans are not in the oil.

Other flax oil products state they contain a certain percentage of lignan particulates such as "20% lignan particulates." This does not mean it contains 20% lignans. This means that 20% of the product is made up of pieces of the flax fiber shell which contains the lignans. But since the fiber meal consists of about 1.6% lignans, such a product would contain only .35% Lignans. Further, if such a product is in liquid form (in the bottle), the particulates will settle to the bottom. Thus no lignans are consumed until the end of the product's use.

Another product says it has "up to 30% more lignans than the whole flax seed." This is essentially a product consisting mostly of the defatted flax fiber without the oil. There is no concentration or extract of lignans. Such a product would thus contain about 1.6% lignans, which is the highest level of lignans currently available.

Health product companies have tried to capitalize on the tremendous health benefits of lignans by offering lignan products. They have been able to get the word "lignan" on the label, but little of it in the product. Some of these flax products advertise that flaxseed has 100 to 800 times more lignans than other plant sources. This sounds impressive but they do not say how little lignan there actually is in a flax seed: just 1%. If it is a flax oil product, it does not matter anyway, since less than 2% of the lignans are in the oil.

The difficulty in separating SDG lignan from flaxseed lies in the fact that the flaxseed hulls, which contain the lignan, adhere tightly to the seed. Therefore, obtaining a pure SDG product has not been economically viable.

The University of Toronto developed an SDG extraction process using chemicals such as methanol, petroleum ether, chloroform, sodium methoxide and sulfuric acid. The method is not very desirable due to trace chemicals leeching into the lignans.

Another Method uses an alkaline alcohol process followed by flash chromatography. The yield, however, is rather low. Finally a new revolutionary and highly proprietary

process has been developed to provide the highest possible, all natural concentration of SDG containing flax seed lignans.

Antioxidants and Disease

It is now known that some diseases, including cancer, can get their start or be promoted by way of free radical damage. There has been an increase in the causes of free radicals in the body, such as high unhealthy-fat diets, fried foods, exposure to radiation, and environmental pollutants. The normal antioxidants (vitamins A, C, E and phytochemicals) are not able to keep up with the increase in free radicals. The balance between your intake of antioxidants and exposure to free radicals may literally be the balance between health and disease or life and death.

Previously the ability of flax seed to scavenge oxygen radicals (antioxidant properties) was not known. Recent research has proven the ability of SDG to scavenge hydroxyl radicals. The results showed that SDG has potent antioxidant activity.

At the University of British Columbia, SDG and its mammalian lignans *enterodiol* (ED) and *enterolactone* (EL) were evaluated in both lipid and aqueous in vitro model systems. All three lignans significantly inhibited the linoleic acid peroxidation and hydroxyl radicals, with ED and EL providing more scavenging activity than SDG. It was included that there is an efficacy of SDG and particularly the mammalian lignans ED and EL to act as antioxidants. This is evidence of a potential anti carcinogenic mechanism in the flaxseed lignan SDG and ED and EL.

In a Study at the University of Saskatchewan College of Medicine, tests were performed to determine the effectiveness and potency of SDG isolated from flaxseed as an antioxidant, along with its mammalian metabolites *secoisolariciresinol* (SECO), *Enterodiol* (ED) and *enterolactone* (EL). Vitamin E was also tested for a comparison. The results of the tests show that the metabolites of SDG have strong antioxidant activity. **In comparison to vitamin E, SDG was 1.27 times more potent as an antioxidant. However, the lignan EL was 4.35 times, more potent, SECO was 4.86 times more potent, and ED was 5.02 times more potent than vitamin E.**

The above studies showed that the higher the concentration of SDG, the greater the antioxidant effect.

Breast Cancer

The American Cancer Society reports that one in eight women will contract breast cancer. Unfortunately, breast cancer may be present for as long as 4 years before it can be detected by mammography or self examination.

According to Dr. Ross Pelton, author of *Preventing Breast Cancer*, the largest misconception among women is that if they do not have a family history of breast cancer,

they are at low risk. This is simply untrue. Dr. Pelton states that the majority of newly diagnosed cases of breast cancer are in women with no family history of the disease.

Standard medical treatment for breast cancer includes lumpectomy (partial removal of the breast), chemotherapy, and radiation.

Evidence of lignans containing SDG being effective in reducing breast cancer came from the University Department of Surgery, Queen Elizabeth II Medical Center, and Perth, Australia. In this controlled study, published in *Lancet*, women with newly diagnosed breast cancer were interviewed by means of questionnaires, and a 72 hour urine collection and blood sample were taken. The urine samples were assayed for various plant constituents including the lignans enterodiol and enterolactone. After adjustments for age at first menstruation, parity, alcohol intake, and total fat intake, high excretion of both equol (a plant estrogen) and enterolactone was associated with a "substantial reduction in breast cancer risk," the researchers stated. They further concluded:

"There is a substantial reduction in breast-cancer risk among women with high intake (as measured by excretion) of phytoestrogens, particularly the isoflavonic phytoestrogen equol and the lignan enterolactone. These findings could be important in the prevention of breast cancer."

Lignans help prevent or reduce breast cancer partly due to the facts that the lignan constituents in plants, such as SDG in flaxseed, resembles the female hormone estrogen. Lignans are thus classified as phytoestrogens. Like other phytoestrogens, they hook onto the same spots (receptors) on the cells where estrogen attaches. When natural estrogen is abundant in the body, lignans reduce estrogen's effects by displacing it from cells. This displacement of the hormone can help prevent those cancers, such as breast cancer, that depend on estrogen to start and develop.

In 1996 study, SDG was tested for effects on mammary tumor genesis in rats. **The consumption of the flaxseed lignan SDG resulted in a 37% reduction in the number of tumors per tumor-bearing rat, and a 46% reduction in the number of tumors per number of rats in each group.** This study showed that SDG has an anti-tumor effect when provided at the early promotion stage of tumor genesis.

Another study was conducted to determine if the lignan SDG could reduce mammary tumor growth at the late stage of carcinogenesis. Flax SDG supplementation began 13 weeks after carcinogen administration to see if it would reduce the size of established mammary tumors (present at the start of treatment), and the appearance of new tumors in rats. **After 7 weeks of SDG treatment established tumors volume was over 50% smaller in all treatment groups, while there was no change on the rats on the normal control diet.** New tumor number and volume were also lower in the SDG group. The conclusions were that SDG is beneficial throughout the promotional phase of carcinogenesis, and at the stage when tumors have already been established.

In a similar study, not only did the use of SDG inhibit mammary tumor development in rats, but it was also noted that certain growth factors were lowered. It is known that increased plasma insulin-like growth factor (IGF-I) concentration are associated with increased breast cancer risk. Thus the anti-cancer effect of flaxseed SDG may also be related, in part, to reductions it causes in plasma IGF-I.

During lactation, breast development occurs involving the terminal end bud (TEB) structures in the breast. A test was conducted to see if flaxseed lignans affected the development of the mammary gland in rats during lactation. This was important because mammary glands with more TEBs are more susceptible to carcinogens. The results were that lignans taken during early postnatal life may reduce the risk of developing breast cancer. Thus lignans work in several different ways to fight breast cancer.

Colon Cancer

There are various factors that put people are risk for colon cancer: lack of dietary fiber and calcium, a build up of toxins in the colon, continued constipation and/ or diarrhea, polyps, a high unhealthy-fat diet.

Since the plant lignan SDG is converted into the mammalian lignans *enterolactone* and *enterodiol* directly within the colon, SDG is particularly effective in combating cancer of the colon.

In a 1992 study, it was discovered that flaxseed ingestion produced anti carcinogenic lignans in the colon. This study determined that flaxseed decreases the risk for colon carcinogenesis. Following an injection of azoxymethane (to induce carcinogenesis) five groups of male rats were fed a high-fat diet with or without supplementation with flax meal for 4 weeks. **In the colons of the supplemented groups, it was discovered that the total number of aberrant crypt and foci were significantly reduced by 41-53% and 48-57% respectively. This suggests that consumption of flaxseed and its lignans may reduce the risk for colon carcinogenesis.**

The above study shows that SDG lignan over the short term decreases some early markers of colon cancer risks. Studies at the University of Toronto Department of Nutritional Medicine, were conducted which showed that over the long term flaxseed lignan still exerts a colon cancer protective effect. Six groups of rats were fed 100 days either a regular diet of one supplemented with 2.5% or 5% defatted flaxseed. All rats were injected with a single dose of azoxymethane one week prior to commencing the dietary treatments. This was done to induce colon cancer. The rats which were fed the defatted flax had significantly reduced number of aberrant crypts in the distal colon compared to the control group. It was concluded that flaxseed had colon cancer protective effect due, in part, to the lignan SDG and that the productive effect of flaxseed and SDG is associated with increased beta-glucuronidase activity.

Another research was performed which involved the mammalian lignans *enterolactone* (EL) and *enterodiol* (ED), which are derived from SDG. In this research, four human colon tumor cell lines were incubated with various levels of EL, ED, or 17 beta-estradiol for 8 to 10 days. At 100 microM concentration, both lignans significantly reduced cell proliferation of all cell lines. EL was more than twice as effective as ED at this concentration. The growth was not affected by the presence of 17 beta-estradiol, implying that these cells are not estrogen-sensitive. The conclusion was the lignans are growth inhibitors of colon tumor cells and may act through mechanisms other than anti-estrogenic activity.

Diabetes

Diabetes is currently the ninth leading cause of death in America. The most common form of diabetes, *Mellitus*, is generally divided into two categories: type 1, called insulin-dependent or juvenile diabetes, and type 2, called adult-onset or non-insulin-dependent diabetes.

Several studies at the University of Saskatchewan indicate that the lignan SDG from flaxseed can help prevent or significantly delay the development of diabetes. **In a study with rats published in 2001, Dr. Prasad of the College of Medicine, Physiology Department, found that SDG reduced development of adult-onset (type 2) diabetes by 80 percent, and delays the development of the disease significantly.**

The finding of this study builds on Prasad's previously published studies involving two animal models of type 1 (juvenile) diabetes. **These two studies showed that SDG reduced the development of the type 1 diabetes by 71 and 75 percent respectively.**

Prasad has shown that both type 1 and type 2 diabetes are associated with oxidative stress (increase in toxic metabolites of oxygen known as oxygen free radicals). But because of SDG's potent antioxidant activity, its ingestion is effective in preventing and reducing the development of diabetes by reducing this oxidative stress. As a complex carbohydrate, lignans can help reduce blood sugar levels.

Prasad stresses that diabetes patients would have to consume very large amounts of whole flax seed to get enough SDG to provide the equivalent beneficial effect found in the animal studies. Drawbacks to doing this would also include high calorie intake (flaxseed is 35-40 percent oil) and a laxative effect. For that reason, SDG extracts derived from newly developed extraction methods would be needed.

Heart Disease

It is well known that flax oil fights heart disease by lowering dangerous LDL cholesterol and triglycerides, and reducing the build up of atherosclerotic plaque on

artery walls. But now, evidence is revealing that SDG lignan in a concentrated form has an equal or greater effect in fighting heart disease.

Researchers produced an extract from flax meal consisting of 99% pure SDG which was fed (15 mg/kg body weight) to rabbits on a high cholesterol diet for a period of 8 weeks. Another group was also fed a high cholesterol diet but received no SDG treatment. After 8 weeks, it was discovered that the addition of SDG resulted in a 73% reduction in atherosclerotic plaques (fatty deposits) compared to the untreated rabbits. It was also noted that there was a 33% reduction in serum cholesterol and an increase in the "good" or protective cholesterol in the SDG-fed rabbits. This shows that flaxseed SDG is effective in reducing hypercholesterolemia atherosclerosis (hardening of the arteries due to high cholesterol).

The ability of SDG in reducing atherosclerosis is partly due to its antioxidant activity. Oxygen free radicals have been implicated in the development of the disease. Dr. Prasad states that oxygen free radicals damage the lining of the blood vessels and set the stage for development of atherosclerosis. SDG antioxidant activity has the ability to remove toxic metabolites of oxygen or free radicals, thus retarding atherosclerosis. Recent work from the University of Saskatchewan has demonstrated the reduction of hypercholesterolemia atherosclerosis is greater with SDG than with the whole flaxseed. The decrease is associated with a reduction of serum cholesterol and LDL-cholesterol. These studies show the need for a more pure and concentrated form of lignan than in most "lignan flax oils" in order to obtain the greatest benefit it offers against heart disease.

In a study of 29 hyperlipidemic subjects who were placed on a diet of 50 grams of partially defatted flaxseed, their LDL cholesterol was reduced 7.6% after only three weeks. Since there was no oil in the flaxseed, the component responsible for those effects was the lignans.

In one test, several dogs were pretreated with lignan-rich flaxseed. The pretreated attenuated endotoxin induced cardiac dysfunction and cellular damage. Thus the lignan's antioxidant and anti-PAF agents may be effective in the treatment of endotoxic shock.

Kidney Disorders

The kidneys are the major regulators of the water, electrolyte, and acid-base (pH) content of the blood and, indirectly, all body fluids. Kidney disease is often the result of damage done to kidneys by exposure to certain drugs or toxins, heavy metals, solvents, poisons, or pesticides. Impaired kidney function can also accompany or result from other disorders, such as diabetes, lupus, hypertension, and liver disease.

There is growing evidence that dietary phytoestrogens, such as flax lignan, have a beneficial role in chronic renal (kidney) disease. Recent findings from dietary intervention studies performed in animals and humans suggest that consumption of flaxseed rich in lignans retards the development and progression of chronic renal disease.

In a study involving the dietary supplementation of flax lignan, the researchers measured the existence of proteinuria, or protein in the urine, which is a sign of severe renal disease. Mice with lupus were fed a diet supplemented with 15% flaxseed for 14 weeks. The flaxseed diet significantly delayed the onset of proteinuria. Further, the incidence of proteinuria was lower in the flaxseed diet group compared to the control diet group. It was also noted that lignans produce specific reversible and competitive inhibitions of PAF. This PAF factor has been implicated with the onset of renal injury. Mortality was lower in the flaxseed-fed mice.

In a study at the University Of Manitoba, it was discovered that lignans in flaxseed improve kidney function in certain types of kidney diseases. When rats with kidney dysfunctions were given flaxseed in their diet, it preserved renal function and reduced histological injury.

Flaxseed has been investigated in both immune and non-immune models of renal injury. It was concluded that both models, flaxseed was beneficial in slowing the decline in renal function. Studies comparing defatted flaxseed meal with full fat meal indicate that components other than the oil, such as fiber or lignans, have desirable properties in some aspects of renal disease.

Lupus

Lupus is a chronic inflammatory disease that can affect many of the body's organs and skin. On the skin it is characterized by remissions and exacerbations of a scaling, red, macular rash. Late in the disease patients suffer significant morbidity and mortality from kidney failure and accelerated vascular disease with heart attacks, strokes and other atherogenic complications. There is no cure and complete remissions are rare.

Lupus is an autoimmune disease, which means the immune system forms antibodies that attack the body's own cells and tissue. At least 90 percent of those that contract the disease are women. It usually develops between the ages of 18 to 35. There are two types of lupus: *Systematic lupus erythematosus* (SLE) and *discoïd lupus erythematosus* (DLE). The SLE type of lupus is a systematic disease that affects many different parts of the body. The DLE type of lupus is a less serious disease that primarily attacks the skin.

Research at the University of Western Ontario indicates that SDG has a therapeutic role in animal and human lupus nephritis. It is known that in patients with lupus nephritis (SLE) there is an increase in the production of platelet activating factors (PAF), and a disease in there metabolism. Platelets are the fragments of megakaryocytes (large

cells in the bone marrow) which get into the blood. Lignans acts as PAF receptor antagonists, which means the lignans reduce the accumulation PAF's.

In this study, a group of mice with induced lupus were fed a diet supplemented with 15% flaxseed, and another group was fed an isocaloric control diet. **Both groups of mice were administered an intravenous lethal dose of PAF (25 pg/kg body weight) for one week. The animals fed the flaxseed diet survived the lethal injection of PAF. Furthermore, the PAF-induced platelet aggregation was significantly inhibited in the flaxseed-fed mice.**

A similar test was conducted with eight lupus patients. The patients were given 15, 30, and 45 grams of flaxseed per day for four weeks. PAF-induced platelet aggregation was inhibited by all doses. In conclusion, the flaxseed conferred significant benefits in the pathogenesis of lupus nephritis. While more research is pending with lupus cases, all tests show very beneficial results from lignan-rich flaxseed.

Men's Health

The biological properties of lignans have several beneficial effects for men. Their potent anti-estrogenic effect has drawn the interest of bodybuilders who are always looking to increase their testosterone to estrogen ratio. Flax lignans offer a natural way to do it without adverse side affects.

Lignans may also offer a benefit to those men who are athletic, do heavy lifting or strenuous work by **preventing damage to muscles**. It was demonstrated that rats which were pretreated with lignan-enriched extract were protected against physical exercise-induced muscle damage.

Prostate Cancer

Cancer of the prostate gland is the second leading cause of cancer death among men. It is a disease that primarily occurs in men over sixty years old. By the age of eighty, 80 percent of all men have prostate cancer to some degree. Fortunately, in most cases, prostate cancer is a slow-growing cancer, doubling in mass every six years. Like all cancers, the rate of prostate cancer is rising in the United States. Part of the reason is due to high unhealthy-fat diets and exposure to chemicals. Current treatments are radical prostatectomy and radiation therapy. Flaxseed ingestion produces large amounts of mammalian lignans with weak estrogenic / anti-estrogenic properties. In tests, these properties reduced adult relative prostate weight and cell proliferation, suggesting potential protection against prostatic disease, without affecting sex hormone levels.

Researchers from the University of Wales College of Medicine, Cardiff, United Kingdom, determined the concentration of lignans in prostate fluid from Portuguese,

Chinese, and British men. The mean concentrations of enterolactone and other plant estrogens were very high among Portuguese and Asian men, respectively. The research team concluded that the level of lignans and related plant estrogens may be responsible, in part, for lower incidence of prostate cancer in men from Mediterranean countries.

It is also noted that vegetarian men have lower incidence of prostate cancer than non-vegetarian males. This is partly due to the higher level of plant lignans consumed by vegetarians. In addition to their estrogenic activity, these plant compounds can interfere with steroid metabolism and bioavailability, and also inhibit enzymes, such as tyrosine kinase and topoisomerase, which are crucial to cellular proliferation and hence contribute to lower incidences of prostate cancer.

A very recent study involved twenty-five patients with prostate cancer which were given a lignan-rich flaxseed supplementation. The results show a favorable affect on prostate cancer biology and associated biomarkers.

Skin Cancer & Melanoma

There are several different types of skin cancers, some of which are benign and other malignant. An estimated 600,000 Americans develop some type of skin cancer each year, and over 10,000 die from the disease. A recent review suggests that both **isoflavonoids** and **lignans** are natural cancer protective compounds, and are useful against skin cancer.

Researchers from the Department of Biomedical Sciences, Creighton University School of Medicine, Omaha, Nebraska, investigated the effect of dietary supplementation of flaxseed, the richest source of lignans, on experimental melanoma cells. **Flax reduced tumor occurrence by up to 63%**. The addition of flaxseed to the diet also caused a dose-dependent decrease on tumor area and volume, showing that it could be beneficial in both prevention and treatment. Further, the rich source of lignans reduced a metastasis (the spread of cancerous cells) and inhibited the growth of the metastatic secondary tumors in the animals tested.

Women's Health

Because lignans are phytoestrogens, they are effective in treating several health issues for women. If there is little estrogen in the body (after menopause, for example), lignans may act like weak estrogen; but when natural estrogen is abundant in the body, lignans may instead reduce estrogen's effects by displacing it from the cells. As discussed earlier, this displacement of the hormone can help prevent breast cancer.

This chemical resemblance to estrogen gives lignan it agonist or antagonist properties to the estrogenic receptor site. A clinical study has shown that SDG phytoestrogen in particular, exhibits agonist properties to the estrogen receptor. This property is of specific value to post-menopause women, which typically exhibit low estrogen levels.

Women consuming lignan-rich flaxseed products generally report a reduction in breast tenderness, bloating, hot flashes, sweating, vaginal dryness, and other systems related to PMS and menopause. This is due to the lignan's estrogenic activity.

For years, people have been attempting to control menstrual cycles. Controlling menstrual cycles has several health benefits including decreasing the risk of breast cancer. **Lignans in flaxseed have been shown to regulate women's menstrual cycles. In one study, women consuming lignans in flaxseed did not miss a single cycle, compared to the control group that missed several cycles. In another study women supplemented their diet with a dose of 10 g/day of flax.** It resulted in elevated progesterone / estradiol ratios in the luteal phase. This was due to a decreased estradiol concentration. The concentration of lignans measured in the urine showed the level of lignans absorbed. Thus flax lignan clearly has a significant impact in controlling women's menstrual cycle.

In a study with rats, the effect of flax and its lignan SDG was compared with tamoxifen, an anti-estrogen drug, by monitoring rat estrous cycling. After four weeks 66% of the rats taking flax SDG had more regular cycling produced by a cessation or lengthening (by 18-39%) of estrous cycles. In the rats given tamoxifen, 83% of the animals had irregular cycles or were in persistent diestrus. The conclusion was that flaxseed and SDG were effective in being anti-estrogenic without gross tissue toxicity. The control which lignan has over the menstrual cycle has an influence on cancer growth. This is because the less time a woman spends in the luteal phase, the lower the risk of breast cancer.

A study of twenty-eight postmenopausal women was conducted in which they consumed lignan-rich flaxseed. The supplementation significantly increased urinary excretion of the estrogen metabolites 2-hydroxyestrogen and 16 alpha-hydroxyestrone. These results suggest that lignan from flaxseed may have chemo-protective effects in postmenopausal women.

Because of the potential effects lignans have on estrogen, women who are pregnant or breast-feeding should avoid taking large amounts of this supplement. It is considered safe when used in moderation at such times.

Other Uses & Treatments

There is evidence that lignans are anti-parasitic. In one test, vitamin E deficient diets containing 5 to 20% ground flaxseed protected mice against the malarial parasite *Plasmodium yoelii* as shown by decrease parasitemia and enhanced survival.

Dietary supplementation with SDG, The lignan from flaxseed, significantly reduced pulmonary metastasis of melanoma cells and inhibited the growth of metastasis tumors that formed in the lungs. This may aid in the fight against lung cancer.

There is clinical and laboratory evidence which indicates that phytoestrogens, such as flaxseed lignan, have an anti-proliferation effect on the breast, and positive effects on the lipoprotein profile and bone density.

Flax lignan is useful for pets and livestock. Flax has been used since antiquity to maintain healthy animals. In cattle its reported uses included the correction of digestive disturbances in calves, easier calving, and reduction of certain infectious diseases such as hoof-and-mouth. Horse owners have reported using it to produce glossy looking coats and to the diets of pets to improve their appearance and general health.

Flaxseed and its lignan have been shown to reduce inflammatory responses, but did not prevent macrophages (*cells of the immune system*) from killing bacteria. The research of Dr. W. Clark involving lupus revealed that lignans are beneficial for reducing inflammation.

History of Flax

Flax is one of the most ancient of useful herbs. Its Latin name, *Linum Usitatissimum*, means "most useful." The usefulness of the flax to humankind predates earliest recorded history. Archaeologists discovered remnants of linen, the cloth derived from flax, in Stone Age Swiss Lake villages.

The Book of Exodus and the Talmud both mention the cultivation of flax. Ancient Egyptians grew flax along the Nile and wove linen fabrics for clothing, bed sheets, diapers, sails, even wrapping for mummies.

Recently, at an archeological site in a small village near the headwaters of the Tigris River in Turkey, a small piece of linen made from flax was found wrapped around a tool handle. This artifact was dated about 7,000 B.C. and is believed to be the oldest piece of cloth ever discovered.

Flax was also used for culinary purposes. Flaxseed excavated from ancient Greek archeological sites has been dated back to 1900 to 1700 B.C. and the use of flaxseed is inscribed on tables at Pylos. Both the Greek historian Thucydides and the Roman historian Pliny mention the use of flax for food. In fact, so impressed with this gift of nature, Pliny wrote, "What department is to be found in active life in which flax is not employed?" **Of flax, Bartholomew had this to say, "No herb is so needed and has so many uses to mankind as flax." And Dioscorides extolled flaxseed's power for "reducing all inflammation inwardly and outwardly."**

As time progressed the role of flax in human usage evolved further still. Hippocrates encouraged the use of flaxseed for the relief of abdominal pains, while Theophrastus recommended flax meal in hot compresses for the treatment of both external and internal ailments. The value of flax to these early cultures is reflected in the rich folklore that surrounds the plant.

After the fall of the Roman Empire flax cultivation waned until the eighth century A.D. when French leader, Charlemagne, so impressed with herb's culinary, medicinal,

and domestic usefulness, passed laws and regulations requiring its cultivation and consumption. Flax was much loved and widely cultivated throughout Europe and its cultivation and use continued to expand to other lands and cultures.