**Flax Hull Lignans Study Information**

Lignans extracted from the hull of flaxseed is proven to have high nutritional contents (see attached food analysis) more than local foods like sorghum and proven to supply necessary body nutrients as well as helping people with HIV/AIDS.  Concentrated Flax Hull Lignans, in powder form, is easy to take; once a day in the morning with juice or cereal or yogurt or it can be used as a salad topping.  The **product has 30-60 mg/g which equals 150-300 mg SDG per serving.  Flax Lignans** helps to control or prevent other chronic diseases such as cancer, diabetics. Studies have shown that flaxseed and lignans has numerous health benefits including various cancer prevention and treatment (Kurzer et al 1995), decrease of some early markers of colon cancer risk in part because of its lignans (Jenab et al, 1999), better blood sugar control in diabetic patients, prevention of atherosclerosis (Prasad, 1999), decrease menopausal symptoms (Adlercreutz, 1997), improvement of kidney function in certain types of kidney disease (Arjmandi, 1998; Prasad, 1999), and reduction of cholesterol (Sung MK, 1998; Prasad, 1997).

**Flaxseed/Flax Lignans.** Flaxseed (*Linum usitatissimum*) is a major source of dietary intake of lignans with high concentrations (0.7-1.5%) present in the seed (Sicilia et al, 2003). In fact, Flaxseed is the richest known source of both alpha-linolenic acid (ALA) and the phytoestrogen, lignans, as well as being a good source of soluble fiber ([Bloedon and](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Bloedon%20LT%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstractPlus) [Szapary,](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Szapary%20PO%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstractPlus) 2004). Human studies have shown that flaxseed can modestly reduce serum total and low-density lipoprotein cholesterol concentrations, reduce postprandial glucose absorption, decrease some markers of inflammation, and raise serum levels of the omega-3 fatty acids, ALA and eicosapentaenoic acid ([Bloedon and](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Bloedon%20LT%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstractPlus) [Szapary,](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Szapary%20PO%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstractPlus) 2004).

Phytoestrogens of the lignan type are widely distributed in plant-derived food items and are believed to protect against hormone-dependent cancer. The richest known dietary source of lignans is flaxseed (Sicilia et al, 2003). The principal lignan present in flaxseed is secoisolariciresinol diglucoside (SDG), together with small amounts of matairesinol, isolariciresinol, and pinoresinol. The flaxseed lignan secoisolariciresinol diglucoside (SDG) and mammalian lignans enterodiol (ED) and enterolactone (EL) have been shown to be effective antioxidants against DNA damage and lipid peroxidation (Hu et al., 2007). It was reported that there are likely extra- and intracellular antioxidant activities of flax-derived lignans at concentrations potentially achievable in vivo (Hu et al., 2007).

 Lignans and isoflavonoids have been shown to have anticarcinogenic properties in animal and cell studies, and have been associated with reduced cancer risk in epidemiological studies (Kurzer et al 1995). Flaxseed has been shown in previous studies to decrease some early markers of colon cancer risk in part because of its lignans. A study (Jenab et al, 1999) determined that the intake of flaxseed and lignans in rats was related to the activity of bacterial beta-glucuronidase, an enzyme suggested to increase colon cancer risk. The specific and total activities of beta-glucuronidase in the cecum were significantly related to the levels of flaxseed (r = 0.539, p < 0.008 and r = 0.599, p < 0.002, respectively) and SDG (r = 0.567, p < 0.007 and r = 0.435, p < 0.04, respectively). The urinary mammalian lignan excretion also increased with increasing flaxseed or SDG levels and thus was significantly related to the specific activity (r = 0.38, p < 0.017) and total activity (r = 0.429, p < 0.007) of beta-glucuronidase. Because flaxseed and lignans are colon cancer protective, it was concluded that, in contrast to other studies, beta-glucuronidase activity may play a beneficial role in their presence by increasing mammalian lignan absorption and enterohepatic circulation.

Another study (Waldschlager et al, 2005) investigated the effects of flax-seed, on the proliferation and hormone production of an estrogen receptor (ER)-positive trophoblast tumour cell line.; the study showed an inhibitory influence of some of the isolated flax-seed fractions on the Jeg3 tumour cells. It was demonstrated that the flax-seed seems to have inhibitory effects on hormone production and proliferation of hormone-sensitive tumour cells. Also, a dose-dependent inhibition by isolated flax-seed extracts on the Jeg3 cell line was reported indicating a potential benefit of a lignan-containing therapy in hormone-dependent diseases.

Phytoestrogens such as lignans have been shown to alter breast cancer incidence and be cancer-protective in rats. A study (Dabrosin et al.2002) showed that supplementation of 10% flaxseed, the richest source of mammalian lignans, to nude mice with established human breast tumors reduced tumor growth and metastasis. Additionally, a number of preliminary human and animal studies suggest that lignans are helpful in cancer treatment and prevention, particularly breast and colon cancer, as well as reduction of cholesterol (Sung MK, 1998; Prasad, 1997). In addition, preliminary research suggests that lignans may prevent atherosclerosis (Prasad, 1999), decrease menopausal symptoms(Adlercreutz, 1997) and improve kidney function in certain types of kidney disease (Arjmandi, 1998; Prasad, 1999). In people with diabetes, lignans delay glucose absorption which leads to better blood sugar control.

**Nutritional Interventions for Reducing Morbidity and Mortality in People Living with HIV/AIDS.** Adequate nutrition promotes and maintains optimal immune function. Dietary support may, therefore, improve clinical outcomes in HIV-infected individuals by reducing the incidence of HIV-associated complications and attenuating progression of HIV disease, thereby improving quality of life and ultimately reducing disease-related mortality (Mahlungulu et al., 2007). In a study conducted by Mahlungulu et al (2007) Overall, macronutrient supplementation (a balanced diet or high protein, high carbohydrate, or high fat diets given orally- with or without nutritional counselling) significantly improved energy intake (5 trials; n=254; WMD 367 kcal.day-1; 95% CI: 217 to 516) and protein intake (3 trials; n=128; WMD 17 g.day-1; 95% CI: 8 to 26) compared with no nutritional supplementation or placebo. There was no evidence of an effect on body weight (8 trials; n=423; WMD 0.24 kg; 95% CI: -0.6 to 1.1), fat mass (6 trials; n=305; WMD -0.73 kg; 95% CI: -1.83 to 0.37), fat-free mass (5 trials; n=311; WMD 0 kg; 95% CI: -2.3 to 2.4) or CD4 count (6 trials; n=271; WMD 0.23 cells.mm-3; 95% CI: -40.2 to 40.6). Given the current evidence base, which is limited to a few small trials in high-income countries, these authors concluded that no firm conclusions can be drawn about the effects of macronutrient supplementation on morbidity and mortality in People Living with HIV/AIDS (Mahlungulu et al. 2007).

**JUSTIFICATION OF STUDY:**

With the increasing rate of HIV/AIDS and the detrimental development challenges especially in African countries, there is need for a strategically designed intervention program to address both the nutritional and developmental challenges. The **purpose of** this project is to provide nutritional support for people living with HIV/AIDS, alongside the supplement supply, about 300 people using the supplement will be selected for a clinical study of the effect of the supplement on the participants. To ensure continuous supply of the FHL supplement, the second phase will comprise of getting a farmland, planting the seed, processing the seed to get the lignin and distributing the finished product.

Studies have shown that good nutrition is important for HIV/AIDS treatment because not only does it provide essential nutrients for people living with HIV/AIDS, it reduces the side effects of medications among other functions (**Tufts University, 2011;** Gerrior & Neff 2005, AIDS and Gov., 2011). Good diet helps to keep the immune system making it possible to better fight the disease and its many symptoms such as diarrhea, nausea, and fatigue as well as ensuring a quality life (**Tufts University, 2011)**.

Adequate nutrition promotes and maintains optimal immune function. Dietary support may, therefore, improve clinical outcomes in HIV-infected individuals by reducing the incidence of HIV-associated complications and attenuating progression of HIV disease, thereby improving quality of life and ultimately reducing disease-related mortality (Mahlungulu et al., 2007).

If proven to have health benefits, Flax Hull Lignans would therefore directly address two objectives of this grant; ***Malnutrition and Improved quality of life of PWAs***. Moreover, it has been stated thatmalnutrition among PHAs remains an important problem even in the era of potent antiretroviral therapy (ART) and correlates directly to mortality. ***Food supplements, Flax Hull Lignans in particular, hold the promise of meeting these criteria, but their widespread use needs to be based on sound scientific evidence of effectiveness and safety.*** Given the current evidence base, which is limited to a few small trials in high-income countries, no firm conclusions can be drawn about the effects of macronutrient supplementation on morbidity and mortality in People Living with HIV/AIDS (Mahlungulu et al. 2007, Irlam et al, 2005).

The current World Health Organization (WHO) recommendation is to promote and support adequate dietary intake of micronutrients wherever possible (Irlam et al, 2005). However, the long-term clinical benefits, adverse effects, and optimal formulation of micronutrient supplements are unknown and require further investigation (Irlam et al, 2005). ***The collaborative team that we have assembled has the expertise and commitment to conduct a sound scientific randomized clinical trial that will test the effectiveness of a Ready to Use Therapeutic Food (RuTF) supplement (Flax Hull Lignans) with placebo or no treatment on clinical and immunological status of People Living with HIV/AIDS (PHAs).***

 Flax Hull Lignans (FHL) is a whole food product that is already available on the US market. Additionally, there are reports (ARAI, 2006) that FHL boosts the immune system of people including millions of People Living with HIV / AIDS (PWAs). For instance, there are studies (Waldschlager et al, 2005) that have indicated that Flux Hull Lignans has a potential benefit of balancing hormone related problems in women through a lignan-containing therapy for hormone-dependent diseases. If proven to have health benefits, Flax Hull Lignans would therefore directly address two objectives of this grant; ***Malnutrition and Improved quality of life of PWAs***. Moreover, it has been stated thatmalnutrition among PHAs remains an important problem even in the era of potent antiretroviral therapy (ART) and correlates directly to mortality.

Phytoestrogens are strikingly similar in chemical structure to the mammalian phytoestrogen, oestradiol, and bind to oestrogen receptors (ER) with a preference for the more recently described ER beta ([Cassidy,](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Cassidy%20A%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstractPlus) 2003). This suggests that these compounds may exert tissue specific effects. Numerous other biological effects independent of the ER (e.g. antioxidant capacity, antiproliferative and antiangiogenic effects) have been ascribed to these compounds. Whether phytoestrogens have any biological activity in humans, either hormonal or non hormonal is a contentious issue and there is currently a paucity of data on human exposure. ***However since biological effects are dependent on many factors including dose, duration of use, protein binding affinity, individual metabolism and intrinsic oestrogenic state, further clinical studies are necessary to determine the potential health effects of these compounds in specific population groups (***[***Cassidy,***](http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=Search&Term=%22Cassidy%20A%22%5BAuthor%5D&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVAbstractPlus) ***2003).***

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