

# Hemp Oil

## Overview

Hemp seed oil is considered to be the best nutritional oil for health because its essential fatty acid (EFA) profile is closest to that required by the human body. Essential fatty acids are termed as such because the body cannot manufacture them. Therefore, they must continually be replenished in the diet. EFAs are not stored or used for energy as are other fats. Instead, they are used as raw materials for cell structure and as precursors for the synthesis of many of the body's vital biochemicals, including hormones and prostaglandins.

Because our brains are made of long-chain omega-3 fatty acids, many assume that the only way you should obtain these is by eating such things as fish, which have the long-chain fats. Such plant sources as hemp seed oil, coconut oil, and flax seed oil are made up mainly of medium-chain fats, which non-vegetarians quickly point out. However, when long-chain fatty acids are eaten, they must be emulsified by bile salts in the small intestine before they can be absorbed into the body. Short- and medium-chain fatty acids are absorbed directly through the portal vein to the liver, where they are immediately available to the body.

Hemp seeds are the only natural source to boast of having the ideal ratio of EFAs required by the human body, which is roughly 3:1 of omega-6 to omega-3, the two most important EFAs. Flax oil ranks second as a valuable EFA source, but flax seed is not in the optimal proportion. Rather, it has the opposite ratio - 1:3. After about two years of regular use, flax seed can eventually cause omega-6 deficiency symptoms.

By weight, hemp seed is 30-35% oil, of which 80% consists of polyunsaturated EFAs, specifically the two most important ones - linoleic acid (LA - omega-6 at 60%) and linolenic acid (LNA or ALA - omega-3 at 20%). These are the parent compounds which build longer-chain fatty acids. LNA then converts to DHA (docosahexaenoic acid) and EPA (eicosapentaenoic acid) - two of the most critically needed forms of EFA and LA converts to AA (arachidonic acid), which has opposite effects of those from DHA.

An excess of AA - the result of too much omega-6 - ultimately leads to such health problems as inflammation and, more importantly, increases blood clotting, which can cause heart attack, stroke, or embolism. In the last 40 years, the American diet has become loaded with excess omega-6 from corn and soybean oil, margarine, and similar processed fats. At the same time, Americans eat 500 mg of omega-3 per day, much less than they need. Consequently, instead of the 3:1 ratio they should be getting, most people consuming the western-type diet, end up with a ratio of 50:1.

Other fatty acids in hemp seed oil include: Palmitoleic acid, Heptadecanoic acid, Arachiditic acid, Eicosenoic acid, Behenic acid, Erucic acid, Lignoceric acid, and Nervonic acid; but it also contains several higher fatty acids. It is one of the only food oils to contain the direct metabolites of LA and LNA. Most notable are GLA (gamma linolenic acid from LA) and SDA (stearidonic acid from LNA), which serve as intermediaries in the formation of longer-chain fatty acids and vital hormone-like prostaglandins in the body. Because of this, hemp seed oil is able to circumvent the impaired EFA metabolism and physical compromise that can result from genetic factors, intake of other fats, aging, and lifestyle patterns.

## Gamma Linolenic Acid

GLA and SDA are not considered to be "essential" because the body is also able to convert some of the parent compounds into GLA and SDA, a process that happens through the enzymatic action of delta-6-desaturase. However, there are many health conditions and nutritional

deficiencies that interfere with this process. Therefore, GLA may very well be an EFA for such individuals as the elderly, diabetics, those with excessive cholesterol, common viral infections, and a zinc deficiency. It is vital for those consuming an excess of saturated fats, refined oils, fried foods, alcohol, and sugar. Trans-fatty acids also inhibit the production of GLA and SDA.

GLA is used in both the pharmacological and cosmetic industries. The most important use is in the area of chronic skin disorders such as neurodermatitis. Used both internally and externally, GLA can balance a lack of essential fatty acids and return the moisture loss of the skin back to normal hydration. The alleviating action of GLA on psoriasis, atopic eczema, and mastalgia are already well documented and GLA preparations are frequently prescribed for the treatment of them. GLA has also been researched for its beneficial effects in cardiovascular, psychiatric, and immunological disorders, particularly that of rheumatoid arthritis, diabetic neuropathy, and premenstrual syndrome.

GLA is found in minute quantities in most animal fats. Oats, barley, and wheat germ also contain small amounts, as does human milk. Excellent sources of GLA, though, are hemp seed and hemp seed oil (2-6%), blue-green algae (spirulina), evening primrose oil, black currant seed oil, borage oil, and some fungal oils. None are as tasty as hemp seed oil and consequently, not nearly as versatile either.

In order to introduce hemp seed oil into medicinal preparations, it would be necessary to increase the GLA content in the seed from the present 2-4% to about a 10% level. Hemp oil with a 10% GLA content would immediately replace other oils.

Symptoms of an LNA (omega-3) deficiency include: dry skin, growth retardation, weakness, impaired learning ability, poor motor coordination, behavioral changes, impaired vision, high blood pressure, sticky platelets, edema, mental deterioration, low metabolic rate, and immune dysfunction (see more under Hemp as Medicine)

Although LA (omega-6) is present in our bodies in much greater quantities and because the western diet has an over-abundance, deficiencies are rare but can happen. Symptoms of an LA deficiency include: skin eruptions (acne and eczema-like), loss of hair, poor blood circulation, behavioral disturbances, liver and kidney degeneration, gallbladder problems, prostatitis, muscle tremors, abnormal water loss through the skin (sweating profusely), susceptibility to infections, impaired wound healing, male sterility, miscarriage, arthritis, cardiovascular disease, and growth retardation.

These deficiency symptoms are all reversible with adequate intakes of EFAs but if ignored for a long time, health problems can develop into more serious degenerative conditions.

## **Saturated Fatty Acids**

While there are many pictures of the horrors of eating saturated fats being painted today, they are necessary to the body. It is the excess consumption of them from meat and fried foods that raise blood levels of LDL cholesterol. This excess contributes to the formation of arterial plaque, thus raising the risk of heart attacks and strokes.

Saturated fatty acids (SaFAs) are an important source of calories. When our energy needs are met, our bodies metabolize excess fatty acids into SaFAs for storage as adipose tissue. There are only small quantities in vegetable oils - about the right amount that is actually needed. Hemp seed oil is composed of about 8% saturated fat.

Foods grown closer to the equator have a higher quantity of SaFAs and less of the polyunsaturated fatty acids. The reverse is true for foods that grow closer to the poles in the colder climates. The reason for this is that plants and seeds that must survive freezing temperatures produce fluids that remain liquid even below the freezing temperature. Tropical plants produce oils that will remain stable in hot conditions. This is the reason that SaFAs are

often solid at room temperature while polyunsaturated fatty acids remain liquid at below-freezing temperatures.

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## Essential Fatty Acids

Link oxygen, electron transport, and energy in the process of oxidation. Oxidation “burns” food to produce the energy required for life processes. EFAs are involved in the transporting of oxygen to all our cells and can be likened to magnets that pull oxygen into our body. EFAs appear to hold oxygen in cell membranes to act as a barrier to viruses, fungi, and bacteria.

increase metabolic rates and burn more fat into carbon dioxide, water, and energy, sometimes resulting in weight loss.

form cell membranes and function and keep them fluid, maintain hormone balance, prevent drying and cracking skin conditions, bring sheen to the hair, helps prevent cardiovascular disease, arthritis, auto-immune disorders and more, and help with wound healing, breast pain, pre-menstrual syndrome, and multiple sclerosis.

help produce life energy in our body from food substances, and moving that energy throughout our systems, thereby governing growth, vitality, and mental state.

particularly, ALA and its derivatives, can lower cholesterol up to 65%.

Disperse throughout the body, giving biological systems the power to carry such substances as toxins to the surface of the skin, intestinal tract, kidneys, or lungs, where these substances can be discarded.

are vital since the brain is comprised of 12% fat, mother’s milk is 40% fat, and the eyes are 60% fat - of which, DHA from omega-3 is the most abundant! DHA stays in the body for only about a week so must be replenished frequently for optimal health.

are very sensitive to light, heat, and oxygen. Therefore, hemp foods should be stored in cold, dark places to preserve potency.

Substantially shorten the time required for fatigued muscles to recover after exercise. They also facilitate the conversion of lactic acid to water and carbon dioxide, which is especially important to athletes.

have a slippery quality that helps make blood platelets less sticky. Sticky platelets clot more easily and can block blood vessels, causing stroke, heart attack, or embolisms. EFAs, on the other hand, help to clear the body’s arteries caused mainly by the imbalance of EFA ratios in the fats that are consumed.

convert into hormone-like substances known as prostaglandins, which regulate such cellular functions as communication, cholesterol production, and blood platelet aggregation. Since different prostaglandins often have opposite effects, they are needed by the body in a delicate balance obtained from a balanced intake of the two essential fatty acids (omega-6 and omega-3). For instance, the prostaglandins that key up the body’s response to stress are all made by omega-6 fatty acids while the ones that gear down the body’s response to stress are nearly all made by omega-3 fatty acids. Not surprisingly, stress-related diseases tend to respond to omega-3 supplementation.

are precursors to the prostaglandin series (PGE 1, 2, and 3). PGE1 inhibits the production of cholesterol and dilates blood vessels and prevents the blood clotting of platelets in arteries. A study reported in 1992 indicated that a diet of hemp seed causes the serum levels of total cholesterol to drop dramatically. Blood pressure also decreases after several weeks of eating hemp seeds, apparently because of the steady supply of EFAs.

## **EFA Dosage**

Although there is no official recommended daily allowance (RDA) for EFAs, many experts recommend a minimum of 3% of calories from omega-6 and 1% from omega-3 fatty acids. Pregnant or lactating women should double this intake.

One tablespoon of hempseed oil or 1 ounce of shelled hempseed supplies roughly 6.6 grams of omega-6 and 2.2 grams of omega-3 - just the amounts needed for a 2000-calorie diet. This is a suitable amount even for vegetarians and takes into account the conversion ration of 1% ALA to DHA, the currently accepted conversion rate for plant sources of omega-3s. However, those who lack such enzymes as ethnic groups with a history of high fish intake may have difficulty converting ALA to DHA.

## **Omega-3 Fatty Acid**

In studies, omega-3 was found useful for treating such varied conditions as:

Abnormal brain and eye development

Abnormal development in infants and children

Age

Aggression

Allergies

Alzheimer's disease

Arterial inelasticity

Asthma

Atherosclerosis

Atopic dermatitis

ADHD

Autoimmune diseases

Bipolar disorder

Birth complications

Blood viscosity

Breast cancer

Cardiac arrhythmia

Cardiac stenosis

Cerebral palsy

Colon cancer

Coronary heart disease

Crohn's disease

Cyclic breast pain

Cystic fibrosis

Dementia

Depression

Diabetes mellitus

Dry skin

Dyslexia  
Eczema  
Elevated serum triglycerides  
Emphysema  
Erythema  
Excessive thirst  
Fibrocystic breasts  
Fingernail and hair problems  
Gastric ulcers  
Growth retardation (fetal/infants/children)  
Hair discoloration, thinning, and loss  
Hypercholesterolemia (high cholesterol)  
Hypertension (high blood pressure)  
Immune weakness  
Impotence  
Increased transepidermal water loss  
Infection  
Inflammatory diseases  
Kidney and liver degeneration  
Lack of coordination  
Learning disabilities  
Low birth weight  
Lupus erythmatosis  
Memory loss  
Menopause complications  
Menstrual bleeding, abnormal  
Menstrual cramps  
Migraine headaches  
Miscarriage  
Multiple sclerosis  
Myocardial infarction (heart attack)  
Obesity  
Osteoporosis  
Platelet stickiness or aggregation  
Poor circulation and glandular function  
Pre-eclampsia  
Premature birth  
Premenstrual syndrome

Prostaglandin and hormone production

Prostate cancer

Psoriasis

Reduced sperm motility

Rheumatoid arthritis

Scaly epidermis

Schizophrenia

Sebaceous duct hyperkeratosis

Sebaceous gland hypertrophy

Side effects of chemotherapy

Slow growth

Slow wound healing

Stroke

Sudden cardiac death

Vasoconstriction

Weakened cutaneous capillaries

And the list goes on....

### **Omega-6 Fatty Acid**

Therefore, increasing EFA consumption can likely help treat and prevent these conditions. Two studies found that the omega-3 product EPA was very powerful in helping reduce depression in patients who previously did not respond to antidepressants.

One study found that it was also important to consume vitamin E with omega-3s in order to prevent oxidation (rancidity). Although most of the studies used omega-3 from fish or flaxseed oils, hempseed oil is likely just as well accepted since it is 20% omega-3 and does not contain harmful chemicals found in the fish.

Omega-6 fatty acid deficiencies can result in such disorders as:

Arthritis

Behaviour disturbances

Cardiovascular problems

Excessive thirst

Hair loss

Infections

Kidney and liver degeneration

Miscarriages

Poor circulation and glandular function

Premenstrual syndrome (PMS)

Reduced sperm motility and impotence in men

Slow growth

Slow wound healing

## Skin diseases

### Conditions Helped by EFAs

The following conditions have been helped by adding EFAs (essential fatty acids) in the form of hempseed oil or shelled hempseed to the diet:

**Addiction:** Nobel Prize nominee Dr. Johanna Budwig suggests that EFAs have been helpful in treating addictions to alcohol, cigarettes, drugs, and sex-and-violence patterns. EFAs enable a person to manage stress better: nerve and brain functions stabilize, and the electric currents across the brain's cell membranes increase, inducing a person to feel calmer and more focused.

**Arthritis and other inflammatory disorders:** GLA reduces inflammation in joints and 'morning stiffness', while omega-3 has demonstrated anti-inflammatory effects in such conditions as tennis elbow, bladder infection, ulcerative colitis and Crohn's disease - chronic inflammations of the bowel. It is now known that EFAs can be used to treat acute joint inflammation without nonsteroidal anti-inflammatory drugs, the typical regime.

**Atopic eczema (neurodermitis) and psoriasis:** They are characterized by high water loss through the skin. An omega-6 deficiency is associated with this. One explanation is that low enzymatic activity results in a slower conversion of LA to GLA, thus causing a prostaglandin imbalance. Since omega-6 FAs are involved in regulating water loss through the outer layer of the skin (epidermis), clinical trials with GLA supplementation were used. Patients had gradual improvement in atopic eczema symptoms and required considerably fewer anti-itching and antihistamine drugs. An internal daily dose of about 20 ml per day of hempseed oil showed improvement in the skin conditions over a 12-weeks period. The external use of hemp oil has proven to improve overall skin integrity.

**Attention deficit, hyperactivity, and other mental disorders (ADHD):** EFAs are critical for the healthy function of the brain cell membranes, as most of the brain's cell walls are composed of fats. Adequate amounts of EFAs maintain the brain cells' fluid and flexible condition. Children require both omega-6 and omega-3 for proper brain maturation. A deficiency in omega-3, in particular, can contribute to learning disabilities. Research using supplementation of omega-3 and omega-6 indicates that they are useful in the treatment of ADHD, depression, and schizophrenia. In countries where the people eat much omega-3, there is 90% less clinical depression.

**Cancer:** Compared to healthy tissue, cancer cells are deficient in delta-6-desaturase, the enzyme needed to convert either EFA to the higher GLA and SDA, which have shown to destroy cancerous cells selectively. Other studies also suggest that by administering them, they may slow the progress of such common cancers as breast and prostate. By improving cellular utilization of oxygen, omega-3 reduces tumor formation and slows tumor growth by decreasing the metastasis of cancer cells. Cancer cells and tissue have lower GLA and omega-6 levels than healthy tissue. Blood samples taken from cancer patients were lacking in EFAs. Saturated fats, refined vegetable oils, and trans-fatty acids are believed to be the contributing factors in cancer. Polyunsaturated fatty acids, and especially GLA, have proven to be beneficial in treating various human cancers, and studies have shown that phytosterols may offer protection against colon, breast, and prostate cancers.

**Cardiovascular diseases:** Through numerous human and animal studies, it is now common knowledge that substituting polyunsaturated fats for saturated fats can reduce the risk of heart attacks and fatal cardiac arrhythmia, as well as reducing blood cholesterol levels and decreasing the cellular proliferation associated with atherosclerosis. A high polyunsaturated-to-saturated fat ratio, especially when it includes linoleic acid (LA), has also been positively associated with reduced arterial thrombosis.

Most cardiovascular diseases are caused by the formation of arterial plaque, the deposit of hardened material on the interior walls of arteries. This process may eventually block blood flow

and cause arteriosclerosis and strokes. LDL cholesterol, a sticky substance present in the blood, has been identified as one of the main contributors to it.

Dietary treatment with daily doses of omega-6 and GLA, which correspond roughly to 4 teaspoons of hempseed oil, has resulted in the decrease of elevated blood levels of both LDL and total cholesterol. Hemp seeds also contain phytosterols (438 mg/100g), which have proven to reduce total serum cholesterol by an average of 10% and low-density lipoprotein (LDL) cholesterol by an average of 13%. Omega-3 is useful for maintaining flexible blood vessels, membranes, and cells.

People who eat nuts at least one to four times per week have a 22% lower risk of heart attack and heart disease compared to those who eat nuts less than once a week. These nuts, however, must be raw and non-processed since processing significantly diminishes the EFAs, changing the valuable oil content into a harmful form.

**Constipation:** Traditional Chinese medicine maintains that large quantities of whole hempseed act as a demulcent laxative, soothing and lubricating the whole bowel and thus, useful in preventing constipation. Since whole hempseed is 40% shell, fiber is likely the active ingredient.

**Diabetes:** Diabetes is a chronic endocrine disease. Insulin, produced by the pancreas, regulates the uptake of blood sugar by tissue cells.

In adult diabetes, sufficient insulin may be produced, but the cells have become resistant to it and do not take up glucose fast enough after a meal. Elevated blood sugar levels can cause an EFA deficiency.

With age-onset diabetes, symptoms of numbness and tingling in the extremities can be alleviated with a daily intake of 360 mg GLA, the equivalent of 3 tsp of hemp seed oil or 6 tsp of shelled hempseed.

Juvenile diabetes is usually associated with a lack of the hormone insulin in the blood. The insulin resistance causes the classic symptoms.

Studies show that daily doses of 360-460 mg of GLA alleviate the tingling and numbness in the feet, a common symptom in diabetics. Evidence shows that insufficient omega-3 intake may be one of the cofactors for the development of the disease and that a balanced supply may alleviate its other effects as well.

**Diarrhea:** Hempseed tea soothes irritated intestines and provides nutrients during bouts of diarrhea. Eaten in moderate amounts as gruel, it can help solidify the stool. EFAs have been shown to reduce infant colitis in premature babies.

**Earache:** Hempseed oil has been used in eardrops to loosen earwax, reduce pain, and fight infection.

**Edema:** EFAs assist the kidneys in eliminating excess tissue water and, since hempseed is also a diuretic, it relieves the swelling.

**Fatigue:** EFAs help maintain alertness. A deficiency can contribute to anemia, which is accompanied by loss of energy. EFAs shorten the time tired muscles need for recovery by assisting the conversion of lactic acid to carbon dioxide and water. Athletes ingesting EFAs report an increase of stamina and strength, higher performance levels, and quicker recovery of muscle fatigue, sprains, and bruises.

**Immune deficiency:** In order to resist and recover from infection, the body needs globular-shaped protein to produce antibodies. Hempseed is rich in the globular proteins albumin and edestin, as well as EFAs, all of which assist the immune response. EFAs improve the metabolic rate, thus helping to prevent the buildup of harmful yeasts and bacteria. They also strengthen cellular membranes, making them less susceptible to infection.

**Infant and child health:** Hempseed is a galactagogue, meaning that it helps to increase production of a nursing mother's milk. Infant formulas are now required to be fortified with EFAs, which are essential for the development of the pre-natal and post-natal baby. When omega-3 and



omega-6 are deficient in an infant's or child's diet, growth is slowed, especially that of the nervous system, brain, and eyes. In addition, skin problems may occur, learning slowed, and colic and diarrhea more common.

Pregnant and nursing mothers should include fresh hempseed oil in their diets, since the fetus and nursing baby drain the mother's body of EFAs. One study found that the babies of mothers who ate more EFAs had a lower incidence of cerebral palsy. Another study found that it took only 6 hours after the consumption of EFAs for them to appear in breast milk, and they remained for 10-24 hours, and in some cases up to 3 days. The mothers' high omega-3 levels decreased the incidence of infants born prematurely; increased average birth weight by 8 ounces; increased placenta weight, birth length, and head circumference; and improved the intelligence of 18-month-old babies. The diet of the culture with the highest average birth weights in the world is fish-based. Clearly, a mother's consumption of EFAs during and after pregnancy gives the new baby a head start on life.

**Menopause:** Dry skin, vaginal dryness, night sweats, hormone production, hot flashes, and moodiness are all improved with EFAs. Studies show that conversion of LA to GLA and the respective prostaglandins are slow in women suffering from PMS and menopause. Improvements came when hemp seed oil was added to the diet, mainly because hemp seed is one of the only plants actually to contain GLA so that the body does not have to rely on converting it as it does with other oils.

**Multiple Sclerosis:** MS is a chronic neurological autoimmune disease, occurring more frequently in northern industrialized countries where, incidentally, the diet also contains a comparatively low proportion of unsaturated fatty acids. Studies have suggested a link between abnormal EFA metabolism and progression of MS symptoms, possibly because of a defective enzymatic system. Many MS patients have proven to be unable to convert EFAs to their respective higher PUFAs (polyunsaturated fatty acids), thereby slowing nerve deterioration. Studies show that supplementation of EFAs can improve MS. In geographical areas where EFA consumption is adequate, MS is rare.

**Neurodermitis and skin ailments:** There is a clear connection between healthy skin and EFA intake. Patients with neurodermitis show a deficiency of omega-6 and omega-3 fatty acids. It is assumed that the enzymatic synthesis of GLA and SDA, and subsequently of prostaglandins, is inhibited. A deficiency in omega-6 is also associated with eczema and psoriasis in humans and dogs, as omega-6 helps regulate water loss through the skin. Because of its high content of omega-6 and GLA, hempseed oil can assist in the treatment of these disorders. The daily oral intake found to improve the skin condition over a 12-week period, corresponds to about 4 teaspoons of hempseed oil or one and one-half ounces of shelled hempseed.

Another study showed improvement through the external application of an ointment containing GLA, so a hempseed oil salve might be useful, but applying the oil itself might be better. Yet another study found that GLA can reduce the redness, swelling, and pain caused by sunburn. Hempseed oil taken internally and applied topically can relieve itching, speed the healing process, and prevent dry, cracked skin as well as stretch marks. As a rejuvenative, it not only keeps the skin smooth and velvety but can actually lower the skin's aging process. Because of its easy and high absorption into the skin, hempseed oil is a perfect carrier for topical medicines, but it is not a good carrier for sunblock.

**Obesity:** Using 'good' fats high in EFAs can help reduce hunger. Fat in the small intestine stimulates the release of chemical transmitters that make the brain feel satisfied and thus the stomach less hungry. EFAs help break down excess saturated fat by increasing the metabolic weight.

**Osteoporosis:** Bone loss is a serious condition for the elderly and often is associated with kidney and artery calcification. EFA supplementation improves calcium absorption, decreases urinary

excretion of the calcium, increases calcium deposition in bones, and enhances bone-collagen synthesis - all of which improve overall bone strength.

**Parkinson's and Alzheimer's diseases:** Polyunsaturated fatty acids have been found to be beneficial in such neurodegenerative disorders as Alzheimer's and Parkinson's diseases. It has been suggested that a diet with a proper balance of omega-6 to omega-3 fatty acids may help delay or reduce the neurologic effects of these diseases. The proper fatty acid ratio of omega-6 to omega-3 (3:1 or 4:1) required is identical to that found in hempseed oil, and has been shown to improve the quality of life of these patients.

**Premenstrual syndrome:** PMS can manifest in painful muscular tension, swelling of the breasts, nervousness, irritability, and depression. Research indicates that women with PMS suffer from a metabolic weakness converting omega-6 into GLA, and subsequently into prostaglandins. An intake of 1.37 grams omega-6 and 156 mg GLA over a period of 12 weeks has been shown to improve PMS symptoms significantly. This intake corresponds to 1 teaspoon of hempseed oil or 2 tablespoons of shelled hempseed every day. Studies show that conversion of LA to GLA and the respective prostaglandins are slow in women suffering from PMS and menopause. Improvements came when hemp seed oil was added to the diet, mainly because hemp seed is one of the only plants actually to contain GLA so that the body does not have to rely on converting it as it does with other oils.

**Tuberculosis:** Thirty years of experience in Czechoslovakia found that a diet appropriate for tuberculosis must be high in protein. The study states that "ground hempseeds extracted by milk at a temperature from 60-89°C prove to be - even in their smallest doses - an utmost effective remedy" and that hempseed is the "only food that can successfully treat the consumptive disease tuberculosis." EFAs help restore wasting bodies by improving the damaged immune systems. They also make it easier for the patient to liquefy and expel mucus that has built up in the lungs.

## Hemp Seed Protein

Hemp seeds have the most complete edible and usable protein in the vegetable kingdom. Although soybeans are said to contain more, much of it is unusable by the human body. Proteins serve such functions as acting as enzymes, antibodies, and the structural components of tissues, hormones, and blood protein. The main function of dietary protein is to supply the building blocks called amino acids so that they can be used to reconstruct other proteins needed for the growth and maintenance of body tissue.

Proteins are often classified as structural (fibrous) or biologically active (globular). Structural proteins include collagen, keratin, and fibrinogen, which are the main constituents of bones, skin, hair, ligaments, feathers, and hooves! Biologically active proteins are mainly globulins and include such things as hormones, hemoglobin, antibodies (immunoglobulins), and enzymes. Although the body can make globular proteins out of any protein that enters the body, it is much more efficient for the body to make globulins out of globular starting material.

What makes globular proteins so special is that they are precursors to some of the most vital chemicals in the body:

hormones (which regulate all the body processes);

hemoglobin (which transports oxygen, carbon dioxide, and nitric oxide);

enzymes (which catalyze and control biochemical reactions);

antibodies (immunoglobulins which fend off invading bacteria, viruses, and other pathogens, as well as toxins or antigens as they enter the body).

The total protein content of hemp seed is about 65% of the globular protein edestin, which closely resembles the globulin found in human blood plasma. It is easily digested, absorbed, and utilized by humans and vital to maintaining a healthy immune system. Edestin has the unique

ability to stimulate the manufacture of antibodies against invasive agents and is nearly phosphorus-free, which is important for kidney ailments. The other important protein in hemp seed is albumin, which is also a highly digestible protein because of its globular shape. Albumin is a major free radical scavenger and is the industry standard for protein quality evaluation.

Hemp protein contains all 21 known amino acids, including the 8 essential ones adult bodies cannot produce. Proteins are considered complete when they contain all the essential amino acids in sufficient quantities and ratios to meet the body's needs. The following are the 21 most common amino acids, with the 8 essential ones in **bold**:

alanine

**arginine**

asparagine

aspartic acid

cysteine

glutamic acid

glutamine

glycine

histidine

isoleucine

**leucine**

**lysine**

**methionine**

**phenylalanine**

proline

serine

taurine

**threonine**

**tryptophan**

tyrosine

**valine**

**taurine** (considered essential for premature babies)

**histidine** (considered essential for children, but not for adults)

Proteins are potential allergens, which also include soy, dairy, or peanut proteins. However, no hemp seed allergies have ever been reported. Several oilseeds also contain anti-nutritional factors; for example, the trypsin inhibitors in soybeans; but none of these factors are known to occur in hemp seeds. Hemp seeds also contain fewer oligosaccharides, present in peas and beans and which cause intestinal gas. A significant number of people are becoming allergic to soy products, possibly because most are from genetically engineered crops or grown with the use of chemicals. On the other hand, because hemp seed does not require chemicals or genetic alteration, it rarely, if ever, causes sensitivity.

Hemp seed protein can supply any diet with a vegetarian source of essential fatty acids, antioxidants, vitamins, minerals, fibre, chlorophyll, and a complete, balanced gluten-free source of the essential amino acids.

## Edestin

History reveals the importance of hemp seed protein.

In 1881, a German scientist discovered that hemp seed contained edestin, its main protein.

In the early 20th century, edestin was one of the most studied proteins in both science and industry.

In 1909, the nature of enzymes became known when a British scientist discovered the protein enzyme protease in hempseed. He called it vegetable trypsin. Today, enzymes are indispensable to the food ingredient industry and are used to make many foods.

In 1915, the *Journal of Biological Chemistry* discussed edestin at length, presenting ideas that would later form the basis for protein complementarity and combining, a popular concept among vegetarians. A later issue published a vegetable protein study. In it, edestin was considered suitable as a sole protein source for animals: "Protein feeding in the future will be based rather on the amino acid makeup than on the results of past feeding experiments." The study also stated that "the relatively large amounts of lysine present in the...hempseed...is especially noteworthy."

In 1932, a patent was issued for a gluing process using hempseed protein. Today, milk protein is used in adhesives.

In 1937, the same scientists who first spun vegetable protein for food issued a patent using hemp seed protein to make spun filaments, films, and threads that are similar to silk and wool.

## Protein Content Compared

Soybeans	35.0%
Hemp seed shelled	31.0%
Hamburger beef	27.1%
Blue fish	26.0%
Cheddar cheese	23.5%
Chicken	23.5%
Hempseed -- whole	23.0%
Almonds	18.3%
Wheat flour	13.3%
Egg	12.0%
Tofu	8.0%
Rice	7.5%
Skimmed milk	3.7%

## Essential Amino Acids Compared

Essential Amino Acid	Hemp Seed	Egg Whites	Tofu	Human Milk	Cow's Milk
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Leucine	18.80	9.50	5.9	2.78	3.44
Lysine	9.10	6.48	5.7	3.12	2.72
Threonine	10.30	4.77	3.7	0.62	1.61
Phen + Tyro	21.90	6.89	4.8	1.21	1.70
Valine	14.20	8.42	4.3	1.39	2.40
Meth + Cyst	9.60	4.20	1.0	0.65	0.86
Isoleucine	11.40	6.98	4.1	0.75	2.23
Tryptophan	3.90	1.64	1.2	0.23	0.49

(See more information about proteins on [HYPERLINK "http://www.innvista.com/health/nutrition/amino/default.htm"](http://www.innvista.com/health/nutrition/amino/default.htm) [this website.](#))

## Hemp Protein Powders

When purchasing a hemp protein powder, look for a brand that supplies at least 50% protein by weight and supplying 15 grams of protein per 30 gram serving. While hemp protein may contain more total fat than many other protein powders, it should be stressed that almost all of this fat comes from the essential polyunsaturated fatty acids Omega-6 and Omega-3. Hemp is recognized by the World Health Organization (WHO) as having what is considered to be an optimal 3:1 balance of omega 6 to omega 3 essential fatty acids.

Unlike hemp protein powder, many soy isolate powders that are not labeled organic are often processed with hexane, a petroleum solvent that has adverse impacts on the environment as well as on human health. The resulting hexane-processed soy is utilized in many soy protein powders, cereals, and bars. Hemp protein powder is produced using only cold-pressed techniques and does not involve the use of hexane in the production process. It is the same technique that ensures valuable vitamins and minerals are not destroyed during processing.

Perhaps the most important difference between soy and hemp seed protein powders is that the non-organic soybeans used in many soy products are often derived from genetically modified soybeans. Hemp is never genetically modified. Hemp foods also have low environmental impacts because growing hemp seeds does not require the addition of herbicides or pesticides.

A pound of hemp seed would provide all the protein, essential fatty acids, and dietary fiber necessary for human survival for two weeks. How far does a pound of meat go?

## Hemp Seeds

### Source of Nutrition

Hemp seeds are actually nuts and called as such on some product labels. "Hempnut" is a term developed by Richard Rose, author of *The Hempnut Cookbook* and used to describe the shelled seed. Hemp seeds have been a traditional source of nourishment in many countries for thousands of years. They can be roasted, ground, or used as flour in such various ways as in the form of hemp milk and tofu or as spreads for bread and crackers. Sprouted seeds can be added to salads.

Hemp seeds are one of the most nutritious foods on earth. Tasting similar to pine nuts and sunflower seeds, hempseeds can be used in any recipe. In terms of nutrient content, shelled hemp seed is basically 34.6% protein, 46.5% fat, and 11.6% carbohydrate. For diabetics, the glycemic index of shelled hempseed is considered low because of its low carbohydrate content. They are also full of nutrients that moderate blood sugar. Since most of the carbohydrate content is in the hull, shelled hemp seed is therefore preferred.

Not only do hemp seeds contain essential fatty acids (EFAs) in the proper ratio required by humans, but also all the essential amino acids and dietary fiber required for good health. The fiber content of hemp seed flour is 40%, which is the highest of all commercial flour grains.

No other single plant source provides balanced protein nutrition with all the essential amino acids in a favorable ratio for digestibility. In fact, two-thirds of the shelled seed is packed with these essential nutrients and is 40% more nutritious than whole hempseed. Yes, the shelled seed is more nutritious than the whole seed. When the hull is removed, the percentage of essential nutrients rises. The protein content increases by 8% (to more than 30%), and the total fat content goes up 17% (to more than 47%). The ratio of EFAs remains the same though.

Furthermore, hemp seed is far more valuable in terms of concentrated nutrients than soybeans, the nearest vegan alternative. Shelled hemp seeds contain 35% protein, of which 65% occurs as the easily digestible storage protein, edestin. Hemp seeds contain all nine essential amino acids with a high content of sulfur-containing AA (methionine and cysteine), which are usually low in vegetable proteins. The absence of trypsin inhibitory activity is a major advantage over the type of protein found in soybeans.

Trace elements found in hemp seed include strontium, thorium, arsenic, and chromium. It is also a good source of the antioxidant vitamin E in the form of alpha-, beta-, gamma-, delta-tocopherol and alpha-tocotrienol.

### **Other Nutrients**

The following are also found in hemp seeds:

Lecithin is a type of liquid found in the protective sheaths surrounding the brain and nervous system. Lecithin helps in the breakdown of fats and enhances liver activity and enzyme production.

Choline is produced from lecithin. It is needed for nerve impulses from the brain throughout the nervous system and for liver and gall bladder function. Its derivative acetylcholine, lacking in Alzheimer patients, is crucial for short-term memory.

Inositol promotes hair growth, reduces cholesterol levels, prevents artery hardening, and is calming to the nervous system.

Phytosterols, sometimes described as 'plant hormones' or phytoestrogens, affect cholesterol absorption, hormone regulation, and cell metabolism.

### **Shelled Hempseed**

It is also high in such minerals as the following:

Potassium supports the nervous system and regular heart rhythm and, with the help of sodium, aids in the body's balance of water.

Calcium is also essential for a regular heartbeat, strong teeth and bones, and nerve impulses.

Magnesium is needed to transmit the nerve and muscle messages.

Sulfur helps the body resist bacterial invasion and protects it against toxic substances.

Iron, in moderate amounts, facilitate the production of red blood cells and energy.

Zinc is important for a healthy reproductive system and the male prostate gland. It improves wound healing and strengthens the immune system.

### **Health Issues**

Scientists are studying the use of hemp seed extracts to boost the immuno-depressed who have such illnesses as AIDS and cancer.

Edestin, a protein found in hemp seed, is so compatible with the human digestive system that in 1955, a Czechoslovakian Tuberculosis Nutrition Study found hemp seed to be the only food that successfully treated tuberculosis, a disease in which nutritive processes become impaired and the body wastes away. Edestin is such a perfect protein that *Science Magazine* complained in 1941 that “the passage of the Marijuana Law of 1937 has placed restrictions on trade in hemp seed that, in effect, amounts to prohibition ... It seems clear that the long and important career of the protein is coming to a close in the US.” As a result, although not solely from the lack of hemp seeds, American health has since suffered a steady decline ever since.

## Hemp Seeds as Medicine

Throughout history, various parts of the hemp plant have been used for medicinal purposes. Please note that the following deals only with the use of hemp seeds and not of marijuana from the flowers or leaves. It is the seed, or nut, that contains the most valued components for achieving long term health.

Hemp seed has been used extensively throughout Asia, especially in China, where the hemp plant originated. Whether in the form of oil, decoction, powder, infusion, paste, or whole, it was a vital ingredient in many formulas.

## Medical Properties

According to numerous Chinese medicinal texts, hemp seeds have the following medicinal properties which are used as a(n):

**Aid** prescribed for conditions related to childbirth; that is, to hasten it when delivery is complicated or overdue, for postpartum recovery, blood deficiency, and following feverish conditions, and to alleviate retained placentas in mothers just starting to breast-feed as well as to increase milk flow.

**Anthelmintic**, since it helps to destroy and dispel parasites, including worms.

**Anti-atherosclerotic**, since it helps break up long-standing problems with the blood flow and restores the blood, pulse rates, veins and arteries.

**Anti-inflammatory**, it soothes and reduces inflammation.

**Antiseptic**, it prevents bacterial growth, inhibits pathogens, and counters sepsis.

**Assisting** in the cure of *zhong feng* (a neurological impairment due to a stroke) and in the reducing excess sweating associated with it.

**Carrier** in herbal formulas used to treat ulcers and sores, internally and externally.

**Corrective** for menstrual irregularities.

**Demulcent**, which soothes, protects, and nurtures intestinal membranes, especially of the mucus membranes during acute episodes of Crohn's or Ulcerative Colitis.

**Diuretic**, since it increases blood flow through the kidneys and bladder, thus promoting urination.

**Energetic**, as it is sweet and neutral, affecting the meridians and organs of the spleen, stomach, and large intestines.

**Hypotensive**, since it is helpful in reducing blood pressure.

**Nutritive** for healthy hair and skin, as well as the entire body.

**Tonic**, which promotes general health and well-being, supports all organs, and builds energy and strength.

**Treatment** for:

dysentery, but not for diarrhea since it loosens, relaxes, or stimulates evacuation of the bowels.

constipation, especially in the elderly. In China today, hemp seed oil capsules are the most commonly prescribed remedy for constipation.

obstinate vomiting.

edema and waste accumulations in the lymph.

### **Animal Health**

Even pets can benefit from hempseed oil. It has long been known that birds, either domesticated or in the wild, thrive and actually seek out hempseed. For centuries many bird hunters knew that their best bet was to lie in wait near a stand of wild hemp. The Birdman of Alcatraz knew this, too, and wrote "Hempseed makes the song birds sing." Wild and domesticated birds are quick to devour and hoard shelled hempseed when it is offered to them, more so than with any other feed.

Animals, deficient in EFAs, have slower wound healing, dry, scaly skin, and a dull, brittle coat. Hempseed oil added to the diet or directly to the hair of the affected area has a remarkable effect on many conditions. This is yet another reason to add hempseed oil to your pet's diet or hempseed to your bird's feed.

Cats, however, should not be fed high omega-6 oils as corn, soy, canola, hempseed, or flaxseed. Since their history is carnivorous, they lack the enzyme necessary for metabolizing plant-based omega-6 and may develop a toxicity from it.