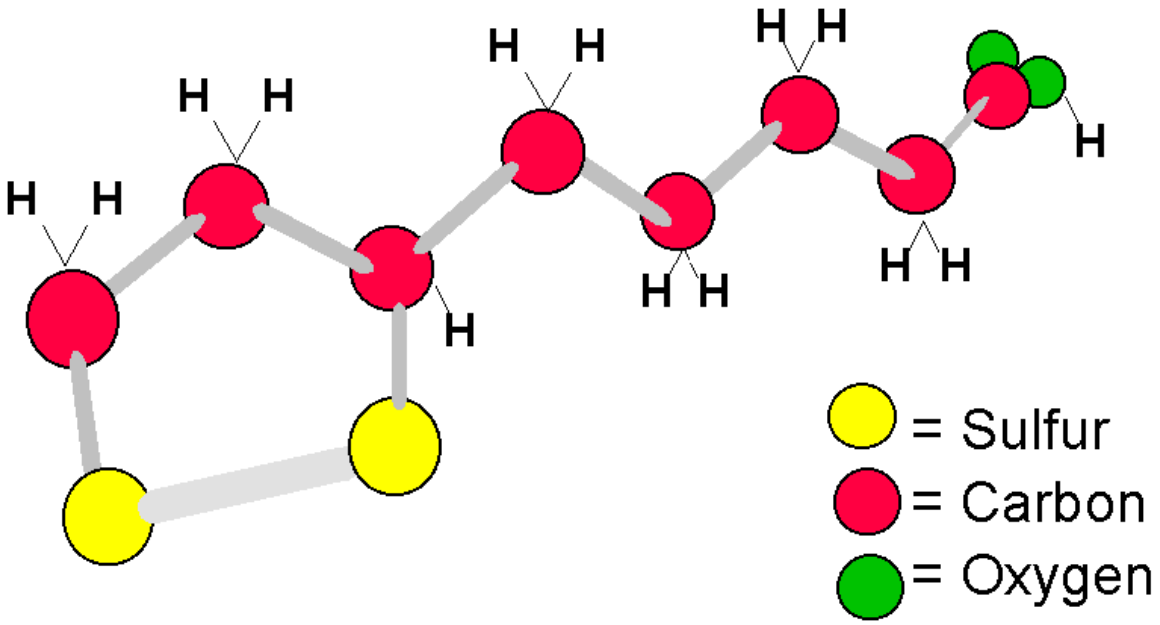
CAMPO ALPHA LIPOIC ACID



AGING is a universal phenomenon seen in all cells, ironically except for cancer cells, which are immortal.

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AGING is an universal phenomenon seen in all cells, ironically except for cancer cells, which are immortal.

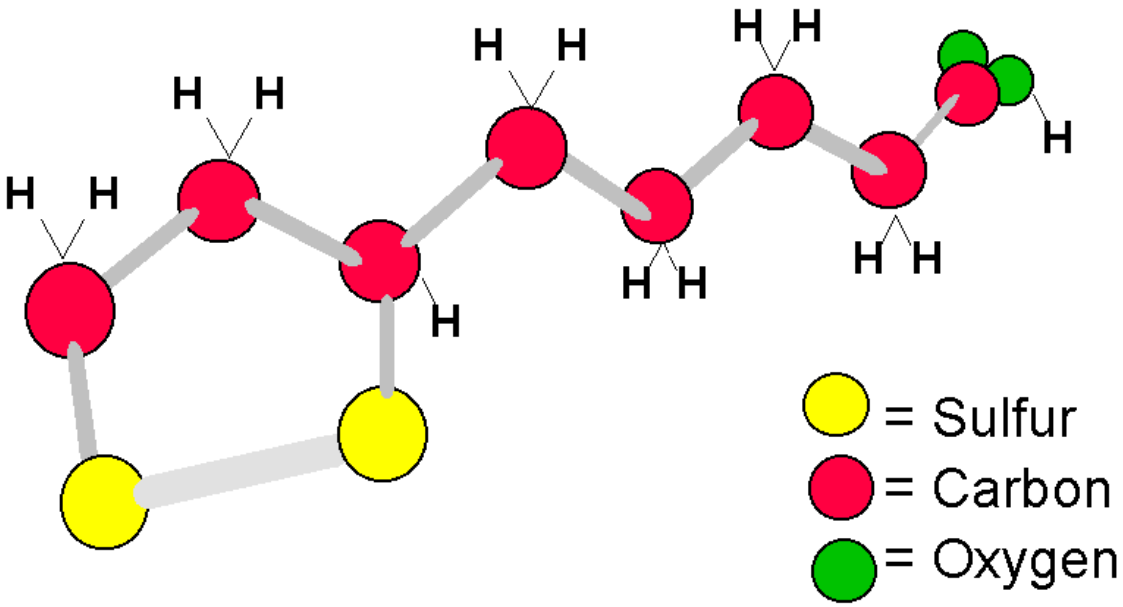
Scientists have struggled for close to a century to understand the aging process, with little progress until Dr. D. Harman proposed the Free Radical Theory of Aging in 1965.

Dr Harman explained that aging was the result of damage to cellular components by free radicals, more predominantly intermediate oxygen species, which caused oxidantion of proteins, lipids, cross-linking of proteins and damage to DNA.

The culmulative damage from free radical activity which is generated by the normal metabolism of the cell, as well as exposure to radation, environmental toxins, and eventually results in a cell that can no longer function. It is known now from extensive research that various diverse forms of diseases of the 20th century are initiated by free radical damage.

CAMPO RESEARCH PTE LTD, offers the most powerfuls anti-oxidants that can be topically applied and are well-documentated to be stable in any given topically applicable formulation.
The anti-oxidants are Enzymes encoupled Vitamin C, DHEA, Bio-Coenzyme Q10 and Alpha-Lipoic Acid

Alpha Lipoic Acid



Alpha lipoic acid is a powerful anti-oxidant that has diverse to its effects within the cell, due unique molecular structure. It is an anti-oxidant that is both lipid and water soluble, and thus has been designated as the universal anti-oxidant. Alpha lipoic acid was first discovered in 1951 as part of an enzyme complex within the cell, which is responsible for energy production. It was later discovered that alpha lipoic acid also acted as an anti-oxidant. Because of its lipid and water solubility, lipoic acid can rapidly penetrate all portions of the cell, providing protection within the lipid cell membrane, as well as the aqueous compartment, and the nucleus. The implications of this solubility are enormous when we look at the aging process. Aging has been equated to inflammation, because both processes are mediated and perpetuated by free radical activity. Any process that causes inflammation in the cell accelerates the aging process, and prevention of inflammation has the opposite effect. All anti-oxidants act as anti-inflammatories. However, all antiinflammatories are not anti-oxidants. Alpha lipoic acid acts as an anti-inflammatory due to its unique effects within the interior of the cell. It is now known that generation of free radicals within the cell activates a messenger called nuclear factor kappa-B. Nuclear factor kappa-B, once activated b y free radicals, then enters the nucleus of the cell and attaches to the DNA molecule. The DNA molecule then translates this factor into protein production which when released into the cells cause damage and cell death.

Alpha Lipoic Acid CAS# 62-46-4; chemical formula C8H14O2S2

Principal, chemical name is 1,2-dithiolane-3-pentanoic acid. ("thioctic acid").

Alpha Lipoic Acid, by blocking the translation factor nuclear factor kappa-B, is proving to be the most powerful anti-inflammatory and cell-protective anti-oxidant discovered.

Lipoic acid is a natural antioxidant which has a high reactivity to specific free radicals including oxygen radicals and ionized metals.

Lipoic acid interacts synergistically with other antioxidants, regenerating both vitamins C and E; and therefore, it can buffer periodic deficiencies due to improper diet and/or

Elevated stress. Lipoic acid increases the tissue levels of glutathione, which is one of the principal endogenous antioxidants that declines with ageing; and it protects mitochondria, which are also associated with ageing.

Alpha Lipoic Acid also acts synergistically with other anti-oxidants and affords protection to vitamin E and Vitamin C (see Enzymes encoupled Vitamin C) on a cellular level.

This means that lipoic acid can actually boost the natural level of Vitamin C and vitamin E within the cell, giving further protection from free radical damage and aging. *(Alpha Lipoic acid is a highly effective antioxidant both on its own and because it recharges other antioxidants.)*

Alpha Lipoic acid is part of an enzyme complex within the mitochondria that controls energy production. By supplementing the cell with lipoic acid, aging cells increase their energy production, allowing them to more efficiently repair cellular damage and expel cellular waste products. Because of this action, alpha lipoic acid has been designated the metabolic anti-oxidant.

The use of topical alpha lipoic acid has proven to be a powerful therapeutic agent in the treatment of aging skin.

Alpha lipoic acid, because of its fat solubility, rapidly penetrates the skin, and then disperses to all parts of the cell, including the mitrochondria and the nucleus. Alpha lipoic acid, by preventing activation of translation factor nuclear factor kapp-B, acts as a powerful anti-inflammatory agent, and thus has a soothing effect on irritated skin. Because of the effects on energy production, the clinical appearance of the skin takes on a healthy glow after 3-4 days of the use of the 1 percent lotion.

Within a few weeks, this diminution of fine lines in the skin has been documented. The anti-oxidant activity has also shown lipoic acid to be effective in prevention of erythema associated with exposure to ultraviolet radiation.
Topical application of alpha lipoic lotion to the skin also boosts levels of the anti-oxidants vitamin C, vitamin E and glutathione within the skin, giving further protection from inflammatory mediators.

Alpha lipoic acid, the universal and metabolic anti-oxidant, also shows tremendous therapeutic potential when given systematically.
Research studies have shown that diseases (sqeuella from ionizing radiation, diabetic neuropathy, liver toxicity from chemical toxins,Pakinson and Alzheimer) associated with free radical damage would be beneficial with Alpha Lipoic Acid therapeutical application.

Alpha Lipoic Acid's use of topical application and treatment is the new and exciting area, which is just being realized.

The use of anti-oxidants in the prevention and treatment of skin diseases and skin aging has just begun. The most important of these anti-oxidants are the Bio-Coenzyme Q10 and Alpha Lipoic Acid

Abstracts – selective on ALPHA-LIPOIC ACID

More reference abstracts available (click here) with your internet connection log on: http://www.pharmanord.dk/pnrm/a1.html#ALPHA-LIPOIC ACID

Anusevicius ZJ; Cenas NK: Dihydrolipoamide-mediated redox cycling of quinones.: Arch Biochem Biophys: 302:2:420-4 (1993)

The nonenzymatic reactions of dihydrolipoamide with a number of low-potential quinones, possessing either a fully or a partially substituted quinone ring at pH 7.0 were accompanied by consumption of oxygen in a significant excess of the quinone concentration, thus establishing their redox cycling. Contrary to this, only partially substituted quinones caused the consumption of oxygen in the presence of reduced glutathione due to reoxidation of reduced quinone- glutathione conjugates. Among compounds tested, 9,10- phenanthrene quinone catalyzed the most rapid consumption of oxygen in the presence of dihydrolipoamide with subsequent formation of lipoamide and H2O2. The rate constant of anaerobic reduction of phenanthrene quinone by dihydrolipoamide was 8.6 +/- 1.6 x 10(3) M-1 s-1 (pH 7.0, 0.1 M phosphate, 20% ethanol, 25 degrees C). The consumption of oxygen and formation of lipoamide were inhibited by superoxide dismutase, indicating that the redox cycling involves the autooxidation of 9,10-dihydroxy phenanthrene, mediated by superoxide. The reaction was accompanied by the reduction of added cytochrome c, which was insignificantly inhibited by superoxide dismutase, and the reductive mobilization of iron from ferritin, activated by superoxide dismutase. These data raise the possibility that dihydrolipoamide, usually regarded as an antioxidant, under certain conditions may exert moderate prooxidant activity, initiating the formation of radicals and activated forms of oxygen.

A-2374
Biewenga G; de Jong J; Bast A: Lipoic acid favors thiolsulfinate formation after hypochlorous acid scavenging: a study with lipoic acid derivatives. Arch Biochem Biophys Jul: 312:1:114-20 (1994)

Lipoic acid, the oxidized form of 6,8-dimercapto-octanoic acid has a strained cyclic disulfide in a 1,2-dithiolane ring. Recently its antioxidant activity gained attention. Hypochlorous acid (HOCl) is an oxidant produced by neutrophils. A prominent effect of HOCl is the inactivation of alpha-1-antiproteinase. Due to this inactivation, the ability of alpha-1-antiproteinase to inhibit elastase is lost. The resulting higher activity of elastase is held responsible for tissue damage in lung emphysema. We studied the HOCl scavenging capability of three metabolites of lipoic

acid: tetranor-, bisnor-, and beta-lipoic acid. To obtain some insight on the molecular basis of HOCl scavenging 1,2-dithiane-4,5-diol, cystine, lipoic acid methyl ester, and lipoamide were also included in the study. The extent of alpha-1-antiproteinase inactivation by HOCl in the presence of scavenger was taken as a parameter to quantify the scavenging activity. It was found that lipoic acid, tetranor- and bisnorlipoic acid, lipoic acid methyl ester, and lipoamide all showed the same activity toward HOCl. beta-Lipoic acid, 1,2-dithiane-4,5-diol and cystine were less active. The products of lipoic acid after reaction with HOCl were studied using GC/MS.

Indications for thiolsulfinate formation were found by comparing these products with the GC/MS profile of beta-lipoic acid. Thiolsulfinate formation may also be suggested in the reaction of tetranor- and bisnorlipoic acid and lipoic acid methyl ester with HOCl. The present results show an antioxidant activity of the metabolites tetranor- and bisnorlipoic acid. The 1,2-dithiolane ring may enhance the reactivity toward HOCl compared to less strained disulfides, resulting in the formation a thiolsulfinate.

A-4756
Biewenga G; Haenen G; Bast A: The pharmacology of the antioxidant lipoic acid:
Gen Pharmac: 29:3:315-31 (1997)

1. Lipoic acid is an example of an existing drug whose therapeutic effect has been related to its antioxidant activity.
2. Antioxidant activity is a relative concept: it depends on the kind of oxidative stress and the kind of oxidizable substrate (e.g., DNA, lipid, protein).
3. In vitro, the final antioxidant activity of lipoic acid is determined by its concentration and by its antioxidant properties. Four antioxidant properties of lipoic acid have been studied: its metal chelating capacity, its ability to scavenge reactive oxygen species (ROS), its ability to regenerate endogenous antioxidants and its ability to repair oxidative damage.
4. Dihydrolipoic acid (DHLA), formed by reduction of lipoic acid, has more antioxidant properties than does lipoic acid. Both DHLA and lipoic acid have metal-chelating capacity and scavenge ROS, whereas only DHLA is able to regenerate endogenous antioxidants and to repair oxidative damage.
5. As a metal chelator, lipoic acid was shown to provide antioxidant activity by chelating Fe2+ and Cu2+; DHLA can do so by cheating Cd2+
6. As scavengers of ROS, lipoic acid and DHLA display antioxidant activity in most experiments, whereas, in particular cases, pro-oxidant activity has been observed. However, lipoic acid can act as an antioxidant against the pro-oxidant activity produced by DHLA.
7. DHLA has the capacity to regenerate the endogenous antioxidants vitamin E, vitamin C and glutathione.
8. DHLA can provide peptide methionine sulfoxide reductase with reducing equivalents. This enhances the repair of oxidatively damaged proteins such as alpha-1 antiprotease.
9. Through the lipoamide dehydrogenase-dependent reduction of lipoic acid, the cell can draw on its NADH pool for antioxidant activity additionally to its NADPH pool, which is usually consumed during oxidative stress.
10. Within drug-related antioxidant pharmacology, lipoic acid is a model compound that enhances understanding of the mode of action of antioxidants in drug therapy.

A-2367
Busse E; Zimmer G; Schopohl B; Kornhuber B:
Influence of alpha-lipoic acid on intracellular glutathione in vitro and in vivo.:
Arzneimittelforschung Jun: 42:6:829-31 (1992)

The influence of alpha-lipoic acid (CAS 62-46-4) on the amount of intracellular glutathione (GSH) was investigated in vitro and in vivo. Using murine neuroblastoma as well as melanoma cell lines in vitro, a dose-dependent increase of GSH content was observed. Dependent on the source of tumor cells the increase was 30-70% compared to untreated controls. Normal lung tissue of mice also revealed about 50% increase in glutathione upon treatment with lipoic acid. This corresponds with protection from irradiation damage in these

in vitro studies. Survival rate of irradiated murine neuroblastoma was increased at doses of 100 micrograms lipoic acid/d from 2% to about 10%. In agreement with the in vitro studies, in vivo experiments with whole body irradiation (5 and 8 Gy) in mice revealed that the number of surviving animals was doubled at a dose of 16 mg lipoic acid/kg. Improvement of cell viability and irradiation protection by the physiological compound lipoic acid runs parallel with an increase of intracellular GSH/GSSG ratio.

A-2368
Kagan VE; Shvedova A; Serbinova E; Khan S; Swanson C; Powell R; Packer L:
Dihydrolipoic acid--a universal antioxidant both in the membrane and in the aqueous phase. Reduction of peroxyl, ascorbyl and chromanoxyl radicals.
Biochem Pharmacol Oct 20: 44:8:1637-49 (1992)

Thioctic (lipoic) acid is used as a therapeutic agent in a variety of diseases in which enhanced free radical peroxidation of membrane phospholipids has been shown to be a characteristic feature. It was suggested that the antioxidant properties of thioctic acid and its reduced form, dihydrolipoic acid, are at least in part responsible for the therapeutic potential. The reported results on the antioxidant efficiency of thioctic and dihydrolipoic acids obtained in oxidation models with complex multicomponent initiation systems are controversial. In the present work we used relatively simple oxidation systems to study the antioxidant effects of dihydrolipoic and thioctic acids based on their interactions with: (1) peroxyl radicals which are essential for the initiation of lipid peroxidation, (2) chromanoxyl radicals of vitamin E, and (3) ascorbyl radicals of vitamin C, the two major lipid-and water-soluble antioxidants, respectively. We demonstrated that: (1) dihydrolipoic acid (but not thioctic acid) was an efficient direct scavenger of peroxyl radicals generated in the aqueous phase by the water-soluble azoinitiator 2,2'- azobis(2-amidinopropane)-dihydrochloride, and in liposomes or in microsomal membranes by the lipid-soluble azoinitiator 2,2'-azobis(2,4-dimethylvaleronitrile); (2) both dihydrolipoic acid and thioctic acid did not interact directly with chromanoxyl radicals of vitamin E (or its synthetic homologues) generated in liposomes or in the membranes by three different ways: UV-irradiation, peroxyl radicals of 2,2'-azobis(2,4-dimethylvaleronitrile), or peroxyl radicals of linolenic acid formed by the lipoxygenase-catalyzed oxidation; and (3) dihydrolipoic acid (but not thioctic acid) reduced ascorbyl radicals (and dehydroascorbate) generated in the course of ascorbate oxidation by chromanoxyl radicals. This interaction resulted in ascorbate-mediated dihydrolipoic acid-dependent reduction of the vitamin E chromanoxyl radicals, i.e. vitamin E recycling. We conclude that dihydrolipoic acid may act as a strong direct chain-breaking antioxidant and may enhance the antioxidant potency of other antioxidants (ascorbate and vitamin E) in both the aqueous and the hydrophobic membraneous phases.

A-4915
Koske D; Elstner EF: Coenzyme Q10, vitamin E and dihydrothioctic acid cooperatively prevent diene conjugation in isolated low density lipoprotein Boston: 1st Conf. of the Intl. Coenzyme Q10 Assn.: 119-120 (1998)

Lodge JK et al.: Natural sources of lipoic acid: determination of lipollysine released from Protease-digested tissues (1997)

A-2372
Packer L; Suzuki YJ:
Vitamin E and alpha-lipoate: role in antioxidant recycling and activation of the NF-kappa B transcription factor.: Mol Aspects Med: 14:3:229-39 (1993)

Nuclear factor kappa B (NF-kappa B) is believed to play an important role in the activation of human immunodeficiency virus (HIV) which causes acquired immunodeficiency syndrome (AIDS). Recent findings suggesting an involvement of reactive oxygen species in signal transduction pathways leading to NF-kappa Bactivation have encouraged the possible clinical use of antioxidants in blocking HIV activation. We have examined the effects of vitamin E and alpha-lipoate derivatives on NF-kappa B activation, and have observed that each of these antioxidants behave differently. Here we propose mechanisms of antioxidant actions ininfluencing cell signalling for NF-kappa B activation.
A-3237
Packer L; Witt EH; Tritschler HJ: alpha-Lipoic acid as a biological antioxidant.:
Free Radic Biol Med: 19:2:227-50 (1995)

Alpha-Lipoic acid, which plays an essential role in mitochondrial dehydrogenase reactions, has recently gained considerable attention as an antioxidant. Lipoate, or its reduced form, dihydrolipoate, reacts with reactive oxygen species such as superoxide radicals, hydroxyl radicals, hypochlorous acid, peroxyl radicals, and singlet oxygen. It also protects membranes by interacting with vitamin C and glutathione, which may in turn recycle vitamin E. In addition to its antioxidant activities, dihydrolipoate may exert prooxidant actions through reduction of iron.

Alpha- Lipoic acid administration has been shown to be beneficial in a number of oxidative stress models such as ischemia- reperfusion injury, diabetes (both alpha-lipoic acid and dihydrolipoic acid exhibit hydrophobic binding to proteins such as albumin, which can prevent glycation reactions), cataract formation, HIV activation, neurodegeneration, and radiation injury. Furthermore, lipoate can function as a redox regulator of proteins such as myoglobin, prolactin, thioredoxin and NF-kappa B transcription factor. We review the properties of lipoate in terms of (1) reactions with reactive oxygen species; (2) interactions with other antioxidants; (3) beneficial effects in oxidative stress models or clinical conditions.

A-5002
Packer L: Alpha-lipoic acid: a metabolic antioxidant which regulates NF-KB signal transduction and protects against oxidative injury Drug Metabolism Reviews: 30:2:245-275 (1998)

Although the metabolic role of alpha-lipoic acid has been known for over 40 years, it is only recently that its effects when supplied exogenously have become known. Exogenous alpha-lipoic acid is reduced intracellularly by at least two and possibly three enzymes, and through the actions of its reduced form, it influences a number of cell processes. These include direct radical scavenging, recycling of other antioxidants, accelerating GSH synthesis, and modulating transcription factor activity, especially that of NF-kB. These mechanisms may account for the sometimes dramatic effects of alpha-lipoic acid in oxidative stress conditions (e.g. brain ischemia-reperfusion), and point the way toward its therapeutic use.

A-2375
Podda M; Tritschler HJ; Ulrich H; Packer L: Alpha-lipoic acid supplementation prevents symptoms of vitamin E deficiency.: Biochem Biophys Res Commun: 204:1:98-104 (1994)

Alpha-Lipoic acid, an essential cofactor in mitochondrial dehydrogenases, has recently been shown to be a potent antioxidant in vitro, as well as being capable of regenerating vitamin E in vitro. In this study, using a new animal model for rapid vitamin E deficiency in adult animals and a new technique for tissue extraction of oxidized and reduced alpha-lipoic acid, we examined the antioxidant action of alpha-lipoic acid in vivo. Vitamin E-deficient adult hairless mice displayed obvious symptoms of deficiency within five weeks, but if the diet was supplemented with alpha-lipoic acid the animals were completely protected. At five weeks on a vitamin E-deficient diet animals exhibited similar decreases in tissue vitamin E levels, whether supplemented or unsupplemented with alpha-lipoic acid: vitamin E levels in liver, kidney, heart, and skin decreased 70 to 85%; levels in brain decreased only 25%. These data show that there was no effect of alpha-lipoic acid supplementation on vitamin E tissue concentrations, arguing against a role for alpha-lipoic acid in regenerating vitamin E in vivo.

A-2373
Scott BC; Aruoma OI; Evans PJ; O'Neill C; Van der Vliet A; Cross CE; Tritschler H; Halliwell B:Lipoic and dihydrolipoic acids as antioxidants. A critical evaluation.: Free Radic Res Feb: 20:2:119-33 (1994)

A detailed evaluation of the antioxidant and pro-oxidant properties of lipoic acid (LA) and dihydrolipoic acid (DHLA) was performed. Both compounds are powerful scavengers of hypochlorous acid, able to protect alpha 1-antiproteinase against inactivation by HOCl. LA was a powerful scavenger of hydroxyl radicals (OH.) and could inhibit both iron- dependent OH. generation and peroxidation of ox-brain phospholipid liposomes in the presence of FeCl3-ascorbate, presumably by binding iron ions and rendering them redox- inactive. By contrast, DHLA accelerated iron-dependent OH. generation and lipid peroxidation, probably by reducing Fe3+ to Fe2+. LA inhibited this pro-oxidant action of DHLA. However, DHLA did not accelerate DNA degradation by a ferric bleomycin complex and slightly inhibited peroxidation of arachidonic acid by the myoglobin-H2O2 system.

Under certain circumstances, DHLA accelerated the loss of activity of alpha-antiproteinase exposed to ionizing radiation under a N2O/O2 atmosphere and also the loss of creatine kinase activity in human plasma exposed to gas-phase cigarette smoke. Neither LA nor DHLA reacted with superoxide radical (O.2-) or H2O2 at significant rates, but both were good scavengers of trichloromethylperoxyl radical (CCl3O2.). We conclude that LA and DHLA have powerful antioxidant properties. However, DHLA can also exert pro-oxidant properties, both by its iron ion-reducing ability and probably by its ability to generate reactive sulphur-containing radicals that can damage certain proteins, such as alpha 1-antiproteinase and creatine kinase.

A-2369
Suzuki YJ; Tsuchiya M; Packer L:
Antioxidant activities of dihydrolipoic acid and its structural homologues.:
Free Radic Res Commun: 18:2:115-22 (1993)

The relationships between structure and antioxidant activity of dihydrolipoic acid (DHLA) were studied using homologues of DHLA: bisonor-DHLA (a derivative which lacks two carbons in the hydrophobic tail), tetranor-DHLA (which lacks four carbons) and a methyl ester derivative. It was observed that: i) DHLA homologues with shorter hydrocarbon tails (i.e., bisnor- and tetranor-DHLA) had greater ability to quench superoxide radicals (O2-); ii) no differences among homologues with different chain lengths were found for peroxyl radical (ROO.) scavenging in aqueous solution, and iii) DHLA was the best membrane antioxidant in terms of ROO. scavenging and lipid peroxidation inhibition. Differences among the DHLA homologues in their antioxidant properties in polar and apolar environments generally agreed with differences in their partition coefficients. The methyl ester was the least effective antioxidant both in aqueous phase and in membranes.

Tetranor-DHLA was found not only to be less effective in preventing ROO.-induced lipid peroxidation, but also to induce lipid peroxidation in the presence of residual iron. Thus, the complexity of biological systems seems to complicate generalizations on the correlation of molecular structure with antioxidant activity of DHLA.

A-3241
Suzuki YJ; Aggarwal BB; Packer L:
Alpha-lipoic acid is a potent inhibitor of NF-kappa B activation in human T cells.:
Biochem Biophys Res Commun: 189:3:1709-15 (1992)

Acquired immunodeficiency syndrome (AIDS) results from infection with a human immunodeficiency virus (HIV). The long terminal repeat (LTR) region of HIV proviral DNA contains binding sites for nuclear factor kappa B (NF-kappa B), and this transcriptional activator appears to regulate HIV activation. Recent findings suggest an involvement of reactive oxygen species (ROS) in signal transduction pathways leading to NF-kappa B activation.

The present study was based on reports that antioxidants which eliminate ROS should block the activation of NF-kappa B and subsequently HIV transcription, and thus antioxidants can be used as therapeutic agents for AIDS. Incubation of Jurkat T cells (1 x 10(6) cells/ml) with a natural thiol antioxidant, alpha- lipoic acid, prior to the stimulation of cells was found to inhibit NF-kappa B activation induced by tumor necrosis factor-alpha (25 ng/ml) or by phorbol 12-myristate 13- acetate (50 ng/ml). The inhibitory action of alpha-lipoic acid was found to be very potent as only 4 mM was needed for a complete inhibition, whereas 20 mM was required for N-acetylcysteine. These results indicate that alpha-lipoic acid may be effective in AIDS therapeutics.

A-3966
Whiteman M; Tritschler H; Halliwell B:
Protection against peroxynitrite-dependent tyrosine nitration and alpha 1-antiproteinase inactivation by oxidized and reduced lipoic acid.
FEBS Lett: 379:1:74-6 (1996)

Peroxynitrite, formed by combination of superoxide radical with nitric oxide, is a reactive tissue-damaging species apparently involved in the pathology of several human diseases. Peroxynitrite nitrates tyrosine residues and inactivates alpha 1-antiproteinase. We show that

both lipoic acid and dihydrolipoic acid efficiently protect against damage by peroxynitrite. By contrast, other disulphides tested did not. The biological antioxidant effects of lipoate/dihydrolipoate may involve scavenging of reactive nitrogen species as well as reactive oxygen species.

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N Y Acad Sci 1996 Jun 15;786:152-68

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Haugaard N; Haugaard ES, 1970. Stimulation of glucose utilization by thioctic acid in rat diaphragm incubated in vitro. (UI: 71090054) Biochim Biophys Acta, 1970 Dec 29, 222(3):583-6.

Kagan VE, Shvedova A, Serbinova E, Khan S, Swanson C, Powell R, Packer L, 1992. Dihydrolipoic acid--a universal antioxidant both in the membrane and in the aqueous phase. Reduction of peroxyl, ascorbyl and chromanoxyl radicals. (UI - 93038865) Biochem Pharmacol
1992 Oct 20;44(8):1637-1649.

Packer L, 1996. A relatively unknown antioxidant, alpha-lipoic acid, may be more potent than vitamin C and E. Univ. Calif. Berkeley News Release #14316, 2-21-96

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& Packer L; Marcel Dekker, 1996, pg. iii-v

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Totskii VN, 1976. Mechanisms and ways of regulation of lipoic acid penetration into biological structures. (UI - 77202097) Biokhimiia 1976 Jul;41(6):1094-1105.

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J Chromatogr B Biomed Appl 1995 Oct 20;672(2):277-81. 95392479. Packer L, Witt EH, Tritschler HJ. alpha-Lipoic acid as a biological antioxidant.

Free Radic Biol Med. 1995 Aug;19(2):227-50. 95392479. Suzuki YJ, Mizuno M, Tritschler HJ, Packer L. Redox regulation of NF-kappa B DNA binding activity by dihydrolipoate.

Biochem Mol Biol Int. 1995 Jun;36(2):241-6. 95160683. Han D, Tritschler HJ, Packer L. Alpha-lipoic acid increases intracellular glutathione in a human T-lymphocyte Jurkat cell line.

Biochem Biophys Res Commun. 1995 Feb 6;207(1):258-64. MED/95091847. Shoji S, Furuishi K, Misumi S, Miyazaki T, Kino M, Yamataka K. Thiamine disulfide as a potent inhibitor of human
immunodeficiency virus (type-1) production.

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human immunodeficiency virus infected patients.

Arzneimittelforschung. 1993 Dec;43(12):1359-62. MED/92177673. Baur A, Harrer T, Peukert M, Jahn G, Kalden JR, Fleckenstein B. Alpha-lipoic acid is an effective inhibitor of human immuno-deficiency virus (HIV-1) replication.

Klin Wochenschr. 1991 Oct 2;69(15):722-4. Entry Month 199511 Last Revision Date 19980416 Thioctic acid [USAN 1997] - Thioctic acid [USAN 1997]

Alpha-Lipoic Acid from the vegetal source – NEEM Tree

A newly recognized, natural, co-vitamin and anti-oxidant nutrient. Alpha Lipoic acid has been called an "ideal antioxidant" by prominent scientists, and it has multiple applications which include: 1) an adjunct to medical therapy, 2) lowering risk factors in preventive medicine, 3) life-extension and general health, 4) sports and physical training; and as 5) de novo topical anti-oxidant

In its simplest terms, the chemistry of life is about **metabolism**, which is the general term that encompasses all of the processes of chemical changes in biological systems. Metabolism is divided into two phases: 1**) catabolism**, which is the process in which chemicals are broken down; and 2) **anabolism**, which is the process in which chemicals are constructed.

Catabolism occurs in the breaking down of food into the chemical, building blocks that are required for biological maintenance and growth. Catabolism also occurs in the destruction of toxic substances, which do not belong in the system, and in the elimination of damaged or surplus components. Most of the **generation of free radicals** occurs in the processes of catabolism and, more specifically, **within those metabolic reactions which involve oxygen.**

Anabolism is the process of biological construction or reconstruction; and it is believed that free radical reactions are much less a factor in this phase. However, it appears that this aspect is not well studied; and there may be disorders of anabolism which do, indeed, involve free radicals reactions.

The genetic template for all life on this planet is the self-replicating molecule called DNA (deoxyribonucleic acid). The in-numerable life-forms on this planet and which

have evolved over about 4 billions years are variations on that particular molecule. **Green plants** are the foundation for almost all life on the planet because they are the only life-form which can bring into the biomass new energy in the form of absorbing **photons from sunlight**. Thus, virtually all currently existing life-forms derive their energy either directly from sunlight, as the green plants do, or indirectly from sunlight by consuming plants or other animals which feed on plants.

Green plants capture the energy of the sun in a chemical process called **photosynthesis** in which **6 carbon dioxide molecules react with 12 molecules of water**, with that complex being energized by photons from sunlight, **creating 1 glucose molecule and releasing 6 oxygen and 6 water molecules.**

The formula for this PHOTO SYNTHETIC reaction is the following:

CARBON
DIOXIDE
+
WATER
+
SUNLIGHT
=
GLUCOSE
+
OXYGEN
+
WATER

6CO2
+
12H20
+
Photons
=
C6H1206
+
602
+
6H20

In plants, multiple glucose molecules link together to form **starch**, which, for us, is the **carbohydrate** that constitutes our most important source of energy. In a similar pathway, one which includes **nitrogen (NO3) and sulfur (SO4),** plants synthesize their proteins and lipids (i.e., fats) and other organic compounds. The **photosynthetic process takes place in a molecule called chlorophyll which is green in color and which resides in an organelle called the chloroplast.**

In animal biology, our hemoglobin molecule, which captures oxygen, is analogous to chlorophyll and our mitochondria, which is the site of oxygen utilization, is analogous to the chloroplast.

As it happens, **Alpha lipoic acid is an integral component in both the photosynthetic process in the chloroplasts of plant cells (Calvin M, 1956) and in the oxidative process in the mitochondria of animal cells (Skrede S, 1968) (Totskii VN, 1976).** In other words, **Alpha lipoic acid is a functional element at the critical junctures of energy exchange in all life-forms, plant or animal.**

This is the concept basis for Campo Natural Active ingredients' study & development. Naturally, as a Natural Product Chemistry Novel Drug Discovery organization, Campo chooses to isolate the most potent source of topically viable Alpha Lipoic Acid from the Neem tree's ("Village Pharmacy") Leaves components, as the desirable properties of Neem are active as side-chains in Alpha Lipoic Acid molecule.

Campo Alpha Lipoic Acid is derived from Neem Leaves (Azadrichta indica), by in-vacuum fractionation of the amphillic components of the photosynthethic processes of the Neem leaves.

TOXICOLOGAL PROPERTIES AND BIOLOGICAL EFFECT PROFILES

Dermal Evaluation (100% in 10ml in Water) 48 Hour 100/100 completely non-irritating Human Patch Test (non-erythema causing Alpha Lipoic Acid) 100 Test Subjects

IN-VITRO OCULAR EVALUATION (10 % soluble In 10ml Water)
Ropak, Eyetex™ Eyetex Classification
Rapid Membrane Assay Minimal/ Mild

Biological effect:
Lipoic acid is observed to be biologically active and can be used clinically at dosages as low as 0.14-0.28 milligrams/kilogram of body weight (i.e., mg/kg), which would be equivalent to 10-22 mg. in an average person.

Toxicology:
Small animals injected with 100-200 mg/kg (i.e., the human equivalent of 7,800 - 15,500 mg.) produced depressive symptoms with tonic-clonic convulsions.

In mice the convulsive dosage for 50% is 140-180 mg/kg (i.e., the human equivalent of 11,000 - 15,000 mg.).

In mice, the lethal dose for 50% was 160-275 mg/kg, (i.e., the human equivalentof 13,000 - 22,000 mg.).

There were no toxic effects in mice treated by injection for 40 days with 75 mg/kg (human equivalent 6,000 mg.) nor in rats treated by injection for 60 days with 15 mg/kg (human equivalent of 1,200 mg.) nor in guinea pigs injected for 20 days at 10 mg/kg (human equivalent of 800 mg.).

Lipoic acid in 0.5% solution had no undesirable effect on the mucosa, serous membrane, endothelium, or subcutaneous and muscular membranes.

"Lipoic acid is rapidly absorbed and eliminated from the organism and its accumulation iis improbable.
" Intravenous administration of lipoic acid in high dosages in humans were "well tolerated".

Additional pharmacology has been detailed in numerous subsequent reports over the years. With oral supplementation, there is about 80% absorption into the blood stream (Harrison EH, McCormick DB, 1974), and it is distributed generally throughout all tissues and most cellular components.

See the table below for some representative references ON PHARMACOLOGY

Eye lens (Maitra I, Serbinova E, Trischler H, Packer L, 1995)

Cardiac muscle (Haramaki N, Assadnazari H, Zimmer G, Schepkin V, Packer L, 1995)

Brain and nerve tissue(Whiteman M, Tritschler H, Halliwell B, 1996)

Lungs (Busse E, Zimmer G, Schopohl B, Kornhuber B, 1992)

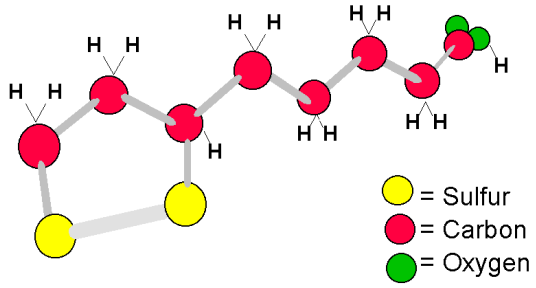
Pancreas (Kallmann B, Burkart V, Kroncke KD, Kolb-Bachofen V, Kolb H, 1992)

Liver (Loginov AS, Nilova TV, Bendikov EA, Petrakov AV, 1990)

Mitochondria (Skrede S, 1968)

Liposomes (Kagan VE, Shvedova A, Serbinova E, Khan S, Swanson C, Powell R, Packer L, 1992)

BOTANICAL SOURCE INFORMATION - ALPHA LIPOIC ACID



LATIN	Azadrichtha indica leaves
ENGLISH	Neem Leaves
INCI/CTFA NAME	Melia Azadirachta Leave Extract
Proposed INCI Name	Alpha Lipoic Acid
PLANT MATERIAL	Leaves Choloroplast cells
ACTIVE COMPONENTS OF PLANT MATERIAL	Thioctic Acid (Alpha Lipoic Acid).

PRODUCT ATTRIBUTES

Anti-oxidant for Wrinkle Remover, Effective Skin Conditioner (anti-aging Products); After-shaves, Skin-Whitening formulations, Anti-perspirants& deodorants; Non-comedogenic, Non-occlusive, Substantive as true natural botanical anti-oxidant

SPECIFICATIONS:

APPEARANCE	Fine Powder
COLOUR	White to Light Cream
ODOUR	Characteristic minimal
SOLUBILITY	Not soluble; Dispersible in water
pH	5.5 – 7.5
SPECIFIC GRAVITY	0.400 – 0.464
EXTRACTION VEHICLE	Liquid Nitrogen and water at 1900 Deg C (-minusZero)
PRESERVATION	None
TOTAL GERMS	Nil - cfu/ml - NON-PATHOGENIC
TOTAL YEAST/MOLD COUNT	Nil - cfu/ml
STORAGE	Store in a closed container in a dry & dark place

CAMPO RESEARCH Pte Ltd
TECHNICAL SPECIFICATION

PRODUCT Name (Campo Research) **Other Trade Names (Campo Research)**	**CAMPO ALPHA LIPOIC ACID (Powder)** **ALPHA LIPOIC ACID**
CTFA TRADE NAME **Existing CTFA/INCI Name**	*Melia Azadiractha Leaf Extract* ***Melia Azadiractha Leaf Extract***
Chinese Translation	印度楝（MELIA AZADIRACHTA）叶提取物
CAMPO PRODUCT # **HS Code:**	**2000/10/0055-100 (Powder)** 1302.19.0000
CTFA Monograph ID:	10740 – Melia Azadiractha Leaf Extract
CAS# CAS# EU	90063-92-6 – Melia Azadirachta Leaf Extract 84696-25-3 / 90063-92-6 (EU) – Melia Azadirachta Leaf Extract
EINECS Number and Name EINECS# EU	290-052-2 (1) – Melia Azadirachta Leaf Extract 283-644-7 / 290-052-2 (EU) – Melia Azadirachta Leaf Extract
EINECS Number and Name EINECS# EU European Commission–Health & Consumer Cosmetics–Cosing	Melia Azadirachta Leaf Extract http://ec.europa.eu/consumers/cosmetics/cosing/index.cfm?fuseaction=search.details_v2&id=78090 Melia Azadirachta Leaf Extract - 283-644-7 / 290-052-2 (EU)
BATCH/LOT	**See COA Batch Lot**
SPECIES	**Azadirachta indica A. Juss**. Syn: Melia Azadiractha Leaf Extract
PARTS USED	Cured leaves – 99.5 %
RAW MATERIAL - ORIGIN	India
CONCENTRATION	-
COMMENTS	100% wildcrafted from Todi Aboriginal tribal land. A Quality Management System, compliant to the International Standard ISO 9001,was used to manufacture and test this material ***Please take note that all specifications are liable to changes without prior notice.**

Specification Parameter Analysis	**Specification Range**	**Results**	**Methods**
Physical Form	Powder Fine	Conforms	Visual
Colour	White to Light Cream	Conforms	Visual
Odour	Characteristic minimal	Conforms	Olfactory
Specific Gravity (20deg.C)	0.400 – 0.460	See COA	USP XXIX/Paar,DMA35
Refractive Index (20deg.C)	-	-	USP XXIX/DGF IV C (52)
pH(20°C) (1% in Solution)	5.50 – 7.50	See COA	USP XXIX/DGF H III (92)
Extraction Vehicle	Liquid Nitrogen and water at 1,900 °C (minus Zero)	-	-
Water Solubility	Soluble	Conforms	-
Saponification Value	-	-	-

Viscosity	-	-	-
Dry Residue (160deg.C /2hrs)	-	-	Mettler 16J
Preservation	None	Conforms	-
Pesticide Content	None	Conforms	Pflanzaniaschuttal1989
Total Germs	<Nil Cfu/ml - Non-Pathogenic	-	USP XXIX/Ph.Eur.2.6.12(97)
Total Yeast/Mold	Nil Cfu/ml	-	USP XXIX/Ph.Eur.2.6.12(97)
Heavy Metals(Total)As,Pb,Hg	<0.03 ppm	-	USP XXIX/Ph.Eur.2.6.12(97)

CAMPO RESEARCH Pte. Ltd, SINGAPORE
CAMPO RESEARCH USA, INC SAN DEIGO CA 92111, & Manhattan, New York City, USA
CAMPO RESEARCH s.r.o., Brno, Czech Republic
CAMPO RESEARCH Pvt. Ltd, CHENNAI , INDIA
CAMPO RESEARCH CANADA LTD, TORONTO, CANADA

MATERIAL SAFETY & CONSUMER SAFETY TESTING LABS.
DIV. OF JTC KAMPOYAKI SINGAPORE
EMERGENCY MATERIAL SAFETY / ACCIDENTAL RELEASE CENTER Contact:
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EMAIL: msds911@campo-research.com

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"(SAFETY DATA SHEET – compliant to GHS)" CONFIRMS TO EC DIRECTIVE 91/155/EEC, EC REGULATION NO#1272/2008, AMENDED EC REGULATION NO#790/2009 and Complies to The EU Cosmetic Products Regulation (Regulation (EC) No 1223/2009) effective on July 2013., and to EU Commission Regulation No.358/2014/9 of 9th April 2014 amending Annexes II and V, to EU Regulation No No.1223/2009 of The European Parliament and of The Council on Cosmetic products, (Effective Date 31st October 2014) AND to US DEPT.OF LABOR-Occupational Safety & Health Admin directives and compliant to Globally Harmonized System of Classification and Labeling of Chemicals (hereinafter referred to as "the GHS")., and Complies and Confirms to the Requirements of State of California Proposition 65.

A Quality Management System, compliant to the International Standard ISO 9001, was used to manufacture and test this material

http://www.osha.gov/dsg/hazcom/ghs.html

http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html

http://www.hc-sc.gc.ca/ahc-asc/intactiv/ghs-sgh/index-eng.php

	DATE OF FIRST ISSUE	February 10th 1992-Reviewer - Dr Balasubramaniam PhD
	DATE OF LATEST REVISION	Dec. 10th 1996- Rev'wer- Dr Fergus Jes .G.Velasquez Bsc. Med Tech, MD **February 10th 2012 – Reviewer=Joshua Teo February 5th 2013 – Reviewer = Balasubramaniam M PhD 12th February 2015 - Joshua Teo BSc. Chem, Balasubramaniam M PhD & Oksana Nemchenko MD 15th May 2016 - Joshua Teo BSc. Chem, Balasubramaniam M PhD & Oksana Nemchenko MD**
1	PRODUCT AND COMPANY IDENTIFICATION	
	COMMERCIAL NAME:	**CAMPO ALPHA LIPOIC ACID (POWDER)**
	OTHER TRADE NAME:	**ALPHA LIPOIC ACID**
	LATIN NAME:	Azadirachta indica A. Juss.
	CTFA ADOPTED NAME / INCI NAME: Chiinese Translation	Melia Azadiractha Leaf Extract 印度楝（MELIA AZADIRACHTA）叶提取物
	INTERNATIONAL CHEMICAL IDENTIFICATION ***(EC REGULATION NO#1272/2008 AMENDED NO#790/2009)and Compliant to the GHS***:	**MELIA AZADIRACTHA LEAF EXTRACT**
	MANUFACTURER: (cGMP MFG. FACILITIES) :	**CAMPO RESEARCH Pte Ltd** **Level 30, 6 Battery Road** **Singapore 049909**.
	EMERGENCY TELEPHONE NUMBERS:	(65)-63833631/(65)-63228503 (Singapore)
2	HAZARDS INDENTIFICATION	
	NOT CLASSIFIED AS DANGEROUS	DIVISION 1.6; NON-HAZARDOUS

	ACCORDING TO DIRECTIVE 67/548/EEC OR ITS AMENDMENTS.	NO HAZARD STATEMENT
	HAZARD CLASS and CATEGORY CODE(s)	PICTOGRAM : NONE
	HAZARD STATEMENT CODE(s) ***(EC REGULATION NO#1272/2008 AMENDED NO#790/2009)*** **and compliant to the GHS**	No GHS Pictogram (Totally Non-Hazardous) Division 1.6; NO HAZARD STATEMENT
	GHS CLASSIFICATION : This material is Non-hazardous according To UN-GHS Criteria.	PICTOGRAM : NONE No GHS Pictogram (Totally Non-Hazardous) Division 1.6: No Hazard Statement.
	GHS LABEL ELEMENTS:	No GHS Pictogram (Totally Non-Hazardous) Division 1.6: No Hazard Statement.
3	COMPOSITION / INFORMATION ON INGREDIENTS	
	100 PERCENT CARBON-DIOXIDE GAS EXTRACTED NEEM LEAVES-CURED. -PLANT PARTS WATER SOLUBLE AND PHOSPHOLIPID COMPONENTS EXTRACT IN WATER CARRIER MENSTRUM	**Neem Leaf Extract** Melia Azadirachta Leaf Extract
	CTFA Monograph ID:	10740 - Melia Azadirachta Leaf Extract
	CAS# CAS# EU	90063-92-6 – Melia Azadirachta Leaf Extract 84696-25-3 / 90063-92-6 (EU) – Melia Azadirachta Leaf Extract
	CAS NO# (CAS Name) ***(EC REGULATION NO#1272/2008 AMENDED NO#790/2009)and compliant to the GHS***	**84696-25-3 / 90063-92-6 – Melia Azadirachta Leaf Extract**
	EINECS Name and Number EINECS# EU	290-052-2 (1) – Melia Azadirachta Leaf Extract 283-644-7 / 290-052-2 (EU) – Melia Azadirachta Leaf Extract
	EINECS# (EINECS Name) ***(EC REGULATION NO#1272/2008 AMENDED NO#790/2009) and compliant to the GHS***	**283-644-7 / 290-052-2 – Melia Azadirachta Leaf Extract**
	EINECS Number and Name EINECS# EU European Commission–Health & Consumer Cosmetics–Cosing	Melia Azadirachta Leaf Extract http://ec.europa.eu/consumers/cosmetics/cosing/index.cfm?fuseaction=search.details_v2&id=78090 Melia Azadirachta Leaf Extract - 283-644-7 / 290-052-2 (EU)
	RISK PHRASES SAFETY PHRASES 25-26	None Not Mandatory
	GHS CLASSIFICATION : This material is Non-hazardous according To UN-GHS Criteria.	**PICTOGRAM : NONE**
	GHS LABEL ELEMENTS:	**No GHS Pictogram (Totally Non-Hazardous) Division 1.6: No Hazard Statement.**
4	FIRST AID MEASURES	
	EYE CONTACT:	Wash with water or standard eye wash solution. Seek

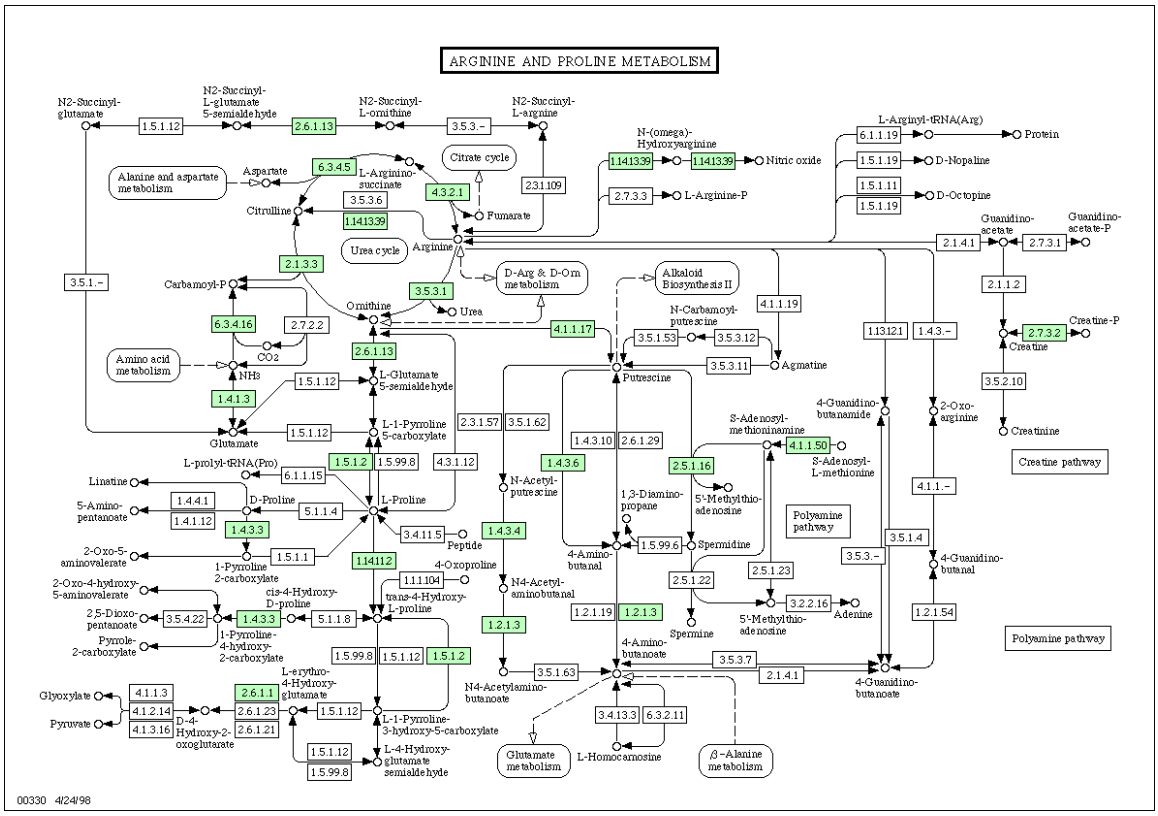
		medical advice, if irritation occur and persist.
	ORAL INGESTATION:	Edible in small quantities
	SKIN CONTACT:	Wash with water or shower.
5	FIRE FIGHTING MEASURERS	
	COMBUSTIBLE AND PRESENTS NO SPECIAL FIRE HAZARD.	
	EXTINGUISHING MEDIA:	Treat as oil fire when store in HDPE drums with CO2, dry foam or dry chemical.
	PROTECTIVE EQUIPMENTS FOR FIGHTERS:	Standard Equipments.
6	ACCIDENTAL RELEASE MEASURES	
	ABSORB ONTO AN INERT MATERIAL AND SCRAPE UP. REMOVE RESIDUE BY SCRUBBING WITH HOT WATER OR DETERGENT SOLUTION.	
7	HANDLING AND STORAGE	
	STORE IN SEALED CONTAINERS UNDER NORMAL COOL, DRY WAREHOUSING CONDITIONS.	
8	EXPOSURE AND PERSONAL PROTECTION	
	IN ACCORDANCE WITH GOOD INDUSTRIAL PRACTICE AND HANDLING USING STANDARD EYE PROTECTION.	
9	PHYSICAL AND CHEMICAL PROPERTIES	
	PHYSICAL FORM:	Powder Fine
	COLOUR:	-
	ODOUR:	Characteristic minimal
	BOILING POINT:	-
	MELTING POINT:	-
	VISCOSITY:	-
	FLASH POINT:	-
	FLAMMABILITY SOLID/GAS:	N/A
	AUTO FLAMMABILITY:	N/A
	SPECIFIC REFRACTIVE:	-
	EXPLOSIVE PROPERTIES:	N/A
	pH: (1% in Solution)	5.50 – 7.50
	OXIDIZING PROPERTIES:	N/A
	VAPOUR PRESSURE:	N/A
	DENSITY:	-
	WATER SOLUBILITY:	Soluble
	OTHER SOLUBILITY:	In Most Cosmetic Solvents
	BULK DENSITY:	-
	PARTITION COEFFICIENT: (OCTANOL/WATER)	-
	EXPLOSIVE LIMITS:	-
10	STABILITY AND REACTIVITY	
	THERMAL DECOMPOSITION:	Stable under normal conditions of use.
11	TOXICOLOGICAL DATA	Animal Tests Last Done 1992, as requirements of the then **EC DIRECTIVE 91/155/EEC**
	ORAL:	LD50 > 36,000 MG/KG (Body Wt.) Rat Essentially Non-Toxic and Edible in Small Quantity.
	DERMAL:	Expected To Be Essentially Non Toxic.
	INHALATION:	Slight Ethanolic Sting – irritation
	SPECIFIC CONCENTRATION LIMITS M-FACTORS ***(EC REGULATION NO#1272/2008 AMENDED NO#790/2009)*** **compliant to the GHS.**	36,000 MG/KG (Body Wt.); CATEGORY 5 Essentially Non-Toxic and Edible in Small Quantity.
	TOXIC EFFECTS:	

	SKIN:	Primarily Irritation Index (PII) = 0.0 (Non- Irritating - Skintex), Not A Primarily Irritant. Non-irritant / Non-sensitizer as per Repeated Patch Insult Test on 50 Human volunteers. Human Repeated Patch Test 48 hours: 50/50 completely non-irritating / non-erythema causing **ingredient at 10% concentrate in water** on 50 human volunteers
	EYE:	Very Mild/Minimal - Not A Transient Conjunctival Irritant at 10% concentrate in water (Eyetex - Eyetex classification).
		Summarized toxicological data as shown here are formation bounded under Non-Disclosure Agreement with various clients as when these Toxicological Data were established or their exclusive uses.
12	ECOLOGICAL INFORMATION	
	BIODEGRATION:	Expected To Be Ultimately Biodegradable.
	FISH TOXICITY:	No Data
	BACTERIAL & VIRAL TOXICITY:	No data
	WGK CLASS:	WGK (Self Classification)
13	DISPOSAL CONDITIONS	
	DISPOSE OFF ACCORDING TO A RECOGNISED METHOD OF CHEMICAL WASTE DISPOSAL.	
14	TRANSPORT INFORMATION	
	UN NUMBER# :	N/A
	UN NAME:	Not Assigned
	IMDG CODE/CLASS:	Not Hazardous
	IMDG CODE PAGE NO.	N/A
	ICAO/IATA AIR CLASS:	Non-Hazardous
	ICAO/IATA AIR CLASS PACKING GROUP:	N/A
	RID/ADR CLASS:	Non-Hazardous
	ADNR CLASS:	Non-Hazardous
	LABELLING: ***(EC REGULATION NO#1272/2008 AMENDED NO#790/2009) and compliant to the GHS.***	
	PICTOGRAM SIGNAL WORD CODE(s):	No GHS Pictograms (Totally Non-Hazardous)
	HAZARD STATEMENT CODE(s):	Division 1.6; No Hazard Statement
	SUPPLEMENTARY HAZARD STATEMENT CODE(s):	Similar Division 1.6; No Hazard Statement
15	REGULATORY INFORMATION	
	OCCUPATIONAL EXPOSURE LIMITS:	N/A
	U.S. State of California Proposition 65 INGREDIENTS Presence	**None (Exempted from CA Prop 65 Register)**
	EU Commission Regulation No.358/2014/9 of 9th April 2014 amending Annexes II and V, to EU Regulation No No.1223/2009 of The European Parliament and of The Council on Cosmetic products	**"Contains No Parabens and nor contains any Branched Chain Parabens".**(EU Regulation No.358/2014/9 of 9th April 2014)
16	OTHER INFORMATION	
	USES AS A COSMETIC ADDITIVE	Anti-Acne products : 0.5 – 5% After Shave preparation : 0.2 – 0.3 % Skin-care preparations : 0.5 – 2% Hair-care preparations : 0.5 – 1.5 % Anti-Perspirant & Deodorant : 0.25 – 0.5 %
	This format and information is compiled by Novel Natural Product Chemistry/ Novel Drug Discovery cGMP Labs Kobe, Japan; for Campo Research, Kyoto and Singapore.	***Please take note that all specifications are liable to changes without prior notice.***

ALPHA LIPOIC ACID APPLICATIONS AND DOSAGE:

Anti-Aging treatment products: 10 – 25%
Anti-Acne products : 0.5 – 5%
After Shave preparation : 0.2 – 3%
Skin-Care preparations : 0.5 – 1.5%
Hair-Care preparations : 0.5 – 5%
Anti-Perspirant & Deodorant : 0.25 – 0.5%
Skin Whitening topical preparations: 1%
Skin Whitening liquid soaps & soap bars: 1%

The Bio-pathway of Alpha-Lipoic Acid Synthesis



Ask about our Herbal Natural Products Chemistry Consultancy Services -Product Registration EEC/UK New Drug Development (NDA-US); Quasi-Drug Topicals (MOHW_Japan); Development of Standards, Analysis & Profiles of Phytochemicals; Literature searches, Cultivation of Medicinal Plants, Clinical-Trials, Development of new uses for Phytochemicals and Extracts; Contract Research and Development Work in Natural Products for Novel Drugs, New Cosmetic Active Ingredients for Active Topica/OTC Cosmetic with functionality and Consumer-preceivable immediate-results, New Food Ingredients for Nutraceuticals & Functional Foods.

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