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Larch Tree Substances for Nutraceuticals, Cosmetics, Food Industry and Agriculture

LARCH VITA US INC.

DOSSIER FOR MARKETING COMPILATION



DIETARY SUPPLEMENT

(DIHYDROQUERCETIN, VITAMIN C and Larch ARABINOGALACTAN are the main active ingredients)



Immune Support

Super-charged VITAMIN C with DHQ and LAG

CAPSULE

Remark: VitaLarchVita producers generic name VitaLaVita

Presentation dossier developed by LIFEVITA UK Ltd., UK (Overseas office) for Larch Vita US Inc.

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The dietary supplement **LarchVita™ EXTRA** offers benefits of the bioflavonoid **DIHYDROQUERCETIN** (DHQ) also known as TAXIFOLIN, VITAMIN C, and low-molecular weight LARCH ARABINO GALACTAN (LAG) [Larch Tree Extract (Arabinogalactan)], derived from Larch tree species (*L. dahurica* L., *L. gmelinii*, *L. laricina* Koch., *L. occidentalis* Nutt., and *L. sibirica* lebed. Family: Pinaceae).

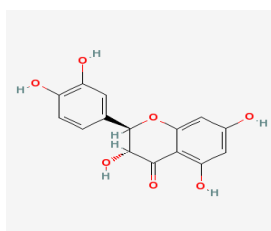
While the combination of Dihydroquercetin and Vitamin C offers powerful, synergistic protection against oxidative stress, Larch Arabinogalactan [Larch Tree Extract (Arabinogalactan)] has immune stimulatory properties.

DHQ [LarchVita™ (Dihydroquercetin)] isolated from the sawlogs of Dahurian and Siberian Larch Tree species (Russia, Siberia & Far East).

DHQ was discovered as an essential molecular intermediate in flavonoid biosynthesis pathways responsible for quercetin, oligoproanthocyanidins (OPC), anthocyanins and catechins formation.

Siberian larch and Far East Dahurian Larch trees have been recognized as an excellent source for market volumes of DHQ.

Dihydroquercetin supports cellular structure and cell metabolism. Dihydroquercetin was shown to scavenge free radicals in different lipid peroxidation inhibition assays. It inhibited superoxide radical production and microsomal lipid peroxidation, thus offering antioxidant protection to the mitochondria, cellular membrane, and subcellular systems. Its antioxidant activity was shown to match antioxidant activity of vitamin E in the peroxidation process of liposome membranes from egg phospholipids induced by ferrous sulfate; to be greater than that of Vitamin C in scavenging oxygen anion-radicals; and to greatly exceed that of trolox *in vitro* lipid peroxidation inhibition assay (Teselkin Iu.O., Zhambalova B.A., Babenkova I.V. et al. 1996; Babenkova I.V., Teselkin Iu.O., Makashova N.V. et al. 1999).



LarchVita™ Dihydroquercetin molecular structure

The ***ORAC_{hydro}** value of LarchVita™ Dihydroquercetin is over **28,000 μM TE/g.**

(Method: ALC114A, AUV203A, AOAC, USP, Journal of Agricultural and Food Chemistry, 2001; 49(10); 4619-4626)
* The ORAC_{hydro} reflects water-soluble antioxidant capacity. Trolox, a water-soluble Vitamin E analog, is used as the calibration standard and the ORAC result is expressed as micro mole Trolox equivalent (TE) per gram.

Due to the native molecule structure – functionality relationship with high potency to donate hydrogen atom, dihydroquercetin can penetrate the human erythrocytes easily and protect from oxidative damage (CAP-e assay by NIS Labs*), which in turn confirms LarchVita™ Dihydroquercetin bioavailability in human tissues.



CAP-e Units per 1 gram: 9.9 -10.5

*CAP-e assay as a cell-based antioxidant protection assay using erythrocytes to address the question of whether antioxidants in complex natural products enter the cytosol and contribute to the reduction of oxidative damage within the cell.

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Moreover, Dihydroquercetin is capable of reducing the ascorbyl radical, thus fulfilling the “ascorbate-protecting function”, while ascorbic acid assists in restoring the bioflavonoid by regenerating its antiperoxidative properties (Sorota et al. 1988; Bobyreva 1998).

For instance, a study conducted by the researchers from Institut für Strahlenbiologie (Germany) showed that, of all flavonoids tested, only Dihydroquercetin was capable of reducing the ascorbyl radical, thus fulfilling the “ascorbate-protecting function” (Bors W., Michel C., Schikora S. 1995).

Biological functions of Vitamin C are based on its ability to provide reducing equivalents for a variety of biochemical reactions. Because of its reducing power, Vitamin C can reduce most physiologically relevant reactive oxygen species. Thus, Vitamin C was shown to reduce oxygen related radicals, such as superoxide, hydroxyl radical, peroxy radical; sulphur radicals; and nitrogen-oxygen radicals (Padayatty S.J., Katz A., Wang Y. et al. 2003).

Vitamin C acts as a co-factor of eight enzymes involved in collagen hydroxylation, biosynthesis of carnitine and norepinephrine, tyrosine metabolism, and other enzymatic reactions.

It also acts as a powerful water-soluble antioxidant that reduces harmful oxidants, quenches oxidants generated during phagocytosis, and promotes iron absorption.

Along with other enzymatic and non-enzymatic components of the body’s antioxidant defense system, Vitamin C offers protection to the organs, tissues, and cells against reactive oxygen species, thus, ensuring overall well-being of the organism (Padayatty S.J. and Levine M. 2001).

DIHYDROQUERCETIN AND VITAMIN C ACT AS METAL CHELATING AGENTS

Dihydroquercetin was shown to be a potent metal chelating agent that is capable of deactivation of transition metals such as copper and iron, both of which are capable of generating the powerful hydroxyl radical.

In this case, it works as a chelating agent that produces stable complexes with metals, like copper and iron, and prevents them from participating in free radical generation (Fedosova N.F., Alisieich S.V., Lyadov K.V. et al. 2004; Potapovich A.I. and Kostyuk V.A. 2003; Teixeira S., Slquet C., Alves C. et al. 2005; Kostyuk V.A., Potapovich A.I., Strigunova E.N. et al. 2004; Mira L., Fernandez M.T., Santos M. et al. 2002).

Laboratory studies indicate that Dihydroquercetin forms metal complexes shown to be more effective radical scavengers than uncomplexed flavonoids (Kostyuk V.A., Potapovich A.I., Vladkovskaya E.M. et al. 2001).

The antioxidant reducing power of Vitamin C can also account for its role in protecting against tissue-damaging effects of some toxic chemicals and heavy metals.

Vitamin C reduces transition metal-mediated reactions (Padayatty S.J., Katz A., Wang Y. et al. 2003).

When supplemented to lead-exposed animals, Vitamin C was shown to inhibit peroxidation levels produced by lead-induced reactive oxygen species (Hsu P.C. and Guo Y.L. 2002).

High serum levels of ascorbic acid have been associated with a decreased prevalence of elevated blood lead levels (PDR 2001).



Vitamin C can have an indirect impact on the serum levels of heavy metals by increasing iron uptake, which competes with cadmium for the absorption site, and by restoring glutathione levels and reducing damage secondary to oxidative stress (Patrick L. 2003).

Vitamin C de-activates such compounds as nitrosamines and hypochlorous acid (Padayatty S.J., Katz A., Wang Y. et al. 2003), which were shown to compromise the immune system.

DIHYDROQUERCETIN AND VITAMIN C SUPPORT HEALTHY IMMUNE SYSTEM

Dihydroquercetin was shown in *in vitro* studies to prevent elevation of oxidized glutathione concentration and the oxidized/reduced glutathione ratio induced by inflammatory cytokines (Crespo I., Garcia-Mediavilla M.V., Almar M. et al. 2008).

Additionally, laboratory experiments indicate Dihydroquercetin may inhibit the formation of activated immune cells, which could lend support to suppressing inflammatory reactions (Bronner C. and Landry Y. 1985).

Ascorbic acid enhances the immune system by stimulating lymphocyte production. Vitamin C appears to play a role in a number of neutrophil functions including increased chemotaxis, enhanced lysozyme-mediated non-oxidative killing, inhibition of the halide-peroxide-myeloperoxidase system without a pronounced bactericidal effect, and stimulation of the hexose monophosphate shunt (Leibovitz B. and Siegel B.V. 1978).

LARCH ARABINO GALACTAN

Arabinogalactans are a class of long, densely branched polysaccharides with molecular weight ranging from 10,000 to 120,000 Daltons. High-grade arabinogalactan extracted from the wood of the larch tree (*Larix* species) is composed of approximately 90-98 percent arabinogalactan, which is a highly branched molecule of 3,6-beta-D-galactan (Kelly G.S. 1999; D'Adamo P. 1990).

Larch arabinogalactan has been granted the GRAS (Generally Recognized as Safe) status and it is used as a dietary supplement, an emulsifier, a bulking agent, a thickener, a foam adhesive, and a film former (FDA, Center for Food Safety & Applied Nutrition, Office of Premarket Approval Notice No. GRN 000047).

Arabinogalactans are found in a variety of plants but are more abundant in the *Larix* genus. The two primary sources of arabinogalactans are *Larix occidentalis* (Western Larch), also known as Mountain Larch or Western Tamarack and native to the Pacific and Inland Northwest United States as well as parts of British Columbia, Canada (Anonymous 2000); and *Larix dahurica* or Mongolian larch, *Larix sibirica* grown in Far East and Siberia, Russia.

Many edible and inedible plants are rich sources of Arabinogalactans, including leek seeds, carrots, radishes, black gram beans, pears, maize, wheat, red wine, Italian ryegrass, tomatoes, ragweed, sorghum, bamboo grass and coconut meat and milk (Robinson R.R., Feirtag J., and Slavin J.L. 2001).

Many herbs with well-established immune-enhancing properties, such as *Echinacea purpurea*, *Baptisia tinctoria*, *Thuja occidentalis*, *Angelica acutiloba* and *Curcuma longa* also contain significant amounts of Arabinogalactans (Robinson R.R., Feirtag J., and Slavin J.L. 2001).

LarchVita™ EXTRA offers benefits of low-molecular weight LARCH ARABINO GALACTAN (LAG) [Larch Tree Extract (Arabinogalactan)], derived from Larch tree species (*L. dahurica* L., *L. gmelinii*, *L. laricina* Koch., *L. occidentalis* Nutt., and *L. sibirica* Ledeb. Family: Pinaceae).



LARCH ARABINOGALACTAN (LAG) supports healthy immune system function by enhancing various functional aspects of the immune system by decreasing number in lymphoid cells and increasing the number of peripheral blood monocytes. (Kelly G.S. 1999).

Experimental data indicate that administration of Larch arabinogalactans resulted in a significant decrease in lymphoid cells (Currier N.L., Lejtenyi D., Miller S.C. 2003) and an increase in peripheral blood monocytes; while pretreated with arabinogalactan cultures of human peripheral blood mononuclear cells (PBMC) as well as cultures of pre-separated peripheral non-adherent cells (PNAC) and monocytes showed enhancement of natural killer (NK) activity, which was proposed to be governed by the cytokine network (Hauer J. and Anderer F.A. 1993).

Highly branched polysaccharides of Larch arabinogalactan is an excellent source of dietary fiber (Kelly G.S. 1999).

Larch Arabinogalactan is a non-digestible soluble dietary fiber that resists breakdown by enzymes and enters the large bowel intact where it is fermented by colonic microflora, with a resulting increase in the production of butyrate and propionate.

These short-chain fatty acids (SCFA) are of particular value to colon cells, and are preferred fuel for energy generation by the intestinal epithelial cells (Kim L.S., Waters R.F. and Burkholder P.M. 2002; Kelly G.S. 1999; Robinson R.R., Feirtag J. and Slavin J.L. 2001).

Some evidence indicates that insufficient production of SCFA can contribute to the unhealthy colon.

Moreover, Larch arabinogalactan has been shown to decrease the generation and absorption of ammonia (Kelly G.S. 1999; Robinson R.R., Feirtag J. and Slavin J.L. 2001). Ammonia is produced as a by-product in the colon by bacterial fermentation of protein and other nitrogen-containing substances. Levels of ammonia in the colon increase as protein intake increases. Elevated levels of colonic ammonia may have adverse health effects by interfering with the structure and function of the epithelial cells that line the colon.

Evidence also indicates human consumption of Larch arabinogalactan has a significant effect on beneficial gut microflora, specifically *Bifidobacterium*, *Lactobacillus acidophilus*, and *Enterobacteriaceae* (Kelly G.S. 1999; Kim L.S., Waters R.F. and Burkholder P.M. 2002; Robinson R.R. Feirtag J. and Slavin J.L. 2001).

These bacteria may confer certain health benefits since they are believed to maintain and restore healthy intestinal balance.

For example, increasing Lactobacilli populations resulted in increased acidity of the gastrointestinal environment, destroyed toxic substances and enhanced phagocytic activity (Robinson R.R., Feirtag J. and Slavin J.L. 2001).

DHQ and vitamin C support the health benefits of LAG, making the **LarchVita™ EXTRA** a unique formula.



LarchVita EXTRA' DIRECTIONS FOR INTAKE AND SUPPLEMENT FACTS:

DIRECTIONS: (Adults) Take one capsule twice daily, one in the A.M. and one in the P.M. preferably with the meal.

SUPPLEMENT FACTS:		
Serving size: 1 Vegetarian Capsule		
	Amount per serving	% Daily Value
VITAMIN C (as ascorbic acid)	70 mg	117%
LARCH ARABINOGALACTAN (not less than 80% Arabinogalactan)	375 mg	†
LarchVita™ (DIHYDROQUERCETIN) [Siberian & Dahurian Larch (sawlogs than 80% Dihydroquercetin)]	100 mg not less	†
† Daily Value had not been established		

OTHER INGREDIENTS: Vegetable cellulose, vegetable stearic acid, micro-cel C, silicon dioxide, vegetable magnesium stearate.

This product contains NO milk, egg, fish, peanuts, crustacean shellfish, tree nuts, wheat, yeast, gluten, corn, or soybeans.

For optimal storage conditions, keep tightly closed in a cool, dry place.

WARNING: Do not exceed recommended dose. Food supplements must not be used as a substitute for a varied and balanced diet and a healthy lifestyle. Consult with a healthcare professional is pregnant, breastfeeding, or if you have any medical condition or taking medication.

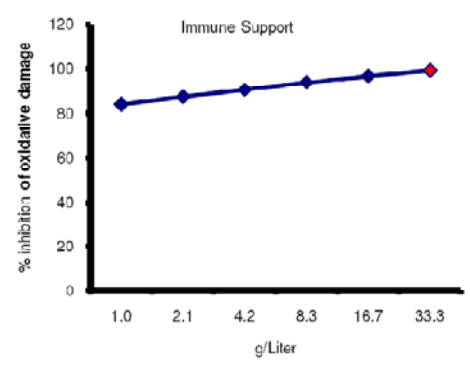
KEEP OUT OF REACH OF CHILDREN

LarchVita™ EXTRA (Immune Support)

ORAC assay per capsule 2,220 µM TE/g.

Covance Laboratories Inc.

ORAC Golden Standard Antioxidant Assay



The CAP-e assay is used to test whether natural products contain antioxidants capable of entering into and protecting live cells from oxidative damage. Thus, when any protective effect is seen in the CAP-e assay, it shows a biologically meaningful antioxidant protection by the product.

Protocol reference: NIS/CAPE/AAPH/20090803. NIS Labs.



The CAP-e value reflects the IC50 dose of the test product, i.e. the dose that provided 50% inhibition of oxidative damage. This is then compared to the IC50 dose of the known antioxidant Gallic Acid (GA).

The statements made in this publication are for informational purposes only, have not been evaluated by the FDA, and are not intended to imply that the products described can cure or mitigate any disease or that they should be used in lieu of generally accepted medical therapies. Persons with serious medical conditions should use these and any products only after consultation with qualified medical personnel. References supporting all statements herein are available upon request. All statements made herein are true to the best of our knowledge; however, we cannot accept responsibility as to the validity or accuracy of information generated outside of our own organization, whether by reference, implication or otherwise.