

# Clinical Validation of

# GOJI

Includes Scientific Papers, Research Papers,  
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## **Clinical Documentation for Goji**

Goji contains well documented, clinically researched ingredients, not well known in the USA, is a 100% pure, wild harvested juice of a unique berry, the fruit of the lycium barbarum. The polysaccharide compounds are the highest concentrations of cell nutrients of any food in the world. Goji berries have many naturally occurring elements and have been used therapeutically since the first century in Asia.

### **Main Ingredients and Research**

The Goji berries of Himalayan quality exhibits a rich polysaccharide profile and a uniquely potent Spectral Signature. It is the true descendant of the original legendary goji.

Four primary bioactive polysaccharides were discovered in Lycium barbarum. Appropriately, these polysaccharides were named LBP1, LBP2, LBP3 and LBP4. These polysaccharides proved to be glycoconjugates, meaning that they are exceptional sources of the essential cell nutrients - rhamnose, xylose, glucose, mannose, arabinose and galactose - that are necessary for proper immune function and intercellular communication. In fact, goji may be the richest source of glyconutrients yet found!

These little Tibetan goji berries are plumper than the Chinese ones, and they taste much better. The taste is a little hard to describe. It's not quite as sweet as a raisin and not as tart as a dried cranberry. They are pleasing to most people. In Tibet and Mongolia, people love these berries so much that they devote two weeks a year to celebrating the berries, probably something like wine fests in Europe in past times. The most commonly cited side effect of eating too many berries is that they might cause you to laugh more. It is said that a handful in the morning will make you happy all day. That is why for over 2,000 years they have been called the "Happy Berry".

They are a very rich source of vitamin C, having 500 times more vitamin C per ounce than oranges, actually more almost any fruit you could name. They are also a superb source of vitamin A, not surprising because they are a really pretty red color. Actually, goji is the richest source of carotenoids of all known foods. Goji berries also have vitamins B1, B2, B6, and E; they are becoming a famous antioxidant. They are also a rich source of both selenium and germanium and have hence been used in a number of clinical trials involving cancer patients. When given to patients undergoing chemotherapy, the berries conferred significant protection for the liver. In Oriental medicine, they are said to correct chi deficiency, meaning that people with low energy, insomnia, heart palpitations, and even anxiety are more comfortable after consuming goji berries.

In vitro studies suggest that goji berries kill many kinds of cancer cells. The mechanism whereby this happens is believed to involve some factor that inhibits the ability of the cell to divide, thus lowering its reproductive capacity. A large study in Japan suggested that tumor growth was inhibited by 58% among the patients eating goji berries as compared to the control groups. A study in Mongolia showed that patients eating the goji berries had a

significant increase in lymphocyte activity and that their blood began to resemble that of much younger persons.

Goji is made from fresh Goji berries, is undiluted, unsweetened, nothing else added, only 100% pure Goji juice. Goji juice contains these naturally occurring organic elements:

- 19 amino acid, including 8 essentials for life
- 21 trace minerals, including germanium, rarely found in foods
- Contains Vitamin E, rarely found in fruits
- Contains more vitamin C than oranges
- Contains Solavetivone, a powerful anti-fungal and anti-bacterial
- Contains Betaine, useful for liver to produce choline, helps reduce levels of homocysteine
- Contains LB1, LB2, LB3, LB4 polysacchrides, the most important compounds responsible for cell nutrients
- Contains Cyperone, a compound that benefits the heart ,blood pressure, alleviates menstrual discomfort, aids with cervical cancer
- Contains Physalin, shown to be effective against all major types of leukemia by increasing natural killer cells

### **Top 10 Benefits of Goji:**

1. Inhibits tumor growth and improves disease resistance
2. Powerful anti-oxidant which extends life, and improves the memory
3. Neutralize the side effects of chemotherapy and radiation
4. Help normalize blood pressure and balance blood sugar
5. Stimulates secretion of hGH (human growth hormone), feel and look younger
6. Lowers cholesterol, helps with weight
7. Enhances sexual functions and improves fertility
8. Supports liver, eyes, kidneys and strengthens muscles and bones
9. Relieves insomnia, headaches and alleviates anxiety and stress

10. The “Happy Berry” is known to promote cheerfulness and brightens the spirit

**Bovis Energy Scale, ORAC and Hertz Measurement**

"Energy Medicine" like no other in the world

**Bovis Energy Scale**

Thanks to a French researcher in the 1930's by the name of Antoine Bovis, we have a means to measure the "life force" or "natural earth energy" present in water, plants, rock formations and the like. For example, human beings show a reading on the Bovis scale of 6,500. Scientific research has correlated the clockwise or right spin of atoms and molecules with a Bovis reading below 6,500 is neutral for human life (i.e. life-depleting), and anything registering above 6,500 is essentially energy invigorating or enhancing to us.

<b>Bovis Energy Rating:</b>
Humans - 6,500
Noni - 17,000
Sea Silver - 24,000
Limu plus - 54,000
Xango - 53,000
<b>GOJI - 355,000</b>

Environmental readings below 6,500 are the effect of underground streams, geological faults, and Earth's magnetic grids. Several of Earth's energy vortices exceed 2,000,000 Bovis.

Himalayan Goji Juice shows a reading of 355,000...the highest reading that many health professionals have ever reported receiving. A truly amazing product!

In a world where science is recognizing "energy medicine" more and more, and its crucial role in releasing healing properties, these stats are a powerful confirmation of Goji Juice.

**ORAC Measurement**

A standardized test adopted by the US Department of Agriculture to measure the Total Antioxidant Potency of foods and nutritional supplements. This standardized test was developed by Dr. Guohua Cao, a physician and chemist at the National Institute on Aging in Baltimore, Maryland. It provides us with a very precise way of determining the Free Radical destroying or neutralizing power of a particular food, supplement or compound.

<b>ORAC - Oxygen Radical Absorbance Capacity:</b>		
ORAC units per 100 grams		
Egg Plant - 390 Corn - 400 Onion - 450 Grapefruit - 483 Kiwi fruit - 602 Cherries - 670 Red Bell Pepper - 710 Red Grapes - 739	Oranges - 750 Beets - 840 Broccoli - 890 Alfalfa sprouts - 930 Plums - 949 Brussel Sprouts - 980 Raspberries - 1,220 Spinach - 1,260	Strawberries - 1,540 Kale - 1,770 Black berries - 2,036 Blueberries - 2,400 Raisins - 2,830 Prunes - 5,770 <b>Goji Berries - 25,300</b>

**Hertz Measurement**

Another energy unit...named for the German physicist Heinrich Rudolf Hertz (1857-1894), who proved in 1887 that energy is transmitted through a vacuum by electromagnetic waves.

<b>Hertz Measurement:</b>
Noni - 500
Sea Silver - 2,000
Limu plus - 2,000
Xango - 2,300

Goji berries are also a rich source of both selenium and germanium and have hence been used in a number of clinical trials involving cancer patients. When given to patients undergoing chemotherapy, the berries conferred significant protection for the liver. In Oriental medicine, they are said to correct chi deficiency, meaning that people with low energy, insomnia, heart palpitations, and even anxiety are more comfortable after consuming Goji berries. The berries have 18 amino acids (higher than bee pollen) and 21 trace minerals, linoleic acid, and more beta-carotene than carrots. They are also a rich source of both selenium and germanium and have hence been used in a number of clinical trials involving cancer patients. When given to patients undergoing chemotherapy, the berries conferred significant protection for the liver. In Oriental medicine, they are said to correct chi deficiency, meaning that people with low energy, insomnia, heart palpitations, and even anxiety are more comfortable after consuming Goji berries. The berries have 18 amino acids (higher than bee pollen) and 21 trace minerals, linoleic acid, and more beta-carotene than carrots.

In vitro studies suggest that Goji berries kill many kinds of cancer cells. The mechanism whereby this happens is believed to involve some factor that inhibits the ability of the cell to divide, thus lowering its reproductive capacity. A large study in Japan suggested that tumor growth was inhibited by 58% among the patients eating Goji berries as compared to the control groups. A study in Mongolia showed that patients eating the Goji berries had a significant increase in lymphocyte activity and that their blood began to resemble that of much younger persons. (7,8)

### **Lycium barbarum (Chinese Wolfberry)**

Lycium barbarum (Chinese Wolfberry) has long been known as beneficial to vision in China. In almost every herbal eye remedy in Chinese medicine, Chinese Wolfberry is always in the ingredient list

The Goji berry has a high concentration of the branched-chain amino acid L-leucine. L-leucine is an essential amino acid that we can only obtain from our diet. Inside the body, L-leucine is converted into a powerful compound called HMB (beta-hydroxy beta-methylbutyrate).

What makes HMB such a breakthrough in health-maintenance? According to noted researcher, Richard Passwater, PH.D.:

"HMB showed that it lowered total and LDL cholesterol levels in blood and helped strengthen the immune system while building muscles and burning body fat. This news is certainly of interest to body builders and other athletes, but it may also become of interest to cancer, AIDS and muscular dystrophy patients."

To date, four human clinical studies have been completed, including a double-blind university study at the American College of Sports Medicine in Minnesota. Test subjects who used only 3 grams of HMB a day gained up to 300% more lean muscle mass and experience 295% in strength gains. In another study, consumption of Goji led to a strengthening of immunoglobulin A levels (a part of our immunity). Because the decline of immunoglobulin A is one of the signs of aging, an increase in these levels suggests that the Goji berry may enable older cells to regenerate.

From July 1982 to January 1984 (Register No. 870303), the Ningxia Institute of Drug Inspection conducted a clinical experiment using multi-index screening. Their Conclusion was that the fruits and pedicels of Goji were effective in increasing white blood cells, protecting the liver and relieving hypertension. The alcoholic extract of Goji fruits inhibited tumor growth in mice by 58%, and the protein of Goji displayed an insulin-like action that was effective in promoting fat decomposition and reducing blood sugar.

A clinical experiment by the Ningxia Institute (Register No. 870306, from October 1982 to May 1985) studied the effects of Goji on blood of aged volunteers. The results were published by the State Scientific and Technological Commission of China, and the authors concluded that the Goji caused the blood of older people to noticeably revert to a younger state.

## **Clinical Studies**

### **Effect of Lycium barbarum Polysaccharide on the Improvement of Insulin Resistance in NIDDM Rats.**

[Zhao R](#), [Li Q](#), [Xiao B](#).

Department of Biological Engineering, College of Environment & Chemical Engineering, Yanshan University.

Lycium barbarum is one of the traditional oriental medicines. It has been reported to reduce blood glucose levels. In this study, the effect of Lycium barbarum polysaccharide (LBP) on the improvement of insulin resistance and lipid profile was studied in rats, a model for non-insulin dependent diabetes mellitus (NIDDM). The rats were divided into three groups: control, NIDDM control, and NIDDM+LBP. Diabetes model groups were made by feeding high-fat diet and subjecting to i.p. streptozotocin (50 mg/kg). LBP treatment for 3 weeks resulted in a significant decrease in the concentration of plasma triglyceride and weight in NIDDM rats. Furthermore, LBP markedly decreased the plasma cholesterol levels and fasting plasma insulin levels, and the postprandial glucose level at 30 min during oral glucose tolerance test and significantly increased the Insulin Sensitive Index in NIDDM rats. In the present study, we have tested that LBP can alleviate insulin resistance and the effect of LBP is associated with increasing cell-surface level of glucose transporter 4 (GLUT4) in skeletal muscle of NIDDM rats. Under insulin stimulus, GLUT4 content in plasma membrane in NIDDM control rats was significantly lower than that of control ( $p < 0.01$ ), and GLUT4 content in the plasma membrane in NIDDM+LBP rats was higher than that of NIDDM control rats ( $p < 0.01$ ). In conclusion, LBP can ameliorate insulin resistance, and the mechanism may be involved in increasing cell-surface level of GLUT4, improving GLUT4 trafficking and intracellular insulin signaling.

PMID: 16327243 [PubMed - in process]

: [Se Pu](#). 2005 Jul;23(4):415-7.

**[Resolution of carotenoid isomers in *Lycium barbarum* L. by heuristic evolving latent projection]**

[Lu H](#).

College of Chemistry and Chemical Engineering, Central South University, Changsha 410083, China.  
lu\_hongmei225@126.com

*Lycium barbarum* L., a kind of traditional Chinese herb, is found to have bioactivities such as anticancer, antioxidant, hypoglycemic and immunological activities. In both in vitro and in vivo studies, the carotenoids were found to be a class of the effective compounds. The carotenoids in *Lycium barbarum* L. were separated by high performance liquid chromatography with diode array detection (HPLC-DAD). Seven peaks were obtained by HPLC on a C18 column with acetonitrile-methylene chloride (60:40, v/v) as mobile phase at a flow-rate of 1.0 mL/min. Most of the peaks that had been validated as single peaks in the 2-dimensional chromatography were found to be overlapping peaks. The overlapping chromatographic peaks were resolved by chemometric method--Heuristic Evolving Latent Projection (HELP) based on 3-dimensional data. As an example, the chromatogram and UV spectra of 4 isomers were obtained by resolving an overlapping peak. These results showed that the combination of chemometric methods and modern analytical instruments provides an effective method for the analysis of complex systems such as isomers.

PMID: 16250456 [PubMed - in process]

[Zhong Xi Yi Jie He Xue Bao](#). 2005 Sep;3(5):374-7.

**[Effects of *Lycium barbarum* polysaccharide on tumor microenvironment T-lymphocyte subsets and dendritic cells in H22-bearing mice]**

[He YL](#), [Ying Y](#), [Xu YL](#), [Su JF](#), [Luo H](#), [Wang HF](#).

Department of Pathology, Guangzhou University of Traditional Chinese Medicine, Guangzhou, Guangdong Province 510405, China. Yahlihe16@163.com

**OBJECTIVE:** To study the effects of *Lycium barbarum* polysaccharide (LBP) on tumor microenvironment T-lymphocyte subsets and dendritic cells in H22-bearing mice and the mechanisms for intervention of tumor immune escape by LBP. **METHODS:** H22-bearing mice were given LBP orally for two weeks. T-lymphocyte subsets and the phenotypes of dendritic cells in tumor-infiltrating lymphocytes (TIL) were detected by flow cytometry (FCM). **RESULTS:** LBP could significantly increase the numbers of CD4(+) and CD8(+) T cells in TIL as compared with those in model control group ( $P < 0.05$ ). In model control group, the number of dendritic cells in tumor microenvironment decreased markedly, while in LBP-treated group, the increased number of dendritic cells and B7-1 expression were observed, but there were no significant differences between these two groups. **CONCLUSION:** LBP has anti-tumor effect probably by increasing the numbers of CD4(+) and CD8(+) T cells in TIL to relieve the immunosuppression and enhance the anti-tumor function of the immune system. But whether LBP can recover the phenotype and function of dendritic cells in H22-bearing mice should be further studied.

PMID: 16159572 [PubMed - in process]

: [Cancer Biother Radiopharm.](#) 2005 Apr;20(2):155-62.

**Therapeutic effects of Lycium barbarum polysaccharide (LBP) on irradiation or chemotherapy-induced myelosuppressive mice.**

[Gong H](#), [Shen P](#), [Jin L](#), [Xing C](#), [Tang F](#).

Capital Medical University Affiliated Beijing Tiantan Hospital, Beijing 100050, China.  
haiyanggong@sin.com.cn

**AIM:** The aim of this study was to investigate the effects of Lycium barbarum polysaccharide (LBP) on irradiation- or chemotherapy-induced myelosuppressive mice and cultured peripheral blood mononuclear cells (PBMCs). **METHODS:** In an in vivo experiment, mice were irradiated with a sublethal dose of 550 cGy X-ray or intraperitoneally (i.p.) injected with carboplatin (CB) 125 mg/kg to produce severe myelosuppression. Four to 6 hours after the irradiation or injection, mice were subcutaneously (s.c.) injected with LBP (50, 100, and 200 mg/kg) daily from day 0 to day 6. Blood samples were collected from the tail veins of mice at different time points, and peripheral white blood cells (WBC), red blood cells (RBC), and platelet (PLT) counts were monitored. In an in vitro experiment, human PBMCs were incubated with LBP at different concentrations in combination with phytohemagglutinin (PHA), and the production of granulocyte colony-stimulating factor (G-CSF) was tested. **RESULTS:** Compared to the control, 50 mg/kg LBP (LBP-L) significantly ameliorated the decrease of peripheral WBC of irradiated myelosuppressive mice on day 13, and 100 mg/kg LBP (LBP-M) did the same on days 17 and 21. All dosages of LBP significantly ameliorated the decrease of peripheral RBC of irradiated myelosuppressive mice on days 17 and 25. Two-hundred mg/kg LBP (LBP-H) and LBP-M significantly enhanced peripheral PLT counts of irradiated myelosuppressive mice on days 10, 13, 17, and 21, as did LBP-L on days 13 and 17. All dosages of LBP increased peripheral WBC counts of chemotherapy-induced myelosuppressive mice to some extent, but there was no statistic difference when compared to the control. LBP-H significantly ameliorated the decrease of peripheral RBC of chemotherapy-induced myelosuppressive mice on days 13, 15, 17, and 20, and LBP-M and LBP-L did the same on days 15 and 17. All dosages of LBP significantly enhanced peripheral PLT counts of chemotherapy-induced myelosuppressive mice on days 7 and 10, as did LBP-H on days 13, 15, and 17, and LBP-M on days 13 and 15. Also, LBP could obviously stimulate human PBMCs to produce G-CSF. **CONCLUSIONS:** LBP promoted the peripheral blood recovery of irradiation or chemotherapy-induced myelosuppressive mice, and the effects may be the result of the stimulation of PBMCs to produce G-CSF.

PMID: 15869449 [PubMed - indexed for MEDLINE]

[Life Sci.](#) 2005 Mar 18;76(18):2115-24.

**Effect of lycium barbarum polysaccharide on human hepatoma QGY7703 cells: inhibition of proliferation and induction of apoptosis.**

[Zhang M](#), [Chen H](#), [Huang J](#), [Li Z](#), [Zhu C](#), [Zhang S](#).

Department of Food Science and Bioengineering, Tianjin University of Science and Technology, Tianjin 300222, PR China. zm0102@sina.com

Lycium barbarum polysaccharide (LBP), extracted from Lycium barbarum that is a kind of traditional Chinese herb, is found to have anticancer activity. In this study, the effect of LBP on the proliferation rate, cell cycle distribution and apoptosis in the human hepatoma QGY7703 cell line were investigated. The effects of this compound were also tested on the concentration of calcium in cells. LBP treatment caused inhibition of QGY7703 cell growth with cycle arrest in S phase and apoptosis induction. The amount of RNA in cells and the concentration of intracellular Ca<sup>2+</sup> were increased. Moreover, the distribution of calcium in cells was changed. Taken together, the study suggests that the induction of cell cycle arrest and the increase of intracellular calcium in apoptotic system may participate in the antiproliferative activity of LBP in QGY7703 cells.

PMID: 15826878 [PubMed - indexed for MEDLINE]

### **Therapeutic effects of Lycium barbarum polysaccharide (LBP) on mitomycin C (MMC)-induced myelosuppressive mice.**

[Hai-Yang G](#), [Ping S](#), [Li JI](#), [Chang-Hong X](#), [Fu T](#).

Institute of Basic Medicine, Beijing University of Traditional Chinese Medicine, Beijing 100029, China.  
haiyanggong@sina.com

AIM: To investigate the therapeutic effects of Lycium barbarum polysaccharide (LBP) on mitomycin C (MMC)-induced myelosuppressive mice. METHODS: Mice were intravenously injected with MMC 150 mg/kg for two consecutive days from day -1 to day 0 to produce severe myelosuppression, and then treated by s.c. injections of LBP (100 or 200 mg/kg/day) from days 0 to 6. Blood samples were collected from the tail veins of mice on days 7, 10, 12, 14, 17, 19, 21, 24 and 27, and peripheral white blood cells (WBC), red blood cells (RBC), hemoglobin (HGB) and platelet counts (PLT) etc. were monitored. RESULTS: LBP at 100 mg/kg (LBP-L) on day 14 and LBP at 200 mg/kg (LBP-H) on days 10, 14, 17, 19 and 21, significantly ameliorated the decrease of peripheral RBC, HGB and hematocrit (HCT) of myelosuppressive mice compared to the control. LBP-L on days 12 and days 14 and LBP-H on days 10, 12, 14, 17, 19 and 21, significantly enhanced peripheral PLT recovery of myelosuppressive mice compared to the control. LBP-H on days 12, 17, 19 and 21, significantly inhibited the increase of mean platelet volume (MPV) of myelosuppressive mice compared to the control. LBP showed no obviously effect on neutropenia induced in mice by MMC. CONCLUSION: LBP is effective on peripheral RBC and PLT recovery of MMC-induced myelosuppressive mice.

PMID: 15724837 [PubMed - indexed for MEDLINE]

[Phytomedicine](#). 2005 Jan;12(1-2):131-7.

### **Lycium barbarum glycoconjugates: effect on human skin and cultured dermal fibroblasts.**

[Zhao H](#), [Alexeev A](#), [Chang E](#), [Greenburg G](#), [Bojanowski K](#).

Sunny BioDiscovery, Inc., 675 Hegenberger Road, 2nd floor, Oakland 94621, CA, USA.

Lycium barbarum L. (Solanaceae) glycoconjugates (LbGp) display an interesting array of anti-apoptotic and antioxidant properties, which may be beneficial for human skin. We therefore set out to determine the effects of LbGp in full-thickness human skin, and in dermal fibroblasts. It was found that LbGp

decreased the level of MMP (matrix metalloproteinase)-1 significantly, but not that of MMP-3 or -13, in the whole human skin system, without compromising the viability of the skin. Consistently, LbGp inhibited skin expansion under mechanical stress, which in this model depends on the activity of MMP-1. We found that one of *L. barbarum* glycoconjugates, the LbGp5, promoted the survival of human fibroblasts cultured in suboptimal conditions. Furthermore, in the presence of LbGp5, these cultures also contained higher levels of the MMP-1 substrate--collagen type I. Together these results suggest that *L. barbarum* glycoconjugates in general, and LbGp5 in particular, may have important skin-protective properties.

PMID: 15693720 [PubMed - indexed for MEDLINE]

[Int J Cardiol.](#) 2005 Jan;98(1):1-14.

### **Cardiovascular pharmacotherapy and herbal medicines: the risk of drug interaction.**

[Izzo AA](#), [Di Carlo G](#), [Borrelli F](#), [Ernst E](#).

Department of Experimental Pharmacology, University of Naples "Federico II", via D. Montesano 49, 80131 Naples, Italy. aaizzo@unina.it

Use of herbal medicines among patients under cardiovascular pharmacotherapy is widespread. In this paper, we have reviewed the literature to determine the possible interactions between herbal medicines and cardiovascular drugs. The Medline database was searched for clinical articles published between January 1996 and February 2003. Forty-three case reports and eight clinical trials were identified. Warfarin was the most common cardiovascular drug involved. It was found to interact with boldo, curbicin, fenugreek, garlic, danshen, devil's claw, don quai, ginkgo, papaya, lycium, mango, PC-SPES (resulting in over-anticoagulation) and with ginseng, green tea, soy and St. John's wort (causing decreased anticoagulant effect). Gum guar, St. John's wort, Siberian ginseng and wheat bran were found to decrease plasma digoxin concentration; aspirin interactions include spontaneous hyphema when associated with ginkgo and increased bioavailability if combined with tamarind. Decreased plasma concentration of simvastatin or lovastatin was observed after co-administration with St. John's wort and wheat bran, respectively. Other adverse events include hypertension after co-administration of ginkgo and a diuretic thiazide, hypokalemia after liquorice and antihypertensives and anticoagulation after phenprocoumon and St. John's wort. Interaction between herbal medicine and cardiovascular drugs is a potentially important safety issue. Patients taking anticoagulants are at the highest risk.

PMID: 15676159 [PubMed - in process]

### **Hypoglycemic and hypolipidemic effects and antioxidant activity of fruit extracts from *Lycium barbarum*.**

[Luo Q](#), [Cai Y](#), [Yan J](#), [Sun M](#), [Corke H](#).

College of Public Health, Wuhan University, Wuhan 430071, Hubei, PR China.

The hypoglycemic and hypolipidemic effects of *Lycium barbarum* fruit water decoction, crude polysaccharide extracts (crude LBP), and purified polysaccharide fractions (LBP-X) in alloxan-induced diabetic or hyperlipidemic rabbits were investigated through designed sequential trials and by measuring blood glucose and serum lipid parameters. Total antioxidant capacity was also assessed using trolox

equivalent antioxidant capacity (TEAC) and oxygen radical absorbance capacity (ORAC) assay. It was found that the three *Lycium barbarum* fruit extracts/fractions could significantly reduce blood glucose levels and serum total cholesterol (TC) and triglyceride (TG) concentrations and at same time markedly increase high density lipoprotein cholesterol (HDL-c) levels after 10 days treatment in tested rabbits, indicating that there were substantial hypoglycemic and hypolipidemic effects. Hypoglycemic effect of LBP-X was more significant than those of water decoction and crude LBP, but its hypolipidemic effect seemed to be weaker. Total antioxidant capacity assay showed that all three *Lycium barbarum* extracts/fractions possessed antioxidant activity. However, water and methanolic fruit extracts and crude polysaccharide extracts exhibited stronger antioxidant activity than purified polysaccharide fractions because crude extracts were identified to be rich in antioxidants (e.g., carotenoids, riboflavin, ascorbic acid, thiamine, nicotinic acid). *Lycium barbarum* polysaccharides (glycocojugates), containing several monosaccharides and 17 amino acids, were major bioactive constituents of hypoglycemic effect. Both polysaccharides and vitamin antioxidants from *Lycium barbarum* fruits were possible active principles of hypolipidemic effect.

PMID: 15519360 [PubMed - indexed for MEDLINE]

1: [Biotechnol Lett.](#) 2004 Jul;26(14):1125-30.

### **Anti-fungal effects of phenolic amides isolated from the root bark of *Lycium chinense*.**

[Lee DG](#), [Park Y](#), [Kim MR](#), [Jung HJ](#), [Seu YB](#), [Hahm KS](#), [Woo ER](#).

Department of Microbiology, Kyungpook National University, Daegu 702-701, Republic of Korea.

Four phenolic amides, dihydro-N-caffeoyltyramine (1), trans-N-feruloyloctopamine (2), trans-N-caffeoyltyramine (3), and cis-N-caffeoyltyramine (4), were isolated from an ethyl acetate extract of the root bark of *Lycium chinense* Miller. All had an anti-fungal effect; compounds 1-3 were potent at 5-10 microg ml<sup>-1</sup> and were without hemolytic activity against human erythrocyte cells. Compound 4 was active at 40 microg ml<sup>-1</sup>. All four compounds impeded the dimorphic transition of pathogen, *Candida albicans*.

PMID: 15266117 [PubMed - indexed for MEDLINE]

### **Comparison of plasma responses in human subjects after the ingestion of 3R,3R'-zeaxanthin dipalmitate from wolfberry (*Lycium barbarum*) and non-esterified 3R,3R'-zeaxanthin using chiral high-performance liquid chromatography.**

[Breithaupt DE](#), [Weller P](#), [Wolters M](#), [Hahn A](#).

Institute for Food Chemistry, University of Hohenheim, Garbenstrasse 28, 70593 Stuttgart, Germany.  
breithau@uni-hohenheim.de

Age-related macular degeneration (AMD) is one of the most common eye diseases of elderly individuals. It has been suggested that lutein and zeaxanthin may reduce the risk for AMD. Information concerning the absorption of non-esterified or esterified zeaxanthin is rather scarce. Furthermore, the formation pathway of meso (3R,3'S)-zeaxanthin, which does not occur in plants but is found in the macula, has not yet been identified. Thus, the present study was designed to assess the concentration of 3R,3R'-zeaxanthin reached in plasma after the consumption of a single dose of native 3R,3'R-zeaxanthin

palmitate from wolfberry (*Lycium barbarum*) or non-esterified 3R,3'R-zeaxanthin in equal amounts. In a randomised, single-blind cross-over study, twelve volunteers were administered non-esterified or esterified 3R,3'R-zeaxanthin (5 mg) suspended in yoghurt together with a balanced breakfast. Between the two intervention days, a 3-week depletion period was inserted. After fasting overnight, blood was collected before the dose (0 h), and at 3, 6, 9, 12, and 24 h after the dose. The concentration of non-esterified 3R,3'R-zeaxanthin was determined by chiral HPLC. For the first time, chiral liquid chromatography-atmospheric pressure chemical ionisation-MS was used to confirm the appearance of 3R,3'R-zeaxanthin in pooled plasma samples. Independent of the consumed diet, plasma 3R,3'R-zeaxanthin concentrations increased significantly ( $P=0.05$ ) and peaked after 9-24 h. Although the concentration curves were not distinguishable, the respective areas under the curve were distinguishable according to a two-sided F and t test ( $P=0.05$ ). Thus, the study indicates an enhanced bioavailability of 3R,3'R-zeaxanthin dipalmitate compared with the non-esterified form. The formation of meso-zeaxanthin was not observed during the time period studied.

PMID: 15137922 [PubMed - indexed for MEDLINE]

[Int Immunopharmacol.](#) 2004 Apr;4(4):563-9.

### **Immunomodulation and antitumor activity by a polysaccharide-protein complex from *Lycium barbarum*.**

[Gan L](#), [Hua Zhang S](#), [Liang Yang X](#), [Bi Xu H](#).

Institute of Materia Medica, College of Life Science and Technology, Huazhong University of Science and Technology, Wuhan 430074, PR China. ganlu07@163.com

The modulation of a polysaccharide-protein complex from *Lycium barbarum* (LBP3p) on the immune system in S180-bearing mice was investigated. The mice inoculated with S180 cell suspension were treated p.o. with LBP3p (5, 10 and 20 mg/kg) for 10 days. The effects of LBP3p on transplantable tumors and macrophage phagocytosis, quantitative hemolysis of sheep red blood cells (QHS), lymphocyte proliferation, the activity of cytotoxic T lymphocyte (CTL), interleukin-2 (IL-2) gene expression and lipid peroxidation were studied. LBP3p could significantly inhibit the growth of transplantable sarcoma S180 and increase macrophage phagocytosis, the form of antibody secreted by spleen cells, spleen lymphocyte proliferation, CTL activity, IL-2 mRNA expression level and reduce the lipid peroxidation in S180-bearing mice. The effect is not dose-dependent in a linear fashion. A total of 10 mg/kg dose is more effective than 5 and 20 mg/kg doses. This suggests that LBP3p at 10 mg/kg has a highly significant effect on tumor weight and improves the immune system. Copyright 2004 Elsevier B.V.

PMID: 15099534 [PubMed - indexed for MEDLINE]

[Wei Sheng Yan Jiu.](#) 2003 Nov;32(6):599-601.

### **[Study on protective action of lycium barbarum polysaccharides on DNA imparments of testicle cells in mice]**

[Huang X](#), [Yang M](#), [Wu X](#), [Yan J](#).

School of Public Health, Wuhan University, Wuhan 430071, China.

To investigate the protective effect of lycium barbarum polysaccharides (LBP) on DNA oxidative damage of testicle cells induced by hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>). The single cell gel electrophoresis(SCGE) was used to detect the breakage of DNA strand and analyze LBP protection against oxidation damage in testicle cells treated by different concentrations of LBP for 1 hour firstly, and then cultured with 100  $\mu$ mol/L H<sub>2</sub>O<sub>2</sub> for 25 min. The results showed that a certain moment action by H<sub>2</sub>O<sub>2</sub> could induce the breakage of DNA strand. The pretreatment of LBP (50, 100, 200, 400 micrograms/ml) significantly decreased the frequencies of cells with tail moment and the tail length of testicle cells treated by H<sub>2</sub>O<sub>2</sub>. It is suggested that LBP itself could not cause the oxidation damage, but it could clean out the free-radical and restrain the DNA damage of testicle cells caused by the oxidative stress.

PMID: 14963914 [PubMed - indexed for MEDLINE]

[Zhongguo Zhong Xi Yi Jie He Za Zhi](#). 2003 Dec;23(12):926-8.

**[Effect of wolfberry fruit and epimedium on DNA synthesis of the aging-youth 2BS fusion cells]**

**[Wu BY](#), [Zou JH](#), [Meng SC](#).**

Department of Cell Biology and Genetics, Medical College, Peking University, Beijing 100083.  
baiyanwu@public.fhnet.cn.net

**OBJECTIVE:** To study the effect of water extracts of Wolfberry fruit (WB) and Epimedium (EM) on DNA synthesis of the aging-youth 2BS fusion cells. **METHODS:** Human embryonic lung diploid fibroblasts 2BS national standard strain, were used as an aging model. Cell denucleation and cell fusion techniques were applied to observe the effect of WB and EM on DNA synthesis of 2BS fusion cells. **RESULTS:** In the 0.025 (V/V) WB or EM water extract containing media, 2BS cells could be continuously cultured for 61.0 +/- 2.9 passages and 56.0 +/- 2.6 passages respectively, while in the control group it was only 49.0 +/- 2.6 passages (P < 0.01). After treatment with WB and EM separately for 2 hrs, the aging 2BS cells were denucleated and fused with young 2BS cells. The [3H]TdR incorporation percentage in these treated cells was significantly higher than that in the untreated control cells (P < 0.01). **CONCLUSION:** Both WB and EM can accelerate the DNA synthesis rate of the aging youth 2BS fusion cells and prolong the life span of 2BS cells.

PMID: 14714367 [PubMed - indexed for MEDLINE]

[Zhongguo Zhong Xi Yi Jie He Za Zhi](#). 2003 Dec;23(12):926-8.

[Related Articles](#), [Links](#)

**Research Reveals Hope For Fight Against Cancer, Alzheimers**

By texasrnat 09:52AM9 (CDT) September 25,2005

Research on the goji berry just continues to get better and better. In July, the Los Angeles Times wrote an article titled, "Lycium May Repress Some Cancer Cells."

Then in August, the following scientific study completed by the Department of Anatomy

at the University of Hong Kong was published in Experimental Gerontology regarding goji for Alzheimer's disease:

Neuroprotective effects of anti-aging oriental medicine Lycium barbarum against beta-amyloid peptide neurotoxicity.

The study concluded with the following extremely positive statement: "Taken together, we have proved our hypothesis by showing neuroprotective effects of the extract from L. barbarum."

Now in September, the following study was completed by the Department of Pathology at Guangzhou University in China regarding goji for cancer:

Effects of Lycium barbarum polysaccharide on tumor microenvironment T-lymphocyte subsets and dendritic cells in H22-bearing mice.

The study concluded with the following incredible statement: "Conclusion: LBP has anti-tumor effect probably by increasing the numbers of CD4(+) and CD8(+) T cells in TIL to relieve the immunosuppression and enhance the anti-tumor function of the immune system."

*Lycium barbarum polysaccharide increases neuroprotective effects and enhances anti-tumor function of the immune system.*

**Protective effect of Fructus Lycii polysaccharides against time and hyperthermia-induced damage in cultured seminiferous epithelium.**

**Wang Y, Zhao H, Sheng X, Gambino PE, Costello B, Bojanowski K.**

Department of Histology and Embryology, Ningxia Medical College, Yinchuan, People's Republic of China.

[Click here to view study](#)

Lycium barbarum L. (Solanaceae) is a Chinese medicinal plant whose fruits (Fructus Lycii) are used by Chinese physicians for treatment of infertility. However, the active ingredients and the mechanism of action underlying Lycium's fertility-facilitating effects remain unknown. Here we report that Fructus Lycii polysaccharides (FLPS) inhibit time- and hyperthermia-induced structural damage in murine seminiferous epithelium, in vitro. Moreover, we found that FLPS delayed apoptosis in this system, both at normothermic and hyperthermic culture conditions. Oxidative stress was reported to be a major cause of structural degradation and apoptosis in hyperthermic testes, and thus the protective effect of FLPS could implicate an antioxidant mechanism of action. To test this hypothesis we assayed the effect of FLPS on ultraviolet light-induced lipid peroxidation, and cytochrome c reduction by free radicals. We found that FLPS is a potent inhibitor of both of these reactions. Together, these results demonstrate the protective effect of FLPS on time- and hyperthermia-induced testicular degeneration in vitro, indicate the potential mechanism of action for this protective effect, and provide a scientific basis for the traditional use of this plant.

PMID: 12241992 [PubMed - indexed for MEDLINE]

**[Effect of wolfberry fruit and epimedium on DNA synthesis of the aging-youth 2BS fusion cells]**

[Wu BY](#), [Zou JH](#), [Meng SC](#).

Department of Cell Biology and Genetics, Medical College, Peking University, Beijing 100083.  
baiyanwu@public.fhnet.cn.net

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PMID: 14714367 [PubMed - indexed for MEDLINE]

1: [Wei Sheng Yan Jiu](#). 2000 Mar 30;29(2):115-7.

**[Isolation and purification of Lycium barbarum polysaccharides and its antifatigue effect]**

[Article in Chinese]

[Luo Q](#), [Yan J](#), [Zhang S](#).

Department of Hygiene, Hubei Medical University, Wuhan 430071, China.

A purified component of lycium barbarum polysaccharide (LBP-X) was isolated from lycium barbarum L. by DEAE ion-exchange cellulose and sephacryl gel chromatography. LBP-X was tested on five different doses (5, 10, 20, 50 and 100 mg.kg<sup>-1</sup>.d<sup>-1</sup>) in mice. The results showed that LBP-X induced a remarkable adaptability to exercise load, enhanced resistance and accelerated elimination of fatigue. LBP-X could enhance the storage of muscle and liver glycogen, increase the activity of LDH before and after swimming, decrease the increase of blood urea nitrogen (BUN) after strenuous exercise, and accelerate the clearance of BUN after exercise. The dosage of LBP-X 10 mg.kg<sup>-1</sup>.d<sup>-1</sup> was the best amount among the five tested doses.

PMID: 12725093 [PubMed - indexed for MEDLINE]

[Yao Xue Xue Bao](#). 2001 Feb;36(2):108-11.

**[Studies on the glycoconjugates and glycans from Lycium barbarum L in inhibiting low density lipoprotein (LDL) peroxidation]**

[Huang LJ](#), [Tian GY](#), [Wang ZF](#), [Dong JB](#), [Wu MP](#).

State Key Laboratory of Bio-organic and Natural Products Chemistry, Shanghai Institute of Organic

Chemistry, Chinese Academy of Sciences, Shanghai 200032, China.

**AIM:** To determine the effects of glycoconjugates and their glycans from *Lycium barbarum* L. on inhibiting low density lipoprotein (LDL) peroxidation. **METHODS:** Using Cu(2+)-induced oxidation as a model, the oxidative production of thiobarbituric acid-reactive substances (TBARS) and the LDL electrophoresis migration on agarose gel were measured. **RESULTS:** The effects of glycoconjugates and their glycans from *Lycium barbarum* L. on inhibiting LDL peroxidation were different, among them, glycoconjugate LbGp5 showed the best effect on inhibiting LDL peroxidation. **CONCLUSION:** The glycoconjugates can inhibit LDL peroxidation while their glycans showed no effects on inhibiting LDL peroxidation.

PMID: 12579875 [PubMed - indexed for MEDLINE]

### **[Inhibition the growth of human leukemia cells by *Lycium barbarum* polysaccharide]**

[Gan L](#), [Wang J](#), [Zhang S](#).

School of Life Science and Technology, Huazhong University of Science and Technology, Wuhan 430074, China.

The effect and the mechanism of *Lycium barbarum* polysaccharide (LBP-X) on inhibiting the growth of human leukemia HL-60 cells were examined. LBP-X(20, 100, 500, 1000 mg/L) could inhibit the growth of HL-60 cells in dose-dependent manner and decrease the membrane fluidity of the cell. Agarose gel electrophoresis of DNA from the cells treated with LBP-X revealed a "DNA ladder" and positive TUNEL test. The results showed that the apoptosis of HL-60 cells induced by LBP-X maybe its important mechanism on anti-tumorigenesis.

PMID: 12561612 [PubMed - indexed for MEDLINE]

### **Specific alpha-galactosidase inhibitors, N-methylcalystegines--structure/activity relationships of calystegines from *Lycium chinense*.**

[Asano N](#), [Kato A](#), [Miyachi M](#), [Kizu H](#), [Tomimori T](#), [Matsui K](#), [Nash RJ](#), [Molyneux RJ](#).

Faculty of Pharmaceutical Sciences, Hokuriku University, Kanazawa, Japan. naoki22@po.incl.or.jp

An examination of the roots of *Lycium chinense* (Solanaceae) has resulted in the discovery of 14 calystegines, a cycloheptane bearing an amino group and three hydroxyl groups, and two polyhydroxylated piperidine alkaloids. Calystegines A7 and B5, in addition to the previously known calystegines A3, A5, A6, B1, B2, B3, B4, C1, C2 and N1, were isolated and determined as 1alpha,2beta,4alpha-trihydroxy-nortropine and 1alpha, 2alpha, 4alpha, 7alpha-tetrahydroxy-nortropine, respectively. *L. chinense* also had two polyhydroxytropans bearing a methyl group on the nitrogen atom, unlike the previously reported nortropine alkaloids. They were established as N-methylcalystegines B2 and C1, and their N-methyl groups were found to be axially oriented from NOE experiments. 1Beta-amino-3beta,4beta,5alpha-trihydroxycycloheptane was also present in *L. chinense* and may be a biosynthetic precursor of the calystegines that occur in this plant. Two polyhydroxypiperidine alkaloids, fagomine and 6-deoxyfagomine, were isolated. Calystegine B2 is a potent competitive inhibitor of almond beta-glucosidase ( $K_i = 1.9 \mu\text{M}$ ) and coffee bean alpha-galactosidase ( $K_i = 0.86 \mu\text{M}$ ), while N-methylcalystegine B2 was a more potent competitive

inhibitor of the latter enzyme ( $K_i = 0.47 \text{ microM}$ ) than the parent compound but showed a marked lack of inhibitory activities towards most other glycosidases. Since this compound is a very specific inhibitor of alpha-galactosidase and inhibits rat liver lysosomal alpha-galactosidase with a  $K_i$  of  $1.8 \text{ microM}$ , it may provide a useful experimental model for the lysosomal storage disorder, Fabry's disease. The addition of a hydroxyl group at C6exo, as in calystegines B1 and C1, enhances the inhibitory potential towards beta-glucosidase and beta-galactosidase but markedly lowers or abolishes inhibition towards alpha-galactosidase. Hence, the N-methylation of calystegine C1 did not enhance its inhibition of alpha-galactosidase. The chemical N-methylation of calystegines A3 and B4 markedly enhanced inhibition of coffee bean alpha-galactosidase, with  $K_i$  values of  $5.2 \text{ microM}$  and  $36 \text{ microM}$ , respectively, but almost eliminated their inhibitory potential towards beta-glucosidase and trehalase, respectively. Thus, methylation of the nitrogen atom significantly altered the specificity of the inhibitors.

PMID: 9346281 [PubMed - indexed for MEDLINE]

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# Goji Summary

By R. Lindsey Duncan, N.D., C.N.

Lycium fruit is an herb derived from *Lycium chinense* and *Lycium barbarum*, common plants of eastern Asia. The root bark of the same plants is also used medicinally throughout Eastern Asia. Lycium is in the Solanaceae family that gives us hot peppers, eggplants, potatoes, tomatoes, and other food item. 'Goji' appears to be derived from the Chinese name for wolfberry, "go zi", meaning berry in Mandarin. Goji is not a Tibetan name but in Mandarin 'z' sounds similar to 'j'. The fruit is known by the Chinese name gouqizi, and has been used since ancient times, recorded in the earliest existing Chinese materia medica published around 100 A.D.

## Traditional And Modern Uses:

Traditionally, lycium fruit is described as having the properties of nourishing the blood, enriching the yin, tonifying the kidney and liver, and moistening the lungs. It is applied in the treatment of such conditions as consumptive disease accompanied by thirst (includes early-onset diabetes and tuberculosis), dizziness, blurred vision, diminished visual acuity, and chronic cough. Several modern clinical trials for treatment of bone marrow deficiency conditions (low production of red blood cells, platelets, or white blood cells) include lycium fruit in a complex prescription for alleviating the disorder.

When making a decoction (tea prepared by boiling the herb in water), 6–18 grams of fruit are used for a daily dose, usually in combination with other herbs, for one to three months as a typical course of therapy. Lycium is being used in many anti-aging formulas today because of the history of longevity and health in people of small rural societies scattered across the mountains of Asia. For the treatment of atrophic gastritis a weak digestion due to reduced activity of the stomach, patients consume the whole fruits in the amount of 10 grams each time, twice daily before meals (for two months). In the treatment of diabetes, steamed lycium fruit is eaten in the dose of 10 grams each time, three times daily (steaming softens the fruits). Thus, the daily dosage range of 10–30 grams is typical of medical applications in China.

## Constituents and pharmacology:

The fruit contains beta-carotene, vitamin C, vitamins B1 and B2, beta-sitosterol (an anti-inflammatory agent), linoleic acid (a fatty acid), immunologically active polysaccharides (5–8%), sesquiterpenoids (cyperone, solavetivone), tetraterpenoids (zeaxanthin, physalin), and betaine (0.1%).

Chinese pharmacological research, conducted during the past forty years, revealed that lycium extracts administered to mice could enhance non-specific immunity, promote production of red blood cells, increase production of interleukin-2 (IL-2), and reverse the inhibition of white blood cells caused by cancer drugs. The principal active components are polysaccharides, betaine, and physalin.

In a review of research on lycium fruit appearing in *Recent Advances in Chinese Herbal Drugs*, Dr. Zhou Jinhua points out that polysaccharides from lycium fruit, like those from astragalus and ganoderma, enhance cell-mediated and humoral immune responses. In a dose of just 5–10 mg/kg daily for one week, lycium fruit polysaccharides could increase activity of T cells,

cytotoxic T cells, and natural killer cells in laboratory animals. The amount of polysaccharides in lycium fruit of the soft edible variety is probably not more than 5%, so this amount corresponds to a human dosage of about 7–14 grams of the whole fruit. In a study of lycium, reported in the *Journal of the Beijing Medical University* (1992), it was noted that lycium fruit reduced antibodies associated with allergy-type reactions, which was presumed to be accomplished through the mechanisms of promoting CD8 T cells and regulating cytokines. As a result of this activity, lycium fruit has been reported to be a useful treatment for psoriasis.

Several plant polysaccharides have been shown to enhance IL-2 production; the enhancing effect of lycium polysaccharides on IL-2 activity was reported by the Institute of Pharmacology and Toxicology in Beijing (1989). In the U.S., IL-2 has been under study as an immune promoting factor since 1983, used for some cancers and for HIV infection.

Betaine, when added to chicken feed, enhances growth of the animals and egg production, and it is currently used in poultry farming because of these effects. Lycium fruit given to rats lowered their blood cholesterol and blood sugar; given to rabbits, it inhibited the formation of atherosclerosis. Betaine was shown to protect the livers of laboratory animals from the impact of toxic chemicals; other pharmacologic studies have shown that it is an anticonvulsant, sedative, and vasodilator.

In 1974, it was reported that betaine could treat various chronic liver diseases; lycium fruit is often administered with another Chinese herbal fruit, schizandra, for that purpose. In recent years, betaine has been included in some Western nutritional supplement products, especially those used for improving muscle mass. Betaine is an alkaloid, sometimes classed as an amino acid, that is found also in capsicum, silybum (the source of the liver-protective flavonoid silymarin), and beets (*Beta vulgaris*, from which betaine gets its name). Betaine is used by the liver to produce choline, a compound which calms nervousness, enhances memory, and protects against fatty liver disease. In the sugar beet, which is the commercial source of the isolated compound, betaine is present at a level of 0.3–0.7%.

Physalin, a major active component naturally found in lycium berries has been found to be effective against many major types of leukemia. The herb is used as a treatment for hepatitis B. Extracts of physalis have been shown to increase splenic natural killer cell activity in normal and tumor-bearing mice, with anticancer effects for several cancer lines.

Lycium fruit has been given to treat sexual impotence. It was reported that by taking lycium fruit orally and in the form of an alcohol extract, it could markedly increase androgen levels in the blood, making patients feel more energetic. It is likely that sitosterols or terpenoids are responsible for this effect. The daily dosage of lycium fruit needed to obtain these effects is about 30 grams/day of whole fruit or 30,000 mg of liquid juice of the lycium berries.

Like other commonly eaten fruits, lycium is non-toxic. Toxicity studies showed that an injected dose of 2.4 grams/kg of lycium fruit extract did not cause adverse reactions, but at the huge dosage of 25 g/kg, toxic reactions were rapid. The LD50 was determined to be about 8.3 grams/kg (about one pound of the dried fruit, extracted and injected, for a human).

Lycium as a source of immune-enhancing polysaccharides

In a review of immune enhancing polysaccharides (ITM, 1993), it was suggested that a daily dose of about 3.5 grams per day of active polysaccharides would be a reasonable minimum

dosage to accomplish substantial effects in relation to inhibiting cancer or chronic viral infection. A similar dosage level, 3.0 grams/day, was determined recently at Sloan-Kettering Cancer Institute (personal communication). To obtain this amount solely from eating lycium fruit (assuming 5% polysaccharides) might be difficult: the daily dose would be 60–70 grams. However, if the lycium fruit is taken along with other polysaccharide-rich supplements, it can represent an important contribution to the desired total daily dose. The good taste of lycium fruit, and the ability to consume it directly—cooked in foods, included in herbal wines, and in tablets—makes it an ideal source. It is also inexpensive. A daily dose of about 30–35 grams of the fruit in crude form has a cost of only about a dollar. Experience of more than 300 patients at the Immune Enhancement Project in Portland shows that adverse reactions to lycium fruit do not occur with the dosages suggested above, confirming the reports from China.

## **LYCIUM FRUIT**

**by Subhuti Dharmananda, Ph.D., Director, Institute for Traditional Medicine, Portland, Oregon**

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**When making a decoction (tea prepared by boiling the herb in water), 6–18 grams of fruit are used for a daily dose, usually in combination with other herbs, for one to three months as a typical course of therapy (lycium is also used in anti-aging formulas, consumed for years). In the treatment of atrophic gastritis (weakened digestion due to reduced activity of the stomach cells), it has been used by having the patients consume the whole fruits in the amount of 10 grams each time, twice daily before meals (for two months). In the treatment of diabetes, steamed lycium fruit is eaten in the dose of 10 grams each time, three times daily (steaming softens the fruits). Thus, the daily dosage range of 10–30 grams is typical of medical applications in China.**

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**December 1997**

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