



## LiquiVida

**The most nutritious food you can provide your body**

It has been shown that if you solve the nutritional deficiencies in your body that the body has the ability to heal itself.

### Science on LiquiVida

#### 1. NONI JUICE

Inhibition of angiogenic initiation and disruption of newly established human vascular networks by juice from *Morinda citrifolia* (noni).

Hornick CA, Myers A, Sadowska-Krowicka H, Anthony CT, Woltering EA.  
Department of Physiology, Louisiana State University Health Sciences Center, New Orleans, Louisiana, USA. [chorni@lsuhsc.edu](mailto:chorni@lsuhsc.edu)

Noni, the juice of the fruit from the *Morinda citrifolia* plant, has been used for centuries as a medicinal agent. We tested the effects of noni juice in a three-dimensional fibrin clot matrix model using human placental vein and human breast tumor explants as sources for angiogenic vessel development. Noni in concentrations of 5% (vol/vol) or greater was highly effective in inhibiting the initiation of new vessel sprouts from placental vein explants, compared with initiation in control explants in media supplemented with an equivalent amount of saline. These concentrations of noni were also effective in reducing the growth rate and proliferation of newly developing capillary sprouts. When used at a concentration of 10% in growth media, noni was able to induce vessel degeneration and apoptosis in wells with established capillary networks within a few days of its application. We also found that 10% noni juice in media was an effective inhibitor of capillary initiation in explants from human breast tumors. In tumor explants which did show capillary sprouting, the vessels rapidly degenerated (2-3 days) in those exposed to media supplemented with 10% noni.

Antitumour potential of a polysaccharide-rich substance from the fruit juice of *Morinda citrifolia* (Noni) on sarcoma 180 ascites tumour in mice.

Furusawa E, Hirazumi A, Story S, Jensen J.  
Department of Pharmacology, John Burns School of Medicine, University of Hawaii, Honolulu, Hawaii, USA.

An immunomodulatory polysaccharide-rich substance (Noni-ppt) from the fruit juice of *Morinda citrifolia* has been found to possess both prophylactic and therapeutic potentials against the immunomodulator sensitive Sarcoma 180 tumour system. The antitumour activity of Noni-ppt produced a cure rate of 25%-45% in allogeneic mice and its activity was completely abolished by the concomitant administration of specific inhibitors of macrophages (2-chloroadenosine), T cells (cyclosporine) or natural killer (NK) cells (anti-asialo GM1 antibody). Noni-ppt showed synergistic or additive beneficial effects when combined with a broad spectrum of chemotherapeutic drugs, including cisplatin, adriamycin, mitomycin-C, bleomycin, etoposide, 5-fluorouracil, vincristine or camptothecin. It was not beneficial when combined with paclitaxel, cytosine arabinoside, or immunosuppressive anticancer drugs such as cyclophosphamide, methotrexate or 6-thioguanine. Noni-ppt also demonstrated beneficial effects when combined with the Th1 cytokine, interferon gamma, but its activity was abolished when combined with Th2 cytokines, interleukin-4 or interleukin-10, thereby suggesting that Noni-ppt induces a Th1 dominant immune status in vivo. The combination of Noni-ppt with imexon, a synthetic immunomodulator, also demonstrated beneficial effects, but not when combined with the MVE-2 copolymer, a high molecular weight immunomodulator. It was also not effective when combined with interleukin-2 or interleukin-12. Copyright 2003 John Wiley & Sons, Ltd.

## GEORGIAN BLUEBERRY EXTRACT AND JUICES

Berries May Protect Against Cancer and Heart Disease

By Hank Becker

February 27, 2001

Blueberries, cranberries, huckleberries and related plants have now been found to contain resveratrol, a potential anticancer agent, according to Agricultural Research Service scientists who made the discovery.

This new finding from ARS chemist Agnes Rimando at the Natural Products Utilization Research Unit, Oxford, Miss., adds to previous research by other scientists who found that dark-skinned bunch grapes contain resveratrol. Rimando is working with scientists at Agriculture and Agri-Food Canada, Kentville, Nova Scotia, and the ARS Small Fruit Research Station in Poplarville, Miss.

Using chemical identification procedures, the team of scientists measured the resveratrol content of 30 whole fruit samples of blueberry, cranberry, huckleberry and related plants. The samples represented five families and 10 species of *Vaccinium* fruit. They also measured resveratrol in skin, juice/pulp and seed samples of muscadine grape.

Because of its important biological properties, resveratrol (3,5,4-trihydroxystilbene) has been examined extensively in grapes. Studies showed the compound protects the grapes from fungal diseases. It also provides health benefits for consumers by reducing the risk of cardiovascular disease. The compound's anticancer potential warranted its examination in other fruits.

The team's studies showed that several fruit samples of *Vaccinium* contain varying amounts of the compound. Analysis of the extracts of the skin, juice/pulp and seed of muscadine grapes showed that concentration of resveratrol in the skin was highest. Levels in the juice/pulp were much lower than in the skin and seeds. Analysis of more *Vaccinium* and muscadine samples is continuing.

The new data could help build a foundation for increasing resveratrol in those berry and grape crops that are important to many small farmers. Future research goals will include enhancing production of resveratrol in selected species.

ARS is the lead scientific research agency of the U.S. Department of Agriculture.

Scientific contact: Agnes Rimando, ARS Natural Products Utilization Research Unit, Oxford, Miss, phone (662) 915-1037, fax (662) 915-1035, arimando@asrr.arsusda.gov.

### Blueberry Medicinal Research

Research program:

We are interested in the medicinal properties of cranberries and blueberries, especially their bacterial anti-adhesion and antioxidant capacities. Our research focus is on bioassay-directed fractionation of cranberry and blueberry to elucidate and characterize the compounds responsible for the medicinal effects. Breeding for higher levels of medicinal compounds has been a major component of our research. Here at the Rutgers Blueberry and Cranberry Research Center, we have access to a broad selection of germplasm. This allows us to incorporate many favorable characteristics into our crosses when we breed for enhanced levels.

Current projects involving blueberries and/or cranberries:

1. Blueberry and Cranberry Compounds Active in the Prevention and Treatment of Urinary Tract Infections

Objectives: To identify, purify, and structurally characterize compounds from cranberry and blueberry fruit and leaves responsible for inhibiting adherence of P-fimbriated uropathogenic strains of *E. coli* to specific oligosaccharide receptors on cellular surfaces found in the urinary tract; and, to test the ability of the compounds to inhibit adhesion of other genera of P-fimbriated bacteria to cellular surfaces.

2. Comparison of the Medicinal Effects Among a Selection of Wild and Cultivated *Vaccinium* Species

Objectives: To collect fruit from wild and cultivated *Vaccinium* spp. from around the world and fractionate the polyphenolic compounds into anthocyanins, flavonols, and tannins. These classes of compounds are tested individually for their relative contributions towards a range of bioactivities, including anti-adhesion, anti-platelet aggregation, and antioxidant capacity. The fruit from each collected plant is ranked for its overall medicinal quality and for the relative bioactive contribution of each of its polyphenolic components.

3. Investigation of Polyphenolic Antioxidants in *Vaccinium corymbosum*

Objectives: To fractionate blueberry fruit into polyphenolic extracts, quantify the relative amounts of each class of polyphenolics, measure the total antioxidant status of the extracts, and isolate and identify a flavanoid that exhibits particularly potent antioxidant capacity.

Blueberries Reverse Certain Aging Characteristics

Forget Viagra. Forget red wine. Anyone seeking to really feel young again should try blueberries, research on rats suggests. Old rats fed the equivalent of a cup of blueberries a day not only were more coordinated, but were smarter than other old rats. Researchers are now working to find out just what it is in blueberries that repairs the damage ageing does to the brain. In the meantime, they are eating blueberries themselves.

Researchers found that rats fed spinach and strawberries learned better than rats on a standard diet. Then they threw a blueberry extract into the diet. The rats who got the supplement not only learned faster than other rats, but their motor skills improved.

There were a lot of changes in neuronal communication ó the ability of one neuron to communicate with one another, but what struck the researchers was the ability to change motor behavior. There is virtually nothing out there that can change motor behavior in ageing. But the blueberries did.

The rats were 19 months old, they are the equivalent of 60 to 65 years of age and the researchers feed them for two months so they're up to 70-75. The blueberry fed rats did better on standard rat tests, like making them swim in a water maze, or find an underwater platform in murky water. But they also did better on tests involving a spinning rod or an inclined rod ó good tests of coordination.

Young rats six months old could stay on a rod an average of 14 seconds. Old rats fell off after six seconds, but the blueberry-supplemented old rats could stay on for 10. The blueberries did not make the rats young again, but did improve their skills considerably. When the rats' brains were examined, the brain cells of the rats that got the blueberries communicated better.

The researchers are doing tests to see what compounds in the blueberries are responsible for the effects. Other scientists have found that the components that give fruits and vegetables their color ó such as the lycopene that makes tomatoes red ó are associated with health-giving effects. One of things they might be doing is to protect against oxidative stress. Oxidation occurs all the time in the body and is cell damage created by charged particles known as free radicals. They also may reduce inflammation.

Fruits and vegetables are loaded with antioxidants, which range from the resveratrol found in red wine, the anthocyanins that make strawberries red and blueberries blue, and the vitamins A, C and E. Diets rich in fruits and vegetables have been shown to reduce the risk of heart disease and cancer. The rats ate supplements made from blueberry juice, but the researchers think the whole fruit may confer even more benefits. You can't overdose on blueberries.

Journal of Neuroscience September 1999

Dr. Mercola's Comment:

I find it amazing that these benefits were observed in rats that were fed fruit juice. Blueberries are low in sugar so their juice would not likely stimulate severe insulin swings. However, the researchers clearly understood that the entire whole blueberry would be more beneficial. Most will know of the benefits of grape seed extract for its powerful antioxidant action.

Well, the blueberry also has similar proanthocyanidins that most likely provide similar, if not even more profound benefits. The European blueberry, bilberry, is one of the most potent substances known to prevent and even reverse the most common cause of blindness, macular degeneration.

Unfortunately, blueberries are hard to grow, as they require a very acid soil. I am in my second year of trying to grow some and I have only been able to grow three while about 25 plants have died probably as a result of adding too much acid to the soil. Eventually, I will get it right so I will have a huge crop of organic blueberries in my back yard. In the meantime, I will be purchasing frozen whole blueberries on a regular basis, not only for their taste but also for their amazing health benefits.

#### Blueberries May Restore Some Memory, Coordination and Balance Lost with Age

By Judy McBride  
September 10, 1999

WASHINGTON, Sept. 10--A diet rich in blueberry extract reversed some loss of balance and coordination and improved short-term memory in aging rats, according to a USDA study to be published in the Sept. 15 issue of the Journal of Neuroscience.

"If this finding holds for humans, it should further encourage consumption of fruits and vegetables high in antioxidants to help fight the effects of aging," said Agriculture Secretary Dan Glickman.

Daily for eight weeks, researchers fed extracts of blueberry, strawberry or spinach to 19 month-old rats, age-equivalent to 65 or 70 year-old humans. All three extracts improved short-term memory. Only the blueberry extract improved balance and coordination.

This is the first study that shows fruits and vegetables actually reversing dysfunctions in behavior and in nerve cells. Earlier, the same researchers, led by neuroscientist James A. Joseph of the USDA Human Nutrition Research Center on Aging at Tufts University in Boston, reported that high-antioxidant fruits and vegetables prevented some loss of function in aging rats.

Blueberries, strawberries, and spinach test high in their ability to subdue oxygen free radicals. These oxygen radicals, which can damage cell membranes, DNA and other delicate internal machinery, are blamed for many of the dysfunctions and diseases associated with aging.

"Motor behavior is one of the first things to go as you age," said Joseph. "The improvements we saw in coordination and balance are really significant. In other studies, little else has reversed these deficits in motor function."

A decline in motor skills starts at about 12 months for rats. By 19 months, the length of time rats can walk a narrow rod before losing balance normally drops from 13 to 5 seconds. After eating blueberry extract, the rats stayed on the rod for 11 seconds, on average.

Joseph and psychologist Barbara Shukitt-Hale were joined in the study by Natalia Denisova, Donna Bielinski, Antonio Martin and John McEwen, all at the USDA center in Boston, and Paula Bickford at the Department of Veterans Affairs Medical Center in Denver.

Scientific contact: James A. Joseph and Barbara Shukitt-Hale, USDA Human Nutrition Research Center on Aging at Tufts University, phone (617) 556-3178 [Joseph], (617) 556-3118, [Shukitt-Hale], joseph\_ne@hnrc.tufts.edu, hale\_ne@hnrc.tufts.edu.

#### IMPROVING THE SURVIVAL AND FUNCTION OF GRAFTED DOPAMINE NEURONS: THE EFFECT OF DIETARY SUPPLEMENTATION WITH BLUEBERRY EXTRACTS

SO McGuire<sup>1\*</sup>, MJ Hejna<sup>1</sup>, B Shukitt-Hale<sup>2</sup>, JA Joseph<sup>2</sup>, CE Sortwell<sup>3</sup>, TJ Collier<sup>3</sup>

<sup>1</sup>Department of Pathology, Loyola University Chicago, Maywood, IL 60153; <sup>2</sup>USDA HNRCA, Tufts University, Boston, MA; <sup>3</sup>Department of Neurological Sciences, Rush Presbyterian St. Luke's Medical Center, Chicago, IL 60612.

Transplantation of embryonic dopamine (DA) neurons into the striatum is a viable treatment for Parkinson's disease (PD). However, transplanted cells survive poorly, with ~90% of transplanted cells dying within the first four days after transplant. Cell death is exacerbated by ~75% in aged animals, resulting in transplants that provide little to no therapeutic benefit. Although the exact mechanism underlying cell death is not known, oxidative stress and inflammation are hypothesized as major contributing factors.

Multiple studies have attempted to improve cell survival by pre-treating the cell transplant material with various anti-apoptotic or antioxidant compounds. This study provides evidence that dietary supplementation with blueberry extract (BBE), a fruit extract with antioxidant and anti-inflammatory properties, provides an efficacious, easily administered and well tolerated therapy that can be used to treat the transplant recipient, thus improving survival of the transplanted cells. Young adult (4 months, n=10) and aged rats (24 months, n=3) were unilaterally lesioned with 6-OHDA to deplete striatal DA and allowed to recover from surgery for 2 months. Animals with stable, amphetamine-induced rotational values, indicating unilateral striatal DA depletion, were assigned to one of two dietary treatments that consisted of custom formulated rat chow with or without 2% BBE. After six weeks of dietary treatment, sub-optimal numbers of primary embryonic (gestational day 14) ventral mesencephalic cells, including the developing midbrain DA neurons, were transplanted into the denervated striatum. Rats were assessed for amphetamine-induced rotational behavior at two week intervals for 8 weeks post-transplantation. Young, BBE-fed rats exhibited fewer rotations per minute than did control-fed rats ( $P<0.05$ ), indicating the presence of a functional graft. However, no behavioral benefit was noted in either group of aged rats.

Morphological analysis revealed a greater than two-fold increase in DA neuron survival within the grafts in both young and aged BBE-fed rats ( $P<0.05$ ) as assessed by tyrosine hydroxylase immunoreactivity (THir). BBE-fed animals also tended to have increased transplant areas ( $P=0.1$ ) with individual graft-derived neurons exhibiting increased THir ( $P=0.1$ ). These data provide evidence that dietary supplementation of the host with BBE can provide an easily tolerated, non-invasive treatment for the graft recipient that has beneficial effects on neural graft survival and function. Supported by NS 42125 (TJC)

## THE 2002 BLUEBERRY HEALTH STUDY: DAILY BLUEBERRIES IMPROVE DECISION-SPEED AND AGE-RELATED HEALTH INDICATORS

R. Martin, R.J. Coppings, K.E. Gerstmann, J.A. Joseph, A.C. Kokesh, B. Kristal, D. Mathew, B. Sachs, A. Pruchnicki, R. Schnoll, A. Wetherell

R. Martin, MMT Corp., Sherman, CT 06784, R.J. Coppings, Lane College, Jackson, TN 38301, K.E. Gerstmann, NY, NY 10014, J.A. Joseph, Human Nutrition Research Center on Aging at Tufts University, Boston, MA 02111, A.C. Kokesh, Charleston, WV 25301, B. Kristal, Weill Medical College-Cornell University Medical Center, NY, NY 10021 and Burke Medical Research Institute, White Plains, NY 10605, D. Mathew, New Fairfield, CT 06812, B. Sachs, HR Herbs, Sherman, CT 06784, A. Pruchnicki, Mount Sinai Medical Center, NY, NY 10029, R. Schnoll, Brooklyn College, Brooklyn, NY 11210, and A. Wetherell, Defence Science & Technology Laboratory, UK. Contact email: BlueberryStudy@aol.com

Joseph and collaborators reported in 1999 that blueberry diet supplementation significantly reduced cognitive decline in older laboratory rats. Our research group observed decision-speed improvement during a pilot study with thirteen multiple sclerosis patients (2001). The 2002 Blueberry Health Study was then conducted to determine if blueberries provide health benefits to a larger number of adults, aged 60 and over.

The 2002 study was a sixteen-week randomized, multicenter, crossover trial involving 100 participants and positive and placebo controls. The protocol included four 4-week steps: baseline measurement, treatment period 1, treatment period 2, and post-treatment follow-up.

To begin the study, Connecticut residents were invited to public meetings at the New Fairfield and Mansfield Senior Centers, and to the study web site at BlueberryStudy.com. Recruitment ended approximately 30 days after newspaper, radio and television announcements were made.

Participants were randomly assigned to receive individually quick frozen wild Maine blueberries (1 cup/day or 10 lbs/month), rice powder (500 mg/day), coenzyme Q10 (30-mg/day) or an antioxidant mixture containing mixed tocopherols (500 IU total/day) plus lipoic acid (25 mg/day). To equalize blueberry and control group expectations, participants were sent email messages citing evidence of health benefits from vitamin E, lipoic acid and our other control supplements. Participants conducted weekly measurements of single-choice decision speed, provided estimates of their aches and pains, energy-level, mood, sharpness, peacefulness, sleep quality, and overall health, and made three separate decision-speed predictions each week to allow expectations and motivation to be measured. Errors and decision speed were recorded before and also after predictions during each measurement session, to provide additional measures of participant expectations and motivation.

Ninety seven participants completed the protocol. Among those receiving wild blueberries, significant improvement occurred in decision speed (t-test  $p = 0.025$ ) and self-reported aches and pains ( $p = 0.017$ ), energy level ( $p = 0.002$ ), sharpness ( $p = 0.001$ ), sleep quality ( $p = 0.017$ ), mood ( $p = 0.010$ ), peacefulness ( $p = 0.005$ ) and overall health ( $p = 0.001$ ). Blueberry group response times improved by 4.2%, decreasing from 39.96 to 38.27 centiseconds, more than twice the improvement in the control group. Actual decision speeds were not displayed during the study so speed improvement could not influence self-reported health. Adjustments to balance decision speed predictions, error rates and within-measurement decision-speed improvement (our measures of expectation and motivation) in blueberry and control groups did not significantly change these results. Two blueberry recipients reported hearing improvement that was confirmed by an independent observer, and three reported their prostate serum antigen level declined. Significant changes were not observed in any control group.

Results of this study indicate that blueberries consumed regularly for four weeks can improve a number of health indicators related to aging, including decision speed, aches and pains, and energy level.

We greatly appreciate assistance provided by Bill Holme, Phil Fichandler, Kathy Hull, Marilyn Gerling and many others at the New Fairfield and Mansfield Senior Centers.

Citations: Joseph et al. (1999) J Neurosci. 19(18): 8114-21. Pappas et al. (2001) 30th Ann. Mtg. Amer. Aging Assoc., Abstr. 106.

## 1. **GOJI JUICE** VAN HET HIMALAJAGEBERGTE

The Himalayan Goji, a potent form of the Chinese Wolfberry, is a very unique fruit that possesses a very wide range of nutrients, and is used to treat a wide range of conditions. It is grown in high altitude regions of the Himalayan mountains, where the climate often ranges from 120 degrees during the day to 40 degrees below zero at night.

The Goji berry is a small red berry with a sweet tangy taste. The most potent and valuable type is grown in the Himalayan Mountains, but different growing regions produce different potencies, so having a standardized variety is important to ensure consistent quality and results.

The currently life expectancy is about 77 years in the United States, while in some parts of the world, the life expectancy exceeds 100 years of prime health, virtually free from the ravages of high blood pressure, diabetes, heart disease, many types of cancer, arthritis, and degenerative diseases.

These people who live such a long and healthy life have 3 things in common:

- 1) They live in isolated places, far away from the influences of modern Western civilization
- 2) Their diets contain fresh fruits, vegetables and whole grains, and is low in animal fats
- 3) Their diet contains regular daily serving of the Goji berry

How does a little red berry from the mountains do all that??? The Goji berry is possibly the most nutritionally dense food on this planet. It contains:

<ul style="list-style-type: none"> <li>*19 amino acids, including 8 that are essential for life</li> <li>*21 trace minerals, including germanium, a trace mineral rarely found in foods</li> <li>*More protein than whole wheat</li> <li>*A complete spectrum of antioxidant carotenoids including beta-carotene and zeaxanthin (protects the eyes). Goji is the richest source of carotenoids in all known foods!</li> <li>*More vitamin C than oranges</li> <li>*Vitamin E, which is rarely found in fruits</li> <li>*B-complex vitamins, needed to convert food into energy</li> </ul>	<ul style="list-style-type: none"> <li>*Beta-Sitosterol, an anti-inflammatory agent</li> <li>*Essential Fatty Acids</li> <li>*Cyperone, a sesquiterpene</li> <li>*Solavetivone, a powerful anti-fungal and anti-bacterial agent</li> <li>*Physalin, which boosts the immune system</li> <li>*Betaine, which is used by the liver to produce choline</li> <li>*Bioactive polysaccharides, called proteoglycans.</li> </ul>
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\*Extends life, protecting your body from premature aging through its powerful antioxidant action

\*Maintains healthy blood pressure

\*Increases your energy and strength, especially when fighting disease

\*Reduces your risk of cancer

\*Makes you feel and look younger. Goji stimulates the secretion of hGH (human growth hormone), the "youth hormone."

\*Reduces cholesterol

\*Promotes normal blood sugar in early adult-onset diabetes

\*Helps you lose weight

\*Enhances sexual function and treats sexual dysfunction

\*Relieves headaches and dizziness

- \*Relieves insomnia and improves the quality of sleep
- \*Strengthens your heart
- \*Inhibits lipid peroxidation (a cause of heart disease)
- \*Improves immune response (T-cell, IL-2, IgA, IgG)
- \*Restores and repairs DNA (preventing mutations that can cause cancer)
- \*Reduces the toxic effects of chemotherapy and radiation
- \*Builds strong blood, enhancing production of red blood cells, white blood cells and platelets, and treatment of bone marrow deficiency
- \*Treats menopausal symptoms
- \*Prevents morning sickness in the first trimester of pregnancy
- \*Strengthens your muscles and bones
- \*Helps chronic dry cough
- \*Promotes cheerfulness and brightens your spirit
- \*Supports eye health and improves your vision
- \*Improves disease resistance
- \*Cancer treatment
- \*Inhibits tumor growth
- \*Improves lymphocyte count
- \*Activates anti-inflammatory enzymes
- \*Supports healthy liver function
- \*Improves fertility
- \*Improves your memory and recall ability
- \*Supports normal kidney function
- \*Alleviates anxiety and stress
- \*Improves weakened digestion

## 2. HAWAIIAN SPIRULINA

### Proven Health Benefits of Spirulina

Whilst personal testimonies are very interesting, they are quite useless for substantiating claims for spirulina's extensive health benefits. Frankly, you'd never know whether I'd written them myself anyway!

So, no "Healed of cancer in 15 days" stories here. All the benefits listed below can be further verified by reading the research references or the links provided on the Links & Books page.

#### General

Extensive research has found that spirulina is beneficial in cases of arthritis, diabetes, anaemia, liver disease, carbohydrate disorders, ulcers, pancreatitis, visual complaints, leucocyte loss prevention, allergies, heavy metal poisoning, skin conditions, assimilation and control of appetite, obesity, digestion, constipation, mood and energy swings, hypoglycaemia, heart disease, cancer prevention and viruses.

### Spirulina's Anti-Cancer Effects

Several studies show Spirulina or its extracts can prevent or inhibit cancers in humans and animals. Some common forms of cancer are thought to be a result of damaged cell DNA running amok, causing uncontrolled cell growth. Cellular biologists have defined a system of special enzymes called Endonuclease which repair damaged DNA to keep cells alive and healthy. When these enzymes are deactivated by radiation or toxins, errors in DNA go unrepaired and, cancer may develop. In vitro studies suggest the unique polysaccharides of Spirulina enhance cell nucleus enzyme activity and DNA repair synthesis. This may be why several scientific studies, observing human tobacco users and experimental cancers in animals, report high levels of suppression of several important types of cancer. The subjects were fed either whole Spirulina or treated with its water extracts.

### Spirulina Strengthens the Immune System

Spirulina is a powerful tonic for the immune system. In scientific studies of mice, hamsters, chickens, turkeys, cats and fish, Spirulina consistently improves immune system function. Medical scientists find Spirulina not only stimulates the immune system, it actually enhances the body's ability to generate new blood cells.

Important parts of the immune system, the Bone Marrow Stem Cells, Macrophages, T-cells and Natural Killer cells, exhibit enhanced activity.

The Spleen and Thymus glands show enhanced function. Scientists also observe

Spirulina causing macrophages to increase in number, become "activated" and more effective at killing germs.

Feeding studies show that even small amounts of Spirulina build up both the humoral and cellular arms of the immune system 16. Spirulina accelerates production of the humoral system, (antibodies and cytokines), allowing it to better protect against invading germs. The cellular immune system includes T-cells, Macrophages, B-cells and the anti-cancer Natural Killer cells. These cells circulate in the blood and are especially rich in body organs like the liver, spleen, thymus, lymph nodes, adenoids, tonsils and bone marrow. Spirulina up-regulates these key cells and organs, improving their ability to function in spite of stresses from environmental toxins and infectious agents.

### Spirulina Phycocyanin Builds Blood

Studies show that Phycocyanin affects the stem cells found in bone marrow. Stem cells are "Grandmother" to both the white blood cells that make up the cellular immune system and red blood cells that oxygenate the body.

Chinese scientists document Phycocyanin stimulating hematopoiesis, (the creation of blood), emulating the affect of the hormone erythropoetin, (EPO). EPO is produced by healthy kidneys and regulates bone marrow stem cell production of red blood cells. Chinese scientists claim Phycocyanin also regulates production of white blood cells, even when bone marrow stem cells are damaged by toxic chemicals or radiation.

Based on this effect, Spirulina is approved in Russia as a "medicine food" for treating radiation sickness. The Children of Chernobyl suffer radiation poisoning from eating food grown on radioactive soil. Their bone marrow is damaged, rendering them immunodeficient. Radiation damaged bone marrow cannot produce normal red or white blood cells. The children are anemic and suffer from terrible allergic reactions. Children fed just five grams of Spirulina in tablets each day make dramatic recoveries within six weeks. Children not given Spirulina remain ill.

### Other Potential Health Benefits

Spirulina is one of the most concentrated natural sources of nutrition known. It contains all the essential amino acids, rich in chlorophyll, beta-carotene and its co-factors, and other natural phytochemicals. Spirulina is the only green food rich in GLA essential fatty acid. GLA stimulates growth in some animals and makes skin and hair shiny and soft yet more durable. GLA also acts as an anti-inflammatory,

sometimes alleviating symptoms of arthritic conditions.

Spirulina acts as a functional food, feeding beneficial intestinal flora, especially Lactobacillus and Bifidus. Maintaining a healthy population of these bacteria in the intestine reduces potential problems from opportunistic pathogens like E. coli and Candida albicans. Studies show when Spirulina is added to the diet, beneficial intestinal flora increase.

Scientists hope the use of Spirulina and its extracts may reduce or prevent cancers and viral diseases. Bacterial or parasitic infections may be prevented or respond better to treatment and wound healing may improve. Symptoms of anemia, poisoning and immunodeficiency may be alleviated. Scientists in the USA, Japan, China, Russia, India and other countries are studying this remarkable food to unlock its potential. More research is needed to determine its usefulness against AIDS and other killer diseases. However, it is already clear this safe and natural food provides concentrated nutritional support for optimum health and wellness.

#### Research References

##### Supporting Spirulina Health Benefits

1. Ayehunie S., Belay A., Hu Y., Baba T., Ruprecht R., 7th IAAA Conference, Knysna, South Africa April 17, 1996. Inhibition of HIV-1 replication by an aqueous extract of Spirulina platensis (Arthrospira platensis).
2. Baojiang G., et al, Second Asia-Pacific Conference on Algal Biotechnology, April 25-27, 1994, p. 24. Study on Effect and Mechanism of Polysaccharides of Spirulina platensis on Body Immune Functions Improvement.
3. Babu.,M., et al, Nutrition and Cancer 1995, V. 24, No. 2, p.197-202. Evaluation of Chemoprevention of Oral Cancer with Spirulina fusiformis.
4. Belay A., Ota Y., Miyakawa K., Shimamatsu H., Journal of Applied Phycology 5:235-241, 1993. Current Knowledge on Potential Health Benefits of Spirulina.
5. Carmichael, et al Scientific American January 1995. "The Toxins of Cyanobacteria."
6. Evets L.B. et al Grodenski State Medical University, January 15, 1994 Russian Federation Committee of Patents and Trade, Patent Number: (19) RU (11) 2005486 C1 (51) 5 A 61K35/80. Means to Normalize the levels of Immunoglobulin E Using the Food Supplement Spirulina.
7. Fukino H., Takagi Y., Yamane Y., Eisei Kagaku 36: 5.,1990. Effect of Spirulina Platensis on the renal toxicity induced by inorganic mercury and cisplatin.
8. Hayashi T. & Hayashi K., et al, Journal of Natural Products 1996, Vol. 59, No. 1, 83-87, American Chemical Society and American Society of Pharmacognosy. Calcium Spirulan, an Inhibitor of Enveloped Virus Replication, from a Blue-Green Alga Spirulina platensis.
9. Hayashi K., et al, Phytotherapy Research, Vol. 7, 76-80 (1993). An Extract from Spirulina platensis is a Selective Inhibitor of Herpes Simplex Virus Type 1 Penetration into HeLa Cells.
10. Hayashi O., et al, Journal of Nutritional Sciences and Vitaminology, 40, 431-441, 1994. Enhancement of Antibody Production in Mice by Dietary Spirulina platensis.
11. Kolman A., et al Toxicology Letters, 48 (1989) 165-169 Elsevier. Radioprotective effect of extract from Spirulina platensis in mouse bone marrow cells studied by using the micronucleus test.
12. Lisheng L., et al, Marine Sciences, Qindao China, N. 5, 1991, p. 33-38. Inhibitive Effective and Mechanism of Polysaccharide of Spirulina platensis on Transplanted Tumor Cells in Mice.
13. Pang Qishen et al, Acta Genetica Sinica (Chinese Journal of Genetics), V.15(5) p. 374-381, 1988. Enhancement of Endonuclease Activity and repair DNA Synthesis by Polysaccharide of Spirulina platensis.

14. Qureshi M.A., Kidd M.T., and Ali R.A., Journal of Nutritional Immunology V.3(4) 1995, pages 35-45. Spirulina platensis Extract Enhances Chicken Macrophage Functions After in vitro Exposure.
15. Qureshi M.A., Ali R.A., Immunopharmacology, Jan. 1996. Phagocytic potential of Feline macrophages after exposure to a water soluble extract of spirulina in vitro.
16. Qureshi M.A., Garlich J.D., Kidd M.T., Immunopharmacology and Immunotoxicology, 1996 (submitted), "Dietary Spirulina platensis Enhances Humoral and Cell-mediated Immune Functions In Chickens".
17. Zhang C., et al, 1994 Second Asia-Pacific Conference on Alga Biotechnology, April 25-27, p.58. The Effects of Polysaccharide and Phycocyanin from Spirulina platensis variety on Peripheral blood and Hematopoietic system of Bone Marrow in Mice.

### Spirulina Quotes and Extracts

Spirulina is the primary source of beta-carotene on the planet. The vitamin A provided by beta-carotene keeps the skin, eyes and inner linings of the body healthy and resistant to infection. It is required for healthy teeth, nails, hair, bones, glands and body tissues, especially mucous membranes.

Research has shown that beta-carotene protects the skin against photosensitivity to sunlight and works as an antioxidant, protecting cells against harmful environmental elements.

"It appears to block the process by which a normal cell can turn malignant"  
Dr. Charles Simone

"Significant investigations indicate that vitamin A or its derivatives counteract the effect of carcinogenic chemicals by inhibiting tumour formation"  
Dr James Outen and Dr Otto Nehaus

"Spirulina is the kind of gold standard proof that physicians have been waiting for."  
Michael Gaziano, Harvard Medical School

"The blue-green algae organisms will be evaluated as sources of potential antineoplastic agents, with the ultimate goal being the discovery of compounds of novel structural types which can be developed for the selective treatment of cancers in man."  
National Cancer Institute

Cystine is an amino acid found in spirulina effective:

"not only in preventing hangovers, but also in preventing damage such as emphysema and cancer caused by smoking."  
Pearson

"A majority of chronic degenerative illnesses, whether physical or mental, have a B-6 utilisation disorder. The culprit in this problem seems to be a cystine deficiency."  
Dr William Philpott

"Eating the right foods can do incredible things for your brain functions. It can add 20 to 30 points to your I.Q., improve your memory and alertness, boost your energy, pull you out of depression, calm anxiety and irritability, and improve your sleep."  
Dr George Schwarz

Spirulina enriched cookies are being supplied by the Mexican Government to all children as part of a new health initiative.

Kala, India, has begun using noodles made with spirulina as part of a self sufficiency project.

### 3. GREEN TEA

Phase I study of green tea extract in patients with advanced lung cancer.

Laurie SA, Miller VA, Grant SC, Kris MG, Ng KK.

Thoracic Oncology Service, Division of Solid Tumor Oncology, Department of Medicine, Memorial Sloan-Kettering Cancer Center, Weill Medical College of Cornell University, 1275 York Avenue, 10126, New York, NY, USA.

**PURPOSE.** Epidemiologic studies suggest that consumption of green tea may have a protective effect against the development of several cancers. Preclinical studies of green tea and its polyphenolic components have demonstrated antimutagenic and anticarcinogenic activity, and inhibition of growth of tumor cell lines and animal tumor models, including lung cancer. Green tea may also have chemopreventive properties, and enhancement of cytotoxicity of chemotherapeutic agents has been demonstrated. This trial was designed to determine the maximum tolerated dose (MTD) of green tea extract (GTE) in patients with advanced lung cancer. **METHODS.** A total of 17 patients with advanced lung cancer were registered to receive once-daily oral dosing of GTE at a starting dose of 0.5 g/m<sup>2</sup> per day, with an accelerated dose-escalation scheme. **RESULTS.** On this schedule, the MTD of GTE was 3 g/m<sup>2</sup> per day, and at this dose, GTE was well tolerated with no grade 3 or 4 toxicity seen. Dose-limiting toxicities were diarrhea, nausea and hypertension. No objective responses were seen in this trial. Seven patients had stable disease ranging from 4 to 16 weeks; no patient remained on therapy longer than 16 weeks due to the development of progressive disease. **CONCLUSIONS.** This study suggests that while relatively nontoxic at a dose of 3 g/m<sup>2</sup> per day, GTE likely has limited activity as a cytotoxic agent, and further study of GTE as a single-agent in established malignancies may not be warranted. Further studies should focus on the potential chemopreventive and chemotherapy-enhancing properties of GTE.

Green tea consumption enhances survival of epithelial ovarian cancer patients.

Binns CW, Zhang M, Lee AH, Xie CX.

School of Public Health, Curtin University of Technology GPO Box U 1987, Perth 6845, Western Australia.

**Aim:** To investigate whether green tea consumption post-diagnosis can enhance survival of patients with epithelial ovarian cancer. **Methods:** A prospective cohort study was conducted in the community, Hangzhou, P. R. China. A cohort of 309 patients with histopathologically confirmed epithelial ovarian cancer, who were recruited in the study during 1999-2000, were followed for a minimum of three years. The variables measured included their survival time and the frequency and quantity of tea consumed post diagnosis. From the original cohort 294 (95.1%) subjects, or their close relatives, were traced and interviewed using a structured questionnaire in 2003. The actual number of deaths was obtained and the hazard ratios were calculated. Cox proportional models were used to compute adjusted hazard ratios (HR) and associated 95% confidence intervals (CI). These models were adjusted for age at diagnosis, locality, BMI, parity, stage at diagnosis, histo-pathologic grade of differentiation, cytology of ascites, and the presence of residual tumor after surgery. **Results:** Increasing frequency and quantity of tea consumption were associated a longer survival in Chinese women with epithelial ovarian cancer. The survival experiences were different between tea drinkers and non-drinkers ( $p < 0.001$ ). There were 109 (79.6%) out of 137 tea-drinkers who survived to the time of interview, compared with only 77 women (49.0%) still alive among the 157 non-tea drinkers. Compared with non-drinkers, the adjusted hazard ratios were 0.6 (95% CI 0.4-0.9) for tea-drinkers, 0.3 (95% CI 0.2-0.8) for consuming at least one cup of green tea per day, 0.4 (95%CI 0.2-0.8) for brewing at least one batch of green tea per day, and 0.3 (95% CI 0.2-0.8) for consumption of 500 grams or more dried tealeaf per year. The corresponding dose response relationships were statistically significant. **Conclusion:** Regular consumption of green tea post-diagnosis can enhance epithelial ovarian cancer survival. There are no previously published studies of ovarian cancer survival and tea consumption. This study has the potential to benefit many women who are diagnosed with ovarian cancer.

**POLYPHENOL ANTIOXIDANTS IN GREEN TEA AND OATS: POTENTIAL ROLES IN ANGIOGENESIS AND ATHEROSCLEROSIS**

Mohsen Meydani, Liping Liu, Shaun Rodriguez

Vascular Biology Laboratory, Jean Mayer USDA-Human Nutrition Research Center on Aging at Tufts University, Boston, MA.

Cancer and cardiovascular diseases (CVD) are the major causes of morbidity and mortality among middle aged and older people in Western societies. Epidemiological and experimental evidence indicate that dietary habits play important roles in the risk of these diseases. Polyphenols with antioxidant capacity have recently been recognized for their potential health effects. Green tea contains catechins and oats are unique for their avenanthramides content; both are polyphenolics with powerful antioxidant capacity. Consumption of green tea, which is associated with a reduced risk of certain forms of cancer, can inhibit carcinogenesis and tumor growth and metastasis by suppressing angiogenesis. We have recently elucidated the molecular mechanism by which epigallocatechin gallate (EGCG), one of the green tea catechins, inhibits angiogenesis. EGCG inhibited tyrosine phosphorylation of vascular endothelial (VE)-cadherin in vascular endothelial cell growth factor (VEGF)-induced tube formation. In addition, EGCG inhibited the signaling pathway involving VEGFR, PI3-kinase,  $\beta$ -catenin, and VE-cadherin complex. We have recently discovered that oats, in addition to their health benefits for CVD through their soluble fiber content, have potential anti-inflammatory and antiatherogenic properties due to their avenanthramides content. We have found that avenanthramides reduced expression of adhesion molecules such as ICAM-1, VCAM-1, and E-selectin, inhibited adhesion of monocytes to endothelial cells, and reduced expression of proinflammatory cytokines such as IL-6, IL-8, and MCP-1. Thus, inclusion of green tea and oats in the daily diet during a lifespan may reduce the risk of cancer and CVD, the two major age-related diseases. Supported by NCI grant# 1 R03CA94290-01 and USDA contract# 58-1950-9-001.

#### **4. GINKGO BALOBA**

##### Studies on the therapeutic effects of Ginkgo biloba

While there is still no cure for Alzheimer's Disease, Ginkgo biloba has been touted in the market for decades as an effective phytomedicine to prevent this fatal disease. This claim was considered unsupported until the studies in 1990's demonstrated that Ginkgo biloba leaf extract could indeed have therapeutic potential in slowing Alzheimer's Disease [Hofferbach, B. (1994) The efficacy of EGb 761 in patients with senile dementia of the Alzheimer type: A double blinded, placebo-controlled study on different levels of investigation. *Hum. Psychopharmacol.* 9:215-222.], and in early stages of Alzheimer's Disease [Kanowski, S. et al. (1997) Proof of the efficacy of the Ginkgo biloba special extract EGb 761 in outpatients suffering from mild to moderate dementia of the Alzheimer's type or multi-infarct dementia. *Phytomedicine* 4(1):3-13.]. Recent studies such as Le Bars et al., DeFeudis and Drieu, Stough et al., McKenna, Jones, and Hughes, Watanabe et al., Forstl, and Wettstein confirmed previous observations of beneficial effects of Ginkgo biloba phytochemicals on Alzheimer's Disease. Although the seeds of Ginkgo biloba have been most commonly employed in traditional Chinese medicine, in recent years standardized extracts of the leaves have been widely sold as a phytomedicine in Europe and as a dietary supplement in the United States. The primary active constituents of the leaves include flavonoid glycosides and unique diterpenes known as ginkgolides; the latter are potent inhibitors of platelet activating factor. Clinical studies have shown that ginkgo extracts exhibit therapeutic activity in a variety of disorders including Alzheimer's disease, failing memory, age-related dementias, poor cerebral and ocular blood flow, congestive symptoms of premenstrual syndrome, and the prevention of altitude sickness. Due in part to its potent antioxidant properties and ability to enhance peripheral and cerebral circulation, ginkgo's primary application lies in the treatment of cerebrovascular dysfunctions and peripheral vascular disorders [McKenna DJ, Jones K, Hughes K. (2001) *Altern Ther Health Med.* 7(5):70-86, 88-90.] After all, Ginkgo biloba's beneficial role in Alzheimer's Disease appear to be more than just a hype, although by no means it is a cure.

### Research in the United States

Researchers at the New York Institute for Medical Research in Tarrytown, New York, conducted the first clinical study of ginkgo biloba and dementia in the United States. Their findings were published in the *Journal of the American Medical Association* (October 22/29, 1997). These scientists examined how taking 120 mg a day of a ginkgo biloba extract affected the rate of cognitive decline in people with mild to moderately severe dementia due to Alzheimer's Disease and vascular dementia. At the end of the study, they reported a small treatment difference in people given the ginkgo biloba extract.

Three tests were used to measure changes in the condition of participants. First, participants showed a slight improvement on a test that measured their cognitive function (mental processes of knowing, thinking, and learning). Second, participants showed a slight improvement on a test that measured social behavior and mood changes that were observed by their caregivers. Third, participants showed no improvement on a doctor's assessment of change test.

Because 60 percent of the people did not complete the study, findings are difficult to interpret and may even be distorted. In addition, this study did not address the effect of ginkgo biloba on delaying or preventing the onset of Alzheimer's Disease or vascular dementia. The researchers recommend more investigation to determine if these findings are valid, understand how ginkgo biloba works on brain cells, and identify an effective dosage and potential side effects.

The National Institute on Aging (NIA) and the Office of Alternative Medicine, both at the National Institutes of Health, are funding a small study to test the effectiveness of ginkgo biloba in treating Alzheimer's Disease. This 2-year study at the Oregon Health Sciences University in Portland started in 1997. It will include 42 patients with mild to moderate Alzheimer's Disease.