



PUBLISHED STUDIES  
AND  
CLINICALS

 GMP Certified 



**ACUMIN<sup>TM</sup>**  
Capsules  
**Eye Health Support**

**LA CRIMA<sup>TM</sup>**  
Softgels  
**Dry Eye Formula**

# **ACUMIN**™

## Clinical Pharmacology Summary/Description:

Acumin offers a full range of antioxidant nutrients which assist in maintaining eye health. These ingredients are shown to support ocular health as reported by the AREDS. By the Age-Related Eye Disease Study (AREDS) in a major clinical trial sponsored by the National Eye Institute, one of the Federal government's National Institutes of Health.

## Treatment:

Take two (2) capsules daily of Acumin comprehensive ocular support.

## Active Ingredients:

Beta-Carotene (as Beta-Carotene® pro-Vitamin A 15mg), Vitamin C, Vitamin E, Riboflavin, Zinc (from L-OptiZinc® Zinc-L-Methionine), Selenium, Bilberry, Lutein, Green Tea Extract, N-Acetyl Cysteine, Rutin, Zeaxanthin (from 200 mg FloraGlo® Marigold Flowers Extract).

## Published Studies and Clinicals:

See Attachments.

## A Comparative Efficacy & Safety Study of Acumin:

Acumin contains Bilberry and Lutein and other essential nutrients. Also present are Vitamin's A , C and E which aid in the synthesis and maintenance of ocular health. Acumin provides a complete eye formula developed by Eye Care Professionals.

GMP Certified



OccuLISTA

ACUMIN™

Eye Health Formula\*  
with OptiZinc®

60 Capsules  
Dietary Supplement



Recommended by  
Eye Care Professionals

Suggested Usage:  
Take 2 daily or as  
directed by your eye  
care professional.

Manufactured for  
OCCULISTA  
32625 W. Seven Mile Rd.  
Livonia MI 48152  
[www.occulista.com](http://www.occulista.com)

Professional  
Vision Care Formulas

## Supplement Facts

Serving Size 2 Capsules Servings Per Container 30

Per Serving	Amount	% Daily Value
Beta-Carotene (Betatene™) (as pro-Vitamin A 10 mg)	16,667 IU	333%
Vitamin C (as Ascorbic Acid)	200 mg	333%
Vitamin E (as d-alpha Tocopheryl Succinate)	133 IU	443%
Riboflavin (Vitamin B-2)	13 mg	765%
Zinc (from L-OptiZinc® Zinc-L-Methionine)	17 mg	113%
Selenium (from L-Selenomethionine)	67 mcg	96%
Bilberry Standardized Extract (Vaccinium myrtillus) (min. 25% Anthocyanosides)	67 mg	†
Lutein (Free-Form) (from 200 mg FloraGLO® Marigold Flowers Extract)	7 mg	†
Green Tea Extract (Camellia sinensis) (min. 40% Catechins) (Contains approx. 6 mg of naturally occurring caffeine)	100 mg	†
N-Acetyl Cysteine (NAC)	67 mg	†
Rutin	67 mg	†
Zeaxanthin (from 200 mg FloraGLO® Marigold Flowers Extract)	333 mcg	†

† Daily Value not established.

Other ingredients: Gelatin (capsule), Cellulose, Magnesium Stearate (vegetable source) and Silica.

Contains soy derivative. Contains no sugar, salt, starch, yeast, wheat, gluten, milk, egg, shellfish or preservatives.

Store in a cool, dry place. Please Recycle.  
Do Not Eat Freshness Packets. Keep in Bottle.  
Betatene™ is a registered trademark of the Conagra Group, Inc.  
FloraGLO® is a registered trademark of Kemin Industries, Inc.  
L-OptiZinc® is a registered trademark of InterHealth NutraScience, Inc.  
These statements have not been evaluated by the FDA. This product is  
not intended to diagnose, treat, cure or prevent any disease.  
Support healthy vision.\*

## **Age-Related Eye Disease Study (AREDS)**

---

### **Purpose**

To assess the clinical course, prognosis, and risk factors of age-related macular degeneration (AMD) and cataract. To evaluate, in randomized clinical trials, the effects of pharmacologic doses of (1) antioxidants and zinc on the progression of AMD and (2) antioxidants on the development and progression of lens opacities.

### **Background**

AMD and cataract are the leading causes of visual impairment and blindness in the United States. Based on many clinical studies, it is apparent that the frequency of both diseases increases dramatically after age 60. Although excellent treatments for cataract are available, there are no equivalent treatments for AMD. As the average lifespan of our population increases, the number of people who develop AMD will increase dramatically in the years ahead. Unless successful means of prevention or treatment are developed, blindness from AMD -- and its importance as a public health problem -- will increase.

Neither the etiology nor the natural history of AMD or cataract is known. Epidemiologic studies suggest that a number of risk factors may be associated with AMD and cataract, but the strength of the evidence in support of these hypotheses varies. Possibly associated with AMD are personal characteristics, such as age, race, height, family history, and strength of hand grip; ocular characteristics, such as hyperopia and color of iris; and cardiovascular diseases, smoking, lung infections, and chemical exposures. Clinical and laboratory studies suggest the following factors may be associated with progression of AMD: drusen type, choroidal vascular diseases, and photic injury.

Epidemiologic studies of cataract suggest that associated risk factors may include personal characteristics, such as age, sex, race, occupation, and educational status; ocular characteristics, such as iris color; and diabetes mellitus, hypertension, drug exposure, smoking, and sunlight exposure. Animal studies and observational epidemiologic studies suggest that deficiencies in vitamins C and E, carotenoids, and the trace elements zinc and selenium also may be associated with the development of the two diseases, especially cataract. Although surgical treatment to remove cataract is very effective, cataract surgery carries risks, as does any other surgery. Therefore, many research efforts focus on preventing or slowing cataract development, as well as on determining the causes of cataract formation.

### **Description**

The Age-Related Eye Disease Study (AREDS) is a major research program to improve our understanding of the predisposing factors, clinical course, and prognostic factors of AMD and cataract. Eligible patients are randomized to treatment with placebo, antioxidants, zinc, or antioxidants plus zinc, and are followed for a minimum of 5 years.

## **Patient Eligibility**

Men and women between the ages of 55 and 80 years whose macular status ranges from no evidence of AMD in either eye to relatively severe disease with vision loss in one eye but good vision in the fellow eye (20/30 or better) are eligible for the study provided that their ocular media are clear enough to allow good fundus photography.

## **Patient Recruitment Status**

Completed. Patient recruitment began in September 1990. The first participant was enrolled November 1992, and recruitment ended in July 1995 for all but minority participants. The last participant was enrolled January 1998. A total of 4,757 participants were enrolled.

Current Status of Study

Ongoing.

## **Results**

AREDS researchers found that people at high risk of developing advanced stages of AMD lowered their risk by about 25 percent when treated with a high-dose combination of vitamin C, vitamin E, beta-carotene, and zinc. In the same high risk group -- which includes people with intermediate AMD, or advanced AMD in one eye but not the other eye -- the nutrients reduced the risk of vision loss caused by advanced AMD by about 19 percent. For those study participants who had either no AMD or early AMD, the supplements did not provide an apparent benefit.

In the cataract portion of the study, researchers discovered that the same nutrients had no significant effect on the development or progression of age-related cataract.

## **Publications**

McBee WL, and the AREDS Research Group: A program designed to provide and maintain training in a large long-term clinical trial. *Controlled Clinical Trials* 22(25): 865, 2001.

The Age-Related Eye Disease Research Group: A randomized, placebo-controlled, clinical trial of high-dose supplementation with vitamins C and E, beta carotene, and zinc for age-related cataract and vision loss. *AREDS Report No. 9. Arch Ophthalmol* 119: 1439-1452, 2001.

The Age-Related Eye Disease Research Group: A randomized, placebo-controlled, clinical trial of high-dose supplementation with vitamins C and E, beta carotene, and zinc for age-related macular degeneration and vision loss. *AREDS Report No. 8. Arch Ophthalmol* 119: 1417-1436, 2001.

Lindblad AS, and the AREDS Research Group: Incorporating a cognitive function ancillary study in an ophthalmic clinical trial. *Controlled Clinical Trials* 22(25): 625, 2001.

The Age-Related Eye Disease Research Group: Risk factors associated with age-

related nuclear and cortical cataract. A case-control study in the Age-Related Eye Disease Study. AREDS Report No. 5. *Ophthalmology* 108: 1400-1408, 2001.

The Age-Related Eye Disease Research Group: The effect of five-year zinc supplementation on serum zinc, serum cholesterol, and hematocrit. A randomized comparison in the Age-Related Eye Disease Study. AREDS Report No. 7. *Journal of Nutrition Accepted*, 2001.

The Age-Related Eye Disease Research Group: The Age-Related Eye Disease Study (AREDS) system for classifying cataracts from photographs. AREDS Report No. 4. *Am J Ophthalmol* 131: 167-175, 2001.

The Age-Related Eye Disease Research Group: The Age-Related Eye Disease Study (AREDS) system for classifying age-related macular degeneration from stereoscopic color fundus photographs. AREDS Report No.6. *Am J Ophthalmol* 132: 668-681, 2001.

The Age-Related Eye Disease Research Group: The Age-Related Eye Disease Study (AREDS): A clinical trial of zinc and antioxidants. AREDS Report 2. *J of Nutrition* 130: 1516S-1519S, 2000.

The Age-Related Eye Disease Research Group: The Age-Related Eye Disease Study (AREDS): Risk factors associated with age-related macular degeneration. AREDS Report No. 3. *Ophthalmology* 107: 2224-2232, 2000.

The Age-Related Eye Disease Research Group: The Age-Related Eye Disease Study (AREDS): Design implications. AREDS Report No. 1. *Controlled Clinical Trials* 20: 573-600, 1999.

Ansay SE, Armstrong JR, Osterby KR, Reimers JL, Badal DR, Geithman PL, Miner KD, King WN, The Age-Related Eye Disease Study (AREDS) Research Group: Evaluation of cortical and PSC lens opacities from fundus camera reflex photographs. Abstract, Annual Meeting. Association for Research in Vision and Ophthalmology (ARVO), Fort Lauderdale, Florida May 11-16, 1997.

Gensler GR, Lindblad AS, Age-Related Eye Disease Study (AREDS) Research Group: Evaluation of a two-phase enrollment design: Experience of the Age-Related Eye Disease Study. Abstract, 2nd Joint Meeting, Society for Clinical Trials and International Society for Clinical Biostatistics, Boston, Massachusetts, July 6-10, 1997.

Magli YL, Klein BEK, Sperduto RD, Hubbard LD, Neider MW, King WN, Davis MD: Age-Related Eye Disease Study (AREDS) Research Group extension of the Wisconsin Lens Opacity Grading System: Abstract, Annual Meeting. Association for Research in Vision and Ophthalmology (ARVO), Fort Lauderdale, Florida May 11-16, 1997.

## **Resource Centers**

### **Central Laboratory**

Anne Sowell, Ph.D.  
Elaine Gunter  
Dayton Miller, Ph.D.  
Nutritional Biochemistry Branch  
Centers for Disease Control and Prevention  
Atlanta, GA

### **Chairman's Office**

Frederick L. Ferris III, M.D.  
Emily Y. Chew, M.D.  
Robert Sperduto, M.D.  
National Eye Institute  
National Institutes of Health  
Building 31, Room 6A52  
31 Center Drive MSC 2510  
Bethesda, MD 20892-2510  
Telephone: (301) 496-6583  
Fax: (301) 496-2297

### **Coordinating Center**

Anne S. Lindblad, Ph.D.  
Fred Ederer, M.A., F.A.C.E.  
The EMMES Corporation  
401 North Washington Street, Suite 700  
Rockville, MD 20850  
Telephone: (301) 251-1161  
Fax: (301) 251-1355

### **Nutrition Coordinating Center**

Mary Stevens  
University of Minnesota  
Division of Epidemiology  
School of Public Health  
Minneapolis, MN

### **Reading Center**

Matthew D. Davis, M.D.  
Barbara E. K. Klein, M.D.  
Ronald Klein, M.D.  
University of Wisconsin - Madison  
Department of Ophthalmology & Visual Sciences  
Madison, WI  
NEI Representative  
Natalie Kurinij, Ph.D  
National Eye Institute  
National Institutes of Health  
Executive Plaza South, Suite 350  
6120 Executive Boulevard, MSC 7164  
Bethesda, MD 20892-7164  
Telephone: (301) 496-5983  
Fax: (301) 402-0528

## **Green Tea: The Eyes Have It**

Eyes Can Absorb Antioxidants From Green Tea, Which May Have a Protective Effect, Researchers Say

By Jennifer Warner

WebMD Health News

Reviewed by Louise Chang, MD

Feb. 18, 2010 -- Researchers say the compounds responsible for many of the health benefits of green tea are capable of penetrating the tissues of the eyes and have antioxidant activity there.

Green tea has been touted for a number of health benefits, such as fighting heart disease and cancer, thanks to its high concentration of disease-fighting antioxidants called catechins.

Researchers say catechins are among a number of antioxidants, including vitamin C, vitamin E, lutein, and zeaxanthin, thought to help protect the delicate tissues of the eye from glaucoma and other eye diseases. But until now it wasn't known if the catechins in green tea were capable of being absorbed into the tissues of the eye.

### **Another Health Benefit of Green Tea**

In the study, published in the *Journal of Agricultural and Food Chemistry*, researchers fed laboratory rats green tea extract and then analyzed their eye tissues.

The results showed that different parts of the eye absorbed varying amounts of catechins. The area with the highest concentration of catechins was the retina, which is the light-sensing tissue that lines the back of the eye. The area with the least absorption of catechins was the cornea, which is the clear, outer layer of the eye.

The study also showed that a measure of antioxidant activity lasted for up to 20 hours after the drinking green tea extract.

Researcher Kai On Chu of the department of ophthalmology and visual sciences at the Chinese University of Hong Kong and colleagues say that their findings suggest that drinking green tea could be protective of the eyes. Further studies, however, will be needed to confirm a protective effect in humans.

## Benefits of Bilberry

**The benefits of bilberry come from its rich antioxidant properties.**

Their antioxidants protect our cells, including our macula from being damaged by free radicals. The dark purple berries are produced in late summer and are known as the European blueberry.



### Bilberry Health Benefits

These berries have historically been used to help improve night vision, treat diarrhea, improve blood sugar levels in diabetics, and strengthen blood vessels and improve circulation.

Bilberry contains flavonoids, which are found in many fruits and vegetables. Flavonoids have antioxidant properties which protect cells in the body and cell membranes from the damaging effects of free radicals.

The flavonoid, anthocyanidins, found in the bilberry provides the blue color of the berry and is the main active ingredient of this plant. It is known for its benefit to the eyes and the circulatory system.

### Bilberry Extract for Eyesight

Bilberry extract for eyesight is used in many vision supplements. Often it is easier to get the nutritional benefits of bilberry from a supplement. It can be difficult to get fresh bilberries or to drink enough bilberry tea to benefit your health.

Anthocyanin is an antioxidant that appears to have the effect of:

fortifying blood-vessel walls, improving blood flow and improving oxygen delivery to the tiny blood vessels that keep eyes healthy, as well as helping to maintain good circulation.

This European blueberry may affect blood platelet stickiness so talk to your doctor if you are taking any anti-coagulation medication.

Bilberry also contains another powerful antioxidant, vitamin C.

### **Bilberry Supplements**

You may want to consider taking bilberry supplements since this antioxidant rich berry is not readily available as part of our diet.

These supplements are available as a single ingredient in eye supplements or in combination with other antioxidants.

## Lutein for Macular Degeneration

**Lutein for macular degeneration? It is certainly something to consider. It is an important carotenoid found in the macula.**



Lutein is a carotenoid that is a powerful antioxidant. This carotenoid helps make up the macular pigment, which protects our eyes from damaging forms of light.

**The body cannot manufacture it so one must get it through diet or supplementation.**

It is found in deep green vegetables such as spinach, kale and collard greens and in egg yolks, corn, squash and tomatoes.

### **What is Lutein**

Lutein and zeaxanthin together make up the macular pigment.



High concentrations of these carotenoids are found in the macula, also known as the macula lutea which means yellow spot in Latin.

The macular pigment is known to provide:

**✓ protection against macular degeneration and cataracts**

**✓ protection to the macula** against the harmful effects of blue light.

**Low levels of macular pigment are associated with macular degeneration.**

Researchers said the two pigments act as "sunglasses" and appear to filter short-wavelength light that can damage the eye's retina.

"When we compared the amount of macular pigment, which is comprised of lutein and zeaxanthin, present in the eyes of people with age-related macular

degeneration to people without the disease, those with the lowest levels of carotenoid accumulation in the outer retina were significantly more likely to suffer from age-related macular degeneration than those with higher pigment levels," said Dr. Landrum.

**"The difference in risk between those having the highest and lowest levels was 75 percent."**

Dr. Landrum, Florida International University

### **Benefits of Lutein**

The Eye Disease Case Control Study looked at 421 cases of wet AMD and 615 matched control cases. This is their conclusion:

Carotenoid levels in the blood were **much lower in patients with macular degeneration.**

"Increasing the consumption of foods rich in certain carotenoids, in particular **dark green, leafy vegetables**, may decrease the risk of developing advanced or exudative AMD."

At this time there is no toxic dose that is known to cause harm. However, as a nurse I need to remind you that if a person is on blood thinners or is taking an aspirin a day for their heart, they should consult their doctor before starting any supplement.

Though this pigment is deposited into many areas of the body prone to free radical damage – like the eyes and skin – **it cannot be manufactured by the body.**

(If a person is smoking, it would not be recommended for a person to begin taking this antioxidant as the combination could be harmful, in a similar way to smoking and beta-carotene has shown to cause cancer in the lungs.)

### **Foods High In Lutein**

It is found in red, orange and yellow colored vegetables like corn, squash and red peppers. Dark green leafy vegetables such as kale, collard greens, and spinach have some of the highest concentrations.



## **Lutein Supplements**

Should a person consider taking lutein for macular degeneration prevention or to prevent the progression of this disease?

It has been shown in several studies that levels of these two carotenoids **can be increased in the eye** when taking a supplement or eating these foods, but blood levels drop as soon as the supplement is not being taken.

Family members at risk may also consider taking lutein for macular degeneration or supplements for macular degeneration prevention beginning at an earlier age.

This, combined with good eye protection from the sun, may be of great help in preventing or prolonging the onset of macular degeneration.

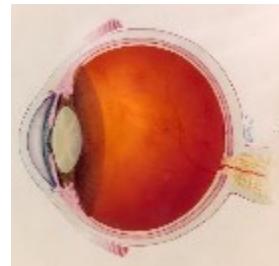
## **Lutein Dosage**

If you are considering taking lutein for macular degeneration here are the recommended amounts.

The USDA Dietary Guidelines for Americans recommends:

✓ **4-8 milligrams per day**

The research recommends:



✓ **6-10 milligrams per day for macular degeneration for maximum benefits of protection**

The typical American consumes:

✓ **about 1-2 milligrams per day**

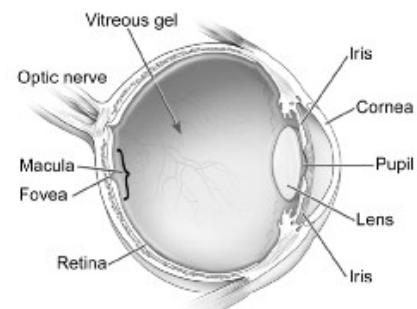
## **AREDS Formula Vitamins with Lutein**

There are many macular degeneration nutritional supplements, from multivitamins to eye care formulas to products containing this carotenoid as the sole ingredient.

Be sure to read the label to see how much is included in each dose.

It is usually listed in milligrams – mg – though some products list it in micrograms – mcg.

One microgram equals one-thousandth of a milligram.



## **What are the benefits of selenium?**

The essential trace mineral, selenium, plays a fundamental part in maintaining human health.

It's found mostly in the liver, kidneys, pancreas, spleen, and lymph nodes, which means it has a role to play in a wide range of bodily functions and is vital to the proper functioning of all these body parts.

### **Improves your health - eyes to your heart and beyond!**

In fact, selenoproteins are involved in processes concerning everything from reproduction to thyroid activity, correct eye functioning, DNA synthesis, muscle function, and the efficient working of the heart. For example, it's essential for helping the body to maintain healthy thyroid hormone function, which is critical for regulating metabolism.

It's also important for ensuring the health of the testes and seminal vesicles in men, and it works to facilitate the production of sperm and its motility, which explains why men have a greater need for this compound. Any deficiency in it can lead to infertility in males.

It is probably best known as an antioxidant because it's an essential component of glutathione peroxidase (GPx).

This enzyme works together with vitamin E, to carry out tasks associated with removing free radicals (toxins caused as a by-product of metabolic functions, and as a result of pollution).

### **Working as a team with vitamin E**

Selenium and vitamin E work synergistically in that they carry out antioxidant and immunostimulating functions better together than they do alone. Both work towards preventing the body ageing too quickly as a result of tissue oxidation, and as a result, they help prevent age related degenerative diseases.

### **The battle against oxidative stress**

Because selenium works as an antioxidant, it may provide important health benefits to people whose oxidative stress loads are high. Examples of these are smokers, and those with inflammatory diseases, like rheumatoid arthritis, or people who suffer from infections that compromise their cell immunity.

For this reason, this compound has particular significance for those with infectious diseases such as HIV and AIDS. It's very much needed for the proper functioning of the immune system, and appears to be a key nutrient in counteracting the development of the virus and inhibiting HIV progression to AIDS.

## **The fight against cancer**

Not only those with viral conditions need it. Several epidemiological studies have shown that people with the highest levels of it have a reduced risk of getting cancer. Those with high selenium levels who already have cancer may have less chance of dying from it.

As early as 1969, scientists showed that cancer mortality rates fell if people had high exposure to sources of it, and that it might therefore have a protective effect against cancer in humans. Since then, the literature on the compound and cancer has grown extensively to include several important studies. Particularly famous are the results of the Linxian trial in China, which has one of the world's highest rates of throat cancer.

Plenty of other studies have shown that consuming more of it could help you cut your risk of developing and dying from prostate, colorectal and lung cancers.

### **Getting enough?**

So how can we ensure we're getting enough selenium? In the human body, its blood and tissue concentrations are extremely low. Despite its importance, there is less than 1 mg. of it in our body, which means that it must be supplied by our daily diet.

Good sources of it include meat, grains, fish and dairy products, but most of our common foods actually contain a very low level of selenium. The reason for these low levels concerns the fact that it is a trace mineral derived from plants that extract selenium from soil. That means its availability is largely dependent on soil conditions.

### **Depends on the soil**

Selenium-poor soils include those in volcanic regions, acid soils, and soils with high iron and aluminum content: parts of Europe, China, and New Zealand are particularly well known for having selenium-deficient soils.

Low or diminishing selenium status in some parts of the world, notably in some European countries, is really giving doctors cause for concern.

The amount of selenium in our meat sources also varies greatly, depending on the levels of it in the plants the animals eat.

Not only that, but most selenium in foods is lost during processing, particularly when we're making foods such as white rice or white flour, which have much of their nutritionally valuable components removed.

### **Link between deficiency in soil and cancer**

Low soil levels of selenium are associated with higher cancer rates (whereas selenium-rich areas have below-average cancer rates, particularly for breast, colon, and lung cancer).

Other problems include heart disease, skeletal and muscle problems, growth retardation, reduced immune function, depression, and higher risk of miscarriage.

### **Getting the right level**

All is not lost, however! Thanks to modern technology, we now have access to a range of good, high quality, supplements.

Preferably in its most easily absorbed form, L-selenomethionine, either on its own, or cultivated with garlic, in combination with other vitamins such as vitamin E, or minerals such as zinc, clinical trials have shown that a selenium supplement of at least 100 µg daily can boost health and may help prevent the problems mentioned above.

# **Lutein, Zeaxanthin and Bilberry for preventive eye health.**

## **Macular degeneration**

Before discussing Lutein, Zeaxanthin and Bilberry we need to have a basic understanding of macular degeneration (MD)

MD is a medical condition affecting the eyes, and it happens when the light-sensing cells in the macula go wrong and stop working. It's the leading cause of blindness in the United States for people over the age of 50, leading to the term 'age-related macular degeneration' (AMD).

## **Oxidative stress and the eyes**

Although AMD and cataracts are the top causes of blindness, how they are caused is still a bit of a mystery. Many experts think they could be the result of oxidative stress. The body constantly reacts with oxygen as part of the energy producing processes of cells, and as a consequence, it produces highly reactive molecules known as free radicals.

These interact with other molecules within the cell, which can cause oxidative damage to proteins, membranes and genes. This kind of damage has been implicated in the cause of certain diseases and almost certainly has an impact on the body's ageing process.

Because its protective cells don't regenerate themselves, the part of the eye most susceptible to oxidative damage is the lens.

When the underlying epithelial cells are exposed to reactive oxygen, the proteins in the lens clump together, and cataracts are formed.

The retina, which uses more oxygen than any other tissue in the body, is also susceptible to damage. Polyunsaturated fatty acids found in the lens and retina, are easily affected by oxidation, resulting in degradation in function and structure of the eye.

Aside from metabolic oxidization, another source of free radicals is pollution, and of course cigarette smoke. Avoiding these as much as possible can only help your eyes.

In addition, experts warn that AMD may well be caused by too much exposure to sunlight (especially high-energy blue light). That's why it's extremely important to wear sunglasses containing top-quality lenses, particularly in high light-exposure environments such as ski resorts and beaches.

## **Lutein**

So is there anything else we can do to help the health of our eyes? As a matter of fact, there is. It's called lutein.

The pigment lutein (LOO-teen) (from the Latin *lutea*, meaning "yellow") is one of over 600 known naturally occurring carotenoids. It's found in corn, egg yolk, and other yellow and green fruits and vegetables, but it also occurs in some eye tissues, specifically the pigment of the retina and parts of the lens.

Lutein may play a role in slowing the age-related degeneration of these tissues, both directly as an antioxidant, and indirectly by absorbing blue light.

In fact, various research indicates that a direct relationship exists between lutein intake and pigmentation in the eye, and studies show that it may reduce blue light intensity by up to 90%. It's one of the secret weapons plants use to protect themselves from the sun. Most people consume lutein as part of a normal diet containing fruits and vegetables, but elderly and ill people can gain from taking a lutein supplement, because their digestive systems may not be functioning at an optimal level. In addition, much of the food grown and distributed today lacks a healthy nutritional content, on account of pollution, poor soil, long storage periods and so on. That means most people could well benefit from supplementing with lutein.

## **Bilberry**

Another superb antioxidant particularly appreciated by your eyes is *Vaccinium myrtillus*, more commonly known as bilberry (and also as whortleberry, blaeberry, whinberry/winberry, whortleberry, fraughan, and myrtle blueberry!)

Bilberry shrubs grow in the world's temperate regions and produce a fruit that's eaten fresh or used to make desserts, preserves and drinks. Its leaves have also historically been used to treat a range of gastrointestinal disorders.

One particular plus point of gorging on bilberries, is that they are said to improve night vision, and rumour has it that RAF pilots in World War II used them specifically for that purpose. Studies have shown they may also reduce or reverse the effects of MD, probably due to the effects on blood capillaries of their antioxidant chemicals, called anthocyanidin flavonoids.

Anthocyanidin flavonoid compounds are derivatives of the pigments that cause the blue, violet, or red colours in flowers and fruits. At least fifteen different versions have been identified in bilberry extracts, which means bilberry supplements can deliver a powerful dose of them right to where they are needed most: in your eyes.

## **Zeaxanthin**

Aside from lutein and bilberry, another excellent 'eye supplement' is zeaxanthin.

It's one of the most common carotenoid alcohols found in nature, and is the pigment that gives saffron, corn and other yellow plants their characteristic colour.

More importantly, zeaxanthin is one of the two carotenoids contained in the retina (the other being lutein, as we saw previously).

Experiments have shown that low levels of zeaxanthin can have a detrimental effect on the eye, in the same way that a lack of lutein can. For that reason, some studies support the view that supplemental lutein and/or zeaxanthin helps protect against AMD.

There's also a fair bit of evidence that increasing your intake of lutein and zeaxanthin will lower your risk of developing cataracts.

### **Combination of high-dose nutrients for eye health**

Aside from lutein, zeaxanthin and bilberry, The Age-Related Eye Disease Study (a clinical trial sponsored by the U.S. National Institutes of Health) shows that a combination of high-dose beta-carotene, zinc, vitamin E and vitamin C can reduce the risk of developing advanced AMD by around 25%. You only get one set of eyes: it's probably wise to look after them as best you can while you still have the chance.

# An A-Z Guide to the Best Nutrients for Your Eyes

Are you trying to figure out what nutrients you need to improve your vision health?

## Bilberry

Bilberry is thought to improve night vision. A close relative of the cranberry, bilberry is high in a certain type of bioflavonoid that speeds the regeneration of rhodopsin, the purple pigment used by the eyes' rods. British air force pilots in World War II ate bilberry jam to improve their night vision during evening sorties.

Bilberry fruits, found in the forest meadows of Europe, western Asia, and the northern Rocky Mountains, contain flavonoid compounds called anthocyanidins. Flavonoids are plant pigments that have excellent antioxidant properties; they have been shown to help prevent a number of long-term illnesses such as heart disease, cancer, and macular degeneration, the leading cause of vision loss and legal blindness in Americans age 65 and older, according to the eye-health organization Prevent Blindness America.

## Lutein

Lutein, found in our retinas, is essential for healthy vision. Lutein and a related dietary carotenoid, zeaxanthin (see entry below), accumulate within the retina and imbue a yellow pigment that helps protect the eye. It lowers the risk of cataracts and macular degeneration (low lutein intake is implicated as a risk factor in age-related macular degeneration), and may also help to prevent or slow down atherosclerosis. Lutein is found in the red, orange, and yellow pigments of fruits and vegetables; for example, tomatoes, carrots, and squash. Green leafy vegetables such as spinach also contain high amounts of lutein.

## N-Acetyl Cysteine (NAC)

NAC is an amino acid similar in structure to cysteine, a building block of proteins. In our body, NAC helps stimulate the production of antioxidants by replenishing the body's levels of glutathione (see entry above). NAC is thought to both stave off disease and play an important role in boosting the immune system.

## Rutin

Another bioflavonoid, rutin, is found in many plants, especially the buckwheat plant, the flour of which is used to make pancakes. Other rich dietary sources of rutin include black and green tea, and citrus fruits. Rutin is considered to be an important nutritional supplement because of its ability to strengthen capillaries. The American Journal of Ophthalmology notes that rutin has been used with success to treat retinopathy in preliminary research.

## Selenium

Selenium is a trace mineral that our bodies need to boost immunity and fight off infections. It can also help prevent cataracts and macular degeneration by acting as an antioxidant that neutralizes free radicals that can damage the eye's lens and macula; studies have identified low selenium levels in cataract

sufferers. Selenium also helps your body to absorb vitamin E. Fish, shellfish, red meat, grains, eggs, chicken, liver, and garlic are all good sources of selenium, as well as brewer's yeast and wheat germ.

### **Vitamin A**

Vitamin A is absolutely essential for eye and vision health. In our bodies, vitamin A is required by the retina for its proper functions?in fact, one of the two sources of dietary vitamin A goes by the name "retinoids." The other source is carotenoids, obtained from fruits and vegetables containing yellow, orange, and dark green pigments, including that old standby, beta-carotene. When Mom told you to eat your carrots for good vision, she wasn't kidding!

Vitamin A is necessary for the production of rhodopsin, the visual pigment used in low light levels. One of the causes of night blindness is vitamin A deficiency; supplements of that vitamin are often recommended for those with poor night vision, along with a diet emphasizing Vitamin A-rich foods, such as sweet potatoes, carrots, mangoes, spinach, and cantaloupe. Vitamin A helps your eyes adjust to light changes; it moistens the eyes, which can enhance visual acuity; it has been shown to prevent the forming of cataracts; and it has been shown to help prevent blindness from macular degeneration.

### **Vitamin C**

Vitamin C's importance as an antioxidant cannot be overstated. The Web site All About Vision even calls this vitamin the "Vision Superhero"!

Vitamin C has been linked to the prevention of cataracts?one study has shown that taking 300 to 600 mg supplemental vitamin C reduced cataract risk by 70 percent?the delay of macular degeneration, and eye pressure reduction in glaucoma patients.

It's an interesting fact that, while most animals produce their own vitamin C, we humans do not have that ability. In addition, we can't store this vitamin in our bodies for very long, so it needs to be constantly replenished to obtain its benefits. Most of us think of orange juice as the quintessential source of vitamin C, but many vegetables are actually even richer sources: chili peppers, sweet peppers, kale, parsley, collard, and turnip greens are full of vitamin C, as are broccoli, Brussels sprouts, watercress, cauliflower, cabbage, and strawberries.

### **Vitamin E**

Because of its antioxidant action, vitamin E helps protect against cataracts and age-related macular degeneration. A clinical study has showed that taking vitamin E can cut the risk of developing cataracts in half. Another study also showed that the combination of vitamins C and E had a protective effect against UV rays. Symptoms of vitamin E deficiency include muscle weakness, loss of muscle mass, abnormal eye movements, and impaired vision.

Uveitis, an inflammation of the middle layer (uvea) of the eye, is another disorder for which the antioxidant vitamins C and E may be helpful. The uvea contains many of the blood vessels that nourish the eye; inflammation of this area can affect the cornea, the retina, the sclera, and other important parts of the eye.

The richest source of vitamin E is wheat germ. Dark green leafy vegetables (such as spinach, kale, and collard greens), sweet potatoes, avocado, asparagus, and yams are also good sources of viatmin E.

## **Zeaxanthin**

Clinical research has determined that lutein (see entry above) and zeaxanthin are two naturally occurring carotenoids present in the macular segment of the retina. The concentration of these two is so high in the macula (the retinal region responsible for fine visual activities), that the carotenoids are visible as a dark yellow spot, called the macular pigment, in normal, healthy retinas. They act like sunglass filters to protect the eye.

Research performed at Harvard Medical School has established that dietary zeaxanthin plays an essential role in protecting the retina of the eye from the damaging effects of light. Epidemiologic studies have shown that people with higher lutein/zeaxanthin levels have reduced risk for advanced stages of macular degeneration.

Blue-eyed individuals need more lutein and zeaxanthin because they have less of these protective pigments in their retinas. Again, dark, leafy greens are the dietary winner here, along with corn, nectarines, oranges, papaya and squash.

## **Zinc**

Our eyes actually contain the greatest concentration of zinc in our body. This essential element is required for the conversion of beta-carotene into vitamin A. Oysters contain more zinc per serving than any other food, but red meat and poultry provide the majority of zinc in the American diet.

While eating a healthy, well-balanced diet is ultimately the best way to obtain the nutrients essential to eye health, in today's busy world, we don't always have time to shop and eat right. Plus, vegetarians and vegans may have a hard time receiving all the nutrition they need from plants alone.

Here's a sampling of what good eye nutrition can do for you:

- \* Improve the distance you can see an object
- \* Help to prevent cataracts, macular degeneration and glaucoma
  - \* Enhance night vision
  - \* Protect delicate eye tissues
- \* Increase blood flow and circulation within the eye
  - \* Remove toxins from the retina
- \* Nourish the parts of your eye necessary for clear vision
- \* And hundreds of more benefits to the overall health and well-being of your body

# Riboflavin: Health Benefits and Food Choices

By Pam Parent

There are many health benefits of taking riboflavin, also known as B2. It can help aid with energy production and certain diseases. It is recommended that a male adult get 1.7 mg daily, and an adult woman get at least 1.3 mg of riboflavin each day. Before adding any new supplement to your diet, check with your physician.

**A deficiency in riboflavin can be the cause of many physical ailments.** If you have sensitivity to light, bloodshot eyes, premature wrinkles, inflammation of the mouth, and a sore tongue you may have a B2 deficiency. If you have any of these symptoms, discuss your concerns with a physician.

**Riboflavin plays a major role in the production of energy.** It helps convert carbohydrates to sugar, and helps process amino acid and fats. Riboflavin is a known antioxidant, which can help aid in slowing down the aging process.

**Riboflavin helps to protect the nervous system.** It can help in treating many nervous system conditions such as multiple sclerosis, anxiety, and epilepsy. It also aids in regulating the thyroid. Riboflavin along with vitamin B6 has also been known to help Carpal Tunnel syndrome.

**Riboflavin helps regulate red blood cells.** It helps to maintain a strong immune system by promoting healthy hair, skin, nails, and vision. It helps produce red blood cells that carry oxygen throughout your body, and keep tissue in good repair. This process helps speed the healing of burns and various other injuries.

**Riboflavin plays an important role in the health of your eyes.** It may help aid and counteract the onset of certain types of glaucoma. Riboflavin is also known to alleviate eye strain.

**There are various types of food that contain riboflavin.** Dairy products contain the highest amount of riboflavin. Milk and eggs being the best dairy choices. It can be found in organ meats such as liver, kidney, and heart. Asparagus, spinach, and mushrooms also are a great source of vitamin B2. Total and other cereals also contain riboflavin and other vitamins needed for your daily diet. Check the side panel to see the percentage of vitamins included in the cereal.

# Lutein improves visual function in some patients with retinal degeneration: a pilot study via the Internet.

Dagnelie G, Zorge IS, McDonald TM

Johns Hopkins University School of Medicine, Baltimore, Maryland, USA.

Comment in:

Optometry. 2000 Aug;71(8):482; author reply 482, 489.

## Abstract

**PURPOSE:** The purpose of this article is to examine the effects of lutein supplementation on visual acuity, central visual-field area, and subjective visual disturbances in retinitis pigmentosa (RP) and related retinal degenerations, in an international study population recruited via an Internet mailing list.

**METHODS:** Sixteen participants (13 with RP, three with other retinal degenerations) completed a 26-week program of lutein supplementation (40 mg/day for 9 weeks, 20 mg/day thereafter); 10 participants also took 500-mg docosahexaenoic acid (DHA)/day, vitamin B complex, and digestive enzymes. Ten participants previously taking vitamin A and/or beta-carotene continued those supplements throughout the study. Participants self-tested their visual acuity on their computer screen and their central visual-field extent on a wall chart, weekly for 14 weeks, bi-weekly thereafter.

**RESULTS:** Mean visual acuity improved by 0.7 dB and mean visual-field area by 0.35 dB. Improvements started 2 to 4 weeks after supplementation began, and plateaued at 6 to 14 weeks. Visual acuity gains were strongly correlated with eye color: 1.2 dB in seven blue-eyed participants, but 0.3 dB in seven dark-eyed participants. Participants who received previous supplements showed greater benefits in central visual-field area (0.55 dB) than those not receiving previous supplements (no change). No significant effects of age, sex, disease stage, or study supplement were found.

**CONCLUSIONS:** Short-term vision improvements after lutein supplementation--previously reported in age-related macular degeneration--also occur in RP, especially in blue-eyed individuals; vitamin A may increase visual field benefits.

## About Zeaxanthin

By Caryn Anderson, eHow Contributor

Zeaxanthin (pronounced "zee-uh-ZANTH-in") is a naturally occurring nutrient that is found in your body as well as in fruits, vegetables, corn and marigolds. Along with lutein, zeaxanthin belongs to the carotenoid family as part of a subgroup called xanthophylls. These are located in the macula and in the lens of the human eye. Zeaxanthin is easily absorbed into the blood stream to be disbursed throughout the body (predominately in the eyes and skin).

### 1. The Facts

- This powerful antioxidant works by protecting your eye from harmful blue light, which can cause oxygen molecules to attack other molecules in your eye (oxidative stress). Zeaxanthin also helps reduce glare and protect delicate cells and cell membranes by inhibiting free radicals. Research conducted at Harvard Medical School supports the role of zeaxanthin in shielding your retina from harmful damage as a result of exposure to light.

### Clinical Research

- Research conducted at Harvard University Medical Center (published in November 2002 in "Investigative Ophthalmology and Visual Science" and "Experimental Eye Research") strongly indicates that supplementing your diet with zeaxanthin helps to prevent and minimize damage to the retinas. Zeaxanthin works by protecting the photoreceptors on the rod and cone area of the retina. Ongoing clinical research being conducted at Queen's Centre of Vision and Vascular Science in Ireland, also suggests that zeaxanthin (along with lutein) can help to prevent vision loss in people diagnosed with age-related macular degeneration, slow progression of the disease and perhaps even sharpen central vision.

### Zeaxanthin's Role in Preventing AMD

Age Related Macular Degeneration (AMD) is a disease in which your eye's macula is attacked, often leaving sufferers with weak peripheral vision, dim images and/or a black hole in the center of their vision. The rods and cones in your macula lend sharpness color perception to your vision. Zeaxanthin helps preserve normal pigment levels in your rods and cones and prevents damage to the photoreceptors.

### Additional Benefits

Zeaxanthin can help to improve your central vision in much the same way as it protects against AMD since it is deposited in the macula, which is predominately responsible for sharp central vision. Taking zeaxanthin can help to reduce glare from blue light (also known as short wave visible light). Increasing amounts of haze and smog in our environment interact with blue light to create glare. Since zeaxanthin acts by absorbing that blue light, it can thereby reduce glare.

### Guidelines

Clinical studies indicate that 6 milligrams daily is beneficial for those seeking to prevent disease, while anyone already diagnosed with AMD should take closer to 10 milligrams. Eating a healthy diet with four to seven servings of vegetables and fruit each day along with taking a dietary supplement should maintain healthy levels of both lutein and zeaxanthin.

# **Selenium And High Dose Vitamin E Administration Protects Cisplatin-Induced Oxidative Damage To Renal, Liver And Lens Tissues In Rats.**

Naziroglu M, Karaoğlu A, Aksoy AO

Department of Physiology, Veterinary Faculty, Firat University, TR-23119, Elaziğ, Turkey.  
mnaziroglu@physiology.rwth-aachen.de

## **Abstract**

Cisplatin is one of the most active cytotoxic agents in the treatment of cancer but its clinical use is associated with nephrotoxicity. Several studies suggest that supplementation with antioxidant can influence cisplatin induced nephrotoxicity.

In the present study, we investigated the effect of selenium with high dose vitamin E administration on lipid peroxidation (MDA) and scavenging enzyme activity in kidneys, liver and lens of cisplatin-induced toxicity in rats. Forty female Wistar rats were used. They were randomly divided into five groups. The first and second groups were used as control and cisplatin (6 mg/kg BW) intraperitoneally administrated groups. Groups III, IV and V received intraperitoneally five doses of selenium (1.5 mg/kg BW) and a high dose of vitamin E (1000 mg/kg BW) combination before, simultaneously and after with cisplatin, respectively. Glutathione peroxidase (GSH-Px), vitamin E and beta-carotene levels in the kidney, lens and liver, vitamin A and reduced glutathione (GSH) levels in the kidney were significantly ( $P<0.05$  to  $<0.001$ ) lower in the cisplatin group than in the control whereas there was a significant increase in kidney, liver and lens MDA levels in rats treated with cisplatin.

The decreased antioxidant enzymes and vitamins and increased MDA levels in the kidney, lens and liver of animals administered with cisplatin were significantly ( $P<0.05$  to  $<0.001$ ) improved with selenium and a high dose vitamin E injection. In conclusion, this data demonstrates that there is an increase in lipid peroxidation in the kidney, liver and lens of animals administered with cisplatin whereas there is a decrease in antioxidant vitamins and enzymes.

However, intraperitoneally injected selenium combined with a high dose of vitamin E seem to produce a significant improvement on antioxidants concentrations in rats treated before, simultaneously and after with cisplatin. The selenium with high dose vitamin E injection may play a role in preventing cisplatin-induced nephropathy and cataract formation in cancer patient.

## Landmark Clinical Zeaxanthin Studies

---

Use of carotenoids in supplements is the fastest-growing category among dietary supplements due to their antioxidant properties. Emerging science is identifying the specific function of zeaxanthin in preventing certain diseases or disorders for which there is often no cure.

Various studies have found that typical intake of zeaxanthin is less than 0.5 milligrams a day. The adequate amount, however, for the body to reap the benefits of zeaxanthin is between 2 and 4 milligrams. The need to supplement daily dietary intake is even greater in adults over the age of 50, when carotenoid consumption is significantly lower. Research has also shown that women, smokers and overweight people are more at risk of developing AMD than other population groups.

---

### ***Main clinical studies about the affects of zeaxanthin on eye health***

#### ***Zeaxanthin & Age-Related Macular Degeneration:***

Risk of age-related macular degeneration (AMD) was significantly higher in people with low concentrations of zeaxanthin in their blood. **Lutein and Zeaxanthin Status and Risk of Age-Related Macular Degeneration** *Investigative Ophthalmology & Visual Science*, June 2003, Vol. 44, No. 6

---

#### ***Zeaxanthin & Visual Performance Under Bright Light:***

Supplementation with 2 mg of zeaxanthin and 10 mg of lutein resulted in an increase in the Macular Pigment that was then directly related to improvements in glare disability and photo stress recovery times.

Supplemented subjects could tolerate 58% more intense glaring light before losing their ability to detect a central target. They also had, on average, 14% faster recovery to photo stress.

**Macular Pigment and Visual Performance Under Glare Conditions.** *Optom Vis Sci* 2008;85:82–88

---

#### ***Intake of Lutein and Zeaxanthin Differ with Age, Sex and Ethnicity***

Among all age groups, both sexes and all ethnicities, lutein intake was greater than zeaxanthin intake. Relative intake of zeaxanthin to lutein decreased with age, with zeaxanthin to lutein ratios lower in females. Further, lower zeaxanthin to lutein ratios were seen in groups at greater risk for AMD—older participants and women. Of note, zeaxanthin to lutein ratios were significantly greater in Mexican Americans compared to all other ethnicities, including other Hispanics. The researchers concluded the relative intake of these carotenoids may be an

important factor in AMD risk. **Journal of American Dietetic Association. Volume 110, Issue 9, Pages 1357-1362 (September 2010)**

---

### ***Zeaxanthin & Cognitive Function:***

It is well recognized that an increase in brain oxidative stress is one of the leading causes of cognitive impairment. High Zeaxanthin concentration in the blood was found to be highly correlated with better performance in a series of cognitive tests (the Digit Symbol Substitution, the Finger Taping Test, the Word Fluency Test and the Trail Making Test Part A). **Plasma Carotenoid Levels and Cognitive Performance in an Elderly Population: Results of the EVA Study. Journal of Gerontology. 2007, Vol 62A, No.3, 308-316**

---

### ***Zeaxanthin, AMD & Cataracts:***

A study involving over 2,500 participants found that people with high levels of zeaxanthin in their blood have 93% less risk of AMD and 75% less risk of developing a nuclear cataract.

**Plasma Lutein, Zeaxanthin, and Other Carotenoids as Modifiable Risk Factors for Age-Related Maculopathy and Cataract: The POLA Study. Invest Ophthalmol VisSci. 2006;47:2329–2335.**

---

### ***Zeaxanthin & Cataracts:***

A study involving close to 5,000 participants found high dietary zeaxanthin and lutein intake reduced the risk of developing a cortical cataract by 30 percent.

**Dietary Carotenoids and Cataract in the Age-Related Eye Disease Study: ARVO Abstracts, 2006**

---

### ***Zeaxanthin & Diabetic Retinopathy:***

Dietary carotenoids are significantly lower in diabetics. Zeaxanthin and lutein significantly inhibit the damage diabetes can cause to the retina.

**Beneficial Effect of Zeaxanthin on Retinal Metabolic Abnormalities in Diabetic Rats. Invest Ophthalmol Vis Sci. 2008;49:1645–1651**

---

### ***Zeaxanthin & Blue Light:***

Supplementation with zeaxanthin significantly increased macular pigment in the retina and reduced the damaging effects of blue light to the retina.

**The effects of supplementation with lutein and/or zeaxanthin on human macular pigment density and color vision. Ophthalmic and Physiological Optics, 2006 26: 137-147**

---

***Zeaxanthin & Visual Performance:***

Supplementation with zeaxanthin or lutein increases macular pigment at the fovea (the central part of the macula) and can also improve visual acuity.

**Supplementation with the carotenoids lutein or zeaxanthin improves human visual performance Ophthalmic and Physiological Optics, 2006 26: 362-371**

---

***Zeaxanthin & Visual Acuity and Visibility:***

Increased zeaxanthin supplementation improved visual performance due to changes in underlying biology and/or optical changes.

# **Corneal Collagen Crosslinking For Keratoconus And Corneal Ectasia: One-Year Results.**

Hersh PS, Greenstein SA, Fry KL

Cornea and Laser Eye Institute-Hersh Vision Group, CLEI Center for Keratoconus, Teaneck, New Jersey 07666, USA. phersh@vision-institute.com

## **Abstract**

**PURPOSE:** To evaluate 1-year outcomes of corneal collagen crosslinking (CXL) for treatment of keratoconus and corneal ectasia.

**SETTING:** Cornea and refractive surgery subspecialty practice.

**DESIGN:** Prospective randomized controlled clinical trial.

**METHODS:** Collagen crosslinking was performed in eyes with keratoconus or ectasia. The treatment group received standard CXL and the sham control group received riboflavin alone. Principal outcomes included uncorrected (UDVA) and corrected (CDVA) distance visual acuities, refraction, astigmatism, and topography-derived outcomes of maximum and average keratometry (K) value.

**RESULTS:** The UDVA improved significantly from  $0.84 \text{ logMAR} \pm 0.34 \text{ (SD)}$  (20/137) to  $0.77 \pm 0.37 \text{ logMAR}$  (20/117) ( $P = .04$ ) and the CDVA, from  $0.35 \pm 0.24 \text{ logMAR}$  (20/45) to  $0.23 \pm 0.21 \text{ logMAR}$  (20/34) ( $P < .001$ ). Fifteen patients (21.1%) gained and 1 patient lost (1.4%) 2 or more Snellen lines of CDVA. The maximum K value decreased from baseline by  $1.7 \pm 3.9 \text{ diopters (D)}$  ( $P < .001$ ),  $2.0 \pm 4.4 \text{ D}$  ( $P = .002$ ), and  $1.0 \pm 2.5 \text{ D}$  ( $P = .08$ ) in the entire cohort, keratoconus subgroup, and ectasia subgroup, respectively. The maximum K value decreased by 2.0 D or more in 22 patients (31.0%) and increased by 2.0 D or more in 3 patients (4.2%).

**CONCLUSIONS:** Collagen crosslinking was effective in improving UDVA, CDVA, the maximum K value, and the average K value. Keratoconus patients had more improvement in topographic measurements than patients with ectasia. Both CDVA and maximum K value worsened between baseline and 1 month, followed by improvement between 1, 3, and 6 months and stabilization thereafter.

# **Protective Effect Of Bilberry (*Vaccinium Myrtillus L.*) Extracts On Cultured Human Corneal Limbal Epithelial Cells (HCLEC).**

Song J, Li Y, Ge J, Duan Y, Sze SC, Tong Y Shaw PC, Ng TB, Tsui KC, Zhuo Y, Zhang KY

The School of Chinese Medicine, LKS Faculty of Medicine, The University of Hong Kong, Pokfulam, Hong Kong SAR, China.

## **Abstract**

The use of bilberry (*Vaccinium myrtillus L.*) as a food and medicine for improving human vision has a long history all over the world. However, there is lack of convincing evidence from rigorous clinical trials or scientific research. This study investigated the effects of different concentrations of bilberry extracts on the cell viability, cell cycle and the expression of hyaluronic acid and glycosaminoglycans of cultured human corneal limbal epithelial cells. The data showed that bilberry extracts had no cytotoxicity to the corneal limbal epithelial cells at a wide range of concentrations ( $10(-9)$ - $10(-4)$  M, equalized to the content of cyanidin-3-O-glucoside). Bilberry extract ( $10(-6)$ ,  $10(-5)$  and  $10(-4)$  M) increased cell viability after 48 h incubation. The number of cells decreased in G(0)/G(1) phase and increased prominently in S and G(2)/M phases after treatment with bilberry extracts at a high concentration ( $10(-4)$  M). The expression of glycosaminoglycans increased prominently after incubation with bilberry extracts ( $10(-7)$  and  $10(-4)$  M) for 48 h while no significant changes were observed for the expression of hyaluronic acid. The results indicated that bilberry extract may be beneficial for the physiological renewal and homeostasis of corneal epithelial cells.

# LaCrima<sup>TM</sup>

## Clinical Pharmacology Summary/Description:

LaCrima provides a balanced blend of essential polyunsaturated fatty acids necessary for many body functions: Omega 3 oil from Flax Seed and Canola, and Omega 6 oil from Primrose and Black Currant. Oleic Acid, an Omega 9 oil from Canola and Flax Seed, plays a beneficial role in ocular health.

## Treatment:

Two (2) softgels daily of LaCrima comprehensive dry eye support.

## Active Ingredients:

Flax Seed Oil  
Evening Primrose Oil  
Canola Oil  
Black Currant Oil  
Pumpkin Seed Oil

## Published Studies and Clinicals:

See Attachments.

## A Comparative Efficacy & Safety Study of LaCrima:

LaCrima contains a blend of oils (Flax Seed Oil, Evening Primrose Oil, Canola Oil, Black Currant oil and Pumpkin Seed Oil) which aid in the synthesis and maintenance of tear production.

Each serving may also provide the following naturally occurring amounts of polyunsaturated fats and monounsaturated fats:
Domega-3 oils: Alpha Linoleinic Acid (ALA) 900 mg
Domega-6 oils: Linoleic Acid and Gamma Linolenic Acid (GLA) 350 mg
Omega-9 oils: Oleic Acid 350 mg
Other oils: Short chain fatty acids, saturated fats, phospholipids, etc. 220 mg
This statement has not been evaluated by the FDA. This product is not intended to diagnose, treat, cure or prevent any disease.
Contains no sugar, salt, starch, yeast, corn, soy, milk, egg, shellfish or preservatives.

This product provides a blank field for us to enter additional polyunsaturated fatty acids (PUFAs) and their derivatives, necessary for many body functions: Omega-3 fatty acids (and their derivatives), Omega-6 fatty acids (and their derivatives), and Gamma-linolenic acid (GLA). From Primrose and Black Seed Oil, we can also add flaxseed oil, hempseed oil, and other PUFAs.

GMP Certified



# LaCrima<sup>™</sup>

## Dry Eye Formula

with Essential Fatty Acids

100 Softgels  
Dietary Supplement

0  
13964  
51498  
8

**Recommended by  
Eye Care Professionals**

**Suggested Usage:**  
Take 2 daily or as  
directed by your eye  
care professional.

Manufactured for  
**OcculISTA**  
32625 W. Seven Mile Rd.  
Livonia MI 48152  
[www.occulista.com](http://www.occulista.com)  
**Professional  
Vision Care Formulas**

## Supplement Facts

Serving Size 2 Softgels Servings Per Container 50

	Per Serving	Amount	% Daily Value
Calories	20		
Calories from Fat	20		
Total Fat	2 g		3%*
Saturated Fat	< 0.5 g		2%*
Trans Fat	0 g		†
Polyunsaturated Fat	1.5 g		†
Monounsaturated Fat	< 0.5 g		†
Cholesterol	0 mg		0%
Flax Seed Oil (cold pressed, organic) (Linum usitatissimum ) (seed)	1400 mg		†
Evening Primrose Oil (cold pressed) (Oenothera biennis ) (seed)	300 mg		†
Canola Oil (cold pressed)	260 mg		†
Black Currant Oil ( Ribes nigrum ) (seed)	20 mg		†
Pumpkin Seed Oil ( Cucurbita pepo ) (seed)	20 mg		†

\*Percent Daily Values are based on a 2,000 calorie diet. † Daily Value not established.

Other ingredients: Softgel Capsule (gelatin, glycerin, water), carob.

Do Not Eat Freshness Packet. Keep in Bottle.

Store in a cool, dry place. Please Recycle.

## **Black Currant**

---

Comparative Study Of Diets Enriched With Evening Primrose, Black Currant, Borage Or Fungal Oils On Blood Pressure And Pressor Responses In Spontaneously Hypertensive Rats.

Prostaglandins Leukot Essent Fatty Acids. 1993 Oct;49(4):809-14.

Engler MM.

Department of Physiological Nursing, University of California, San Francisco 94143-0610.

### **Abstract**

The effects of oils enriched with gamma-linolenic acid (GLA) on blood pressure and pressor responses were examined in spontaneously hypertensive rats (SHR). Rats were fed purified diets containing evening primrose (EPO), black currant (BCO), borage (BOR) or fungal (FGO) oils for 7 weeks.

Significant reductions in blood pressure were obtained in SHR rats maintained on diets enriched with GLA oils. The antihypertensive effect was not associated with enhanced pressor responsiveness to norepinephrine or angiotensin II.

Moreover, no differences were found in blood pressure responses to the calcium channel blocker, verapamil. The results suggest that GLA-enriched oils inhibit the development of hypertension in the SHR rat. The blood pressure lowering effect is not mediated by altered pressor responses to vasoconstrictor hormones or intracellular calcium mechanisms.

## Canola Oil

---

Dietary Modeling Shows That The Substitution Of Canola Oil For Fats Commonly Used In The United States Would Increase Compliance With Dietary Recommendations For Fatty Acids.

J Am Diet Assoc. 2007 Oct;107(10):1726-34.

Johnson GH, Keast DR, Kris-Etherton PM.

Department of Food Science and Human Nutrition, The University of Illinois, Urbana-Champaign, USA. guy@nutritionsolutions.net

Comment in:

- J Am Diet Assoc. 2007 Oct;107(10):1701.
- J Am Diet Assoc. 2007 Oct;107(10):1723-5.

### Abstract

**OBJECTIVE:** To examine the effect of substituting canola oil for selected vegetable oils and canola oil-based margarine for other spreads on energy, fatty acid, and cholesterol intakes among US adults.

**DESIGN:** Twenty-four-hour food recall data from the 1999-2002 National Health and Nutrition Examination Survey (NHANES) were used to calculate the effect of substituting canola oil for dietary corn, cottonseed, safflower, soybean, and vegetable oils described as "not further specified" and of canola oil-based margarine for other spreads at 25%, 50%, and 100% replacement levels.

**SUBJECTS:** Adult participants aged > or = 20 years (n=8,983) of the 1999-2002 NHANES.

**STATISTICAL ANALYSIS:** Sample-weighted mean daily intake values and the percentage of subjects meeting dietary recommendations were estimated at the various replacement levels. Standard errors of the means and percentages were estimated by the linearization method of SUDAAN.

**RESULTS:** Significant ( $P<0.05$ ) changes compared to estimated actual intakes included: saturated fatty acid intake decreased by 4.7% and 9.4% with 50% and 100% substitution, respectively. Complete substitution increased monounsaturated fatty acid and alpha-linolenic acid intakes by 27.6% and 73.0%, respectively, and decreased n-6 polyunsaturated fatty acid and linoleic acid intakes by 32.4% and 44.9%, respectively. The ratio of n-6 to n-3 fatty acids decreased from 9.8:1 to 3.1:1 with 100% replacement. Energy, total fat, and cholesterol intakes did not change.

**CONCLUSIONS:** Substitution of canola oil and canola oil-based margarine for most other vegetable oils and spreads increases compliance with dietary recommendations for saturated fatty acid, monounsaturated fatty acid, and alpha-linolenic acid, but not for linoleic acid, among US adults.

## **Evening Primrose Oil**

---

The Clinical Advantages Of Cold-Pressed Non-Raffinated Evening Primrose Oil Over Refined Preparations.

Med Hypotheses. 2004;62(1):116-8.

Puri BK.

Department of Imaging Sciences, MRI Unit, MRC Clinical Sciences Centre, Faculty of Medicine, Imperial College School of Medicine, Hammersmith Hospital Campus, Du Cane Road, London W12 0HS, UK. basant.puri@csc.mrc.ac.uk

### **Abstract**

The non-triglyceride fraction of unrefined evening primrose oil has recently been shown to contain 3-O-trans-caffeooyl derivatives of betulinic, morolic, and oleanolic acid. These lipophilic pentacyclic triterpenes have free radical scavenging, cyclooxygenase and neutrophil elastase inhibitory activities, and are therefore likely to be of benefit to human health.

However, biochemical assays have suggested that these lipophilic antioxidants only occur in trace amounts, if at all, in commercial samples of evening primrose oil. A newly available commercially available cold-pressed, non-raffinated evening primrose oil preparation was found to contain a pentacyclic triterpene ester.

Given the potential benefits of the triterpene esters, it is suggested that such a cold-pressed, non-raffinated commercially available evening primrose oil product is likely to have greater health benefits than conventional evening primrose oil preparations

# Flax Seed Oil

## Development And Validation Of A Flax (*Linum Usitatissimum L.*) Gene Expression Oligo Microarray.

Fenart S, Ndong YP, Duarte J, Rivière N, Wilmer J, van Wuytsinkel O, Luau A, Cariou E, Neutelings G, Gutierrez L, Chabbert B, Guillot X, Tavernier R, Hawkins S, Thomasset B. Université Lille Nord de France, Lille 1 UMR INRA 1281, SADV, F- 59650 Villeneuve d'Ascq cedex, France.

### Abstract

**BACKGROUND:** Flax (*Linum usitatissimum L.*) has been cultivated for around 9,000 years and is therefore one of the oldest cultivated species. Today, flax is still grown for its oil (oil-flax or linseed cultivars) and its cellulose-rich fibres (fibre-flax cultivars) used for high-value linen garments and composite materials. Despite the wide industrial use of flax-derived products, and our actual understanding of the regulation of both wood fibre production and oil biosynthesis more information must be acquired in both domains.

Recent advances in genomics are now providing opportunities to improve our fundamental knowledge of these complex processes. In this paper we report the development and validation of a high-density oligo microarray platform dedicated to gene expression analyses in flax.

**RESULTS:** Nine different RNA samples obtained from flax inner- and outer-stems, seeds, leaves and roots were used to generate a collection of 1,066,481 ESTs by massive parallel pyrosequencing. Sequences were assembled into 59,626 unigenes and 48,021 sequences were selected for oligo design and high-density microarray (Nimblegen 385K) fabrication with eight, non-overlapping 25-mers oligos per unigene. 18 independent experiments were used to evaluate the hybridization quality, precision, specificity and accuracy and all results confirmed the high technical quality of our microarray platform. Cross-validation of microarray data was carried out using quantitative qRT-PCR.

Nine target genes were selected on the basis of microarray results and reflected the whole range of fold change (both up-regulated and down-regulated genes in different samples). A statistically significant positive correlation was obtained comparing expression levels for each target gene across all biological replicates both in qRT-PCR and microarray results. Further experiments illustrated the capacity of our arrays to detect differential gene expression in a variety of flax tissues as well as between two contrasted flax varieties.

**CONCLUSION:** All results suggest that our high-density flax oligo-microarray platform can be used as a very sensitive tool for analyzing gene expression in a large variety of tissues as well as in different cultivars. Moreover, this highly reliable platform can also be used for the quantification of mRNA transcriptional profiling in different flax tissues.

## Pumpkin Seed Oil

### Characteristics And Composition Of Watermelon, Pumpkin, And Paprika Seed Oils And Flours.

J Agric Food Chem. 2001 Mar;49(3):1253-9.

El-Adawy TA, Taha KM.

Food Science and Technology Department and Agricultural Biochemistry Department,

Faculty of Agriculture, Menofiya University, 32516 Shibin El-Kom, Egypt.

El\_Adawy@hotmail.com

#### Abstract

The nutritional quality and functional properties of paprika seed flour and seed kernel flours of pumpkin and watermelon were studied, as were the characteristics and structure of their seed oils. Paprika seed and seed kernels of pumpkin and watermelon were rich in oil and protein.

All flour samples contained considerable amounts of P, K, Mg, Mn, and Ca. Paprika seed flour was superior to watermelon and pumpkin seed kernel flours in content of lysine and total essential amino acids. Oil samples had high amounts of unsaturated fatty acids with linoleic and oleic acids as the major acids. All oil samples fractionated into seven classes including triglycerides as a major lipid class.

Data obtained for the oils' characteristics compare well with those of other edible oils. Antinutritional compounds such as stachyose, raffinose, verbascose, trypsin inhibitor, phytic acid, and tannins were detected in all flours. Pumpkin seed kernel flour had higher values of chemical score, essential amino acid index, and in vitro protein digestibility than the other flours examined.

The first limiting amino acid was lysine for both watermelon and pumpkin seed kernel flours, but it was leucine in paprika seed flour. Protein solubility index, water and fat

absorption capacities, emulsification properties, and foam stability were excellent in watermelon and pumpkin seed kernel flours and fairly good in paprika seed flour.

Flour samples could be potentially added to food systems such as bakery products and ground meat formulations not only as a nutrient supplement but also as a functional agent in these formulations.

