Herbal treatment of cataract: A review of the literature

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Abstract
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HERBAL TREATMENT OF CATARACT:
A REVIEW OF THE LITERATURE

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and
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Jeremy Taylor received his bachelors of Science degree in biology from Western Oregon University in 2000. He received a Health Professions Scholarship from the United States Air Force while attending Pacific University College of Optometry. After receiving his Doctor of Optometry from Pacific University in 2004, Jeremy will serve as Captain in the United States Air Force.
ABSTRACT

A comprehensive literature review was conducted to determine the extent of research performed on herbal remedies used for the treatment and prevention of cataract. Topics discussed include cataract epidemiology, conventional means of treatment and prevention, discussion of different philosophies such as naturopathy, homeopathy, and allopathy, and overviews of scientific research regarding herbal formulations and their efficacy on treatment and/or prevention of cataract.
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Herbal Treatment of Cataract:  
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Allopathic Remedies, Antioxidants, Bilberry, Buddlejae Flos, Cataracts, Cineraria Maritima, Corydalis Tuber, Ginkgo Biloba, Goshajinkigan, Hachimi-Jio-Gan, Herbal Supplements, Homeopathic Remedies, Momordica Charantia Linn, Naturopathic Remedies, Orengedoku-To, Pa-Wei-Di-Hum-Wan, Kakkon-To

INTRODUCTION:  
Clinically, "cataract is defined as visual impairment as a result of a disturbance of lens transparency". It is estimated that 400,000 people each year develop cataracts in the United States alone, and cataract is responsible for about 35% of existing visual impairment. Because of these staggering numbers a better understanding of cataract formation is sought and more efficacious treatment is currently being investigated. Age-related, or senile cataract, develops with age. During a lifetime the lens is subjected to several cataractogenic stresses, coupled with the loss of some ability to protect itself. (A review of these mechanisms will be discussed later) These facts are well known, not only in the health care fields, but also to the general public. When searching the internet there is a plethora of herbal medications that claim to be "cataract cures". The lack of scientific information about the safety and efficacy of these products presents a problem to the eye care practitioner when patients ask for recommendations about them. The purpose of this study is to explore the scientific research regarding the efficacy and safety of these herbal medications.
The lens is an elegant structure that relies on its organization to focus images on the retina. It is made up of a lens capsule, cortex, adult nucleus, fetal nucleus, and embryonic nucleus. Crystallins, (an important part of the lens structure) are water-soluble structural proteins that make up 90% of the lens proteins. These proteins are packed together to allow lens transparency, and are the topic of many biochemical studies. Alteration of these proteins may contribute to cataract formation.\textsuperscript{2} Senile cataracts manifest changes in both cortical and nuclear regions.\textsuperscript{'} Cortical cataracts are caused by a change of electrolyte and water balance, while nuclear cataracts are associated with protein modification and insolubilization, with increased coloration.\textsuperscript{'} In order to better understand these processes, one must look at the biochemistry of the lens, and some of the changes that take place during cataract formation. Figure 1 indicates various factors that can lead to senile cataract formation, several of which are implicated in the cause of other types of cataracts also, such as diabetic cataract. These factors are the causative agents in cataract development regardless of age.\textsuperscript{3} This paper will cite selected research regarding the efficacy of herbal medications on age-related cataract, as well as sugar (diabetic) cataract, and other earlier onset cataracts that have similar mechanisms.
CONVENTIONAL WESTERN MEDICINE METHODS OF TREATMENT AND PREVENTION OF CATARACT

It has been widely accepted, but not conclusively proven, that protecting the eyes from ultraviolet radiation in combination with eating the appropriate vegetables is the best method for prevention and slowing of cataract. Studies to prove this hypothesis are very difficult to control, because of the long course of cataract development and the variation of diet between individuals. In the AREDS study, the administration of vitamin C, vitamin E, and B-carotene, was shown to have virtually no impact on progression of cataracts, however, other studies do support the hypothesis that a higher intake of vitamin C and vitamin E does prevent or delay cataract development. An example of this is the Nurses’ Health Study, in which there was a lower cataract incidence in those with the
highest dietary intake of lutein, zeaxanthin, and vitamin A over a 12 year period. The longitudinal Study of Cataract showed a one-third decrease in developing nuclear opacification when multivitamins were used regularly, and a one-half decrease with regular use of vitamin E, although the authors do state results are inconclusive. The Blue Mountain eye study shows long-term use of multivitamins including vitamin A and B is associated with reduced incidence of cataract. There are also other studies in which the use of a multivitamin showed varying degrees of efficacy in the prevention or slowing of progression of cataract. Most of these studies recommend further research before definitive conclusions are drawn.

According to the American Optometric Association (AOA) guidelines, oxidation of membrane lipids, structural or enzymatic proteins, or DNA by peroxides or free radicals induced by UV light may be early initiating events that lead to loss of transparency in both the nuclear-and-cortical lens tissue. It is because of these hypotheses and studies that there is a recommended approach, but still not yet a clinically established treatment, for prevention of cataract. As stated in the AOA guidelines, a "low-cost and low-risk preventative strategy is to reduce exposure to sunlight, decrease or discontinue smoking, and possibly increase antioxidant vitamin intake." Aspirin, which had been previously mentioned in the AOA guidelines as a possible prevention for cataract, has recently been refuted by three studies showing no association between the use of aspirin and the risk of developing cataracts.

Because there is little proof in the scientific literature about methods of preventing cataract, much of the clinical focus has been directed toward methods of treatment. According to the AOA guidelines determining the best method of treatment begins with deciding if the patient is a surgical or nonsurgical patient. (See Figure 2: Flow chart) This is determined by the level of visual acuity, contrast sensitivity measurement, and the patients' own perception of whether or not their symptoms are interfering with activities of daily living. Nonsurgical patients with incipient cataract may have changes in refractive status, increased blur, reduced contrast, and recent glare problems. The first
Figure 2: Optometric Management of the Adult Patient With Cataract: A Brief Flowchart

Patient History and Examination

Supplemental Testing

Assessment and Diagnosis

Asymptomatic Cataract

Symptomatic Cataract

No significant Vision loss
Educate patient; Schedule for Periodic Re-evaluation Per Guideline

Significant Vision loss
Educate patient; Discuss surgery option

Mild vision Loss
Educate patient; Discuss surgical option

Moderate to severe vision loss
Educate patient; Discuss surgical option

Decision against surgery

Prescribe spectacles or contact lenses; Employ other optical and nonoptical aids as needed to enhance visual abilities; Schedule for periodic re-evaluation per Guideline

Decision for surgery

Consultation with ophthalmic surgeon for preoperative evaluation

Surgery contraindicated

Surgery provided

Schedule postoperative evaluations per Guideline; Prescribe optical correction; Schedule long-term follow-up

treatment recommended for this patient is to prescribe the optimal lenses, whether spectacle or contact lenses. It is important to remember that with a monocular refractive change, which is possible from cataractous changes, spectacles may cause an increase in size difference, which may be less noticeable with contact lenses. Sometimes decentration of the spectacle lens may be necessary in order to reduce visual discomfort or vertical diplopia. Filters are recommended to decrease glare, primarily ones that filter the shorter wavelengths. Patients with nonsurgical cataracts are also advised to wear brimmed hats and sunglasses to decrease glare. There is no mention in the AOA guidelines of whether these products to reduce the amount of UV light entering the eye and possibly slow cataract progression. Dilation of the pupils with phenylephrine 2.5% or tropicamide 0.5% has also been suggested with a centrally located cataract, to allow light to enter peripherally leading to improved vision. This may be indicated for patients who defer cataract surgery.4

Surgery is the preferred method of treatment "when cataract formation has reduced visual acuity to the level that it interferes with the patient's lifestyle and everyday activities, and when satisfactory functional vision cannot be obtained with spectacles, contact lenses, or other optical aids." 4 Current surgical techniques for cataract extraction include extracapsular cataract extraction (ECCE) by phacoemulsification.

Phacoemulsification, which is depicted in Figure 3, is the most commonly used procedure for cataract extraction. This procedure is constantly being improved, but the basic procedure is as follows: two small incisions are made, one for the phaco probe and one for the manipulating probe. A controlled circular tear is made in the anterior lens capsule. Hydrodissication of the lens capsule from the cortex is performed by injecting fluid between the cortex and capsule. The phaco probe is used to sculpt the nucleus to form two trenches at right angles to each other. The manipulator probe may be used with the phaco probe to chop the nucleus into several pieces. These pieces are then aspirated, along with the remaining cortex. Then the intraocular lens (IOL) is inserted into the capsule and newer IOL’s have been designed which are folded and inserted through a smaller incision. The advantages of phacoemulsification include faster wound healing
time and faster stabilization of refractive error when compared to the larger incision procedures used in the past.\textsuperscript{12}

Figure 3: Phacoemulsification of cataract during surgery.


ALLOPATHIC PREVENTION AND TREATMENT MODALITIES

Many patients today prefer to try a "natural" method of treatment before resigning to or in conjunction with the use of conventional western medicine. Therefore it is important to know the difference between some common terms used to describe a philosophy of treatment.
**Allopathy:** use of non-homeopathic remedies. The treatment of disease by using remedies whose effects differ from those produced by that disease. This is the principle of mainstream medical practice as opposed to that of **homeopathy**.13

**Homeopathy:** Complimentary disease treatment system in which the patient is given minute doses of natural drugs that in larger doses would produce symptoms of the disease itself. This system was created by Dr. Samuel **Hahnemann** in 18th century on the assumption that like can be cured by **like**.13

**Naturopathy:** Drug-free medical treatment: A system of medicine founded on the belief that diet, mental state, exercise, breathing, and other natural factors are central to origin and treatment of **disease**.13

**Herb:** A plant with a soft stem containing little wood, especially an aromatic plant used in medicine or seasoning. The plant usually produces seeds and then dies down at the end of the growing **season**.14

**Herbal medicine:** Treatment with herbs: The system of medical treatment based on properties of medicinal **herbs**.13

**HERBAL TREATMENTS INTENDED FOR CATARACTS**

Many herbal remedies have been purported to have an affect on prevention or treatment of cataracts. These claims predominantly lack evidence to support them. An exhaustive search of peer-reviewed journals yielded few scientific studies related to herbal treatment options for cataracts. The scientific studies that were found will be discussed in this section.
U.S. STUDIES OF HERBAL MEDICATIONS

SUCCUS CINERARIA MAFUTIMA (Dusty Miller)

Succus Cineraria Maritima is a simple formula in which the common plant Senecio cineraria is coupled with Hamamalis vulgaris (Witch Hazel) in a boric-glycerin solution. "This formulation is the only anticataract agent currently available by prescription in the United States", although there has been no apparent published scientific reports on this agent. The topical instillation of this preparation is purported to increase circulation by acting as a lymphagogue, (stimulating the production or flow of lymph). This is a caustic formulation, which may be destructive to living tissue.

GINGKO BILOBA

Figure 4: Ginkgo Biloba supplement. www.drugstore.com/products

Ginkgo biloba (Figure 4) is a medicinal herb whose effects on many organ systems are currently being studied. Gingko is one of the most popular herbal supplements sold in the United States, with sales estimates reaching over 310 million dollars per year. A study published in 2002 reported that Ginkgo biloba extract (GBE) has some potential as an ophthalmic drug. The study included a section specifically
pertaining to cataracts, which included an in vivo study on rat cataract retardation with use of GBE injections. The results state "gingko biloba appears to be of value to the lens since our results show that it has cataracto-static ability".17 This study suggests that cataracts can be prevented by the antioxidative properties of flavanoids, several of which are contained in GBE (quercetin, kaempferol, isorhamnetin, and myricetin).17

**BILBERRY** *(Vaccinium myrtillus)*

![Bilberry plant and berries.](www.kareth.com/systematik/html/nordens141.html)

While bilberry (Figure 5) is referred to by naturopathic physicians as a common herbal medication used for the eye we were only able to find one study in which bilberry was shown to be efficacious in slowing progression of cataract. Bilberry is commonly referred to as an herbal medication for the eye because it contains flavanoids called anthocyanosides, which are potent antioxidants. This particular study used a combination of concentrated 25% anthocyanosides extract (180mg 2x/day) and vitamin E (200 mg/day). During a four month period this combination slowed the progression in 48 of 50 patients with senile cataract, compared to only 76 percent of the control group.7
CHINESE STUDIES OF HERBAL MEDICATIONS

HACHIMI-JIO-GAN (Traditional Chinese herbal preparation)

Several studies have been performed on the effects of Hachimi-Jio-Gan (HJG) in traditional Chinese medicine. This medicine is reportedly used for various senile illnesses in China and other Asian countries. Animal studies were performed with both hereditary and galactosemic cataract models. A mouse hereditary cataract study was performed to determine the efficacy of this medication on biochemical mechanisms related to cataract formation. The results show that it may provide prophylaxis against cataractogenesis. The authors also suggest that the mechanism of action may be a combination of antioxidant activity and effects on the Na⁺K⁺-ATPase pump. The authors suggest that dosage studies and human trials should be performed before any conclusions are made on efficacy in humans.¹⁸

A rat galactosemic cataract study was also performed using this preparation. The drug appears to have efficacy against galactosemic cataract and appears to have hypoglycemic effects. The results of this animal study showed that HJG may have prophylactic efficacy against rat galactosemic cataract and may slow the progression of cataract. The preparation of HJG appeared to restore the ionic balance in the lens thus ensuring clarity. The authors again suggest further investigation before parallels for human results are drawn.¹⁹

PA-WEI-DI-HUAN-WAN (PWDHW) Contains the same ingredients as HJG mentioned in a previous study, ZHANG-YAN-MING (ZYM), AND FLAVANOID (Traditional Chinese herbal formulation)

PWDHW and ZYM are both tablets made up of 8 and 12 Chinese herbs, respectively. PWDHW contains the following Chinese herbs: *Cinnamomum cassia* Blume, *Corunus officinalis* Sieb. et Zucc, *Dioscorea batatas* Decaisne, *Rehmannia glutinosa* Libosch var.
purpurea Makino, Alisma oriental Juzepczuc, Porioscos Wolf, Aconitum carmichaeli Debx and Poeonia sulffridicosa Andrews.\textsuperscript{20} ZYM contains: Cornus officinalis Sieb. Et Zucc (8%), Cistanche salsa G. Beck (12%), Cimicifuga foetida L. (2%), Vitex rotundifolia L. (6%), Prinsepia uniflora Batal (10%), Codonopsis pilosula Nannf (12%), Ligusticum wallichii Franch (3%), Chrysanthemum morfolium Ramat (10%) Lycium chinense Mill (12%), Astragalus membranceus Bge (15%), Buddleia officinalis Maxim (8%), and Acorus gramineus Soland (2%).

These two tablets were found to have efficacy in a study on diabetic cataract. They were shown to reduce the amount of sorbitol in an \textit{in vitro} study of intact rabbit lenses. The amount of sorbitol in the lens was measured by using C-nuclear magnetic resonance spectroscopy. The results state that among the commercially available products used in China for treatment of cataract, PWDHW and ZYM showed promising efficacy in treatment of diabetic cataract, while the two topical herbal formulations used for cataract treatment, Bai-Nei-Ting and Pearl Min-Mu-Ye, showed no efficacy at all. The statement was made that the flavanoids (chemical structures making up natural colors of flowers and vegetables) tested showed moderate inhibition of sorbitol metabolism, but required much higher concentrations than could feasibly get to the lens.

In the discussion the authors mention that PWDHW and ZYM could become popular anti-cataract drugs if a topical application could be developed.\textsuperscript{20}

\textbf{CORYDALIS TUBER (Rhizoma Corydalis)}

Corydalis Tuber was tested for its inhibitory efficacy against the aldose reductase enzyme, which is implicated in the development of diabetic cataract. In this study rat lenses were used to acquire the enzyme and \textit{C. tuber} was used to develop an extract. A methanolic extract and the alkaloidal component, dehydrocorydaline, were found to be inhibitory against the enzyme in this \textit{in vitro} study. Inhibition was determined by spectrophotometry absorption of the 340nm wavelength. The authors state that dehydrocorydaline may be effective in the treatment of the complications of diabetes, such as cataract and keratopathy.\textsuperscript{21}
BUDDLEJAE FLOS (Pale Butterflybush Flower)

Buddlejae Flos, the flower of Buddleja officinalis, was found to be an affective inhibitor of the aldose reductase enzyme in a similar in vitro study. Buddlejae Flos was found to contain the flavonoids, luteolin, apigenin, and acacetin, which are thought to be the primary inhibiting components. Inhibition was determined by spectrophotometry absorption of the 340nm wavelength, which shows NADPH oxidation and reductase enzymatic activity. The authors expect this herbal extract to have promise in the treatment of complications of diabetes, such as cataract and keratopathy.  

INDIA STUDIES OF HERBAL MEDICATIONS

MOMORDICA CHARANTIA LINN

The fruit of bitter-gourd (Momordica charantia Linn.) has a protein as its active principal. This protein (vegetable insulin) is homologous to human insulin. It is proposed that when consumed orally this herb is an effective hypoglycemic agent. A study was performed on rats, which were injected with alloxan, to cause hyperglycemia and simulate diabetic rats. Once rats were found to have high blood sugar, they were divided into two groups one received the herbal extract orally and the other didn't. The results showed that Momordica caused a reduction of blood sugar, which was postulated to be the reason for the delayed appearance of cataract.

JAPANESE STUDIES OF HERBAL MEDICATIONS

GOSHAJINKIGAN (Traditional Chinese herbal preparation) very similar to PWDHW and HJG

In a case study, a 65 year old female with diabetes and developing PSC cataract was given Catalin and \textit{tathion} (topical formulation for cataract). The results showed no success and worsening of the cataract. The patient wanted to use \textit{Goshajinkigan} (GJ), and was put on GJ at a dose of 5.0g/day, with continued Catalin and thathion. After 10 days the patient reported less blur and improved visual acuity. The patient reported even less blur when the dosage was increased to 7.5g/day 3 months later, but no clinically measurable improvement of visual acuity was noted. After 8 months of treatment the ocular findings were unchanged. GJ contains two additional herbs, evodia fruit and \textit{plantago} seed. It is also well known for its effectiveness in suppressing the rat lens aldose reductase enzyme. The authors conclude that GJ improves blurred and misty vision in a senile diabetic woman with progressive cataracts, but clarification of the mechanism awaits further studies.\textsuperscript{24}

\textbf{ORENGEDOKU-TO, KAKKON-TO, SAIREI-TO}

Three traditional herbal medicines, Orengedoku-to, Kakkon-to, and Sairei-to, that are currently commercially available in Japan, were studied for their effects on aqueous flare and inflammation after small incision cataract surgery. The preparations were in the form of a tea that the patient took three days preoperatively and seven days postoperatively. Aqueous flare was then measured. Two of the herbal medicines, Orengedoku-to and Kakkon-to, caused a clinically measurable reduction in flare, while the third, Sairei-to, did not. The side effects of the medications were also addressed in this study.\textsuperscript{25}

\textbf{THOUGHTS FROM A NATUROPATHIC PHYSICIAN}

After discussion with a naturopathic physician, Jill \textit{Stansbury}, CMA, BS, ND, it became clear that the use of herbal medications for cataract prevention or slowing cataract progression is not viewed as a simple treatment plan. It is a very holistic approach in which many herbal remedies are combined to give not only the lens, but the eye as a whole the nutrients it needs. This can be done through tinctures, pills, teas, drops, or by a specific diet. It has been mentioned many times that blue berries
(bilberry), or any berries containing blue or purple pigments, (flavanoids called anthocyanins, and anthocyanoids) are the primary natural medication that target eye health, specifically lens health. In general, antioxidants and UV protectors, for instance, flavanoids, are believed to be the primary natural ingredient responsible for the slowing of the progression of cataracts. Practitioners still recommend anti-oxidants even after the release of the aforementioned AREDS study results.26

The approach most commonly used by Naturopathic physicians includes the use of some or all of the following:

Cineraria maritima, which is from old literature and folklore to remove the "film" from inside the eye. This particular herbal medication is thought to work through its causticity, thereby increasing blood flow to the eye and stimulating natural methods of repair to ocular tissues. Zinc Chloride was also mentioned for cataract prevention by this caustic method, but its main use has been in veterinary medicine. Along with Cineraria, the flavanoids are thought to work as powerful antioxidants, which as discussed earlier, is controversial as to its efficacy. Gingko Biloba is a common herbal medication on the market today, and is thought to prevent cataracts by maintaining good blood flow to ocular tissues, which in turn maintains good overall health. Euphrasia, or "Eyebright" is another commonly mentioned herbal medication used for the eye, but no literature or information to support or negate the use of Euphrasia for the prevention of slowing the progression of cataracts was found.26

QUALITY CONTROL OF HERBAL MEDICATIONS USED IN THE UNITED STATES

The American Herbal Products Association states that, "All supplements, including herbs, vitamins, minerals, etc., must conform to Federal regulations that control their manufacture, labeling, and advertising."27 Herbal supplements must conform to Federal and state regulations, and also adhere to state and local health and business regulations, before a manufacturer can distribute them. Herbal products are regulated just like food products in the U.S., which means they are free of adulteration and are not misbranded. Manufacturers now are also required to limit their ingredients to either those that were already in the market prior to passage of the Dietary Supplement Health and
Education Act of 1994, or to those that a company can convincingly prove to be safe to the Food and Drug Administration. In addition the Commissioner of the FDA stated in testimony, before Congress, "FDA has tools at its disposal to take enforcement actions against dietary supplements found to have safety, labeling, or other violations..." and that she believes the current law, “...provides FDA with the necessary legal authority to protect the public health.” Further details on this Act can be found at the American Herbal Products Association and The United States Food and Drug Administration websites. It is also recommended to purchase products from companies who are members of the American Herbal Products Association (AHPA). This is a self-governing association whose members have agreed to abide by a Code of Ethics that requires adherence to specific regulations and policies. It is in this manner that the herbal industry is self-governed.

SUMMARY
This article attempts to bring the reader current information on research for the herbal treatment of cataract. The collection of herbal cataract studies is still small, and much more research is needed before any conclusions can be made about the effectiveness as well as the safety of many of these treatment options. These studies are important to aid in the treatment of patients and to ensure their safety. Many plant preparations can contain powerful chemicals that may be harmful if not used properly. It is also important to determine if there is any benefit from these preparations to aid medical professionals in making informed recommendations. At this time, herbal and antioxidant treatment of cataract is a widely expanding area of research, and in the future studies may open new doors for cataract prevention. Right now, it is the authors’ opinion that there is insufficient evidence to suggest that any herbal preparation can cure or prevent cataract formation. The scientific evidence to support such a claim is not conclusive. It is important that future studies be performed to ensure that the patients' quality of life is improved rather than harmed before such a claim can be made. Right now, the authors feel that the only 'cure' for cataract that already exists remains cataract extraction surgery. As for prevention, the scientific community is still in the early stages of research. There is still much to explore in the herbal treatment of cataract.
REFERENCES:


