



## A GUIDE FOR PATIENTS LIVING WITH DRY EYES

*Joseph Tauber, M.D.*

### *What is Dry Eye?*

One of the more common causes of eye irritation is chronic dry eye disease. Dry eyes are estimated to affect almost 90 million Americans and nearly 75 million have never been diagnosed by a doctor. The tear film which covers the surface of the eye is a complex 3 layered structure. It is made mostly of water, but also has an inner layer of mucus, which holds the tear film to the eye surface and an outer layer of lipids (oils) which slow evaporation of tears. The tear film lubricates the eye, smoothes irregularities for better vision, washes germs and other irritating substances from the eye surface and carries oxygen to the surface of the eye. "Dry eye disease" is a general name for various disorders of the tear film, which may be classified into two broad categories: (1) decreased tear production or (2) excessive tear evaporation. Regardless of the mechanism, water is lost from the tear film, making it more "concentrated". This draws water from the eye tissues, leading to further deterioration of the health of the eye surface. Eventually, dry rough spots appear on the eye surface, which may reduce vision. In severe cases, scarring may develop.

### *Who is at Risk to Suffer from Dry Eyes?*

Dry eye becomes more common with increasing age and as body hormone changes occur. Most commonly affected are post-menopausal women. Medications taken by mouth are another common cause of dry eyes. Several categories of drugs may cause or worsen the symptoms dry eye, but especially antihistamines. More rarely, there can be a genetic or hereditary cause of dry eyes. Most likely to cause worsening of dry eye are low humidity environments, wind, central heat or air conditioning and airplane travel. Contact lens wear may also worsen symptoms.

Certain autoimmune conditions, such as Rheumatoid arthritis and Lupus, occur together with dry eyes. The most severe form of dry eye is related to a condition known as Sjogren's Syndrome. This condition affects several million people throughout the world. Not only are the eyes dry, but there is usually dryness of the mouth, nose, throat and other tissues throughout the body. The cause of Sjogren's syndrome is not known, but probably results from a combination of genetic and external factors.

## ***How is Dry Eye Diagnosed?***

Dry eye disorders pose a challenging problem in diagnosis for physicians. Many different factors can contribute to dry eyes, and determining the cause may affect selection of the best treatment. Most important is listening carefully to a patient's history. Patients with dry eye report symptoms which worsen as the day goes on, including:

- Sandy, gritty sensation
- Eye redness
- Burning or stinging
- Dryness
- Blurred vision
- Foreign-body sensation
- Contact lens intolerance

## ***How is Dry Eye Treated?***

There are three broad strategies to treating dry eye:

### ***1. Tear supplementation***

The mainstay of treatment for dry eyes is artificial tears. Many good artificial tear preparations exist and are available in drugstores without a doctor's prescription. Some artificial tear preparations are thin and watery while others are thick and viscous. The thicker ones last longer but they may be somewhat sticky and have a tendency to blur the vision slightly. The ideal artificial tear is one that lasts a long time, is comfortable to put in the eyes, and does not cause blurring or stickiness. There is, however, no single ideal artificial tear preparation that is good for everyone. Often, people with dry eyes must try several different preparations to find the one that works best for them. In recent years, artificial tears without preservatives have become available in unit doses. These may have some advantages since people using artificial tears several times a day may react adversely to a preservative. Several brands include electrolytes (salts), which may help heal the damaging effects of dry or "concentrated" tears on the surface of the eye.

Lubricating ointments are very useful, especially for nighttime use. Because these ointments blur the vision, they are less suitable for daytime use. At night, however, they keep the eye moist and avoid the need for frequent artificial tears. Generally, only a small amount of ointment is necessary, about the size of a grain of rice. If the eyes are too blurry or sticky in the morning, it may be that too much ointment was used the night before.

## ***2. Stimulate greater tear production***

One of the most important scientific breakthroughs in improving our understanding of dry eye came over the last 15 years, as it became clear that inflammation is an important part of the disease. For patients who have an autoimmune inflammatory disease and for those who do not, changes occur, in part due to age-related hormonal changes that create inflammation within the lacrimal glands. These glands, located just above each eye, produce the water component of our tears. As inflammation in these glands develops and increases, tear production drops and symptoms of dry eye develop. Inflammation eventually involves the entire ocular surface, not just the glands.

There is one medication eyedrop available today that has been proven to reduce inflammation on the ocular surface resulting in increased tear production. Restasis is a prescription eyedrop that can be used twice daily (or rarely up to four times daily) to increase “natural” tear production. By reducing inflammation, one’s own glands can resume producing tears, unless chronic inflammation has destroyed too much of the tear-producing tissue. For this reason, Restasis may not be effective for all patients. Some (15% or so) find the drop to be irritating and are unable to maintain chronic treatment. Restasis does not cure dry eye, and must be continued to maintain maximal tear production.

## ***3. Retaining the moisture being produced***

In addition to using artificial tears, it is helpful to make the most of the tears that are being produced. Wrap-around glasses can help seal in moisture particularly when they fit closely against the skin. Some opticians may be able to fit prescription glasses with side shields that help retain moisture.

### ***Punctal Occlusion***

As for most medical conditions, surgery is usually a last resort. Fortunately, there are some simple office procedures which can be extremely helpful for dry eyes. The most important one is known as “punctal occlusion”. This is simply a way of sealing up the tear drainage so that one’s tears are retained on the eye. This is similar to placing a plug in the drain in order to help a slow-running faucet fill the kitchen sink. There are several ways of doing punctal occlusion. These include “dissolving” plugs made from collagen, permanent plugs made from silicone or rarely, closure by heat treatment or cautery. Punctal plug procedures are permanent but reversible.

### ***Tarsorrhaphy***

Partial closure by suture of the edges of the lids at the outer margin of the eye is another procedure which can be helpful for the patient with severe dry eye. This surgery reduces the area of exposure and thus reduces evaporation of the tear film.

## ***What is Being Learned from Current Research on Dry Eye?***

Current research has revealed much new information about what causes dry eye to develop. Hormonal factors are becoming understood, and eventually it is hoped that specific correction of hormonal abnormalities will change how we treat dry eye. Within several years, hormone-containing tear substitutes may become available. Much work has been done on the use of medications, which reduce inflammation on the eye surface. Dr. Tauber has been very personally involved in the research on Restasis, other forms of cyclosporine and newer medications which are in development to treat the cause of dry eye, rather than simply treating the symptoms. Our office has been very involved in this research for the past twenty years.

Support groups, such as the Sjogren's Syndrome Foundation are especially helpful in bringing new research developments and practical information to the attention of people with dry eyes. It is clear that the efforts of scientists, medical practitioners, and the drug industry are leading to new and better ways of solving the problems related to dry eyes.

## ***What is Blepharitis and How Does It Relate to Dry Eye?***

Blepharitis is an eye condition caused by inflammation of the eyelid margins. This may be due to 1. infection of the eyelid or 2. excess oil production from the oil glands within the eyelid. A complete eye examination is necessary for an accurate diagnosis of the type of blepharitis to determine the most effective treatment.

Eyelid abnormalities can produce the same symptoms as dry eye, and can also make dry eye symptoms worse. In fact, 50-70% of patients with dry eye (underproduction of tears) also have eyelid-related dry eye (excessive tear evaporation). It is important to identify any eyelid abnormalities, which may be present and contribute to symptoms of dry eye. Oils produced by eyelid glands function like "chapstick" to slow evaporation of tears from the surface of the eye. Failing to correct eyelid problems often results in failure of dry eye treatments to relieve symptoms. For example, some people do not fully close their eyelids together when they sleep, causing "exposure" of the eye surface all night long. This causes tears to evaporate overnight, severely drying the surface. A careful eye examination allows the physician to test the quality, quantity and stability of the tears and to look for irritation of the eye surface. Tear production can be measured using absorbent paper strips.

## **Types of Blepharitis**

Some patients have bacteria (germs) growing on the involved lids. Common findings in this type of “anterior blepharitis” are scaly skin flakes along the eyelid margins and dried crusts sticking to the lashes. Inflammation caused by accumulation of this material causes the eyelid margins to redden, stick together and can alter the growth of the eyelashes or cause lashes to fall out. When crusts get into the tear film, a gritty sensation occurs that can lead to rubbing, which worsens the already red, irritated eyes. Sometimes, infection of the lids develops in addition to the “mechanical” irritation caused by the crusting, recognizable by a thick mucoid discharge and “sticky lids” all day.

“Posterior blepharitis” or “meibomitis” is caused by improper function of the oil glands located along the eyelid margins. Many patients with this form of blepharitis have dandruff, acne or other general skin conditions such as seborrhea or acne rosacea. Burning, stinging, blurred vision and redness are common symptoms. Excess oil gland production can also lead to roughened eyelids and mucous debris that accumulates during sleep. The ducts which carry oil from the gland to the tear film can become blocked from the thick, abnormal oil. Infection, (a stye), or inflammation (a chalazion) can develop after a duct is blocked. Posterior blepharitis is far more common than anterior (2:1), but some patients have both forms of the condition at the same time.

### ***Treatment Recommendations***

**EYELID CLEANSING** One of the best ways to relieve the symptoms associated with anterior blepharitis is to carefully clean the eyelids of accumulated flakes and crusts. Until the crusts are eliminated, comfort is unlikely to be achieved. Daily lid cleaning, using the specific technique recommended for you is the cornerstone of controlling symptoms of blepharitis. Sometimes, shampoo treatment of the lids is recommended to loosen the crusts.

For posterior blepharitis / meibomitis, a different technique of eyelid cleaning is recommended, emphasizing a squeezing of the eyelid to express the thick oils out of the glands and into the tear film. Details of these techniques should be discussed with your doctor, as variations are recommended for different patients. Inadequate performance of lid cleaning is the greatest obstacle to achieving control of symptoms. Medications taken by mouth are useful to thin or alter the oil composition of the glands. Tetracycline, or doxycycline may be recommended to help thin the excessively thick oils. These drugs have anti-inflammatory effects in addition to their antibiotic activity. Side effects may occur in some individuals, including skin rash, slight nausea and especially increased sensitivity to sunburn. Following the initial treatment course, the medication dosage may be slowly decreased. This is usually based on tolerance and improvement of your eye condition. Some patients benefit from months of treatment with these pills.

## ***What is Being Learned from Current Research on Blepharitis?***

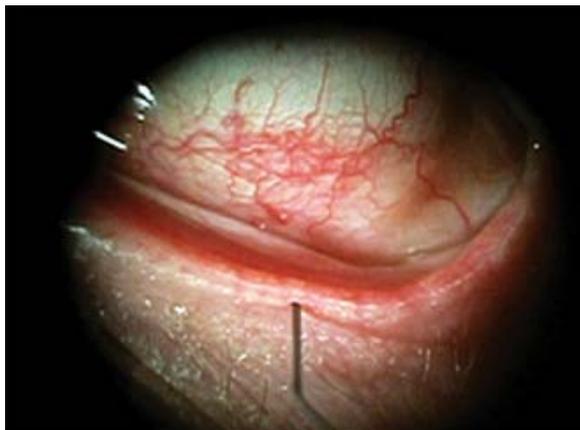
Recent research of a prescription antibiotic eyedrop called Azasite has shown that this eyedrop also has anti-inflammatory effects and may help “normalize” the abnormal oils that lead to posterior blepharitis / meibomitis. Large clinical trial studies are underway now to study this. Tauber Eye Center is very closely involved with these studies and other research on this medication.

### ***MEIBOMIAN GLAND DUCT PROBING***

A new method of relieving the obstruction to the flow of oil from the meibomian gland has recently been shown to offer marked relief of symptoms. This technique, developed by Dr. Steven L. Maskin of Tampa, Florida, involves an in-office treatment using tiny stainless steel probes measuring 2mm, 4mm or 6mm in length to break up adhesions and fibrotic bands within the duct of the glands. Because the duct openings are extremely small and there are 20-30 ducts in each eyelid, this treatment takes some time to perform. Because eyelids in patients with meibomitis are often tender and sore, it may be necessary to perform the treatment in stages over several weeks. The eyelid is numbed using a liquid anesthetic before the treatment, which is performed in our office. Benefits reported by patients who have had this procedure performed include:

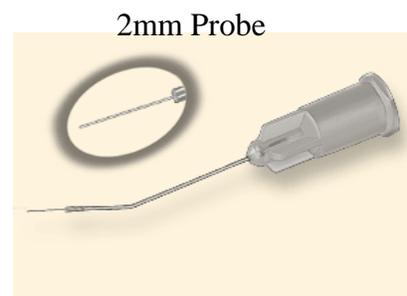
- |                                  |                                     |
|----------------------------------|-------------------------------------|
| ● Relief from lid tenderness     | ● Decreased light sensitivity       |
| ● Increased lubrication          | ● Improved vision                   |
| ● Less friction                  | ● Decreased gumminess and filminess |
| ● Improved lid blinking comfort  | ● Decreased lid heaviness           |
| ● Less need for artificial tears |                                     |

Our experience to date has shown that 70% of patients who undergo probing experience marked relief of their worst symptoms. While results cannot be guaranteed, meibomian gland duct probing is an exciting advance in our ability to treat this chronic irritating condition.



**Lower eyelid probing being performed**

IMAGE COURTESY OF STEVEN MASKIN, M.D.



## Helpful Tips For Choosing and Using Artificial Lubricants

- Bottled artificial tears contain a preservative, and should not be used more than four times daily. If more frequent use is needed, unit-dose or non-preserved tears should be used. Several newer brands of bottled tears (Refresh tears, Genteal) have a rapidly disappearing preservative. These tears are better than preserved products, but not as mild as preservative-free tears.
- Thicker gel tears give longer lasting lubrication, but may blur for a time after their use.
- Bedtime lubricating ointments provides long lasting relief because it works during the time that tear production is lowest – overnight.
- Use artificial tears on a set schedule, not after discomfort occurs. It is more effective to prevent symptoms than to relieve them.
- Avoid over-the-counter “eye whiteners” such as Visine, Clear Eyes, Albalon, Allergy drops, Degest 2, Murine Plus, Opcon, Naphcon, Prefrin, Relief, Soothe, etc.

### Eyelid Cleaning Instructions

<b>Anterior blepharitis:</b> <b>SOAK → SHAMPOO → SCRUB</b>	<b>Posterior blepharitis:</b> <b>SOAK → SQUEEZE → SCRUB</b>
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1. (A) Place a clean face cloth under hot water from the faucet or heat in a microwave oven (8 – 9 seconds) until it is **warm but not burning**. (B) A small size gel pack is a more convenient way to heat the lids (microwave 8-15 seconds).
2. **Close your eyes** and press the warm facecloth closely against your lids and eyelashes. Reheat the cloth (hot water or microwave) once it cools off. Continue soaking for **5-7 minutes**, usually 3 repetitions.
  - Looking upwards, place the side of your index finger just under the lower lashes and squeeze the lid firmly between your one finger and the eyeball for about 4 seconds. You should be pushing the lid against the eyeball, pressing towards the back of your head. Reposition your finger across each lower lid, repeating this at 4 areas. While looking downwards, repeat this squeezing at 4 areas on each upper lid near the lashes.

**(4 SPOTS - 4 LIDS - 4 SECONDS)**

Done properly, squeezing should briefly blur vision.
  - Put a small amount of Johnson & Johnson Baby Shampoo on a facecloth and rub into eyelashes.
3. Wrap the warm facecloth over your index finger and gently scrub the lid edges to remove crusts and debris.
4. Do this entire treatment two times a day.
5. If prescribed, apply eye medications after the warm soaks.

→  
**Posterior  
Blepharitis  
Only**

→  
**Anterior  
Blepharitis  
Only**

## Artificial Tear Preparations

NOTE: PF = preservative – free. Usually sold as unit dose vials, which should be used and discarded within 24 hours. Without preservative, germs can multiply within the vial if contaminated.

BAK = Benzalkonium chloride, a preservative that may worsen dry eye

### ARTIFICIAL TEARS & LIQUIGELS: METHYLCELLULOSE

PRODUCT	ACTIVE INGREDIENT(S)	PRESERVATIVE	APPOX. COST
<u>Bion Tears</u>	0.3% <u>HPMC</u> , 0.1% Dextran 70	None (PF)	\$14.99 (28 vials)
<u>Gentel Mild</u>	0.2% <u>HPMC</u>	GenAqua	\$11.49 (0.84 fl oz)
<u>Gentel Moderate to Severe</u>	0.3% <u>HPMC</u> , 0.25% <u>CMC</u>	GenAqua	\$11.49 (0.84 fl oz)
<u>Optive</u>	0.5% <u>CMC</u> 0.9% Glycerin	Purite	\$10.49 (0.5 fl oz)
<u>Refresh Tears</u>	0.5% <u>CMC</u>	Purite	\$9.59 (0.5 fl oz)
<u>Refresh Plus</u>	0.5% <u>CMC</u>	None (PF)	\$17.63 (70 vials)
<u>Refresh Celluvisc</u>	1.0% <u>CMC</u>	None (PF)	\$12.39 (30 vials)
<u>Refresh Endura</u>	Glycerin 1.0%, polysorbate 80 1.0%	None (PF)	\$15.49 (20 vials)
<u>Refresh Liquigel</u>	1.0% <u>CMC</u>	Purite	\$9.59 (0.5 fl oz)
<u>Tears Naturale Forte</u>	0.3% <u>HPMC</u> , 0.1% Dextran 70, 0.2% glycerin	Polyquad	\$14.99 (30mL)
<u>Tears Naturale II</u>	0.3% <u>HPMC</u> , 0.1% Dextran 70	Polyquad	\$14.49 (30 mL)
<u>Tears Naturale Free</u>	0.3% <u>HPMC</u> , 0.1% Dextran 70	None (PF)	\$14.99 (60 vials)
<u>Thera Tears</u>	0.25% <u>CMC</u>	Sodium perborate	\$9.99 (15mL)
<u>Thera Tears single-use vials</u>	0.25% <u>CMC</u>	None (PF)	\$11.99 (32 vials)
<u>Thera Tears Liquigel</u>	1.0% <u>CMC</u>	None (PF)	\$12.49 (28 vials)
<u>Visine Tears</u>	0.2% <u>HPMC</u> , 0.2% glycerin, 1% polyethylene glycol 400	<u>BAK !!</u>	\$8.59 (30mL)
<u>Visine Pure Tears Portables</u>	0.2% <u>HPMC</u> , 0.2% glycerin, 1% polyethylene glycol 400	None (PF)	\$6.99 (28 vials)
<u>Visine Pure Tears Single Drop Dispenser</u>	0.2% <u>HPMC</u> , 0.2% glycerin, 1% polyethylene glycol 400		\$9.99 (0.3 fl oz)

## Artificial Tear Preparations – continued

Artificial tears: PROPYLENE GLYCOL AND/OR glycerin

PRODUCT	ACTIVE INGREDIENT(S)	PRESERVATIVE	APPRX. COST
Note: "Advanced Eye Relief" is the B&L product formerly known as MoistureEyes			
<u>Advanced Eye Relief "Environmental"</u>	1.0% Propylene glycol, 0.3% glycerin	<u>BAK !!!</u>	\$6.69 for 15mL
<u>Advanced Eye Relief "Rejuvenation"</u>	0.95% propylene glycol	<u>BAK !!!</u>	\$6.69 for 15mL
<u>Advanced Eye Relief "Rejuvenation"</u>	0.95% propylene glycol	None (PF)	\$8.69 for 32 vials
<u>Oasis Tears</u>	0.2% glycerin (15%)	None (PF)	\$20.00
<u>Oasis Tears Plus</u>	0.2% glycerin (30%)	None (PF)	\$22.00
<u>Systane</u>	0.4% Polyethylene Glycol 400, 0.3% Polyethylene Glycol	Polyquad	\$10.99 for 15mL
<u>Systane P.F.</u>	0.4% Polyethylene Glycol 400, 0.3% Polyethylene Glycol	None (PF)	\$11.49 for 28 vials

### **ARTIFICIAL TEARS: PVA, POVIDONE**

PRODUCT	ACTIVE INGREDIENT(S)	PRESERVATIVE	APPRX. COST
<u>Dwelle (1)</u>	2.7% blended <u>PVAs</u> , 2% povidone	Polexitonium	\$10.00 (15mL)
<u>Dakrina (1)</u>	2.7% blended <u>PVAs</u> , 2% povidone	Polexitonium	\$10.00 (15mL)
<u>Freshkote (2)</u>			
<u>Hypotears</u>	1% Polyvinyl Alcohol , 1% Polyethylene Glycol 400	<u>BAK !!!</u> But also available PF	\$11.49 (15mL). Could not locate pricing for PF vials
<u>NutraTear (1)</u>	0.4% <u>PVA</u> (99% hydrolyzed), 0.2% <u>PVA</u> (87% hydrolyzed)	Polexitonium	\$10.00 (15mL)
<u>Refresh Lubricant Eye Drops</u>	1.6% <u>PVA</u> , 0.4% povidone	None (PF)	\$16.49 for 50 vials
<u>NutraTear (1)</u>	0.4% <u>PVA</u> (99% hydrolyzed), 0.2% <u>PVA</u> (87% hydrolyzed)	Polexitonium	\$10.00 (15mL)

## Artificial Tear Preparations – continued

### EMOLLIENTS

PRODUCT	ACTIVE INGREDIENT(S)	PRESERVATIVE	APPRX. COST
<u>Soothe</u>	Light mineral oil, mineral oil	Polyhexamethylene Biguanide	\$10.99 (15mL)

### ARTIFICIAL TEARS: HOMEOPATHIC

PRODUCT	ACTIVE INGREDIENT(S)	PRESERVATIVE	APPRX. COST
<u>Similasan</u>	HOMEOPATHIC mercurius sublimatus 6x, belladonna 6x, euphrasia	silver sulfate	\$8.49 0.33 fl oz

### GELS & LIQUIGELS

PRODUCT	ACTIVE INGREDIENT(S)	PRESERVATIVE	APPRX. COST
<u>Gentleal Gel</u>	0.3% <u>HPMC</u> , Carbopol 980	GenAqua	\$10.49 for 10mL
<u>Refresh Liquigel</u>	1.0% <u>CMC</u>	Purite	\$11.72 for 30mL
<u>Soothe XP</u>	Light mineral oil 1% mineral oil 4.5%	Polyhexamethylene Biguanide	\$13.99 (15mL)
<u>TheraTears liquid gel</u>	1.0% <u>CMC</u>	None (PF)	\$12.49 (28 vials)

### OINTMENTS

PRODUCT	ACTIVE INGREDIENT(S)	PRESERVATIVE	APPRX. COST
<u>Advanced Eye Relief Night Time</u>	White petrolatum, mineral oil	None (PF)	\$10.59 (0.12 oz)
<u>Gentleal PM</u>	White petrolatum, mineral oil	None (PF)	\$8.99 (0.12 oz)
<u>Lacrilube</u>	White petrolatum, mineral oil	Chlorobutanol	\$18.89 (0.25 oz)
<u>Refresh PM</u>	White petrolatum, mineral oil	None (PF)	\$10.99 (0.12 oz)
<u>Tears Naturale PM</u>	White petrolatum, mineral oil	None (PF)	\$10.19 (0.12 oz)
<u>Systane Ointment</u>	White petrolatum, mineral oil	None (PF)	\$10.99 (0.12 oz)
<u>Gentleal Ointment</u>	White petrolatum, mineral oil	None (PF)	\$10.99 (0.12 oz)

### SPRAYS/mists

PRODUCT	ACTIVE INGREDIENT(S)	PRESERVATIVE	APPRX. COST
<u>Clarymist (UK)</u>	Soy lecithin 1.0%	Phenoxyethanol 0.5%	£12.50 (10mL)
Nature's Tears		None	\$7.95
<u>Quintess Qusome eyelid spray</u>	(NOTE: As far as we know, this is NOT a liposome spray.)	TBA	\$16.95 (0.5 fl oz)
<u>Tears Again liposome spray</u>	(We understand this to be equivalent to the Clarymist liposome spray)	TBA	\$20.95





## **Joseph Tauber, M.D.**



Dr. Joseph Tauber specializes in anterior segment surgery, corneal transplantation, the treatment of corneal and external diseases and laser vision correction procedures. A board-certified ophthalmologist, Dr. Tauber received his doctorate from Harvard Medical School, his training in internal medicine at Beth Israel Hospital and in ophthalmology at Tufts-New England Medical Center, all located in Boston, Massachusetts. Dr. Tauber enhanced his medical education with two years of ocular immunology

and corneal and external disease fellowship training at the Massachusetts Eye and Ear Infirmary. Dr. Tauber has been performing laser vision correction surgery since 1989, and has experience with all the major lasers in use today. Avidly involved in research for over a decade, Dr. Tauber has been a principal investigator in over 60 research studies of high-risk corneal transplantation, inflammation and allergic eye diseases, corneal infectious diseases and numerous studies related to dry eye disease. He is a member of the American Academy of Ophthalmology and numerous other professional associations. He has been Medical Director of the Heartland Lions Eye Bank since 2000, and was one of the first surgeons in the Midwest doing DSAEK, the new near-sutureless method of corneal transplantation. Dr. Tauber specializes in advanced ocular surface surgeries such as stem cell transplants and amniotic membrane grafting. He is a leading national surgeon for keratoprosthesis, the artificial corneal transplant.