



Dry Eye Disease

A simplified explanation of what it is, how we test for it and how we treat it.

Joseph Tauber, MD

Crystal Remington, OD

“Dry eye disease” can cause varied complaints, even tearing (wet eyes).

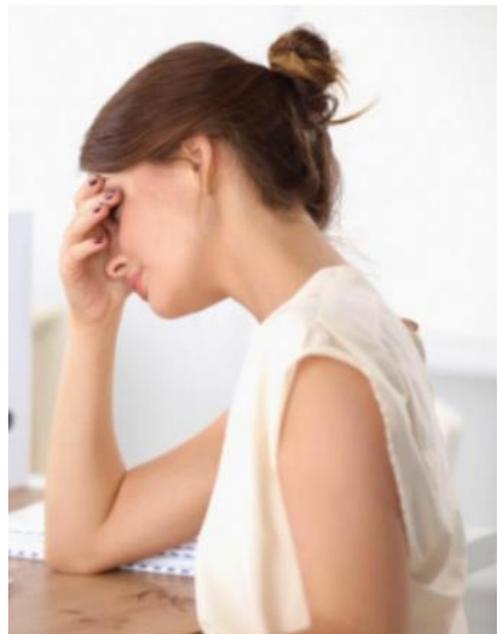
The most common symptoms of dry eye are:

- Dryness
- Discomfort and Irritation
- Grittiness
- Burning
- Stinging
- Tearing
- Redness
- Discharge
- Tiredness
- Itching
- Blur
- Sensitivity to light



Dry eye affects everyday living:

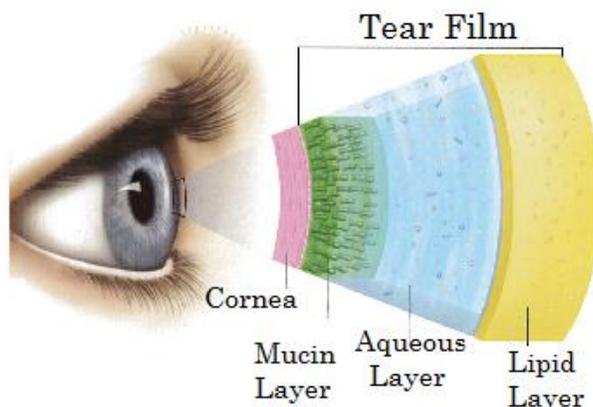
- Difficulty performing visual tasks, such as reading, using a computer, driving and watching television
- Inability to wear contact lenses
- Fluctuating vision
- Constant need for lubricating eye drops
- Trouble being out in the sun
- Symptoms that worsen late in the day



Understanding Dry Eye Disease

The **Tear Film** that coats the cornea and the surface of the eye has many functions, but especially:

1. Lubrication of the eye surface;
2. Smoothing minor irregularities for better vision;
3. Rinsing germs and other irritants from the eye surface;
4. Delivering oxygen to the surface of the eye.



“Dry eye disease” is a phrase that describes any disorder of the tear film that causes symptoms. Dry eye disease is typically categorized into two types, according to the root cause of the tear deficiency:

**decreased tear production (water deficient) and / or
excessive evaporation (oil deficient).**

While evaporative dry eye is the more common type, most patients (50-70%) have both types of tear abnormality. It is very important to identify and treat each type of dry eye disease that is identified.

If both conditions are not well treated, it is unlikely symptoms will be relieved.

Even a perfect treatment plan for tear underproduction will not be enough to control excessive tear evaporation and vice versa.

A combination of a thorough eye examination and special testing help to identify the type of dry eye disease that is present.

Testing for Dry Eye Disease

When dry eye symptoms develop, testing is important to identify the cause and the type of tear film abnormality that needs to be corrected. Testing is non-invasive and does not affect vision.

Tear Quality – We can test for the presence of specific components of the tears.

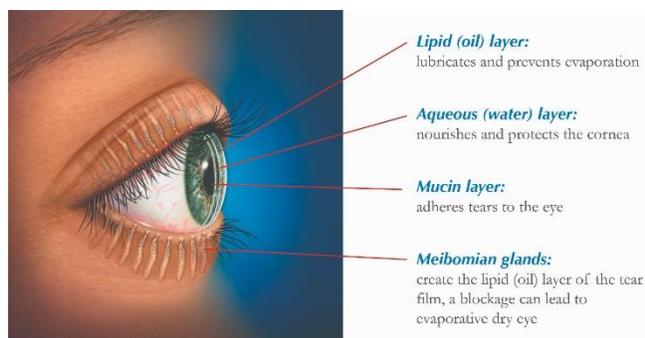
Osmolarity – This test measures the amount of dissolved molecules (mostly salts) in the tears. Osmolarity is often elevated in tears from patients with dry eye, either because there is too little water component produced or because the water component evaporates too quickly. This test requires a painless collection of a tiny amount of tears from each eye. No anesthetic is required for this test.

Inflammation – The presence of inflammation-related chemicals (MMP-9 or matrix metalloproteinase) in tears can be detected using a test called **InflammaDry**. This test requires a painless collection of a tiny amount of tears from each eye. No anesthetic is required for this test. If inflammation is detected, certain treatments may be prescribed to reduce or eliminate this problem.

Oil or Lipid Content – One of the essential components of tears is lipid, that acts like “chapstick” keeping the water component from evaporating. A reduced lipid layer can occur because the oil-producing glands in the eyelids are malfunctioning or are blocked by dried oils or have stopped working altogether. **LipiView** is an imaging (photographic) test that measures how much oil is in the tear film. If reduced oil is detected in the tears, treatments may include reopening clogged or blocked glands (if present) or oil-replacement eyedrops (if glands are non-functioning).

Eyelid Oil Glands – The eyelids are examined by direct observation during the eye exam, looking for abnormal crusting of the lashes, buildup of keratin (dry skin changes) on the margin or plugging of the oil producing glands (20-30 per eyelid).

We can observe details about the oil-producing glands in the eyelids using special imaging called Meibography. Two different tests perform infrared photography that shows the glands (**LipiView and Keratograph**) and shows areas where glands are shortened or not functioning. Both upper and lower lids can be imaged with these non-invasive tests that require only minimal positioning of the eyelids while the scan is recorded.



Examining the Eyes for Dry Eye Disease

While this handout cannot explain everything involved in an eye examination, several parts can be highlighted as they relate to dry eye disease.

Attention must be given to whether the eyelids fully close and to the anatomy of the eyelid margin and the oil producing glands (meibomian glands) that line the eyelid margin.

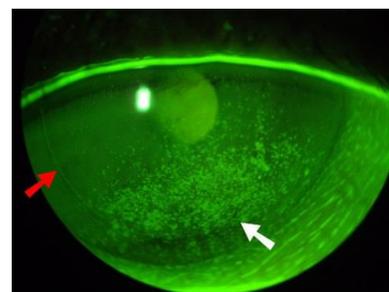
Incomplete lid closure requires specific treatment.



Tear Production – We can measure how much tears are produced with a test called the **Schirmer Test** that involves placing small strips of paper at the corners of the eyelids to measure the volume of tears produced over a five minute interval. As more tears are produced, a longer area of wetting is recorded on the paper strips. Numbing drops are used so that the paper strips do not cause discomfort.



Corneal Health – Special dyes (colored eyedrops), sometimes called stains, are applied to the eye surface to detect damage that can be caused by dry eye disease. These dyes wash off the eye surface after a short time



Dry Eye Treatment

Specific recommendations for any individual patient can only be made after appropriate examination and testing. Below is a broad overview of the strategies used to address the different causes of symptoms related to both decreased tear production and excessive tear evaporation.

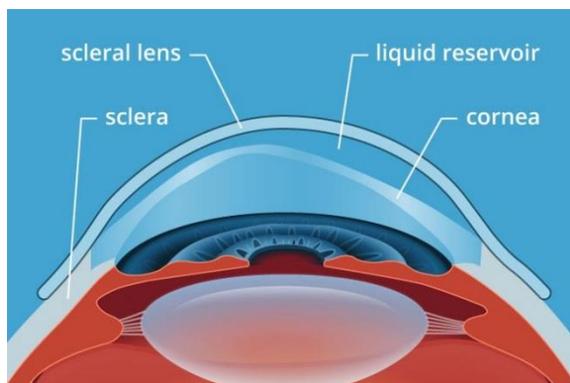
Treating dry eye symptoms caused by **decreased tear production** focuses on:

1. Tear supplementation (use of eyedrops, gel drops, ointments)
2. Tear stimulation (use of one of several prescription medication eyedrops)
3. Tear Retention (use of permanent but removable “plugs” to keep tears on the eye surface longer)

The mainstay of treatment for dry eye disease is artificial tears, and these should always be tried first. The ideal tear provides relief that lasts a long time and is comfortable without blurring. There is no one tear product that is ideal for everyone, but there are preferred choices for each type of dry eye, individualized for specific patient’s needs. Some patients do better with oil-containing artificial tears. Nighttime lubricating ointments are very useful. In severe cases, “serum tears” may be recommended. Serum tears are lubricant eyedrops prepared from a patient’s own serum, providing natural growth factors to the surface of the eye. These tears are prepared from the patient’s own serum, not from any other person’s serum.

Other more advanced treatments used in specific cases include:

- “Bandage” soft contact lenses
- Scleral contact lenses utilizing a tear reservoir to maintain surface lubrication
- Amniotic membranes to deliver anti-inflammatory and healing factors to the eye surface



Treating dry eye symptoms caused by **excessive tear evaporation** focuses on:

1. Effective eyelid hygiene
2. Pharmaceutical treatment of the eyelid oils (to liquefy or loosen oils)
3. Re-opening of the oil glands (meibomian gland ducts)
4. Thermal expression treatment (to melt and remove built up oils from glands)

Abnormal function of the oil producing (meibomian) glands can cause thickened and/or inflamed oil secretions that function improperly, leading to inflammation of both the glands and the tears. Abnormal oil function allows rapid evaporation (loss into the air) of tears, leaving a dry surface. Eyelid hygiene treatment (warming the lids, expressing the oils and removing eyelash crusts) is an essential part of controlling symptoms. **Without good lid hygiene, it is unlikely that symptoms will be completely relieved.** Instruction in effective methods to mobilize abnormally thick, stagnant and inflammatory oils is best done in person, as many patients perform this incorrectly or inadequately.

Thermal Expression Treatment is a phrase that describes the use of instruments to warm and then squeeze out oils from the clogged meibomian glands. We have two instruments for this treatment, LipiFlow and iLUX. These use different methods to reach the same goal – removal of clogged oils from glands. Details of each should be discussed during your examination.

Over thirty publications have reported great success with LipiFlow® treatment, in as many as 79% of patients within four weeks of the start of treatment and lasting for nine months or longer. The iLUX device was released much more recently and long term follow-up studies have not yet been reported, but early results suggest equivalent symptom relief as compared with LipiFlow, at least in the short term.



LipiFlow



iLUX

Meibomian gland duct probing This technique, in use since 2009, is an in-office treatment using tiny stainless steel probes 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 15 – 20 minutes 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 gel anesthetic before the treatment, which is performed in the office. Many patients report 70% of more relief of their symptoms, including:

- Relief from lid tenderness
- Improved lid blinking comfort
- Less need for artificial tears
- Decreased light sensitivity
- More stable and improved vision
- Decreased gumminess and filminess
- Decreased lid heaviness

While results cannot be guaranteed, meibomian gland duct probing is an exciting advance in our ability to treat this chronic and irritating condition.

Dr. Tauber is an internationally recognized authority on Dry Eye Disease and has been conducting research and lecturing in this field for over a decade.

Dr. Remington is a nationally recognized educator in the field of advanced contact lens fitting.

There is no substitute for an in-person consultation to discover the specific causes of dry eye for individual patients. This handout is intended as a guide and general reference only.



ADDITIONAL HANDOUTS



Eyelid Hygiene – Treat One Lid at a Time!

SOAK → SQUEEZE → (SHAMPOO) → SCRUB

1. Place the gel mask in a microwave oven (10 – 15 seconds) to get it as **warm as you can stand but not to be burning**.
 2. **Press** the mask firmly against your closed lids and lashes.
 3. Continue heating for **2-5 minutes**, to soften lid oils / crusts.
 4. **Treat each lower lid individually** by: Looking upwards, place the **side of your index finger** (not the fleshy bottom) just under the lower lashes and press the lid firmly towards the center of the eyeball for about 4 seconds. **To release oils, you must be pushing towards the center of the eyeball**. Treat both lower lids, each at 4 areas to treat the entire lid. Then, treat each upper lid while looking downwards, perform this squeezing at 4 areas on each upper lid near the lashes, also towards the center of your eye. Squeezing should briefly blur vision.
(PRESS FOR 4 SECONDS AT - 4 SPOTS - 4 LIDS)
- If your lashes are crusty, put a small amount of Baby Shampoo on a facecloth and rub into eyelashes.
5. Wrap a warm facecloth over your index finger and gently scrub the lid edges to remove crusts and debris.
 6. **Do this treatment two or more times a day.**
 7. If prescribed, apply eye medications after the lid hygiene.

DRY EYE & OCULAR SURFACE ONLINE RESOURCES

Education on dry eye chronic disease (scan with your phone app):

<https://www.myeyelove.com/chronic-dry-eye/the-skinny>



Education on dry eye and meibomian gland dysfunction:

<https://www.taubereye.com/procedures/video-gallery/>



Education on meibomian gland dysfunction and Lipiflow

<https://vimeo.com/129708070>



Education on proper warm-compress technique:

<https://www.youtube.com/watch?v=9oR8SpSNz6I>

