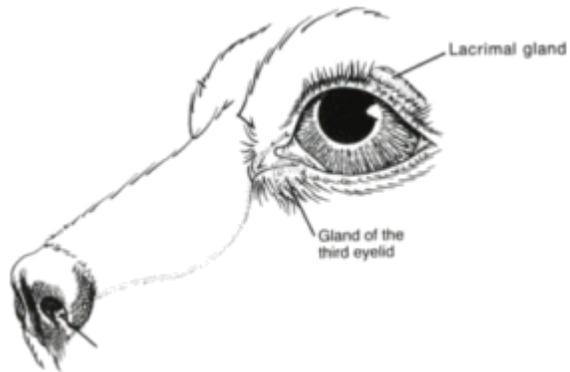


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Dry Eye (Keratoconjunctivitis Sicca)

Why Tears Are Good

We can all imagine the discomfort of dry, irritated eyes and the soothing provided by eye drops. Tears are essential to the comfort of our eyes but they do more than just provide lubrication. Tears contain anti-bacterial proteins, salts, sugars, and even oxygen to nourish the eye. Tears flush away irritants and infectious agents that are constantly getting in our eyes. Since the outer portions of the eye does not have a blood supply, the tears must bring sugars and oxygen and must remove metabolic waste.



Tears consist of oil secreted by the eyelid glands, mucus, and (mostly) water. Tears are secreted by two lacrimal glands in dogs and cats: one just above the eye and another in the third eyelid (or so-called nictating membrane).

Without tears, eyes become irritated, the conjunctival tissues around the eyes get red, the cornea itself in time will turn brown in an effort to protect the eye, and a gooey, yellow discharge predominates. Blindness can result.

Keratoconjunctivitis sicca, or KCS, is a fancy way of saying the eye is dry. Kerato refers to the cornea or clear covering of the eye that faces the outside world. Conjunctivae are the moist pink membranes of the eye socket. "It is" means inflammation and sicca means dry. KCS means inflamed, dry cornea and conjunctiva. It occurs when there is a deficiency in the water portion of the tear film that normally accounts for 95% of the tear volume. Without the water, one is left with oil and mucus; hence, the gooey yellow eye discharge characteristic of this condition.

Why Do Eyes Become This Dry?

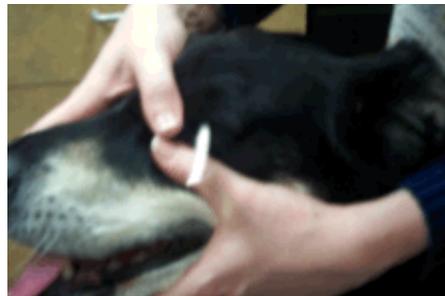
There are many causes of dry eye. Here are some of them:

- Distemper infection attacks all body interfaces with the environment including the eyes. Dry eye is part of the constellation of symptoms that can occur with distemper infection.
- In cats, Herpes upper respiratory infection can lead to a chronic dry eye
- There could be a congenital lack of tear producing gland tissue (as described in certain lines of Yorkshire terrier).
- Exposure to sulfa containing antibiotics (such as Trimethoprim sulfa combinations) can lead to dry eye (which can be either temporary or permanent and occurs unpredictably).
- Anesthesia will reduce tear function temporarily (thus eyes are lubricated with ointment by the attending nurse.)
- Removal of the third eyelid tear-producing gland (instead of replacing the gland in its proper location) during surgery for cherry eye can lead to KCS, as can too much damage to the gland prior to proper gland replacement.
- A knock on the head in the area of one of the tear producing glands can lead to KCS.
- The most common cause of KCS appears to be immune mediated destruction of the tear-producing gland tissue.

We do not know what causes this type of inflammatory reaction but certain breeds are predisposed: the American Cocker Spaniel, the Miniature Schnauzer, and the West Highland White Terrier.

How We Make the KCS Diagnosis

When KCS is in advanced state it is pretty obvious, but in earlier cases it may look like a simple case of conjunctivitis. In either case it is important to actually measure the tear production to determine how dry the eyes are. This test is called the Schirmer Tear Test.



To perform the test, a strip of special paper is inserted just inside the lower eyelid in the outer corner of the eye for 60 seconds. The moisture of the eye will wet the paper. At the end of the 60-second period, the height of the moistened area is measured. A height of 15 mm or more is normal. A height of 11mm to 14 mm is a borderline result. A height of less than 10 mm is dry. A height less than 5 mm is severely dry.

How Do We Treat This Condition?

Not that long ago all we had to treat this condition was tear replacement formulas and mucus dissolving agents. These are still helpful but require an impractical frequency of administration. A breakthrough came with the discovery of cyclosporine topical therapy to control the immune mediated gland destruction.

Cyclosporine® is an immunomodulating drug that had already been found helpful to organ transplant patients. When applied as an eye drop or ointment, it suppresses the immune destruction that is the most common cause of KCS and tear production is restored. The success of this treatment plus its convenient dosing interval (once or twice a day) has made this medication the primary treatment for KCS. This is LePar's "Dry Eye Mix" which is hand compounded with this active ingredient.

If our hospitals own cyclosporine eyedrops don't work, we will recommend **Optimmune eye ointment** that contains 0.2% cyclosporine. Currently, production problems have made this product difficult to obtain and many practices have resumed making their own eye drops or having compounding pharmacies formulate them.

After beginning cyclosporine eye drops or ointment, a recheck in 3 weeks or so is a good idea to check for improvement. If the Schirmer tear test is still showing poor results, the medication can be given three times a day; similarly if excellent results are seen, the medication can be dropped to once a day.

Dogs with Schirmer tear tests as low as 2 mm still have an 80% chance of responding to cyclosporine. This medication has been a very miraculous breakthrough in the treatment of KCS. Unfortunately, it is relatively expensive as eye medication goes but after messing around with less effective treatments requiring more frequent administration for less predictable results, cyclosporine is probably worth it.

Tacrolimus is another medication able to locally suppress immunity. This product has recently gained popularity in human medication as a topical anti-inflammatory treatment that is cortisone-free. It does not come in a formulation appropriate for eyes but can be made into one by a compounding pharmacy. It is used in a manner similar to cyclosporine and is generally of similar cost.

Pilocarpine is what is called a cholinergic drug, which means it works on the autonomic nervous system (the part that controls automatic functions such as gland secretion). Without going into too much neurologic detail, this medication can be given in the eye or even orally to stimulate tear production. To use this medication orally, the eye drops are given at an increasing dose until side effects are seen (diarrhea, drooling, vomiting, or drop in heart rate). At that point the dose is reduced and continued indefinitely, usually twice a day. Alternatively the drops can be given in the eyes. Recent studies have shown that pilocarpine does not increase tear production in normal dogs so there is some question over how well this method works.

Artificial tears can be purchased in most drug stores. These can be combined with other therapies and are certainly very soothing. The problem is that they are typically recommended for use 4 to 6 times a day.

Antibiotic products are often needed especially when starting treatment for KCS as secondary infections are common when there are inadequate tears to wash infectious agents away. These products do not increase tear production but may be important, especially early in therapy.

Mucomyst® Eye Drops are made from a respiratory product used to dissolve thick mucus. In an eye formula, Mucomyst (active ingredient is Acetylcysteine) helps remove the thick eye discharge that accompanies dry eye.

Severin's Solution is a mixture of Mucomyst, pilocarpine, artificial tears, and antibiotic that can be made up and prescribed. The recipe originated in an article published by a veterinary ophthalmologist named Dr. Severin in 1996. Many animal hospitals mix up their own conglomerations based on this recipe. In most cases, cyclosporine has made these mixtures obsolete.



Surgical Solutions

There is a surgical solution to KCS, but it is a delicate procedure in general is only done by veterinary ophthalmologists. This is called the **parotid duct transposition**. The parotid duct is the salivary gland on either side of the facial cheek. It produces saliva that is carried to the mouth via a long duct. This duct can be carefully dissected out and moved so as to deliver saliva over the eye. Saliva actually makes a reasonable substitute for tears though in time some mineral deposits will form on the eye surface and eye drops may be needed to control this. The dog's eyes will water when he is fed and facial wetting may be objectionable.

The pigment on the surface of the cornea resulting from long standing KCS is like the lens of dark sunglasses and interferes with a dog's vision, especially in dark situations. If tear function is restored, vision may also be restored via a procedure called a superficial keratectomy where the pigmented surface of the cornea is sanded away. This is obviously not worth doing if the tear issue is still problematic as the pigment would in that case just return. As with the parotid duct transposition, a veterinary ophthalmologist is probably best suited to perform such a procedure.