



## Keratoconjunctivitis Sicca (Dry Eye)

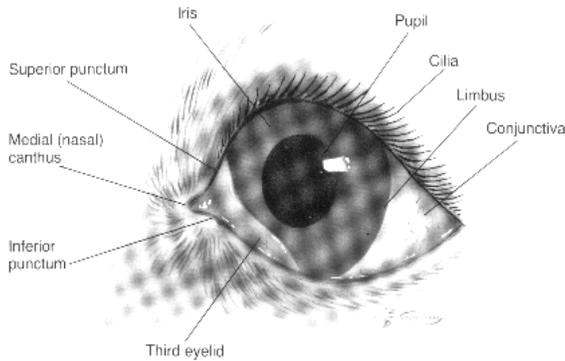


Figure 1. The Normal Canine Eye (Front View)<sup>1</sup>

This disease process occurs when tear secretion is deficient, and the cornea and conjunctiva (white part of the eye) becomes dried. This deficiency of tears results in excessive mucus buildup, bacterial conjunctivitis (eye inflammation/infection), corneal ulcers, corneal pigmentation, vascularization and scarring of the cornea. Keratoconjunctivitis sicca is traditionally a difficult disease to manage, and is one of the most frequent causes of vision loss in dogs.

### Natural Tear Production:

- Tears provide the cornea with lubrication and vital proteins, vitamins, growth factors and hormones. The normal cornea has no blood vessels and the lacrimal glands (tear glands) have evolved to produce the appropriate nutrients and other materials to sustain a healthy, clear cornea.
- The tear film is composed of three separate layers - each of which coats and protects the cornea.
- Tears flow from the tear ducts and coat all the exposed surfaces of the cornea and conjunctiva. The overflow exits through the nasolacrimal drainage system, which begins as a small duct in the inside corner of the eye and exits into the nose.

### Causes:

- Keratoconjunctivitis sicca (KCS) is the most common cause of canine conjunctivitis. KCS is suspected in any dog with chronic or re-occurring conjunctivitis, keratitis or corneal ulceration. Despite a long list of known causes of canine KCS, in most animals the disease is considered to have no known cause or is a result of immune-mediated disease.

- The following is a small list of causes of KCS with common characteristics of these causes:

Cause	Common Characteristics
Idiopathic or immune-mediated	Frequently associated with allergies, ear outer ear infections, hypothyroidism, rheumatic diseases, deficient salivation.
Congenital alacrima (birth defect)	Usually seen only in one eye - most likely in small breeds.
Neurologic	Associated with other nervous system disorders(e.g. deficient blinking, head tilt, lip drop, inner ear infection)
Drug-induced	Certain drugs may cause this problem; stopping the drug usually stops the KCS problem (e.g. sulfadiazine, sulfasalazine)
Distemper Virus	In puppies with inadequate vaccinations or a recent distemper infection.

### Clinical Signs:

- Long standing mucus discharge is the hallmark of KCS. Secondary bacterial growth often occurs with this disease and must be treated as well. Treatment of only the bacterial infection and not the underlying KCS will often result in mild or short-term improvement, however, the condition will return.
- In KCS, blepharitis (eyelid inflammation) and conjunctivitis occur with reddening of the eyes, crustiness around the eyes and itchy eyes.
- The surface of the cornea appears dull and opaque. Corneal scar formation varies in severity with this disease. Signs of scarring include blood vessel growth into the cornea and pigmentation.
- Blindness often occurs because of cornea becomes too opaque for light to be transmitted through.
- Ulceration of the cornea may occur in rapidly progressing cases of KCS. Most long-term cases of KCS cause thickening of the corneal surface and therefore less likelihood of ulceration.
- Pain is highly variable. Common signs of pain include excessive blinking, sensitivity to light and eye rubbing.

### Diagnosis:

- The diagnosis of KCS is made using a technique called a Schirmer Tear Test (STT). A small piece of sterile filter paper strip is placed in the eye for 1 minute. At the end of one minute the amount of wetness of the strip is measured. Normal wetting for dogs and cats is approximately 20 +/- 5 mm/minute. Typically, cases of KCS wet less than 10 mm/min, with the majority of cases less than 5 mm/min.
- The diagnosis of KCS may be made when decreased STT values occur together with corneal inflammation, ulceration, pigmentation or mucoid eye discharge.

### Treatment:

- The treatment of choice for KCS uses a topically applied immunosuppressive agent, cyclosporine, which is intended to reverse immune-mediated destruction of the tear glands and restore normal tear production.
- There are several advantages to treating this disease with cyclosporine:
  - *Production of natural tears*; cyclosporine appears to interrupt the disease process in the tear glands, allowing them to resume normal tear production. Because tears contain antibodies, vitamins, proteins, mucus, hormones and many other factors essential to the health of the cornea, the production of natural tears is a major advantage over the use of artificial tears.
  - *Anti-inflammatory effects*; cyclosporine is an immunosuppressive drug that reduces the corneal scarring, pigmentation, blood vessel growth, and conjunctival inflammation.
  - *Dosage frequency*; cyclosporine is usually administered twice daily in both eyes. Artificial tear supplementation requires much more frequent dosing.

### Method of Use:

- Cyclosporine is indicated for twice daily use, applied topically to both eyes. A commercial preparation, Optimunne®, is the preferred product at this time.
- An additional, broad-spectrum antibiotic eye ointment may be used 4 times daily in conjunction with the cyclosporine for 2 weeks to decrease secondary bacterial conjunctivitis while the cyclosporine takes effect.

### Monitoring:

- The patient is re-evaluated using STT results and other clinical signs 2-4 weeks after beginning treatment, and then monthly, until control of the disease process is achieved. Following 6 weeks of treatment, if signs have not improved, the dosage may need to be increased to three times daily (every 8 hours). If the STT is greater than 20 mm/min (normal to greater than normal), then a reduction to once daily or alternate-day dosing may be warranted.
- The STT should be performed approximately 3 hours after the cyclosporine was administered if possible. This is because the effect of cyclosporine on increase of the tear production is lost in most cases within 12-24 hours after the last dosage was administered.
- When treatment is interrupted for 24 hours (missed dosages), signs recur in approximately 90% of dogs that have been treated for over a year. Reapplication of the cyclosporine results in rapid increase of the STT, usually within 3 hours, and usually the clinical signs decrease within a week after resuming treatment.

### Response Rate:

- About 70% of all dogs with KCS respond positively to cyclosporine treatment within 2-4 weeks. An additional 10-15% of dogs respond to long-term treatment. About 10-15% of dogs will not increase their tear production, but may show some reduction in the corneal scarring, mucus production and inflammation. Approximate 10% of dogs do not benefit clinically from cyclosporine treatment.
- Increased amounts of tear production in response to cyclosporine therapy is related to the initial STT. The dogs with a STT greater than 2 mm/min wetting had a much greater response rate (87-100%) than those with STT of less than 2 mm/min (29-59%).
- If management fails with cyclosporine therapy, additional medical management with artificial tears and other tear stimulants, antibiotics and anti-inflammatories may be tried. When medical management fails, the parotid salivary duct can be surgically moved to the surface of the eyelid to provide a source of moisture to the eye. This surgical procedure should be used as a last resort.

<sup>1</sup> Taken from Slatter, *fundamentals of Veterinary Ophthalmology*, 2<sup>nd</sup> ed. Additional material taken from *Saunders Manual of Small Animal Practice*, 1994. pp.1230-34.