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# KERATOCONJUNCTIVITIS SICCA (KCS)

## What is KCS?

Keratoconjunctivitis sicca (KCS) or "dry eye" describes a deficiency of the aqueous layer of the tear film, which results in changes in the cornea. It occurs commonly in dogs and infrequently in cats.
The cornea is the transparent portion at the front of the eye that allows light to enter. The cornea requires a supply of oxygen and nutrients to remain healthy. The healthy cornea has no blood vessels to provide it with these nutrients, so they are provided by the tear film. The tear film consists of three layers which are produced by glands in the conjunctiva and eyelids. The outermost layer consists of a lipid (oily) substance, supplied by the meibomian glands, which helps prevent evaporation of the aqueous layer. The middle layer is an aqueous (fluid) substance, produced by the lacrimal glands, which provides oxygen, nutrition and lubrication to the eye. The innermost layer is a mucous substance, produced by goblet cells, which helps the aqueous layer adhere to the surface of the cornea.
With each blink the eyelids spread the tear film over the eye. Any excess tears flow into two tiny ducts in the corner of the eye and connect to the nasal passage, where the tears flow out.
Dry eye is caused by a breakdown in the tear film and a loss of the aqueous layer. This results in drying of the corneal surface. When the cornea is deprived of the oxygen, nutrients and lubrication provided by the tear film, it rapidly undergoes destructive changes such as corneal ulceration, blood vessel growth across cornea, scar tissue formation, and pigmentation of corneal tissue. Dry eye is very uncomfortable, and may result in loss of vision.

## What causes KCS?

A number of causes have been reported for dry eye. These include:

- Autoimmune adenitis of glandular tissue is the most common cause of KCS. The immune system causes inflammation of the lacrimal gland, causing it to break down and stop producing tears.
- Congenital abnormalities such as abnormal functional development or lack of growth of the lacrimal glands.
- Trauma or neurological diseases which damage the nerves that supply the lacrimal glands.
- Chronic conjunctivitis can cause the membranes to swell and obstruct the ducts leading from the glands, leading to secondary KCS.
- Distemper virus can destroy the lacrimal glands.
- Toxic or drug-induced KCS can be produced by certain sulpha-containing drugs, anti-inflammatories, or other chemical agents.
- Inherited predisposition to KCS has been noted in certain breeds such as the American Cocker Spaniel, Bulldog, Bull Terrier, Cavalier King Charles Spaniel, Chihuahua, Dachshund, Lhasa Apso, Miniature Schnauzer, Shih Tzu, Pekinese, Pug, and West Highland White Terrier.

In many cases the cause of KCS remains unknown. However, in all cases medical treatment can be initiated with varying levels of success.

**What will I see if my pet has KCS?**
KCS is a chronic, progressive disorder that may affect either one or both eyes. Initially, you may notice a chronic or recurring conjunctivitis. As the disease progresses you may notice a thick mucoid discharge from the affected eye(s), a red and thickened conjunctiva, a dull cornea, and dry nose. Although the degree of discomfort may vary between pets, blinking and squinting are commonly seen with this disease. In some cases the patient may develop a painful corneal ulcer, which increases the risk of a globe rupture.

**How is KCS diagnosed?**
Diagnosis is made by collecting a complete history about the condition, doing an ophthalmic examination, and performing a number of tests. The most important of these tests is the Schirmer Tear Test which measures the production of the aqueous tear layer. In addition, a Fluorescein stain can be used to diagnose corneal ulcers and help estimate the rate of the tear break-up.

**How is KCS treated?**
There are several objectives in treating KCS, including:

- **Tear replacement and corneal lubrication** is important because the aqueous tear fraction is absent or reduced. Artificial tear products such as Tears Naturale II, Lacrilube, Tear Gel and Isopto-Tears can be found in any pharmacy. It is important to apply artificial tears four to six times daily to keep the cornea lubricated.
- **Reduction of bacterial growth** is important to keep the eye healthy. It is important to keep the eye clean by removing the mucous build-up from the eyelids and around the eye. A topical antibiotic will be prescribed to prevent the overgrowth of harmful bacteria.
- **Control of inflammation and scarring** can be achieved through the use of topical anti-inflammatory drugs. Although effective, the corticosteroids used to treat the inflammation may hinder the healing of corneal ulcers. Therefore, they will only be used if the Fluroscein test is negative and there is no ulceration present.
- **Stimulation of natural tear production** is the most important part of the treatment regime. It is thought that the lacrimal gland is being attacked by the body's own immune system. An immunosuppressant drug will be prescribed to suppress the body's immune response. Cyclosporine is used most commonly to provide relief of symptoms, and to increase tear production. Initially a 0.2% cyclosporine ointment called "Optimmune" may be used which has proven effective in many cases. Occasionally, some patients require a stronger 1% or 2% formulation of cyclosporine. It is important to note that treatment will be required for the rest of your pet's life and frequent visits to the ophthalmologist for monitoring will be required.

The medical treatment described above is sufficient in most cases of KCS. However, in some cases surgical intervention is required.
In breeds with protruding eyes, such as the Shih Tzu, it may be necessary to surgically close a portion of the eyelids in order to reduce the amount of moisture that evaporates from the surface of the eye.
In patients that develop deep corneal ulcers, surgery to apply a conjunctival flap may be performed. This may be necessary to prevent perforation of the eye. A portion of the soft tissue surrounding the eye is sutured directly onto the ulcer and provides protection for the weakened cornea, and blood vessels to aid in healing.
In severe cases of KCS, medical management is unsuccessful. At this point it may be necessary to perform a parotid duct transposition, in which the parotid salivary gland is removed from the dog's cheek and sutured into the dog's lateral conjunctiva. The saliva produced provides lubrication to the eye. Complications of this surgery include the deposition of calcium from the saliva into the cornea. This can be controlled with EDTA drops and flushing of the eye after eating.