Dry Eye in Dogs: When Good Glands Go Bad

Shelby Reinstein, DVM, MS, DACVO
Veterinary Specialty & Emergency Center
Levittown, Pennsylvania

Introduction

Dry eye, or keratoconjunctivitis sicca (KCS), is a common condition in dogs characterized by decreased tear production that most often results from idiopathic lacrimal gland inflammation with secondary glandular atrophy.1-3 (See Common Causes of KCS.)

Neurogenic KCS is caused by loss of parasympathetic innervation to the lacrimal gland and is less common than immune-mediated KCS. Neurogenic KCS occurs secondary to chronic otitis, peripheral neuropathies, idiopathic disease, and primary neurologic disease.1,4

Common Causes of KCS

- Congenital conditions (eg, congenital lacrimal aplasia)13
- Infectious diseases (eg, canine distemper virus)14
- Metabolic conditions (eg, diabetes mellitus, hyperadrenocorticism, hypothyroidism)1,2
- Temporary or permanent drug toxicity (eg, from sulfasalazine, trimethoprim sulfa)15,16
- Temporary drug side effects (eg, from atropine, general anesthesia)17-19
- Trauma (eg, blunt trauma, radiation treatment)20

See also Drugs in Brief, page 38.

▲ FIGURE 1 KCS, indicated by mucopurulent ocular discharge, conjunctival swelling and hyperemia, and corneal pigmentation in an 8-year-old English bulldog

Photos courtesy of Shelby Reinstein, DVM, MS, DACVO
Decreased tear production results in corneal and conjunctival cellular hypoxia, debris accumulation, and bacterial overgrowth, causing inflammation of the ocular surface. Clinical signs include conjunctival hyperemia, squinting, and thick, sticky discharge.\(^1\) (See Figure 1, page 33, & Clinical Signs of KCS.)

### Clinical Signs of KCS\(^1,2,4\)

**ACUTE (see Figure 3)**
- Marked pain
- Squinting
- Thick, sticky discharge
- Conjunctival hyperemia
- Corneal edema
- Corneal ulceration
- Dense corneal vascularization

**CHRONIC (see Figure 1, page 33)**
- Minimal to mild squinting
- Thick, sticky discharge
- Wispy corneal vascularization
- Corneal fibrosis
- Corneal and conjunctival pigmentation

### Diagnosis

KCS should be suspected in all patients with clinical signs, especially in those with breed predisposition. (See Breeds Predisposed to KCS, page 36.) Any patient with ocular surface inflammation, discharge, or corneal opacification should undergo the Schirmer tear test (STT), which quantifies the aqueous component of the tear film. Perform the test by placing the tear strip in the ventral conjunctival fornix, approximately midway between the medial and lateral canthi. Take care not to handle the tear strip excessively because oils present on

### Table 1

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;15 mm wetting/minute</td>
<td>Normal</td>
</tr>
<tr>
<td>10-14 mm wetting/minute</td>
<td>Early KCS</td>
</tr>
<tr>
<td>5-10 mm wetting/minute</td>
<td>Moderate KCS</td>
</tr>
<tr>
<td>&lt;5 mm wetting/minute</td>
<td>Severe KCS</td>
</tr>
</tbody>
</table>

### TAKE ACTION

1. Perform Schirmer tear testing in all dogs with ocular surface inflammation, discharge, or corneal opacification to rule out KCS.
2. Set client expectations early by preparing owners for regular follow-up ocular examinations and lifelong medication.
3. Implement routine KCS screening at wellness visits for at-risk breeds.

\(\text{Figure 2}\) STT results for a 10-year-old Chihuahua showing neurogenic KCS with abnormal results only in the left eye.

(See Figure 3, page 33, & Clinical Signs of KCS.)
fingers may affect the absorption dynamics. Leave the strip in place for 1 minute, remove it, and immediately record the measurement. (See Figure 2 & Table 1.)

Once KCS is confirmed by STT results, thoroughly evaluate the patient’s ocular and systemic health to rule out underlying conditions such as hypothyroidism. A detailed eye examination, including fluorescein staining, should also be performed.

Neurogenic KCS most often occurs unilaterally, with ipsilateral nasal crusting a common supportive clinical finding. (See Figure 4.)

**Treatment**

KCS is managed medically, often with a combination of agents. (See Table 2, page 36.) Refractory cases may require alternative treatments, such as parotid duct transposition or eyelid surgery, by an ophthalmologist. Treatment regimens require periodic adjustments based on serial eye examinations and STT measurements. Lifelong treatment is usually necessary.  

**Tear Stimulants**

Immunomodulating agents (eg, cyclosporine, tacrolimus), which reduce glandular inflammation and improve tear secretion, are most commonly used to treat KCS. Cyclosporine and tacrolimus are used q8-12h initially; 30 to 45 days are required for full response. In dogs that respond well to initial therapy and achieve STT values >20 mm wetting/minute, treatment may be decreased to q24h or q12h for long-term maintenance. Tear-stimulant therapy is usually lifelong. (See Goals of Tear Stimulant Therapy, page 37.)

**Cholinergic Agents**

Cholinergic agents are used to treat neurogenic KCS. Pilocarpine can be administered either topically (ie, as a 0.125% or 0.5% drop) or orally (ie, by adding a commercially available 1% or 2% ophthalmic solution to the patient’s food). Topical administration is often quite irritating. Oral administration is effective but may cause systemic side effects with inappropriate doses. Given the markedly narrow safety margin, the dose should be adjusted slowly and the client advised to monitor the patient closely for side effects.

**Tear Replacements**

Many commercial tear replacement products are available to treat tear deficiencies. Veterinarian preference, product availability and cost, and the patient’s specific needs determine treatment choice. These medications play a crucial role in KCS management and should be combined with tear-stimulant therapy.
Secondary bacterial conjunctivitis is common in dogs with KCS because of reduced ocular debris removal and surface inflammation. Broad-spectrum topical antibiotics should be administered in the early stages of treatment, usually q6-8h. As tear levels improve and ocular surface inflammation subsides, administration frequency can be decreased and treatment eventually stopped. Topical anti-inflammatories or anti-inflammatory and antibiotic combinations are useful in reducing ocular surface inflammation, improving comfort, and diminishing corneal opacities and vascularization.

**Conclusion**

KCS is a common ocular condition in dogs that occurs more frequently in predisposed breeds and should always be suspected in patients with ocular irritation signs. Diagnosis is made with the STT. A thorough eye examination helps identify concurrent corneal disease (eg, ulceration). KCS is initially treated with multiple medications that improve tear secretion, provide surface lubrication, and reduce bacterial overgrowth and surface inflammation. Medications can be adjusted as tear production improves; however, therapy with tear stimulants is almost always lifelong.

**References**

10. Berdoulay A, English RV, Nadelstein B. Effect of topical 0.02% tacrolimus


SHELBY REINSTEIN, DVM, MS, DACVO, is a board-certified veterinary ophthalmologist at Veterinary Specialty & Emergency Center in Levittown, Pennsylvania. Shelby completed a fellowship and residency in ophthalmology at Matthew J Ryan Veterinary Hospital at University of Pennsylvania. She has numerous publications in journals and textbooks. She has a passion for continuing education and frequently lectures at national conferences. Shelby is also an ophthalmology consultant for VEGirl.

FUN FACT: Shelby and her husband are amateur wine enthusiasts. After learning the basics in Napa Valley, they continue to enjoy food pairings and tastings at local wineries in Bucks County, Pennsylvania.