



# Ulcerative Keratitis

## (Type of Inflammation of the Cornea)

### Basics

#### OVERVIEW

- “Keratitis” is inflammation of the cornea; the “cornea” is the clear outer layer of the front of the eye
- The “corneal epithelium” is the top surface layer of the cornea; the “corneal stroma” is the thick, clear middle layer of the cornea; the “corneal endothelium” is the inner lining layer of the cornea
- “Ulcerative keratitis” is inflammation of the cornea associated with loss of the top surface of the cornea (corneal epithelium; condition known as a “corneal erosion”) and possibly loss of variable amounts of the underlying thick, clear middle layer of the cornea (known as the “stroma”; condition known as a “corneal ulcer”)
- Ulcerative keratitis is identified by retention of fluorescein stain in the corneal erosions or ulcers; “fluorescein stain” is a dye that is used to identify ulcers of the cornea—if the very top layer of the cornea has been disrupted (as with an erosion or ulcer), the dye will enter the lower layers of the cornea and will cause a temporary stain that glows under an ultraviolet light

#### GENETICS

- No proven basis, although certain breeds appear to be more likely to have ulcerative keratitis
- May occur secondary to other corneal diseases that have breed predispositions and presumably a genetic basis, such as degeneration of the top surface of the cornea, leading to erosions or ulcers (condition known as “corneal epithelial dystrophy”) in Shetland sheepdogs and degeneration of the lining of the cornea, leading to progressive fluid buildup in the cornea (known as “corneal edema”; condition known as “corneal endothelial dystrophy”) in Boston terriers

#### SIGNALMENT/DESCRIPTION OF PET

##### Species

- Dogs
- Cats

##### Breed Predispositions

- Dogs—short-nosed, flat-faced (known as “brachycephalic”) breeds are more likely than other breeds to develop ulcerative keratitis
- Spontaneous, long-term defects in the top surface of the cornea (known as “spontaneous chronic corneal epithelial defects”)—occurs in any breed
- Cats—Persian, Himalayans, Siamese, and Burmese are more likely to develop a condition in which part of the cornea tissue dies, leaving a pigmented lesion and fluid buildup (known as “edema”; condition known as “feline corneal sequestration”) than other cat breeds

## Mean Age and Range

- Age of onset—variable; determined by cause
- Spontaneous, long-term defects in the top surface of the cornea (spontaneous chronic corneal epithelial defects)—middle-aged and older dogs

## SIGNS/OBSERVED CHANGES IN THE PET

- May be sudden (acute) or long-term (chronic)
- Tearing, squinting, rubbing at eyes
- Appearance of a “film over the eye” (often due to fluid buildup in the tissues of the cornea [known as “corneal edema”]); prolapsed third eyelid
- Sometimes history of trauma
- Herpetic ulcers (cats)—may have history of upper respiratory infection (URI)
- Discharge from the eye(s); may be clear or may contain mucus and/or pus
- Squinting or spasmodic blinking (known as “blepharospasm”)
- Avoidance of light (known as “photophobia”)
- Redness of the moist tissues of the eye (known as “conjunctival hyperemia”)
- Superficial inflammation of the cornea (keratitis)—may note one or more circumscribed, linear, or geographic defects in the cornea
- Deep stromal ulcer (involving the thick, clear middle layer of the cornea [known as the “stroma”]) or extremely deep ulceration of the cornea, to the inner most membrane of the cornea (known as a “descemetocoele”)—may appear as a “crater-like” defect
- Depending on cause and duration—may see encroachment of blood vessels into corneal tissue (known as “corneal vascularization”); pigmentation; scarring; mineral or lipid (a group of compounds that contain fats or oils) deposition in the corneal tissue; inflammatory cell infiltrate (yellow to cream-colored opacity with indistinct margins, often surrounded by fluid buildup [corneal edema]) in the corneal tissue; collagenolytic activity (melting) of the thick, clear middle layer of the cornea (the stroma)
- Spontaneous, long-term defects in the top surface of the cornea (spontaneous chronic corneal epithelial defects)—loose or redundant epithelial edges; veterinarian may see fluorescein stain extending into areas with seemingly intact epithelium (ring of less intense staining)
- Ulcerative corneal disease usually stimulates tear production; absence of obvious tearing suggests pet may have “dry eye” (known as “keratoconjunctivitis sicca” or KCS)
- Inflammation of the front part of the eye, including the iris (known as “anterior uveitis”)—mild or severe, secondary to ulceration; severe anterior uveitis may result in accumulation of white blood cells in the anterior chamber of the eye (condition known as “hypopyon”); severe anterior uveitis suggests co-existent bacterial infection

## CAUSES

- Trauma—blunt; penetrating; perforating
- Disease of tissues surrounding the eye (known as “adnexa”), such as eyelids, third eyelid, and tear glands
- Inability to close eyelids completely (known as “lagophthalmos”)—results in inflammation of the cornea due to exposure to air and irritants (known as “exposure keratitis”); may be breed-related in short-nosed, flat-faced (brachycephalic) dogs and cats
- Tear-film abnormality—quantitative tear deficiency (such as in “dry eye” [KCS]); qualitative tear film deficiency caused by mucin deficiency or some other unidentified tear abnormality
- Infection—usually secondary in dogs; can be primary in cats (herpesvirus infection)
- Primary corneal disease—degeneration of the lining of the cornea (endothelial dystrophy); other diseases of the lining of the cornea
- Miscellaneous—foreign body (corneal or conjunctival); chemical burns; loss of nerve (trigeminal nerve) sensation; immune-mediated disease

## Treatment

### HEALTH CARE

- Hospitalize pets with deep or rapidly progressive ulcers; these may require surgery and/or frequent medical treatments
- Keep facial hair out of eyes

## ACTIVITY

- Restrict in pets with deep stromal ulcers (involving the thick, clear middle layer of the cornea [the stroma]) or extremely deep ulceration of the cornea, to the inner most membrane of the cornea (known as “Descemet's membrane”; condition known as a “descemetocele”) to prevent rupture of the cornea (eye)
- Prevent self-trauma with Elizabethan collar

## SURGERY

- Superficial ulcers do not usually require surgery, if the underlying cause has been eliminated
- Ulcer that extends one-half or greater of the corneal thickness and particularly to the inner most membrane of the cornea (known as “Descemet's membrane”; condition known as a “descemetocele”) may benefit from surgery
- Extremely deep ulceration of the cornea, to the inner most membrane of the cornea (descemetocele) or full thickness corneal laceration—considered a surgical emergency; emergency referral to a veterinary ophthalmologist (eye specialist) is suggested

## Procedures

- Spontaneous long-term (chronic) corneal epithelial defects—removal of loose epithelium after application of anesthesia directly to the eye (known as “topical anesthesia”); punctate or grid incisions into the cornea (procedure known as a “keratotomy”) are performed easily after removal of loose epithelium with topical anesthesia; surgical removal of the surface of the cornea (known as “superficial keratectomy”) is more invasive and may cause more scarring; application of a contact lens or third-eyelid flap after any of these procedures will improve comfort and aid healing
- Therapeutic contact lens placement—acts as a bandage to reduce both frictional irritation from the eyelids and pain; most useful in cases with spontaneous long-term (chronic) corneal epithelial defects; easy application and can still monitor and examine the eye; most retained 1–2 weeks, then removed; should monitor eye for increased pain and fluid buildup in the cornea (corneal edema), which may indicate that the contact lens does not fit and is causing corneal injury
- Various surgical procedures (such as rotational pedicle conjunctival flap, corneoscleral transposition, corneal transplant) may be performed for cases with ulcers greater than 50% thickness of the thick, clear middle layer of the cornea (the stroma) and extremely deep ulceration of the cornea, to the inner most membrane of the cornea (descemetocele)
- Cyanoacrylate repair (corneal glue)—can be used for deep ulcers; promotes encroachment of blood vessels into corneal tissue (corneal vascularization) and stabilizes the cornea, but has somewhat lower success rate compared to corneal surgery

## Medications

Medications presented in this section are intended to provide general information about possible treatment. The treatment for a particular condition may evolve as medical advances are made; therefore, the medications should not be considered as all inclusive

## ANTIBIOTICS

- Antibiotics applied to the eye directly (known as “topical antibiotics”)—indicated for all affected pets
- Frequency of application—determined by severity of the corneal disease and the type (ointment, liquid solution) of topical antibiotic used; ointments have a relatively long contact time; solutions are applied more frequently
- Commonly used topical antibiotics—oxytetracycline (cats); triple antibiotic, gentamicin, and tobramycin
- Uncomplicated ulcers or superficial erosions—combination of neomycin, polymyxin B, and bacitracin (that is, triple antibiotic) is an excellent first choice; broad spectrum of antimicrobial activity
- Complicated ulcers—often use combination therapy of ceftazidime with either an aminoglycoside (tobramycin, gentamicin) or fluoroquinolone (ciprofloxacin, ofloxacin); particularly in rapidly progressive, deep, or melting ulcers; frequency depends on severity

## ATROPINE

- 1% ointment or solution applied to the eye directly (topical treatment)
- Indicated for inflammation of the front part of the eye, including the iris (anterior uveitis)

## ANTIVIRAL AGENTS

- Indicated for herpetic ulcers in cats
- Trifluridine (Viroptic) solution

## NONSTEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDS)

- May be indicated for anti-inflammatory and pain-relieving (known as “analgesic”) properties

## OTHER MEDICATIONS

- Acetylcysteine—anti-collagenolytic agent used for treatment of melting ulcers
- Autologous serum—anti-collagenolytic agent; keep refrigerated; avoid contamination; discard after 48 hours

# Follow-Up Care

## PATIENT MONITORING

- Superficial ulcers—repeat fluorescein stain in 3–6 days; if ulcer persists 7 days or longer, either inciting cause has not been eliminated or the pet has spontaneous long-term (chronic) corneal epithelial defects
- Deep stromal (involving the thick, clear middle layer of the cornea [the stroma]) or rapidly progressive ulcers—assess every 24 hours initially if outpatient until improvement is seen; many of these pets are hospitalized or undergo surgery

## PREVENTIONS AND AVOIDANCE

- Short-nosed, flat-faced (brachycephalic) dogs—lubricant ointment administration, permanent partial closure of the eyelids (surgical procedure known as a “tarsorrhaphy”) or both may help prevent recurrent ulceration
- “Dry eye” (KCS)-related ulcers—life-long treatment of KCS with cyclosporine or surgical movement of the duct from the parotid salivary gland to the eye (procedure known as a “parotid duct transposition”), the saliva then acts as “tears” in the eye, to prevent continued ulceration
- Herpesvirus (cats)—may try oral lysine to prevent viral replication; may decrease severity and/or frequency of outbreaks

## POSSIBLE COMPLICATIONS

- Progressive corneal ulceration—rupture of eyeball
- Bacterial infection/inflammation of the tissues within the eyeball (known as “endophthalmitis”)
- Secondary glaucoma (in which the pressure within the eye [intraocular pressure] is increased secondary to inflammation in the front part of the eye)
- Softening and loss of tissue of the eyeball (known as “phthisis bulbi”)
- Blindness
- Blind and painful eye (may require surgical removal of the eyeball [known as “enucleation”])

## EXPECTED COURSE AND PROGNOSIS

- Uncomplicated superficial ulcer—usually heals in 5–7 days
- Spontaneous long-term (chronic) corneal epithelial defects—may persist for weeks to months; may require multiple treatment procedures
- Deep corneal ulcer treated medically—may require several weeks for repair of defect; does not always heal satisfactorily; continued deterioration of ulcer and eyeball (globe) rupture are possible
- Deep ulcer treated with conjunctival flap—frequently results in more comfort within a few days after surgery

# Key Points

- Wait at least 5 minutes between medications, if more than one eye drop medication is applied to the eye directly (topical treatment); wait longer between ointments
- Contact your pet's veterinarian if the pet appears more painful or the eye markedly changes in appearance
- Spontaneous long-term (chronic) corneal epithelial defect—discuss prolonged course of disease with your pet's

veterinarian; usually achieve healing within 2–6 weeks, but may require weekly rechecks and multiple procedures

## Notes

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