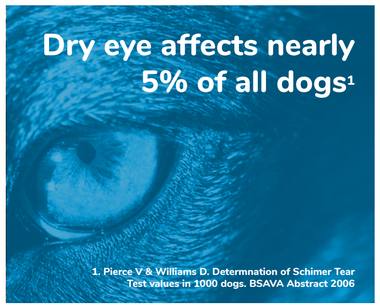
The Essential Role of Tears in Healthy Eyes

More than just moisture, tears and the tear film support overall ocular health in a variety of ways. Under or over tear production can lead to various diseases and conditions. Tears help to:

- Lubricate the cornea, eyelids and conjunctiva (the tissue that lines the eyelids)
- Protect the eyes against infection
- Provide oxygen and nutrients to the cornea
- Remove metabolic by-products like carbon dioxide
- Play a role in the local immune defense
- Wash away irritating particles or foreign bodies
- Keep the eye surface smooth and clear



What is Dry Eye?

Keratoconjunctivitis sicca (KCS), or Dry Eye, is an ophthalmic disorder in both dogs and humans. In dogs, the primary cause is immune-related lacrimal gland disease, but other causes include[2]:

- Drug-induced injury
- Traumatic injury
- Neurological dysfunction

Left untreated, KCS can lead to[2]:

- Corneal damage and scarring
- Increased vascularisation
- Hyperpigmentation
- Vision loss

Symptoms of Dry Eye include:

BLINKING Excessive blinking, eye rubbing or trying to keep eyes closed.	**REDNESS** Bloodshot appearance or inflammation of the eye.	**DISCHARGE** Discharge from the eye, staining the coat.
DULL APPEARANCE If the eyes have a dull or dry appearance.	**DARK PIGMENT** The surface of the eye appears to have a dark pigmentation.	**CONJUNCTIVITIS** Frequent vet visits for conjunctivitis, eye infections or corneal ulcers.

Dry eye affects up to 20% of predisposed breeds[2]

All breeds of dogs can develop Dry Eye at any age, but some are much more prone to the condition. veterinary ophthalmic specialists recommend testing susceptible breeds regularly. Dog breeds particularly susceptible to Dry Eye include:

- English Cocker Spaniel
- West Highland White Terrier
- Cavalier King Charles Spaniel
- Shih Tzu
- Yorkshire Terrier
- Bulldog
- Pekingese
- Pug
- Lhasa Apso

sentrx™ Animal Care

Hyaluronic Acid: Can We Use This To Better Canine and Feline Corneal Health?

Erica Bono, BS, DVM and DJ Haeussler, Jr., BS, MS, DVM, DACVO
The Animal Eye Institute

Why cross-linked HA: The main limitation of non-cross-linked HA containing tear replacement therapies is the frequency at which owners need to apply the medication (4 to 6 times daily) in order to achieve an appropriate response to treatment. It has been found that cross-linked HA formulations have increased the amount of time HA exists on the cornea, thus leading to the same benefits that regular HA solutions provide, with the added benefit of decreased dosing frequencies.[1,2] Cross-linked HA has also been found to aid in the faster healing of some corneal ulcers when compared to non cross-linked HA.[3-5] This added benefit of crossed-linked HA makes these types of tear film replacements superior when choosing between a product to use for patients with existing corneal damage.

We are committed to partnering with industry experts to provide free educational opportunities to support our mission of every pet comfortable, every day. Get recent CE opportunities:

8 Module Master Course in Ophthalmology & Access the eBook: The Essentials of Veterinary Ophthalmology here as well! Scan the QR code or visit **www.sentrxanimalcare.com/au**

1. Williams, D.L.; Mann, B.K. Efficacy of a crosslinked hyaluronic acid–based hydrogel as a tear film supplement: A masked controlled study. PLoS ONE. 2014; 9: 1-6.
2. Williams, D.L.; Mann, B.K. A crosslinked HA–based hydrogel ameliorates dry eye symptoms in dogs. Int. J. Biomater. 2013; 2013.
3. Fallacara, A.; Vertuani, S.; Panozzo, G; et. al. Novel Artificial Tears Containing Cross-Linked Hyaluronic Acid: An IN Vitro Re-Epithelialization Study. Molecules. 2017; 22: 1-13.
4. Nishida, T.; Nakamura, M.; Mishima, H.; Otori, T. Hyaluronan stimulates corneal epithelial migration. Exp. Eye Res. 1991; 53: 753–758.
5. Williams, D.L.; Wirostko, B.M.; Gum, G.; Mann, B.K. Topical cross-linked HA–based hydrogel accelerates closure of corneal epithelial defects and repair of stromal ulceration in companion animals. Investig. Ophthalmol. Vis. Sci. 2017; 58: 4616–4622.

Sentrx Product Name	Concentration of BioHAnce™	# of Daily Applications*	Use Case Support
Ocunovis™ BioHAnce™ Lubrication designed to last longer	0.40%	2x a day 1-2 drops	• For topical application to the eye where long lasting lubrication may be of benefit in dogs and cats • It creates a cellular matrix of modified HA that provides a sheer aqueous barrier on the eye without blurring • This thin, long-lasting coating mechanically protects and lubricates the ocular surface
Oculenis™ BioHAnce™ Ocular Barrier Gel	0.75%	2x a day 1-2 drops	• For topical application to the eye where a higher concentration of protective barrier lubrication may be of benefit in dogs and cats • For use during sedation of dogs and cats, or post-surgery where eyes may be unprotected. BioHAnce™ is a unique, crosslinked hyaluronic acid (HA) that has been specifically modified for the ocular environment • It creates a cellular matrix of modified HA that provides a sheer aqueous barrier on the eye without blurring
Episanis™ BioHAnce™ Barrier Skin and Wound Gel (Product range extension available 2023)	1.00%	1x a day	• Hot spots • Abrasions and tears • Skin ulcers • Surgical incisions • Bites and punctures

*See product insert for full product information and application instructions.

To order, contact your local Provet Branch or visit Provet Connect to place your order **provet.connect.com.au**

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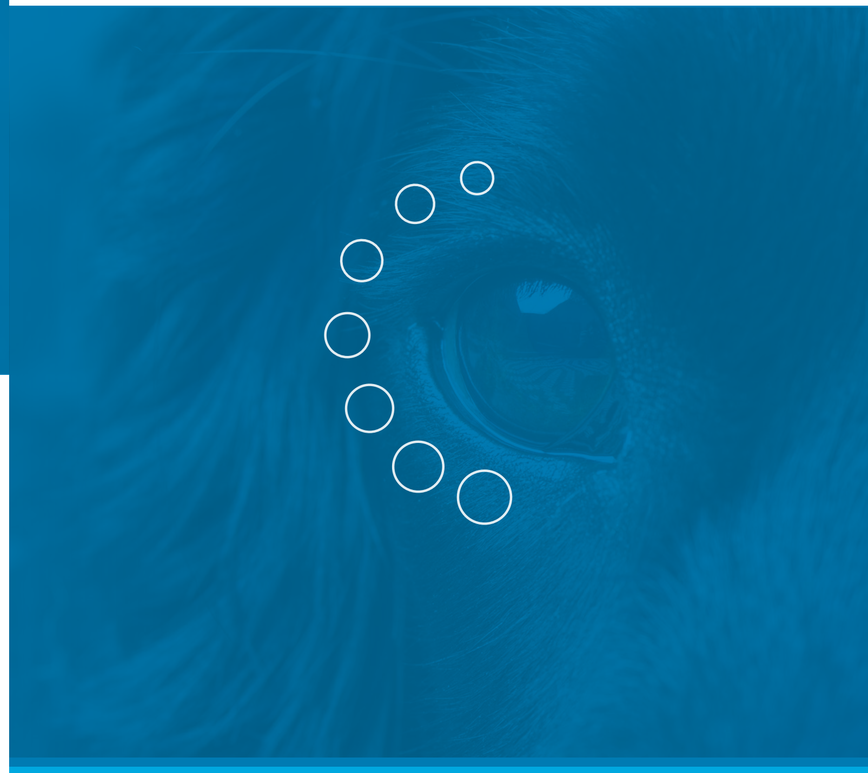

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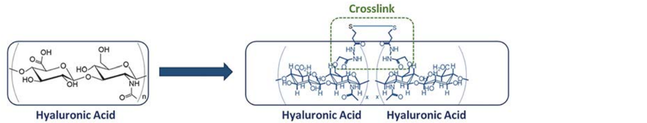
EXCLUSIVELY VET ONLY!

NEW technology to enhance ophthalmic hydration with proven extended duration of cover & protection.

BioHAnce™ Technology uses advanced bioengineering to create a molecular matrix of cross-linked hyaluronic acid (HA). This cellular scaffolding enhances hydration and extends the duration of time the product remains on the ocular surface.[1]

This cross-linked HA technology reduces the number of applications required for eye lubrication.

HA is a naturally occurring substance found in the body, and this unique formulation requires no preservatives, antibiotics or synthetic additives that may cause stinging, pain or irritation to the patient.



Oculenis™ BioHAnce™ Ocular Barrier Gel

0.75% BioHAnce™ Highest eye care concentration, providing a more viscous covering.

Higher concentration of protective barrier lubrication may be of benefit in dogs and cats.

Provet Code OCUL CBG

Ocunovis™ BioHAnce™ Gel Eye Drops

0.4% BioHAnce™ Cross-linked hyaluronic acid gel technology reduces the number of applications.

For topical application to the eye where long lasting lubrication may be of benefit in dogs and cats.

Provet Code OCUN ELG

To order, contact your local Provet Branch or visit Provet Connect to place your order
provet.connect.com.au

Ocunovis: Clinical Study

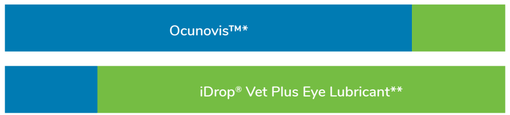
Masked controlled study shows Ocunovis significantly improves dry eye symptoms in dogs[1]

Ocunovis™ is a long lasting lubrication drop that is intended to help maintain lubrication and reduce redness.

- 25 dogs with keratoconjunctivitis sicca (dry eye)
- Ocunovis™ BioHAnce™ Eye Gel Drops* applied topically to the eyes twice daily
- Clinical signs associated with the condition assessed before and after treatment
- Ocunovis™ significantly improved the characteristic signs of dry eye in two weeks when administered twice daily[1]

	Hyperemia pre-treatment	Hyperemia post-treatment	Irritation pre-treatment	Irritation post-treatment	Discharge pre-treatment	Discharge post-treatment
Ocunovis™*	2.20 / 1.80	0.30 / 0.10	1.50 / 1.10	0.30 / 0.20	1.40 / 0.80	0.40 / 0.30
Other**	2.20 / 2.00	0.90 / 0.90	1.70 / 1.30	0.90 / 0.90	1.30 / 1.30	0.70 / 0.60

Comparison of right/left eye scores, which indicate absent (0), mild (1), moderate (2), or severe.
Ocunovis's significantly improved the characteristic signs of canine keratoconjunctivitis sicca in two weeks.



8 out of 10 dog owners rate Ocunovis™ as highly effective compared with only 2 out of 10 for the alternative tear supplement[1]

In conclusion, Sentrx BioHAnce™ technology:

- Provides greater activity in less volume
- Lasts longer than standard HA-containing formulas
- Backed by clinical studies that demonstrate superiority

* Referenced as crosslinked hyaluronic acid-based hydrogel (xCMHA-S) in study. Brand product name is Ocunovis.

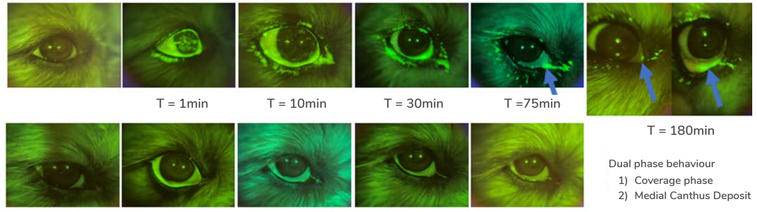
** Referenced as HA-based tear supplement (ITRD) in study. Brand product name is iDrop Vet Plus Eye Lubricant from I-MED Animal Health.

1. Williams DL, Mann BK (2014) Efficacy of a Crosslinked Hyaluronic Acid-Based Hydrogel as a Tear Film Supplement: A Masked Controlled Study. PLoS ONE 9(6): e99766. Doi:10.1371/journal.pone.0099766.
2. Williams D, Mann B. A Crosslinked HA-Based Hydrogel Ameliorates Dry Eye Symptoms in Dogs. International Journal of Biomaterials. Volume 2013, Article ID 460437

BioHAnce™ extends residence time and is maintained on the ocular surface for HOURS* compared to 10-20 minutes for non cross-linked hyaluronic acid (HA)†

Extended Residence Time and Protective Barrier of Crosslinked of HA

Oculenis: Crosslinked HA = BioHAnce (0.75%)



Dual phase behaviour
1) Coverage phase
2) Medial Canthus Deposit

Linear HA(0.75%)

Not all lubricating drops are the same with traditional eye drops only lasting 10-20 minutes†

In-vivo proof of concept ocular residence time study in target species to replicate prior study results. Precorneal retention of fluorescent labeled cross-linked Hyaluronic Acid Ocunovis™ ProCare BioHAnce™ Gel Eye Drops (0.4%) and Oculenis™ BioHAnce™ Ocular Barrier Gel (0.75%) evaluated for comparative residence time.

* Privately held study performed by EyeGate Pharma (rabbit, healthy and debrided eyes), Privately held study perfromed by Sentrx Animal Care with healthy dog eyes,
†Mochizuki et al, Laboratory Science 2007, Snibson et al, Cornea, 1992

Backed by Research

BioHAnce™ Technology:

- The Effects of a Crosslinked, Modified Hyaluronic Acid (xCMHA-S) Gel on Equine Tendon Healing Henry W. Jann1, James C. A. Hart[2], Larry E. Stein[3], Jerry Ritchey[4], Margaret Blaik[5], Mark Payton[6], Gustave E. Fackelman[7], Grant B. Rezabek[8], and Brenda K. Mann[9,10]
- Glycosaminoglycan hydrogel films as bio-interactive dressings for wound healing Kelly R. Kirkera, Yi Luob, J. Harte Nielsonc, Jane Shelbyc, Glenn D. Prestwicha,b,
- Ophthalmic Uses of a Thiol-Modified Hyaluronan-Based Hydrogel Barbara Wirostko,[1,] * Brenda K. Mann,[2,3] David L. Williams,[4], and Glenn D. Prestwich[5]

Oculenis™ Corneal Barrier Gel:

- Topical Cross-Linked HA-Based Hydrogel Accelerates Closure of Corneal Epithelial Defects and Repair of Stromal Ulceration in Companion Animals David L. Williams,[1] Barbara M. Wirostko,[2] Glenwood Gum,[3], and Brenda K. Mann[2,4]
- A cross-linked hyaluronan gel accelerates healing of corneal epithelial abrasion and alkali burn injuries in rabbits Guanghui Yang, * Ladan Espandar, † Nick Mamalis† and Glenn D. Prestwich*

Ocunovis™ Lubricating Drops:

- A Crosslinked HA-Based Hydrogel Ameliorates Dry Eye Symptoms in Dogs David L. Williams[1] and Brenda K. Mann[2,3]
- Efficacy of a Crosslinked Hyaluronic Acid-Based Hydrogel as a Tear Film Supplement: A Masked Controlled StudyDavid L. Williams[1]*, Brenda K. Mann[2,3]

Links to all of these studies and more can be found at **www.sentrxanimalcare.com/au**