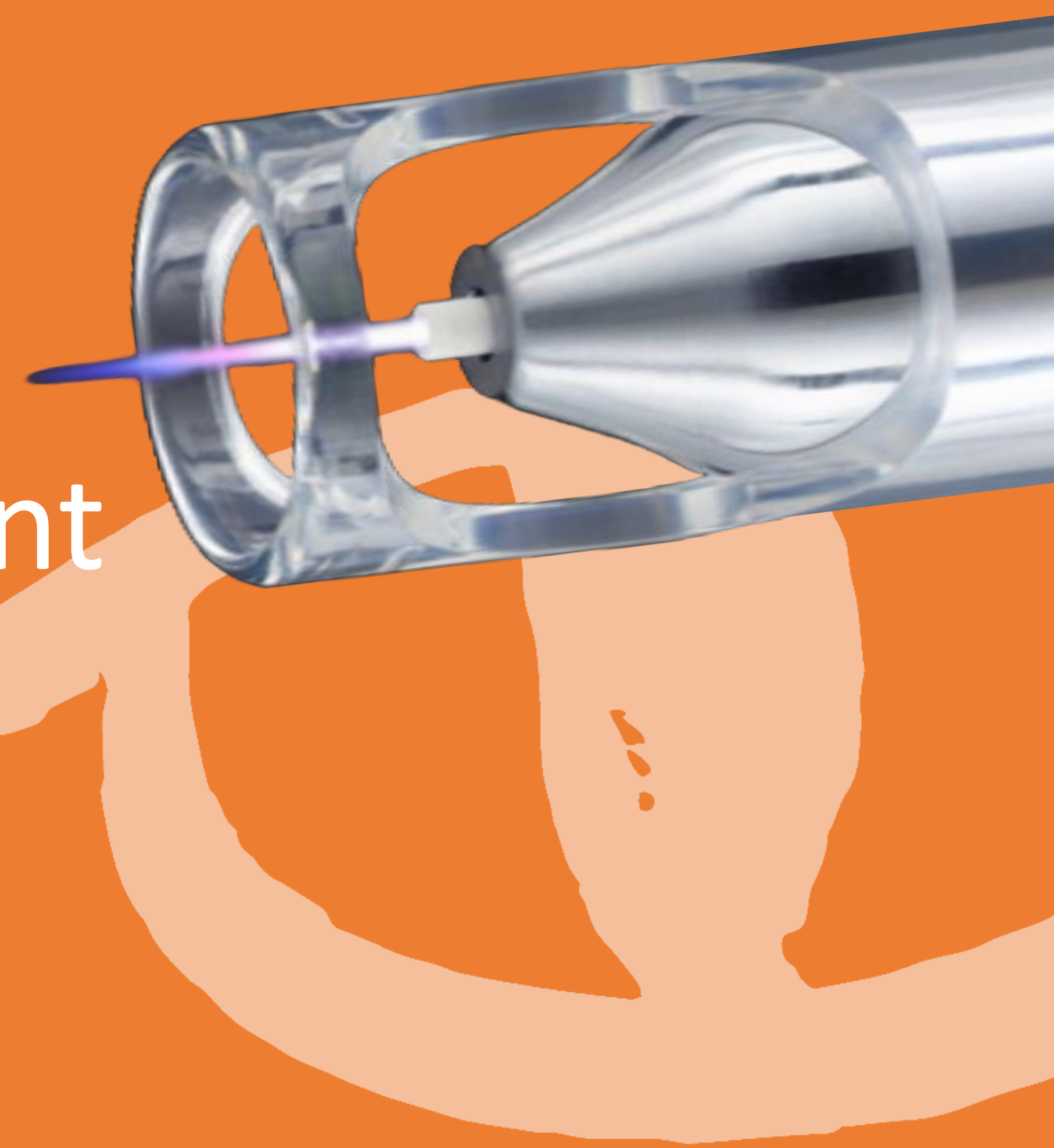


Cold plasma treatment can be easily implemented into corneal disease treatment protocols, is **well tolerated** and **safe** with a very low number of adverse reactions.



Argon cold atmospheric plasma treatment in corneal disease: Feasibility, safety and tolerability in clinical setting

PURPOSE

- To evaluate feasibility, safety and tolerability of cold plasma as **add-on** to standard regimen

COLD PLASMA TREATMENT

- Topical anesthesia (proxymetacaine): 2 drops repeated every 3 minutes over 20 minutes
- Application of plasma stream in meandric movement over lesion for 30-60s (60s ≈ 1 cm²)
- Flow rate 4.6 L/min, distance: plasma jet tip slightly touching cornea
- Repeated treatment every 2-6 days until healed

CLINICAL CASES

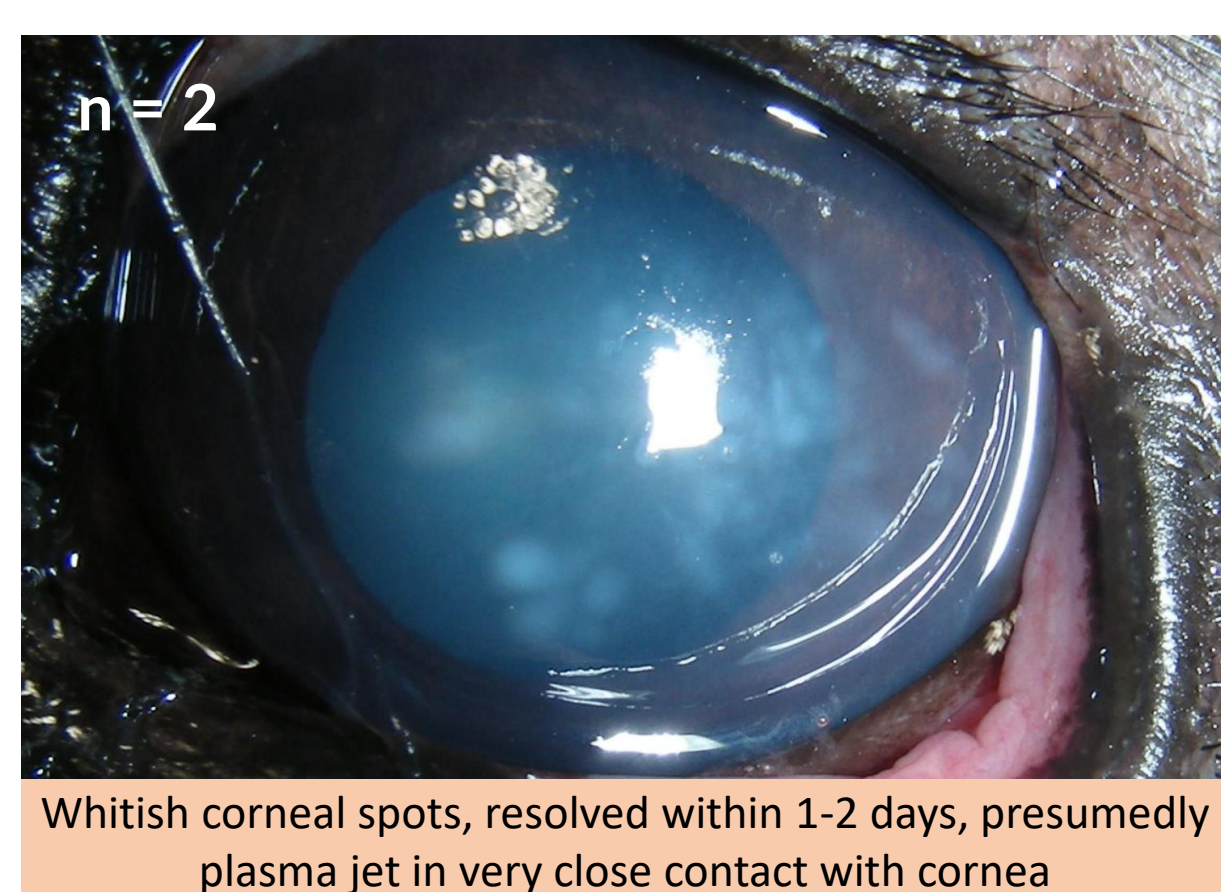
- 81 dogs, 4 cats, 6 rabbits, 1 guinea pig
- Spontaneous corneal chronic epithelial defect (SCCED) n=62, infected stromal ulcers n=20, melting ulcer n=9, corneal perforation n=4, other n=3
- 339 single treatments, average per case 3.5±1.84 treatments, median 3 treatments (1-9)

FEASIBILITY AND TOLERABILITY

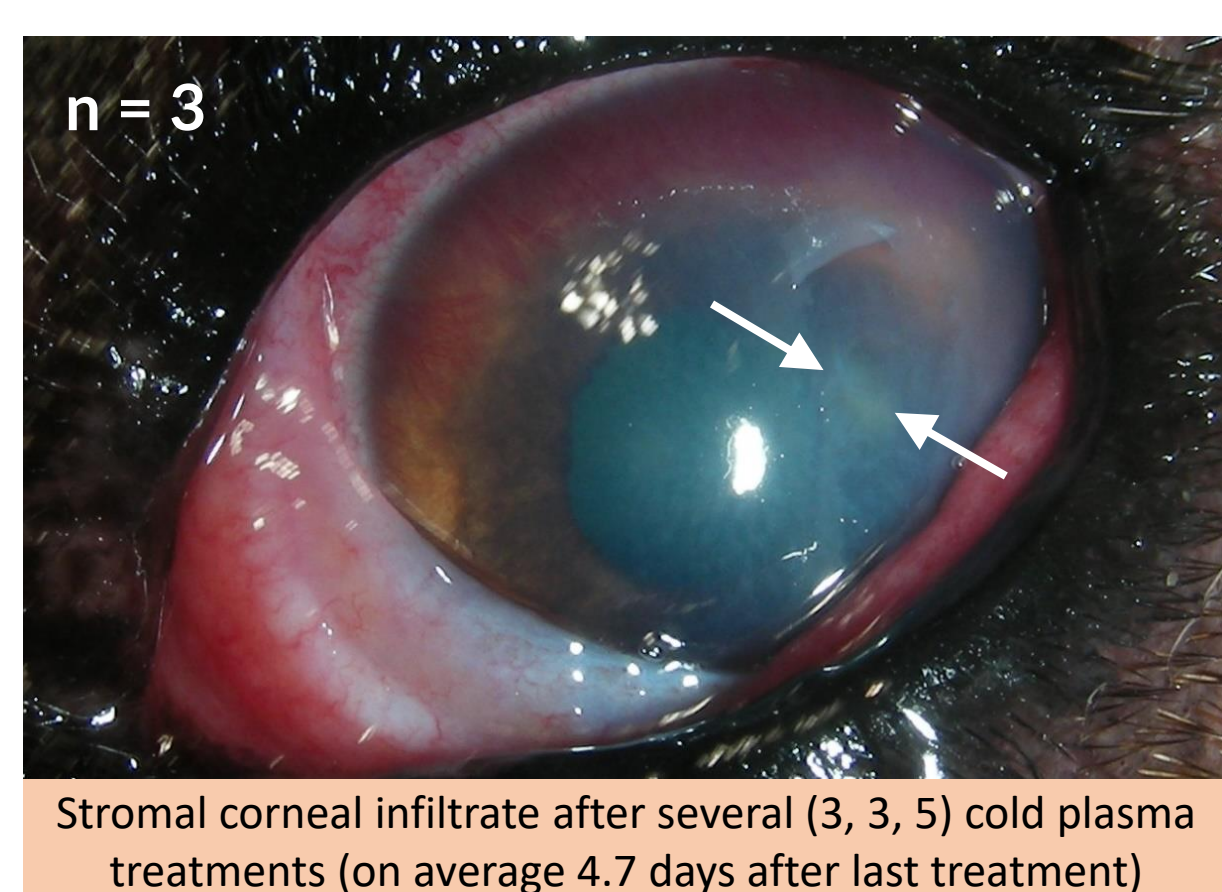
- Cold plasma can be easily applied in unsedated animals
- Several large breed dogs (Australian shepherd, German shepherd) as well as one cat showed signs of discomfort and needed to be conditioned to get used to it
- One dog was painful after insufficient topical anesthesia, one dog was reported as painful after each session by the owner (sensitive allergic white-coat French Bulldog)

ADVERSE REACTIONS

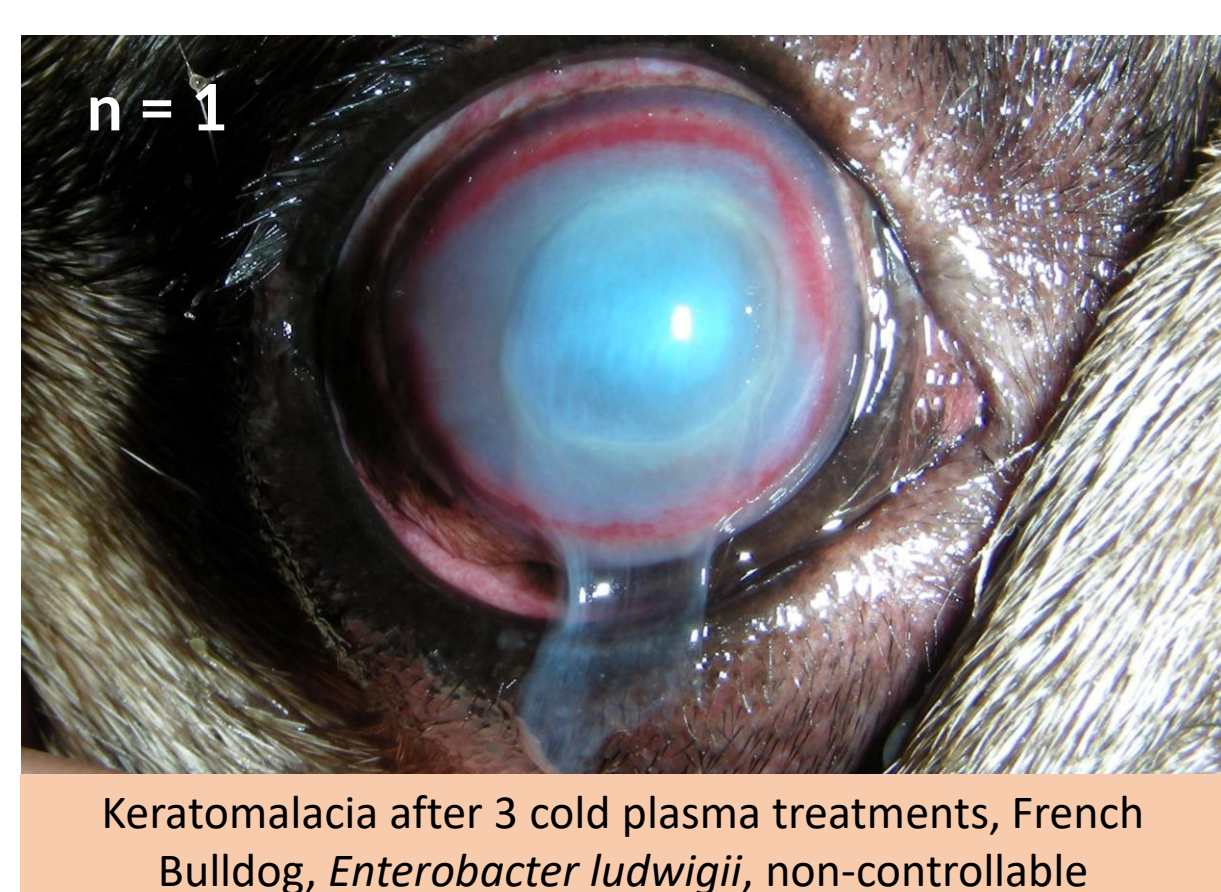
- All adverse reactions were seen in SCCED cases only:



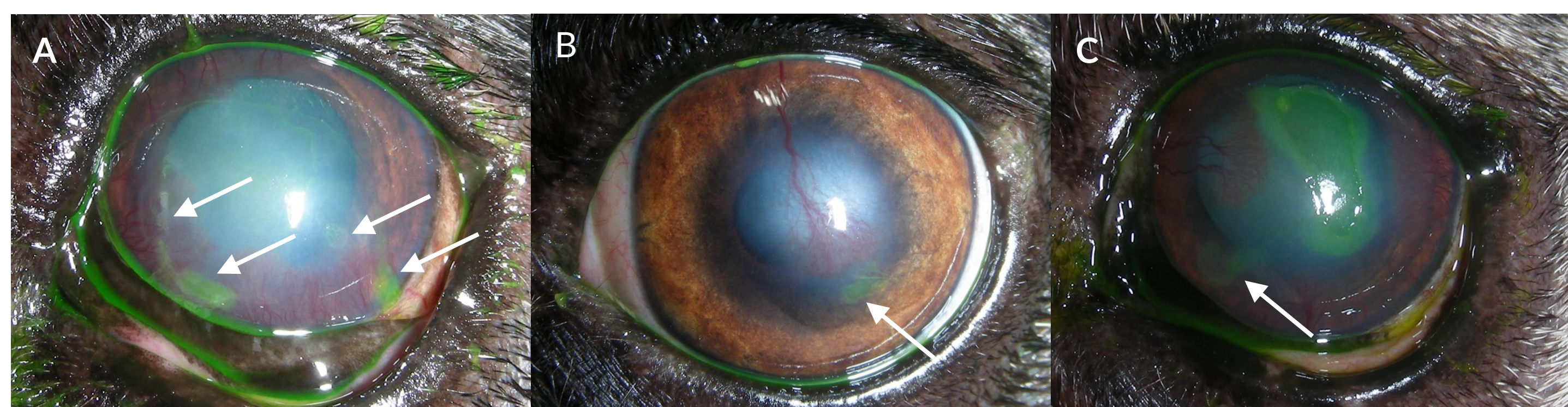
Whitish corneal spots, resolved within 1-2 days, presumedly plasma jet in very close contact with cornea



Stromal corneal infiltrate after several (3, 3, 5) cold plasma treatments (on average 4.7 days after last treatment)



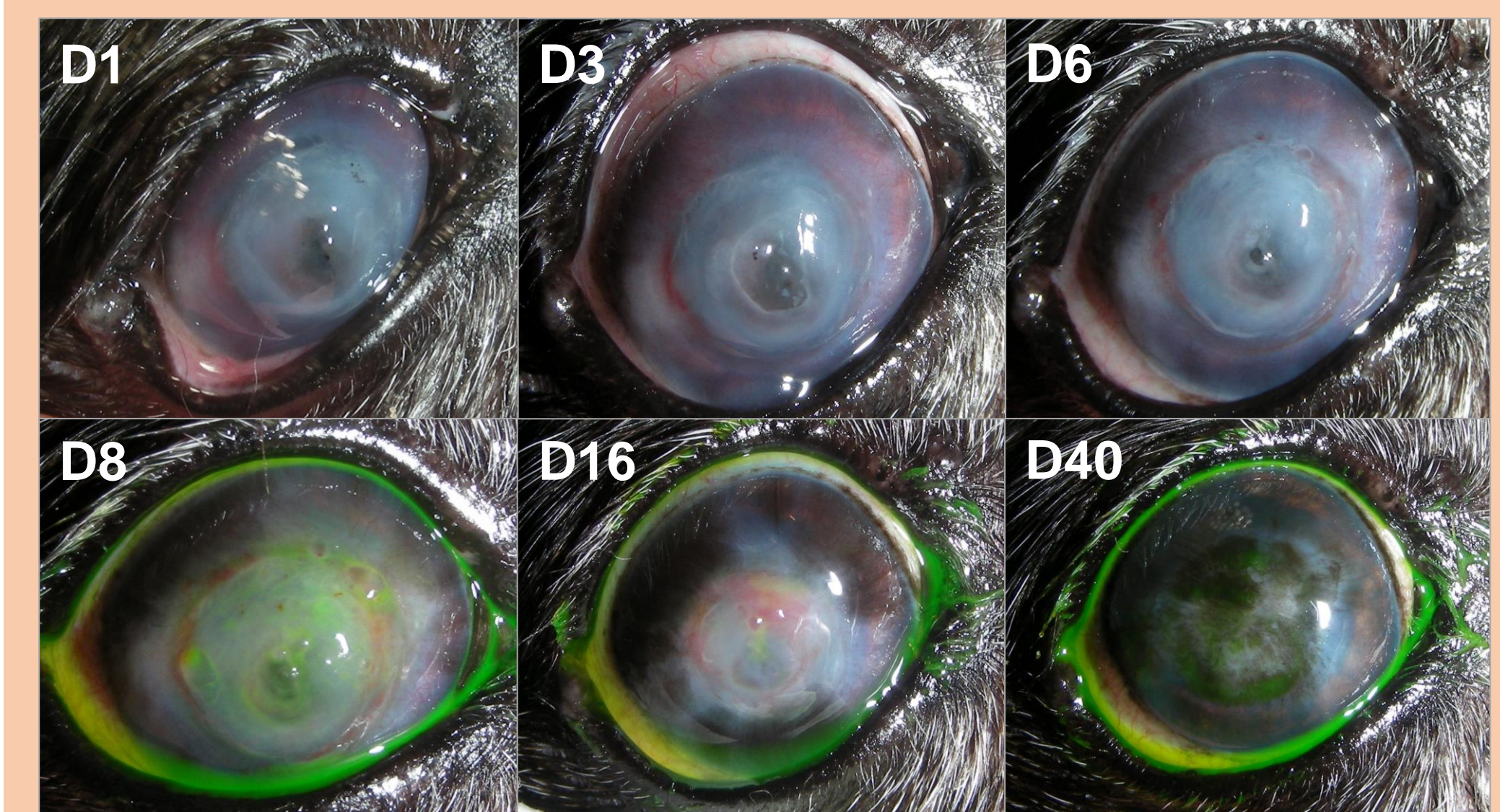
Keratomalacia after 3 cold plasma treatments, French Bulldog, *Enterobacter ludwigii*, non-controllable



Most common adverse reaction in SCCEDs was epithelial non-adhesion and tears after complete reepithelization (n=4, **A and B**) and peripheral epithelial tears in not-yet healed ulcers (n=3, **C**). Arrows show ulcerated areas already epithelized before. This was observed in French Bulldogs only. Significance of this reaction remains unclear and could be due to overly fast epithelial healing process.

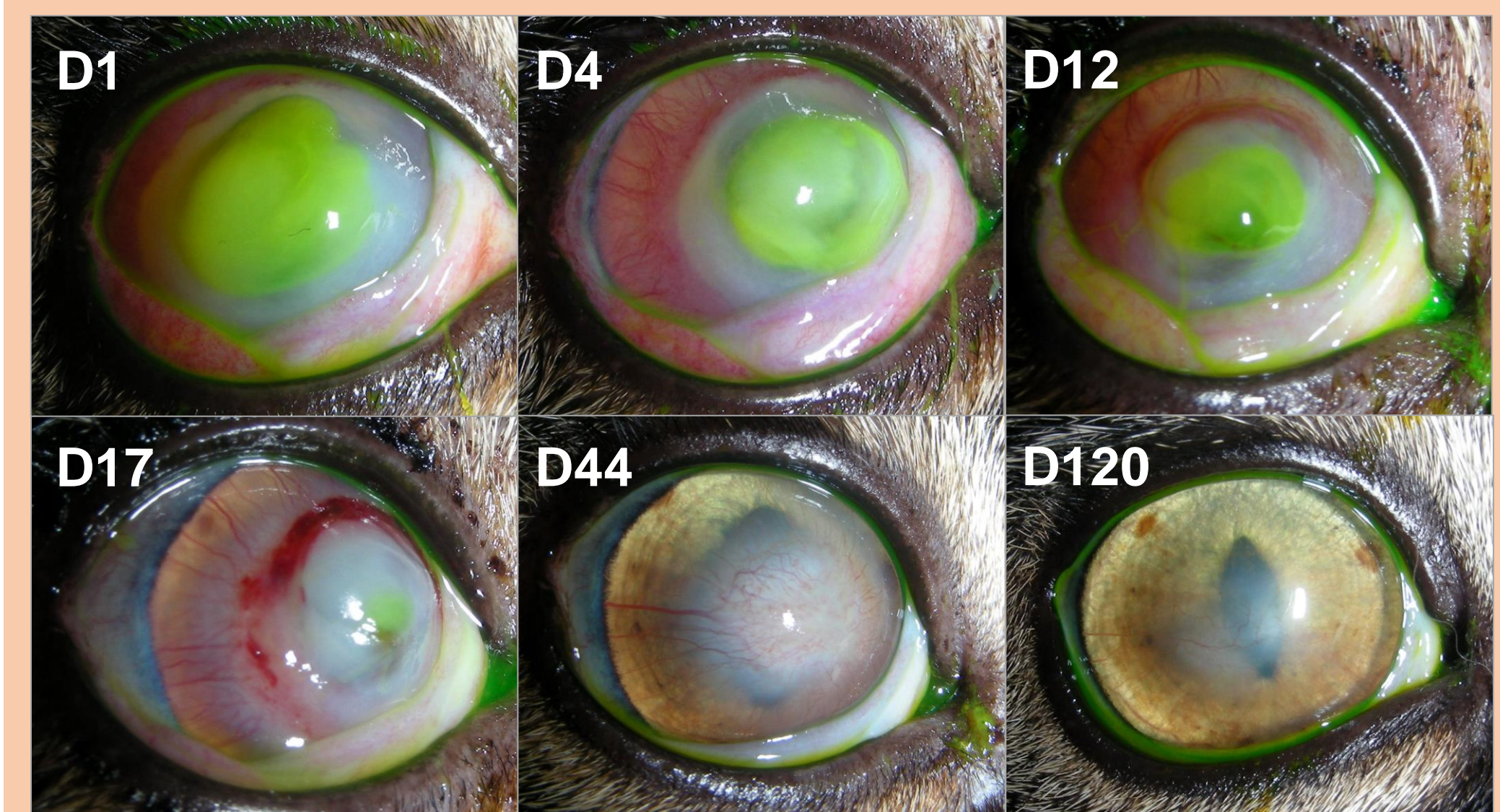
Therapy example: Corneal perforation

- 14 year-old Chihuahua-mix
- Medical therapy with topical antibiotics, atropine, serum and acetylcysteine with **cold plasma add-on** treatment: 5 treatments
- Wound epithelized in 15 days

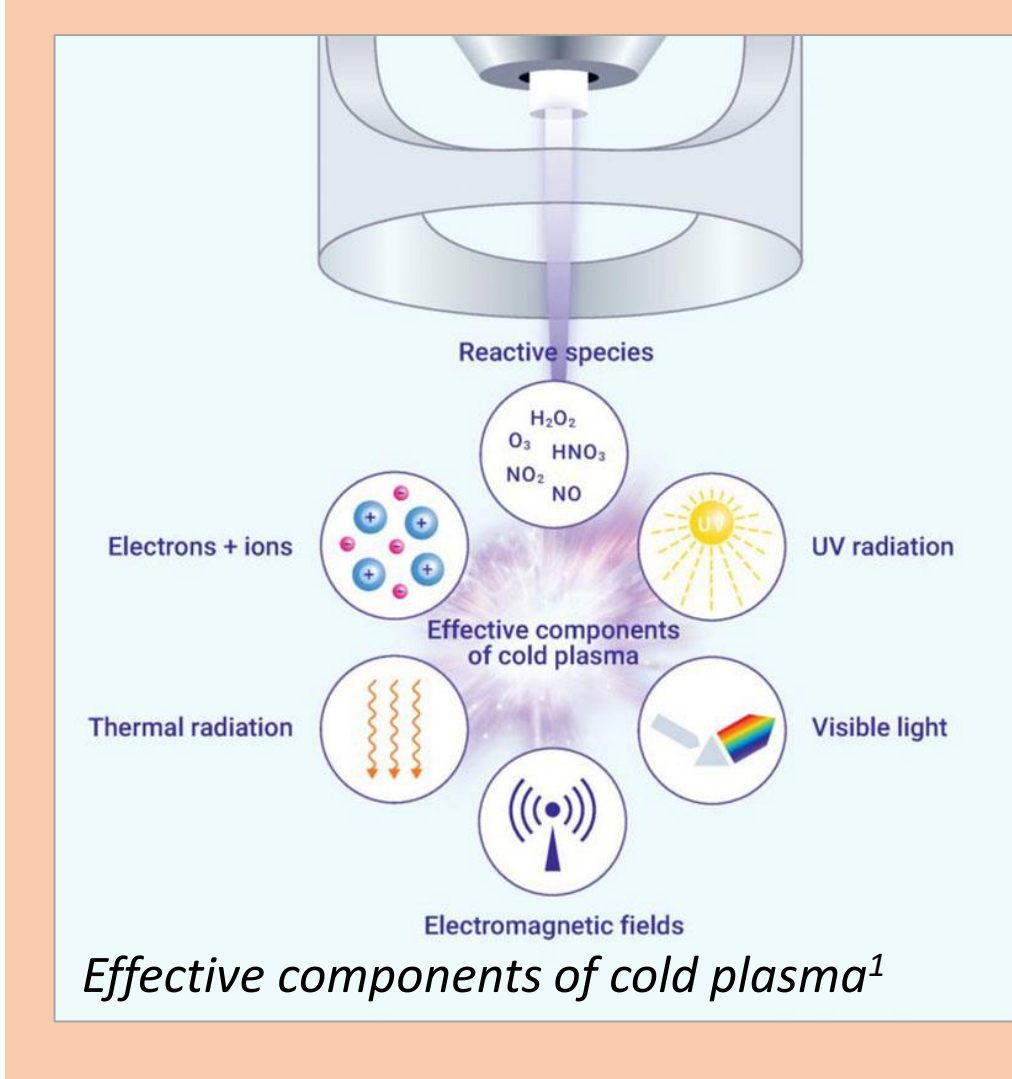


Therapy example: Melting ulcer

- 6 year-old domestic shorthair cat
- Medical therapy with topical and systemic antibiotics, topical atropine, serum, and systemic NSAIDs
- Cold plasma add-on** treatment: 5 treatments
- Cold plasma could not improve secondary bullous keratopathy, third eyelid flap was needed on day 18



Argon cold atmospheric plasma

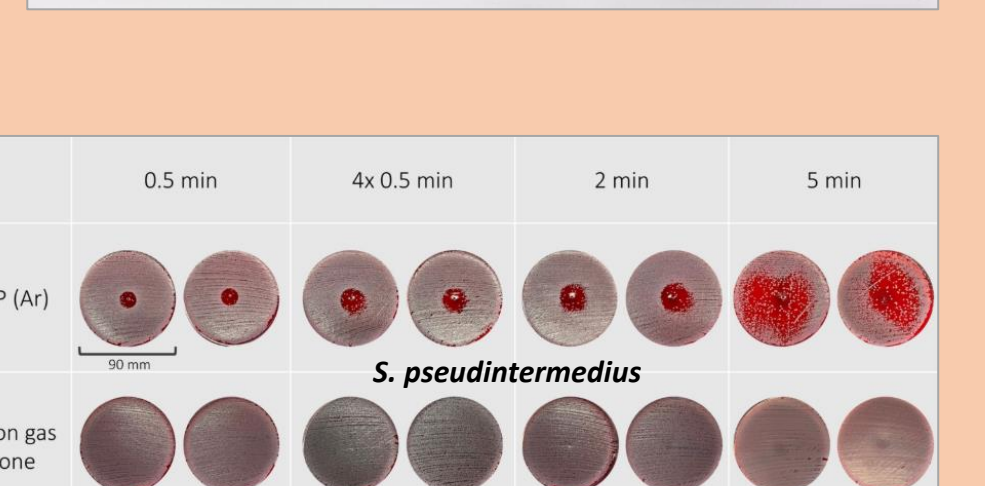


In-vitro study² on effectivity of cold plasma against canine bacterial keratitis pathogens:

frontiers | Frontiers in Veterinary Science
2024
Argon cold atmospheric plasma eradicates pathogens *in vitro* that are commonly associated with canine bacterial keratitis

Anne Helene Marx¹, Hilke Oltmanns², Jessica Meißner³, Jutta Verspohl⁴, Thomas Fuchsluger⁵ and Claudia Busse^{6*}

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Literature/sources: 1. <https://www.neoplas-vet.com/kinpenvet/>
2. Marx AH, Oltmanns H, Meißner J, Verspohl J, Fuchsluger T, Busse C. Argon cold atmospheric plasma eradicates pathogens *in vitro* that are commonly associated with canine bacterial keratitis. *Front Vet Sci.* 2024;10:1320145. doi:10.3389/fvets.2023.1320145.



Do not miss our second poster on successful use of cold plasma as add-on therapy for SCCED in French Bulldogs!

Petr Soukup, Sarah Lettmann, Matthias Erhard, Joschka Spornberger, Maria Finneisen & Ingrid Allgoewer

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