



THE



CAMPUS

*we could be heroes!*

The first and only vet. med. students' journal in Romania and probably the best in Europe



# THE CAMPUS

*we could be heroes!*

- 01** *Not a Tumor: Suspected Intraocular Neoplasia in a Dog Ultimately Diagnosed as Severe Chronic Proliferative Panuveitis* by Giovanni Marciano x OFTAVET/ p. 5
- 02** *Idiopathic generalized tremor syndrome: what to know as a practitioner and as an owner* by Daria Gănescu/ p.11
- 03** *The Hidden Killer Many Horse Owners Miss* by Mahmoud naeem kabha/ p. 13
- 04** *Pain Management in Small Animals: Current Approaches and Future Perspectives* by Esther Cheron / p. 17
- 05** *One Health Impacts of Armed Conflict* by Rama Halabi / p. 20
- 06** *Closing the Gap: A Baby Vet's Guide to Cutaneous Reconstruction* by Blanche Nicolle / p. 23
- 07** *Pulmonary Metastatic Osteosarcoma in a Breton Dog: A Case Report* by DVM Virginia Patumi / p. 26
- 08** *Pain and Nociception in Veterinary Medicine: Physiological, Ethical, and Clinical Perspectives* by DVM Andrea Majorino/ p. 31
- 09** *Fibrocartilaginous embolism (FCE) in dogs* by Anne-Kristoffy Bluteau / p. 34
- 10** *Anasarca in Veterinary Medicine: A Comprehensive Academic Review* by Assunta Piccolo / p. 39
- 11** *Myxomatosis in Rabbits: Pathogenesis, Therapy and Epidemiological Control* by Carla Stein / p. 43
- 12** *The French Bulldog: When Selective Breeding Becomes a Medical Issue* by Alessia Delle Cave / p. 52
- 13** *Emergency management of heatstroke in pets* by Sally Mustafa / p. 56
- 14** *Nutritional Influences on Canine Cardiac Function: A Review of Clinical and Longitudinal Evidence* by Maria Dinică / p. 59
- 15** *Corneal Ulcer in Atopic Dog: Integrated Medical and Regenerative Approach* by DVM Dan-Andrei Diaconescu & Giovanni Marciano / p. 63
- 16** *Leptospirosis as an Immune-Mediated and Systemic Disease: Beyond Antibiotic-Centric Therapy* by Irene Romanelli & Giovanni Marciano / p. 68

## PUBLISHER

Ex Terra Aurum - USAMV Bucharest

---

## SCIENTIFIC COMMITTEE

Dr. Emilia Ciobotaru  
 Dr. Iuliana Ionascu  
 Dr. Dan Cringanu  
 Dr. Gheorghe V. Goran

---

## GENERAL COORDINATOR

Dr. Seralp Uzun

---

## CHIEF EDITORS

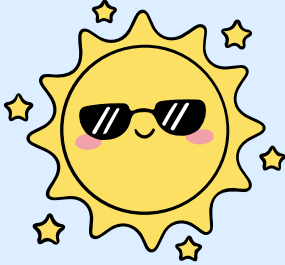
Vet.Med.Stu. Giovanni Marciano  
 Vet.Med.Stu. Daria Gănescu

---

## EDITORS

Vet.Med.Stu. Giovanni Marciano  
 Vet. Med. Stu. Irene Rita Romanelli  
 Vet.Med.Stu. Daria Gănescu  
 DVM Dan-Andrei Diaconescu  
 Vet.Med.Stu. Mahmoud Kabha  
 Vet. Med. Stu. Maria Dinică  
 Vet. Med. Stu. Sally Mustafa  
 Vet.Med.Stu. Assunta Piccolo  
 Vet.Med.Stu. Alessia delle Cave  
 Vet. Med. Stu. Blanche Nicolle  
 Vet. Med. Stu. Anne-Kristoffy Bluteau  
 DVM Virginia Patumi  
 DVM Andrea Majorino  
 Vet. Med. Stu. Rama Halabi  
 Vet. Med. Stu. Esther Cheron

---



# A YEAR OF GROWTH, CARE, AND NEW BEGINNINGS - THE CAMPUS 2025/2026

Dear students, veterinarians, professors, and animal lovers,  
 As we conclude the 2025/2026 academic year, we look back with pride on a year marked by learning, dedication, and growth in the field of veterinary medicine.

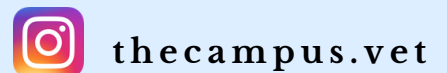
Throughout these months, students, clinicians, and professors have shared challenges and achievements that have strengthened both knowledge and passion for animal care. From lectures and laboratories to clinical practice, every experience has contributed to shaping more skilled, aware, and compassionate professionals.

To the graduating students of this academic year, we extend our sincere congratulations. You are now ready to take the next step into the veterinary profession—an exciting and demanding path where your knowledge, empathy, and commitment will truly make a difference. To those continuing their studies, may the upcoming year bring new motivation, curiosity, and confidence in your abilities.

Thank you all for your dedication and hard work. We wish you a well-deserved summer and a successful continuation of your journey in veterinary medicine.

*The Editorial Team of The Campus.*

*Giovanni Rocca*  
*Concetto*



# A True Champion Joins Us: New Chief Editor

Daria Gănescu is a 23-year-old, fifth-year veterinary medicine student with a clear passion for emergency surgery and high-intensity clinical work. Raised surrounded by animals, she developed an early and natural connection with the veterinary world, which continues to shape her professional ambitions today.



Daria has also built a strong sporting background alongside her academic journey. After six years of horse riding, she moved into competitive moto racing, where her determination and talent quickly set her apart. She has been racing since the age of 12 and is recognized as the first Eastern European Champion and National Champion in her category.

Beyond her achievements, Daria stands out for her energy, curiosity, and passion for adrenaline-fueled challenges, both in sport and in clinical settings. Her international mindset and fearless approach make her a promising voice for the next generation of veterinary professionals.

As Chief Editor, she brings experience, ambition, and a dynamic vision that connects storytelling, science, and the future of veterinary medicine.



@Dariaganescu

# NOT A TUMOR: SUSPECTED INTRAOCULAR NEOPLASIA IN A DOG ULTIMATELY DIAGNOSED AS SEVERE CHRONIC PROLIFERATIVE PANUVEITIS



Article by Giovanni Marciano X OFTAVET

## Abstract

An elderly mixed-breed dog was referred for chronic unilateral ocular redness with recent contralateral involvement. Ophthalmic examination revealed marked abnormalities in the left eye, including increased intraocular pressure and an intraocular space-occupying lesion, consistent with suspected intraocular neoplasia and secondary glaucoma. This report describes the clinical findings, diagnostic approach, and therapeutic considerations.

*Key words: canine ophthalmology; elderly dog; mixed-breed dog; ocular redness; intraocular neoplasia;*

## Introduction

Kimbo, a 13-year-old mixed-breed dog, was presented to the Oftavet Clinic (Naples, Italy) for evaluation of chronic ocular redness. According to the owner, the left eye (OS) had been red for over one year, while redness of the right eye (OD) had appeared the day before presentation.

Routine hematological and biochemical analyses were reviewed and were largely within normal limits. The dog had a history of recurrent cystitis, but no other systemic diseases were reported.

## Ophthalmic presentation

### *Neuro-ophthalmic Reflexes*

- Palpebral reflex: present bilaterally
- Menace response:
  - Positive in the right eye (OD)
  - Absent in the left eye (OS)

The menace response evaluates the integrity of the visual pathway, including the retina, optic nerve, optic chiasm, lateral geniculate nucleus, visual cortex, cerebellum, and facial nerve. An absent menace response suggests visual impairment or central neurological dysfunction.

It is physiologically absent in puppies up to approximately 12 weeks of age, as cortical visual pathways are not yet fully developed. (de Lahunta & Glass, 2009; Lorenz, Coates & Kent, 2011).

### *Dazzle reflex:*

- Present in OD
- Absent in OS

The dazzle reflex is a subcortical reflex elicited by a sudden bright light stimulus and results in blinking. It assesses retinal and optic nerve function but does not require cortical processing; therefore, it may be present even in blind animals.

### *Intraocular Pressure (IOP)*

#### *Measured using TonoVet®:*

- OD: 12 mmHg
- OS: 28 mmHg

In general, the “golden number” for intraocular pressure (IOP) in the dog is approximately 20 mmHg; however, small physiological variations are considered normal. The elevated IOP in the left eye is consistent with glaucoma.



The TonoVet® rebound tonometer is a handheld instrument designed for non-invasive measurement of intraocular pressure in veterinary patients. It provides rapid, accurate readings, making it ideal for routine ophthalmic examinations. Copyright © tonovet.com

*Pupillary Light Reflexes (PLR)*

Direct PLR:

- Present in OD
- Not visible in OS

Consensual PLR:

- Not visible when stimulating OD
- Absent when stimulating OS

The pupillary light reflex assesses the integrity of the retina, optic nerve, midbrain, and oculomotor nerve pathways. Abnormal PLRs may indicate retinal disease, optic nerve dysfunction, or intracranial pathology.

**Detailed Ocular Examination**

*Right Eye (OD)*

Adnexa

- Mild protrusion of the third eyelid

Anterior Segment

- Cornea and anterior chamber: within normal limits

Posterior Segment

- Lens: nuclear sclerosis
- Vitreous: unremarkable
- Fundus: normal

Normal canine fundus typically appears tapetal with a green to yellow-green reflective area dorsally, a darker non-tapetal area ventrally, well-defined retinal vessels radiating from the optic disc, and a round to oval optic nerve head with clear margins.

*Left Eye (OS)*

Adnexa

- Marked episcleral vessel congestion
- Conjunctival chemosis
- Seromucous ocular discharge

Anterior Segment

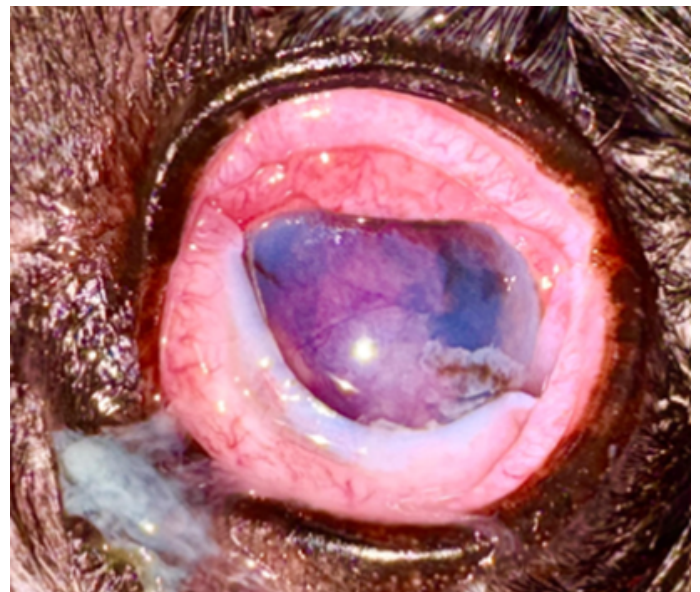
- Linear bilateral corneal calcific deposits, consistent with corneal calcific dystrophy, a condition commonly observed in elderly dogs due to age-related metabolic changes.

Anterior Chamber

- Intraocular space-occupying mass associated with fibrin accumulation

Posterior Segment

- Not visible due to media opacity
- Fundus examination not possible



*Left eye (OS) of Kimbo*

**Diagnostic Assessment**

Based on clinical findings, the following diagnostic procedures were recommended:

- Ocular ultrasonography (B-scan and/or UBM) to characterize the suspected intraocular mass and assess posterior segment structures

Systemic staging, including:

- Echocardiography
- Abdominal ultrasound

**Presumptive Diagnosis**

- Suspected intraocular neoplasia (OS)
- Secondary glaucoma (OS)

Differential diagnoses include hypertensive uveitis. In the absence of evidence of infectious disease based on laboratory testing, an idiopathic uveitis should also be considered. Definitive diagnosis, however, can only be achieved through histopathological examination post enucleation.

**Therapeutic Management**

The following medical treatment was initiated:

- Kanadol® - TID AO
- Lotemax® eye drops – TID, AO
- Yellox® eye drops – TID, AO
- Cosopt® eye drops – BID, OS

**Kanadol®**

Kanadol® is a nutraceutical formulation containing palmitoylethanolamide (PEA), a fatty acid amide with anti-inflammatory and analgesic properties. PEA modulates mast cell activation and neuroinflammatory pathways, contributing to pain control and reduction of inflammatory responses. In this patient, Kanadol® was prescribed as supportive therapy to improve ocular comfort and help manage chronic inflammation associated with intraocular disease.

**Lotemax® (Loteprednol Etabonate 0.5%)**

Lotemax® is a topical corticosteroid specifically designed for ocular use, characterized by a high anti-inflammatory efficacy and a relatively favorable safety profile. Loteprednol inhibits phospholipase A2, reducing the synthesis of prostaglandins and leukotrienes, thereby decreasing ocular inflammation.

In this case, Lotemax® was administered to control anterior segment inflammation, conjunctival hyperemia, and fibrinous reaction, while minimizing the risk of steroid-induced intraocular pressure elevation.



*PCopyright © farma-web.it*

**Yellox® (Bromfenac 0.09%)**

Yellox® is a topical non-steroidal anti-inflammatory drug (NSAID) that inhibits cyclooxygenase (COX), leading to decreased prostaglandin production. Bromfenac is particularly effective in controlling intraocular inflammation and pain, and it penetrates well into ocular tissues.

In the case of Kimbo, Yellox® was used in combination with corticosteroid therapy to provide additional anti-inflammatory effects and to help control uveitis-associated discomfort.



## Histopathological Findings

*Histopathological evaluation was performed by Prof. Chiara Giudice (Diplomate ECPV), University of Milan, Italy. The original histopathological report is provided below:*

The globe shows a diffusely altered and corrugated profile. The cornea is characterized by mild diffuse epithelial hyperplasia with keratotic changes, irregularity of the basement membrane profile, and a wide area of basal epithelial pigmentation. Superficial stromal fibrosis and neovascularization are also observed.

The anterior chamber is diffusely occupied by loose, edematous fibrovascular membranes, variably infiltrated by macrophages containing hemosiderin pigment and by pigmented cells of uveal origin. These membranes diffusely adhere to the inner corneal surface, replacing the endothelium, extend over the iris surface, and connect with post-iridal membranes, occluding the pupil and causing extensive posterior synechiae.

The normal iris architecture is markedly distorted with ectropion iridis, and the filtration angle is closed and collapsed. An increased number of pigmented cells (melanocytes) is observed within the iris stroma and ciliary processes.

Thick and dense cyclitic membranes incorporate the lens, which shows diffuse degeneration of cortical fibers and focal rupture of the posterior capsule associated with mild perifocal macrophagic inflammation.

Extensive aggregates of asteroid bodies are entrapped within cyclitic and anterior vitreous fibrous membranes.

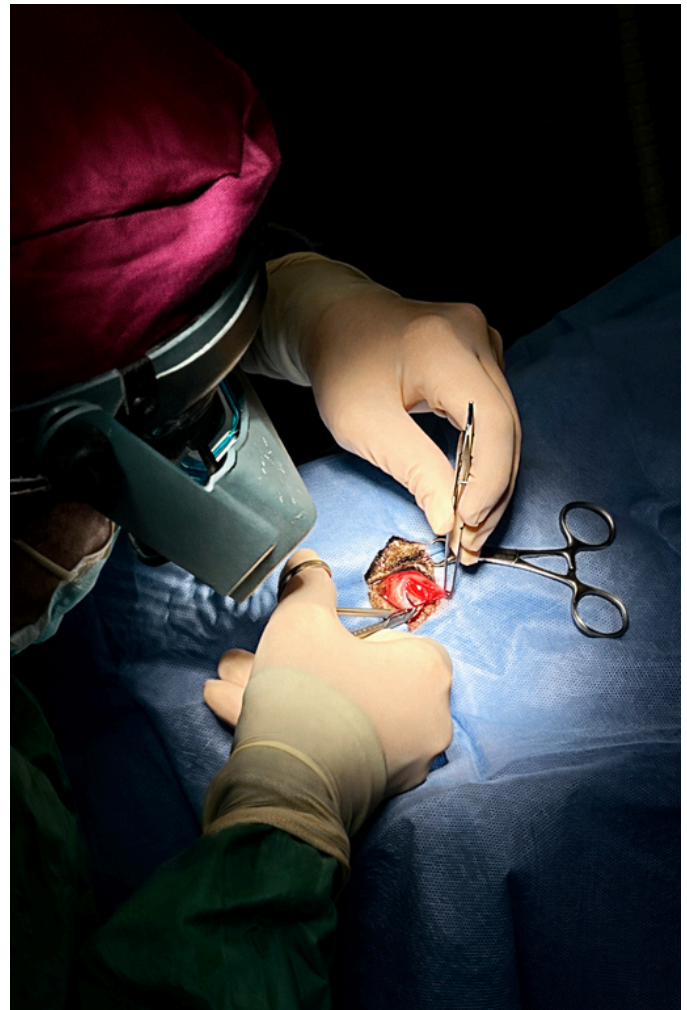
Large, dense fibrous and fibrovascular membranes traverse the vitreous, extend along the posterior surface of the lens, and cover the choroid, markedly distorting its profile. Both recent and previous hemorrhages (hemosiderin deposits) are evident within these fibrovascular membranes.

The choroid is detached from the underlying sclera over a wide area, most likely due to cicatricial remodeling of the overlying fibrous membranes.

Short segments of completely atrophic retina infiltrated by pigmented cells are recognizable within the anterior vitreous, surrounded by the previously described fibrotic reaction.

Diffuse spongiosis affects the optic nerve.

**No evidence of neoplastic proliferation was identified.**



*Intraoperative view of enucleation of the left eye (OS) of Kimbo.*

*Procedure performed by Dr. Stefania Trio, Oftavet Clinic, Naples, Italy.*



*Enucleated globe (OS) from Kimbo, fixed in formalin for histopathological analysis.*

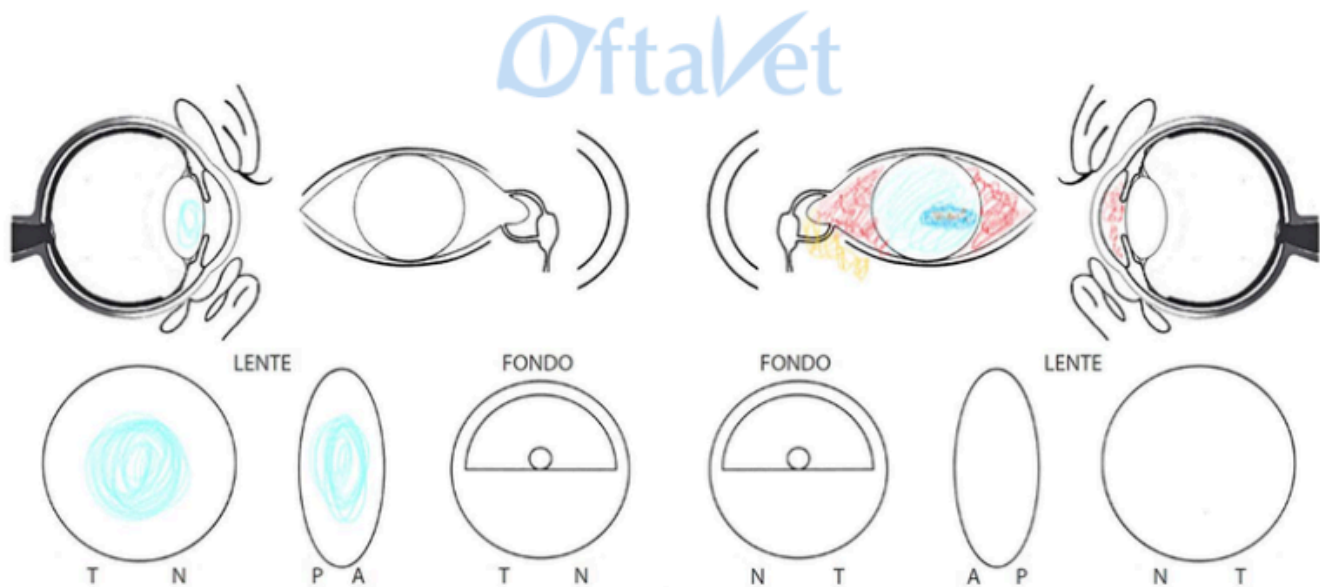


Illustration of Kimbo's ophthalmic examination, courtesy of Dr. Stefania Trio, Oftavet Clinic, Naples.

### Final Diagnosis

Severe chronic fibrovascular proliferative panuveitis with cyclitic membrane formation, extensive intraocular fibrosis, and secondary angle-closure glaucoma, mimicking intraocular neoplasia.

### Conclusion

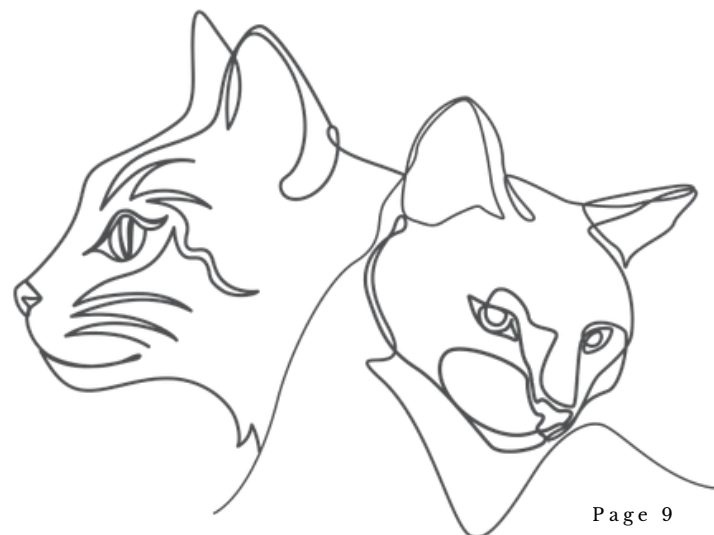
Although the clinical presentation strongly suggested intraocular neoplasia, histopathological findings definitively excluded a tumor and revealed a severe chronic inflammatory and fibrovascular condition responsible for the intraocular mass effect and secondary glaucoma.

### Acknowledgements

The author would like to express their sincere gratitude to the Oftavet Clinic (Naples, Italy) and to Dr. Stefania Trio for providing the clinical case and for their essential support throughout the study. Their expertise, availability, and meticulous ophthalmological evaluation greatly enriched the diagnostic process and guided the clinical management of the patient. Their contribution was fundamental to the development and completion of this work, and the author deeply appreciate their professionalism and collaboration.

### References

1. Gelatt KN, Gilger BC, Kern TJ. *Veterinary Ophthalmology*. 5th ed. Wiley-Blackwell; 2013.
2. de Lahunta A, Glass EN. *Veterinary Neuroanatomy and Clinical Neurology*. 3rd ed. Saunders Elsevier; 2009.
3. Lorenz MD, Coates JR, Kent M. *Handbook of Veterinary Neurology*. 5th ed. Saunders Elsevier; 2011.
4. Zăvoi AA, Enache AE. Glaucoma in Dogs. *Cluj Veterinary Journal*. 2021;26(3):8–22.
5. Raut SW, Venugopal SK, Philip LM, Martin KD, George A, Joy G. Management of canine glaucoma using a combination of dorzolamide and timolol. *J Vet Anim Sci*. 2023;54(4):1127-1130.
6. Dumitrașcu DM, Ionașcu I, Vlăgioiu C. CT aspects in acute glaucoma secondary to anterior lens luxation with hypermature cataract in a dog – a case report. *Practica Veterinara*. 2024



# THANK YOU, DR. STEFANIA TRIO !



## A tribute to her expertise and dedication in veterinary ophthalmology

Dr. Stefania Trio, DVM, PhD, graduated in Veterinary Medicine from the University of Naples Federico II with 110/110 cum laude. Between 1999 and 2002, she completed an internship/residency in veterinary ophthalmology at the École Nationale Vétérinaire d'Alfort (ENVA) under the supervision of Prof. Bernard Clerc (ECVO founding member and Past President), focusing on medical and surgical ophthalmology.



During this period, she obtained the Diplôme d'Études in Ophthalmology (ENVA, 1999–2000), the Diplôme Universitaire in Experimental Surgery and Microsurgery at Université Paris VII – Lariboisière (2001–2002), and attended the Basic Science Course in Veterinary and Comparative Ophthalmology and Histologic Basis of Ocular Disease at North Carolina State University (NCSSU), USA (2002).

She has served as a lecturer and surgical instructor in numerous national and international courses and is the author and co-author of several peer-reviewed scientific publications in veterinary ophthalmology.

Since 2003, she has worked as a private practitioner in Campania and surrounding regions, providing a referral service dedicated to medical and surgical ophthalmology.

In 2013, she obtained a PhD in Veterinary Ophthalmology from the University of Messina. She is also accredited for ENCI certification for hereditary ocular diseases in breeding programs. In 2022, she completed the Executive Master in Veterinary Ophthalmology (EMVO).



[@oftavet\\_oculisticaveterinaria](https://www.instagram.com/oftavet_oculisticaveterinaria)



[info@oftavet.it](mailto:info@oftavet.it)



# IDIOPATHIC GENERALIZED TREMOR SYNDROME: WHAT TO KNOW AS A PRACTITIONER AND AS AN OWNER



Article by Daria Gănescu

## Introduction

Idiopathic generalized tremor syndrome (IGTS) is characterized by an acute onset of full-body tremors that are responsive to treatment with corticosteroids. This disease was initially described in small (<15 kg), white dogs (e.g., Maltese, West Highland White terrier, Bichon Frise), and was at first introduced as “little white shaker syndrome“, but since then it has been sporadically reported in the literature and known under many differing names, such as “Idiopathic cerebellitis,” “Corticosteroid-responsive tremor syndrome” and “Steroid-responsive tremors“. However, various other dog breeds with different coat colors have since been reported, so the term IGTS may be more appropriate.

## Etiopathology

IGTS is a disorder characterized by an acute onset of full-body tremors, sometimes accompanied by vestibulo-cerebellar signs, that is responsive to treatment with corticosteroids. Although considered to have an overall good outcome, relapsing and persistent mild clinical signs have been described. So far, little is known about the etiopathology of this syndrome, but it is believed to have an immune-mediated origin. In human medicine, description of numerous autoantibodies involved in certain non-infectious neurologic disorders has revolutionized understanding of their pathophysiology, diagnosis and treatment. No gender predisposition has been documented, but a female bias has been suggested in some studies. The disease occurs predominantly in dogs, with only a few cases described in cats.

## Clinical signs

The prevailing clinical sign in dogs with this disease is a fine, whole-body tremor that worsens with anxiety and excitement, accompanied by cerebellar ataxia with hypermetria and wide based stance and sometimes by vestibular signs (head tilt, nystagmus, vestibular ataxia), decreased menace response, opsoclonus, paraparesis, tetraparesis, mild hyperthermia and seizure activity. In a recent study, of 33 dogs, the most common clinical sign was head tremor, present in 94% dogs in this study (31/33), mostly as part of a generalized (whole body) tremor, present in 88% of the dogs in this study (29/33). Only two dogs were reported to have only a head tremor without a generalized tremor. Twenty-four dogs were reported to have an intention tremor (73%). Ataxia was noted in 27/33 dogs (82%); seven dogs were reported to have a combination of vestibular and cerebellar ataxia, 12 dogs had a purely cerebellar ataxia, and eight dogs had a purely vestibular ataxia. Menace response deficits were reported in 14 dogs, hypermetria in 12 dogs, a head tilt in 11 dogs, a pathologic spontaneous nystagmus in 10 dogs, and a reduced pupillary light reflex in five dogs. Epileptic seizures were reported in one dog in this study. Hyperthermia was noted in seven dogs (21%), with a mean rectal temperature of 39.5°C (range 39.3–40.3).

## Treatment

Immunomodulatory therapy should be initiated promptly, with prednisolone serving as the mainstay treatment at a recommended starting dose of 2 mg/kg/day.

In severe cases, doses up to 4 mg/kg/day may be used, while milder presentations can be managed with 1 mg/kg/day. Gradual tapering is recommended over a period of less than six months whenever clinically possible. For enhanced immunosuppression or refractory cases, adjunctive therapy may include ciclosporin administered orally at 3.5–7 mg/kg twice daily, cytarabine given as four 50 mg/m<sup>2</sup> subcutaneous injections every 12 hours over 48 hours and repeated every 3 weeks, or mycophenolate mofetil at 10 mg/kg orally twice daily. Supportive treatment should include anticonvulsants such as diazepam or phenobarbital when indicated, alongside antibiotics if secondary infections are suspected. Common corticosteroid related adverse effects include polyuria/polydipsia, polyphagia, lethargy, muscle wasting, alopecia, and abdominal distension, requiring regular monitoring throughout therapy.

### Diagnosis

A presumptive diagnosis of IGTS can be made based on signalment, clinical signs, neurologic examination findings, and exclusion of other potential causes of whole-body tremors. Magnetic resonance imaging (MRI) results are usually normal in IGTS patients, and cerebrospinal fluid analysis revealed pleocytosis (abnormal increase in white blood cells) in a limited number of cases. Although considered to have an overall good outcome, relapsing and persistent mild clinical signs have been described. Currently the syndrome is still considered idiopathic but based on the positive response to immunomodulatory drugs (namely corticosteroids), an immune-mediated etiology is suspected. Apart from that, little is known about the underlying etiology of IGTS and until recently, there have been no larger studies reporting on treatment and long-term outcome of this disease.

### As an owner, when to worry about your dog's shaking

Not all shaking requires immediate vet attention, but certain signs warrant concern. If the tremors are sudden, severe, or accompanied by disorientation, seek help right away. Persistent shaking that interferes with eating, walking, or resting is a red flag. Watch for additional symptoms like vomiting, diarrhea, seizures, or behavioral changes—these could indicate poisoning, infection, or other serious issues. In Maltese, due to their size, even minor problems can escalate quickly. If shaking starts after a head injury or exposure to toxins, don't delay. Puppies and senior dogs are more vulnerable, so err on the side of caution. Routine vet visits can catch issues early.



Copyright © getapet.com

Trust your instincts—if something feels off, professional advice is invaluable. Remember, early intervention often leads to better outcomes, especially for conditions like Shaker Syndrome.

### Living with a dog with IGTS

Having a dog with Shaker Syndrome doesn't mean a diminished quality of life. With proper management, these dogs can thrive. Create a calm home environment to reduce stress triggers—soft lighting, quiet spaces, and routine schedules help. Adapt your home for safety: use ramps for furniture, non-slip mats on floors, and baby gates to prevent falls. Exercise should be gentle; short walks and play sessions avoid overexertion. Nutrition plays a role—feed high quality, balanced meals to support overall health. Supplements like omega-3 fatty acids might aid in reducing inflammation, but check with your vet first. Socialization remains important so introduce new experiences gradually to build confidence. Joining support groups for owners of dogs with neurological issues can provide valuable tips and emotional support. Above all, shower them with love—they'll reward you with unwavering companionship.

#### References :

1. Phillipps S, DeDecker S, Gutierrez-Quintana R, Alcoverro E, Gomes SA, Goncalves R. Idiopathic generalised tremor syndrome in dogs. *Vet Rec.* 2022;e1734. <https://doi.org/10.1002/vetr.1734>
2. <https://maltese.rs/blog/why-is-my-dog-shaking-understanding-shaker-syndrome/>
3. Kajin, F. et al. (2024) Canine idiopathic generalized tremor syndrome, immune mediated? *Frontiers in Veterinary Science*, 11, 1453698. (doi: 10.3389/fvets.2024.1453698)
4. Fikri F, Hendrawan D, Wicaksono AP, et al. (2023). Incidence, risk factors, and therapeutic management of equine colic in Lamongan, Indonesia. *Veterinary World*, 16(7), 1408–1414.
5. Lowrie M, Garosi L. Classification of involuntary movements in dogs: Tremors and twitches. *Vet J.* 2016 Aug;214:109-16. doi: 10.1016/j.tvjl.2016.05.011. Epub 2016 May 19. PMID: 27387736.



*Article by Mahmoud naeem kabha*

## Understanding Colic in Horses

Colic has always remained one of the most common life-threatening emergencies in equine medicine. Despite the major advances in veterinary diagnostics, surgery, and intensive care, colic continues to be one of the leading causes of death in horses worldwide. What makes this condition particularly dangerous is not only its severity, but also how frequently the early warning signs are underestimated or misunderstood by horse owners. (Reed et al., 2018; Gillen & Archer, 2023) Many horses survive colic when intervention occurs early, yet many others are lost because the first clinical signs are mistaken for simple discomfort, temporary stress, or mild digestive upset. For this reason, understanding what colic is, why it happens, how it develops, and when immediate veterinary attention is required is essential for every horse owner, breeder, trainer, and future veterinarian. Rapid recognition and intervention can often mean the difference between recovery and tragedy. (Fereig, 2023)

### What Is Colic? The Broad Term Behind a Serious Threat

One of the most important concepts to understand is that colic itself is not a specific disease. Colic is a broad medical term used to describe abdominal pain in horses. The pain may originate from different portions of the gastrointestinal tract, including the stomach, small intestine, cecum, or large colon, but in some cases it may even arise from organs outside the digestive system. (Reed et al., 2018) The equine digestive tract is anatomically unique and extremely sensitive.

Horses are monogastric herbivores with a very long and complex gastrointestinal system designed for continuous grazing and constant movement of fibrous feed material.

Even small disruptions in motility, gas production, hydration, or intestinal positioning can rapidly progress into severe and potentially fatal conditions. (Auer & Stick, 2019)

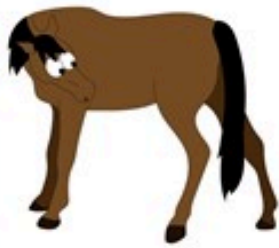
Several anatomical characteristics make horses particularly vulnerable to colic:

- Horses possess a relatively small and non-distensible stomach. Because the stomach cannot expand significantly, excessive accumulation of gas or fluid can increase pressure rapidly and may even lead to gastric rupture. (Reed et al., 2018)
- The equine large colon is exceptionally long and highly mobile inside the abdominal cavity. This mobility predisposes the intestine to displacement, twisting, or torsion, conditions that can compromise blood supply and lead to intestinal death. (Auer & Stick, 2019)
- Horses are physically unable to vomit because of the powerful one-way structure of the cardiac sphincter at the entrance of the stomach. Consequently, pressure caused by feed, gas, or reflux cannot be relieved naturally. (Fereig, 2023)

For these reasons, what may initially appear as mild abdominal discomfort can deteriorate into a surgical emergency within only a few hours.

# RECOGNIZING COLIC

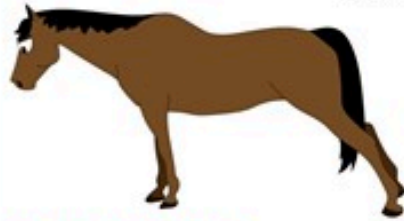
Horses show signs of abdominal pain in a wide variety of ways. **Among the more common signs of colic are:**



Turning the head toward the flank, **kicking or biting at the belly.**



**Pawing.**



**Stretching out as if to urinate,** without doing so.



**Repeatedly lying down, rolling, and getting up,** or attempting to do so.



**Inappropriate sweating, rapid breathing and/or flared nostrils, elevated pulse rate.**

**Leaving food behind** or completely disinterested in food; putting the head down to water without drinking.

**If you suspect your horse is suffering from colic, alert your veterinarian immediately.** They may not need to come out and examine the horse if the colic signs are mild, but leave that decision to the veterinarian.

Copyright © swiftsureequine.com

## Common Causes of Colic

Colic can develop through several different mechanisms, and identifying the exact cause is essential for determining the appropriate treatment and prognosis. (Bihonegn & Bekele, 2018) One of the most frequent causes is intestinal obstruction or impaction. Feed material, sand accumulation, foreign bodies, or dehydrated intestinal contents may obstruct the movement of digesta through the gastrointestinal tract. Impactions are especially common in horses with poor water intake, inadequate dental care, or diets low in roughage. (Fikri et al., 2023) Another common form is gas colic, which occurs when excessive fermentation inside the gastrointestinal tract produces large quantities of gas. The resulting intestinal distension stretches the intestinal wall and causes significant abdominal pain. Sudden dietary changes, high-grain diets, or poor-quality feed can contribute to abnormal fermentation processes. (Bihonegn & Bekele, 2018)

Because the equine colon is highly mobile, displacement and torsion are also major causes of severe colic. In these cases, portions of the intestine move from their normal anatomical position or twist around themselves. When torsion occurs, blood circulation to the affected intestine becomes compromised, leading to ischemia, tissue necrosis, endotoxemia, and potentially death if surgery is not performed rapidly. (Auer & Stick, 2019)

Parasitic infestations remain another important cause, especially in horses with inadequate deworming programs. Strongyle larvae and heavy worm burdens can damage blood vessels and intestinal walls, reduce intestinal motility, and in severe cases contribute to intestinal obstruction or thromboembolic disease. (Fereig, 2023)

Inflammatory and infectious disorders affecting the intestines may also trigger colic. Enteritis, colitis, and intestinal inflammation can alter motility, increase fluid accumulation, and produce severe abdominal pain accompanied by systemic illness. (Reed et al., 2018)

Additional risk factors associated with colic include dehydration, stress, transportation, abrupt feed changes, lack of exercise, poor dental condition, and irregular feeding schedules. (Gillen & Archer, 2023)

## Early Signs Owners Often Miss

Recognizing the earliest clinical signs of colic is one of the most important responsibilities of horse owners. Unfortunately, horses do not always display dramatic symptoms during the initial stages, and mild signs can progress rapidly into life-threatening conditions. (Fereig, 2023)

One of the earliest indicators is behavioral change. A horse experiencing abdominal discomfort may appear restless, anxious, or unable to settle comfortably.

Pawing at the ground, repeatedly shifting weight, or frequently looking back toward the abdomen are common warning signs that should never be ignored.

Some horses repeatedly lie down and stand up again because they cannot find a comfortable position. Others may roll excessively in an attempt to relieve pain. Although rolling is commonly associated with colic, not all affected horses display this behavior. In some cases, the signs are extremely subtle. Reduced appetite is another critical indicator. Horses suffering from abdominal pain often lose interest in feed, stop eating hay, or appear unusually quiet and depressed. Owners may incorrectly interpret this as temporary fatigue or mood changes, delaying veterinary intervention. Certain horses adopt abnormal postures, such as stretching out as if attempting to urinate. This position reflects abdominal discomfort and intestinal pressure rather than urinary disease. Mild abdominal distension may also become visible, especially in cases involving gas accumulation or intestinal obstruction. Some horses display the flehmen response, characterized by curling the upper lip. While this behavior is sometimes associated with smell recognition and reproductive behavior, it can also appear in horses experiencing pain or discomfort. Importantly, no sign of abdominal pain should ever be dismissed as insignificant. Colic severity cannot be judged solely by the intensity of visible symptoms. A horse with mild signs may still suffer from a serious intestinal lesion requiring immediate treatment.

### Why Veterinary Evaluation Is Essential

Veterinary examination is fundamental for determining both the cause and severity of colic. Because many forms of colic initially appear similar from the outside, professional assessment is necessary to distinguish cases that can be medically managed from those requiring urgent surgery. The diagnostic process begins with obtaining a detailed clinical history and performing a complete physical examination. The veterinarian evaluates heart rate, respiratory rate, rectal temperature, mucous membrane color, hydration status, and capillary refill time. These parameters provide essential information regarding circulatory stability, pain severity, and systemic compromise. Elevated heart rate in particular is considered one of the most important prognostic indicators in equine colic.



*Nasogastric Intubation for Horses*  
Copyright © madbarn.com

Nasogastric intubation is frequently performed both for diagnostic and therapeutic purposes. Passing a stomach tube allows the veterinarian to detect gastric reflux and relieve dangerous accumulation of fluid and gas within the stomach, reducing the risk of gastric rupture.

Rectal examination remains one of the most valuable diagnostic procedures in adult horses. Through palpation of abdominal structures, the veterinarian can identify intestinal distension, impactions, abnormal intestinal positioning, or displacement of the colon. (Reed et al., 2018) Abdominal ultrasonography provides additional information regarding intestinal motility, fluid accumulation, intestinal wall thickness, and abdominal abnormalities not detectable during rectal examination. In some cases, blood analysis and abdominal fluid evaluation are also required to assess inflammation, endotoxemia, and tissue damage. (Fereig, 2023)

Combining these diagnostic tools enables the veterinarian to determine whether the horse requires medical treatment, intensive monitoring, or immediate surgical intervention.

### Treatment and Prognosis

Treatment depends entirely on the underlying cause, severity, and duration of the colic episode. Fortunately, many cases respond successfully to medical management when treated early.

Medical therapy commonly includes analgesic and anti-inflammatory drugs such as non-steroidal anti-inflammatory drugs (NSAIDs), intravenous or oral fluid therapy to correct dehydration, and laxatives such as mineral oil or magnesium sulfate to facilitate intestinal transit. Controlled walking and close monitoring are often recommended to stimulate motility and prevent self-trauma caused by rolling. (Bihonegn & Bekele, 2018)

However, some forms of colic cannot be resolved medically. Intestinal displacement, torsion, strangulation, and severe impactions frequently require surgical correction. During surgery, compromised portions of intestine may need repositioning or removal if tissue death has occurred.

Time is one of the most critical factors influencing survival. Delayed referral to an equine surgical facility significantly reduces prognosis because prolonged intestinal compromise increases endotoxemia, systemic inflammation, and irreversible tissue damage.

Survival rates vary depending on lesion type and treatment approach:

- Medical colic cases often have survival rates exceeding 90% when diagnosed and treated promptly. (Reed et al., 2018)
- Surgical colic cases generally have survival rates ranging between 50–80%, depending on the nature of the lesion, duration before surgery, and systemic response of the horse. (Straticò et al., 2022)

Rapid diagnosis and early initiation of treatment therefore remain the most important factors for improving outcome and survival.

### Prevention: Owners Have the Most Powerful Tool

Although not all forms of colic are preventable, proper management can significantly reduce the risk. Prevention is based largely on maintaining gastrointestinal stability and minimizing factors that disrupt intestinal function.

A consistent feeding routine is essential because sudden dietary changes can alter microbial fermentation and intestinal motility.

High-quality forage should form the basis of the diet, while abrupt introduction of concentrates or grain should always be avoided.

Adequate hydration is equally important. Horses must always have access to clean, fresh water, particularly during cold weather when water intake commonly decreases. Proper hydration helps maintain intestinal motility and reduces the risk of impaction.

Regular deworming programs and routine dental care are fundamental preventive measures. Poor dentition can impair chewing efficiency and digestion, while inadequate parasite control increases the risk of intestinal damage and obstruction.

Daily turnout and regular exercise also contribute significantly to gastrointestinal health by promoting intestinal motility and reducing stress. Horses confined for prolonged periods or exposed to sudden management changes may have increased susceptibility to colic episodes.

Owners should also monitor manure production, appetite, hydration status, and behavioral patterns closely. Often, subtle changes observed early can provide the first indication that a horse is developing gastrointestinal distress. Good management practices cannot eliminate every case of colic, but they substantially decrease the likelihood of severe disease and improve overall equine health.

### Conclusion

Colic is considered a hidden killer not because it is rare, but because it is frequently underestimated. What initially appears to be mild discomfort can rapidly evolve into a life-threatening emergency within only a few hours.

The combination of owner awareness, rapid recognition of clinical signs, and immediate veterinary intervention represents the most effective strategy for saving equine lives. Many horses can recover completely when diagnosis and treatment occur early enough.

As future veterinarians, our responsibility extends beyond diagnosis and treatment alone. Education of horse owners is equally important. By teaching owners to recognize early warning signs, understand risk factors, and seek veterinary assistance without delay, we contribute not only to successful treatment outcomes but also to the prevention of avoidable equine deaths.

### References :

1. Auer JA, Stick JA. (2019). *Equine Surgery*. 5th ed. Elsevier..
2. Bihonegn T, Bekele F. (2018). Colic in Equine: A Review Article. *International Journal of Advanced Research in Biological Sciences*, 5(5), 151–163.
3. Fereig RM. (2023). A review on equine colic: Etiology, differential diagnosis, therapy, and prevention. *German Journal of Veterinary Research*, 3(4), 1–12.
4. Fikri F, Hendrawan D, Wicaksono AP, et al. (2023). Incidence, risk factors, and therapeutic management of equine colic in Lamongan, Indonesia. *Veterinary World*, 16(7), 1408–1414.
5. Gillen A, Archer DC. (2023). Epidemiology of Colic: Current Knowledge and Future Directions. *Veterinary Clinics of North America: Equine Practice*, 39(2), 157–174.
6. Reed SM, Bayly WM, Sellon DC. (2018). *Equine Internal Medicine*. 4th ed. Elsevier.
7. Straticò P, Varasano V, Palozzo A, et al. (2022). Retrospective study on risk factors and short term outcome of horses referred for colic from 2016 to 2022. *Veterinary Sciences*, 9(10), 545.

# PAIN MANAGEMENT IN SMALL ANIMALS: CURRENT APPROACHES AND FUTURE PERSPECTIVES



Article by Esther Cheron

## Abstract

Pain management is a cornerstone of modern veterinary medicine, playing a critical role in animal welfare, recovery, and long-term clinical outcomes. In small animal practice, significant advances have been made in understanding the physiological mechanisms of pain and in developing effective therapeutic strategies. Despite these advances, pain remains underdiagnosed and undertreated in many clinical settings. This article aims to provide a comprehensive overview of pain physiology, assessment methods, and current treatment options in dogs and cats, with a particular focus on multimodal analgesia. In addition, emerging therapies and future perspectives are discussed, highlighting the need for continuous improvement in pain recognition and management in veterinary medicine.

*Key words: veterinary pain management; animal welfare; small animal practice; pain physiology; pain assessment; multimodal analgesia;*

## Introduction

Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage (IASP, 2020). In veterinary medicine, the inability of animals to verbally communicate their discomfort makes pain assessment particularly challenging. As a result, pain has historically been underestimated and, in many cases, insufficiently treated. Over the past decades, increasing awareness of animal welfare and advances in veterinary science have significantly improved pain management strategies. It is now well established that inadequate analgesia can lead to numerous adverse effects, including delayed healing, immunosuppression, behavioral changes, and the development of chronic pain states (Mathews et al., 2014; Epstein et al., 2015).

## Pathophysiology of Pain

Pain perception involves a complex and dynamic process known as nociception, which is traditionally divided into four stages: transduction, transmission, modulation, and perception (Klaumann et al., 2008). Transduction occurs at the level of peripheral nociceptors, where noxious stimuli—mechanical, thermal, or chemical—are converted into electrical signals. This process is mediated by the release of inflammatory mediators such as prostaglandins, bradykinin, and cytokines, which sensitize nerve endings and lower the activation threshold. Transmission refers to the propagation of these signals along peripheral nerves to the spinal cord and then to higher brain centers. At the spinal level, modulation processes can either amplify or inhibit pain signals through complex interactions involving excitatory and inhibitory neurotransmitters. One of the most important mechanisms in persistent pain is central sensitization, characterized by an increased responsiveness of neurons in the central nervous system. This phenomenon is largely mediated by NMDA receptors and plays a key role in chronic and neuropathic pain (Woolf, 2011). From a clinical perspective, it is essential to distinguish between nociceptive pain, resulting from tissue damage or inflammation, and neuropathic pain, caused by lesions or dysfunction of the nervous system. These different types of pain require different therapeutic approaches.

## Pain Assessment in Small Animals

Accurate pain assessment is a prerequisite for effective management but remains one of the greatest challenges in veterinary practice. Clinicians must rely on indirect indicators, including behavioral and physiological changes.

Common behavioral signs of pain include altered posture, reduced mobility, decreased appetite, vocalization, and changes in social interaction. However, these signs can be subtle or absent, particularly in cats, which tend to mask pain as a survival mechanism. To improve objectivity, several validated pain scoring systems have been developed. The Glasgow Composite Measure Pain Scale (CMPS-SF) is widely used in dogs and provides a structured approach based on behavioral observations (Reid et al., 2007). In cats, the Feline Grimace Scale has gained popularity, focusing on facial expressions as indicators of pain (Dalla Costa et al., 2019). Despite these tools, pain assessment remains subjective and requires clinical experience. Regular reassessment is essential to adjust analgesic protocols and ensure optimal patient comfort.

## Pharmacological Management

### *Opioids*

Opioids are considered the gold standard for the treatment of moderate to severe acute pain. They exert their effects by binding to opioid receptors in the central nervous system, thereby inhibiting nociceptive transmission (Mathews et al., 2014). Commonly used opioids in veterinary medicine include morphine, methadone, and buprenorphine. While highly effective, these drugs may induce side effects such as sedation, respiratory depression, nausea, and gastrointestinal disturbances. Their use must therefore be carefully monitored.

### *Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)*

NSAIDs are among the most widely used analgesics in small animal practice. Their mechanism of action involves the inhibition of cyclooxygenase (COX) enzymes, leading to a reduction in prostaglandin synthesis and inflammation (Lascelles et al., 2007). They are particularly useful in conditions involving inflammation, such as osteoarthritis. However, their use is associated with potential adverse effects, including gastrointestinal ulceration, renal toxicity, and hepatic dysfunction. Proper patient selection and monitoring are therefore essential.

### *Adjunctive Analgesics*

Adjunctive drugs play a crucial role in enhancing analgesia and addressing specific types of pain. Ketamine, an NMDA receptor antagonist, is particularly useful in preventing central sensitization and managing severe pain states. Gabapentin is widely used for neuropathic pain, especially in chronic conditions.

Alpha-2 adrenergic agonists, such as dexmedetomidine, provide both sedation and analgesia but must be used cautiously due to their cardiovascular effects.

Local anesthetics, including lidocaine and bupivacaine, are essential tools for regional anesthesia techniques, allowing targeted pain control and reducing the need for systemic drugs.

### *Multimodal Analgesia*

Multimodal analgesia is based on the combination of different classes of analgesic drugs acting at various levels of the pain pathway. This approach is now considered the standard of care in veterinary medicine (Mathews et al., 2014). By targeting multiple mechanisms simultaneously, multimodal analgesia enhances pain relief while minimizing the doses and side effects of individual drugs. For example, a typical perioperative protocol may include an opioid for central analgesia, an NSAID for inflammation control, and a local anesthetic for peripheral blockade. This strategy is particularly beneficial in complex cases, such as major surgery or chronic pain conditions.

## Clinical Applications

In clinical practice, pain management must be adapted to the specific context and individual patient. In perioperative settings, preemptive analgesia is crucial. Administering analgesics before the onset of painful stimuli has been shown to reduce central sensitization and improve postoperative outcomes. Chronic pain, such as that associated with osteoarthritis, requires a long-term and multimodal approach. In addition to pharmacological treatment, weight management, physiotherapy, and environmental modifications play a key role in improving quality of life. In emergency situations, rapid and effective pain control is essential. Opioids are typically the first-line treatment, often combined with other agents such as ketamine in cases of severe trauma.

## Non-Pharmacological Approaches

Non-pharmacological therapies are increasingly recognized as valuable components of pain management strategies. Physiotherapy and rehabilitation help restore mobility, strengthen muscles, and reduce pain, particularly in chronic conditions. Acupuncture has been shown to stimulate the release of endogenous opioids and modulate pain pathways (Xie & Preast, 2013).

Other modalities, such as laser therapy and therapeutic ultrasound, may promote tissue healing and reduce inflammation. Additionally, weight management is a critical factor in reducing mechanical stress on joints, especially in overweight animals.

### Future Perspectives and Challenges

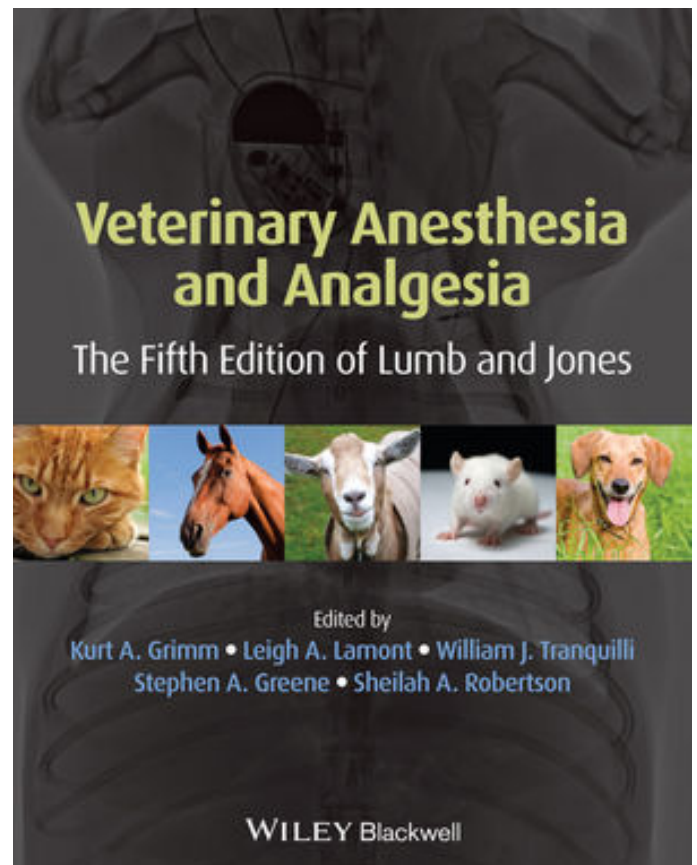
Recent advances in veterinary medicine offer promising new approaches to pain management. Monoclonal antibodies targeting nerve growth factor (NGF) have shown significant efficacy in managing chronic pain, particularly in osteoarthritis. Regenerative medicine, including stem cell therapy and platelet-rich plasma (PRP), represents another exciting field, with the potential to not only alleviate pain but also promote tissue repair. However, several challenges remain. The cost of advanced therapies may limit their accessibility, and further research is needed to fully evaluate their long-term safety and efficacy. In addition, improving pain recognition and owner compliance remains a critical issue in clinical practice.

### Conclusion

Pain management in small animals has evolved considerably, reflecting growing awareness of animal welfare and advances in scientific knowledge. Multimodal analgesia now represents the cornerstone of effective pain control, combining pharmacological and non pharmacological approaches. Despite significant progress, pain remains underdiagnosed and undertreated in many cases. Continued education, research, and innovation are essential to further improve the recognition and management of pain in veterinary patients. Ultimately, effective pain control is not only a clinical objective but also a fundamental ethical responsibility for veterinarians.

### References :

1. Dalla Costa, E., et al. (2019). Development of the Feline Grimace Scale. *Scientific Reports*, 9, 19128.
2. Epstein, M. E., et al. (2015). AAHA/AAFP pain management guidelines. *Journal of Feline Medicine and Surgery*, 17(3), 251–272.
3. Klaumann, P. R., et al. (2008). Pathophysiology of pain. *Archives of Veterinary Science*, 13(1), 1–12.
4. Lascelles, B. D. X., et al. (2007). Nonsteroidal anti-inflammatory drugs in veterinary medicine. *Veterinary Clinics of North America*, 37(1), 116.
5. Mathews, K., et al. (2014). Guidelines for recognition, assessment and treatment of pain. *Journal of Small Animal Practice*, 55(6), E10–E68.
6. Reid, J., et al. (2007). Development of the Glasgow Composite Measure Pain Scale. *Veterinary Anaesthesia and Analgesia*, 34(6), 430–438.
7. Woolf, C. J. (2011). Central sensitization. *Pain*, 152(Suppl), S2–S15.
8. Xie, H., & Preast, V. (2013). *Veterinary Acupuncture*. Wiley-Blackwell.



*Veterinary Anesthesia and Analgesia: Lumb & Jones (5th Edition) is widely considered one of the most authoritative and comprehensive textbooks in veterinary medicine, particularly in the fields of anesthesia, analgesia, and perioperative care. Edited by leading international experts, it serves as a key reference for veterinary students, clinicians, and researchers seeking an in-depth, evidence-based understanding of pain management across different animal species, with a strong focus on small animal practice.*

*The book provides a solid foundation in the physiology and neurobiology of pain, explaining the mechanisms of nociception, peripheral and central sensitization, and pain perception. This scientific framework allows readers to better understand how and why different analgesic strategies are applied in clinical practice.*

*A major focus of the text is the pharmacology of anesthetic and analgesic drugs. It offers detailed, evidence-based discussions of opioids, NSAIDs, local anesthetics, sedatives, dissociative agents, and adjunctive medications, including their mechanisms of action, clinical uses, and potential adverse effects. Particular attention is given to patient-specific considerations such as species differences, comorbidities, and physiological status.*

*The concept of multimodal analgesia is central throughout the book and is presented as the standard approach in modern veterinary pain management. The text explains how combining different drug classes that act at multiple points in the pain pathway can improve analgesic efficacy while reducing side effects, and it supports this with practical clinical applications.*

*In addition to pharmacology, the book covers essential aspects of clinical anesthesia, including patient assessment, anesthetic planning, monitoring, and postoperative care. It also emphasizes patient safety, early detection of complications, and the importance of individualized anesthetic protocols.*

*Overall, Lumb & Jones remains a cornerstone reference in veterinary anesthesia and analgesia, offering a clear connection between scientific principles and clinical application, and representing an essential resource for modern veterinary practice.*



*Article by Rama Halabi*

## Introduction

This article is grounded in two complementary frameworks—One Health and One Welfare—which emphasize that human, animal, and environmental systems are not isolated domains but interdependent components of a single, dynamic ecological network. Drawing from epidemiology, public health, veterinary medicine, ecology, and environmental science, these frameworks recognize that the wellbeing of humans is inseparable from the wellbeing of animals and ecosystems. This interdependence is not based on utility or anthropocentric benefit, but on the intrinsic interconnectedness of living systems and the shared conditions required for life to persist.

Among the most extreme disruptions to this equilibrium are large-scale armed conflicts, which function as powerful multi-system stressors capable of destabilizing health, ecological integrity, and welfare simultaneously. In such contexts, violence acts not only as a direct cause of mortality and injury but also as an upstream driver of systemic collapse across infrastructure, food systems, sanitation networks, biodiversity, and environmental stability. Modern conflict increasingly produces cascading effects that extend far beyond immediate human casualties, altering ecological processes and degrading the environmental foundations of health. From a One Health perspective, armed conflict can be understood as an etiological agent of complex, interlinked crises. Its effects propagate through damaged healthcare systems, disrupted veterinary services, contaminated ecosystems, and compromised food production chains. The resulting conditions create long-term vulnerabilities that persist well beyond the cessation of hostilities, shaping disease dynamics, ecological resilience, and population health outcomes for decades.

## Human, Animal, and Environmental Health Under Systemic Destruction

The impacts of armed conflict simultaneously affect all dimensions of One Health. Human health is compromised through the destruction of healthcare infrastructure, displacement of populations, interruption of essential services, and breakdown of sanitation and clean water systems. These conditions increase susceptibility to infectious diseases, exacerbate chronic illness management failures, and intensify psychological stressors associated with instability and insecurity. Vulnerable populations—including children, older adults, pregnant individuals, and those with pre-existing health conditions—experience disproportionate risk due to reduced access to care and environmental exposure.

In parallel, animal populations—including livestock, working animals, companion animals, and wildlife—are significantly affected by habitat destruction, resource scarcity, and disruption of care systems. The loss of veterinary infrastructure, combined with environmental degradation and food chain interruption, contributes to increased mortality, reduced reproductive capacity, and long-term population decline. These effects also indirectly impact human livelihoods, food security, and cultural relationships with animals, illustrating the bidirectional nature of human-animal dependence. Environmental systems are similarly destabilized through physical destruction, pollution, and ecosystem fragmentation. Damage to agricultural land, water infrastructure, and waste management systems contributes to soil degradation, water contamination, and loss of biodiversity.

Explosive residues, chemical pollutants, and debris accumulation further alter soil chemistry and aquatic ecosystems, reducing their capacity to support both human and non-human life. Coastal and freshwater systems are particularly vulnerable, with cascading impacts on fisheries, agriculture, and public health.

The breakdown of food production systems represents another critical pathway of impact. Disruption of agricultural activity, supply chains, and storage infrastructure leads to food insecurity, malnutrition, and long-term changes in land use patterns. Simultaneously, habitat loss reduces ecological resilience, diminishing ecosystem services such as pollination, nutrient cycling, and natural water purification.

### **One Health and Selective Attention in Crisis Contexts**

One Health and One Welfare frameworks emphasize integration, yet their application in real-world crisis contexts often reveals uneven patterns of attention and response. While some forms of ecological or animal suffering may receive rapid visibility and mobilization of resources, broader systemic collapses affecting human populations, ecosystems, and infrastructure may be addressed with differing urgency depending on geopolitical and institutional factors.

This asymmetry highlights a broader methodological and ethical challenge: how multispecies and environmental suffering is documented, prioritized, and acted upon within global health and humanitarian systems. The visibility of certain impacts—such as harm to companion animals or emblematic wildlife cases—can contrast with the slower or less visible recognition of widespread human health deterioration, environmental degradation, or infrastructural collapse.

These dynamics do not negate the importance of animal welfare interventions; rather, they underscore the need for consistent, scalable application of One Health principles across all affected systems. Effective implementation requires that human, animal, and environmental harms be assessed within a unified analytical framework, particularly during crises where rapid decision-making shapes survival outcomes across species and ecosystems.

### **Conclusion**

Armed conflict represents one of the most severe forms of systemic disruption affecting interconnected human, animal, and environmental health domains. Within a One Health and One Welfare framework, it is not reducible to a sequence of isolated humanitarian or medical events, but rather must be understood as a multi-layered ecological disturbance that propagates through biological, environmental, and infrastructural systems simultaneously. Its effects extend across spatial and temporal scales, producing both immediate mortality and long-term degradation of the conditions that sustain life.

From a public health perspective, conflict-driven destruction of healthcare systems, sanitation networks, and supply chains generates conditions conducive to infectious disease emergence, chronic disease deterioration, and increased mortality from otherwise preventable causes. These impacts are compounded by displacement, overcrowding, and environmental contamination, which together alter baseline epidemiological patterns and weaken population resilience. Importantly, these effects often persist long after active hostilities cease, embedding structural vulnerabilities into health systems and social organization.

From an ecological standpoint, armed conflict acts as a catalyst for accelerated environmental degradation. Soil systems are disrupted through physical destruction and chemical contamination, water systems are compromised by infrastructural collapse and pollution, and atmospheric and terrestrial ecosystems are altered by explosive residues and large-scale habitat fragmentation. These processes contribute to biodiversity loss, reduced ecosystem functionality, and long-term impairment of essential ecosystem services such as nutrient cycling, carbon storage, water purification, and agricultural productivity. The ecological consequences of conflict are therefore not incidental but systemic, affecting both macro- and micro-level environmental processes.

Animal populations, both domestic and wild, are embedded within these same systems of disruption. Loss of habitat, interruption of care networks, food scarcity, and exposure to toxic environments contribute to population decline and altered species distributions.

These changes, in turn, feed back into human systems through impacts on agriculture, zoonotic disease dynamics, labor structures, and cultural practices linked to human–animal relationships. The breakdown of these interdependencies underscores the foundational principle of One Health: that no species exists in isolation from the systems that sustain it.

Across all domains, armed conflict functions as an amplifying force that destabilizes pre-existing vulnerabilities while generating new, interconnected risks. It transforms localized environmental damage into regional or even transboundary ecological stress, and converts disruptions in infrastructure into prolonged systemic failures. In doing so, it reveals the fragility of the networks that support life and highlights the importance of resilience-based approaches to health and environmental governance.

A comprehensive One Health approach to conflict-related crises must therefore extend beyond immediate response and recovery. It must incorporate long-term ecological restoration, reconstruction of health and veterinary systems, rehabilitation of food production networks, and monitoring of environmental recovery trajectories. Equally important is the development of predictive and preventive frameworks capable of identifying systemic risk before collapse occurs, integrating environmental surveillance, epidemiological modeling, and ecological assessment into unified strategies.

Ultimately, armed conflict exposes the fundamental interdependence of human, animal, and environmental systems in the most extreme terms. It demonstrates that health cannot be partitioned into separate domains without loss of analytical and practical coherence. A truly integrated One Health paradigm must therefore be both descriptive and operational: capable of explaining systemic collapse while also guiding recovery, resilience-building, and the prevention of future large-scale ecological and public health disruption.

#### References :

1. Aldis W. (2008). *Health security as a public health concept: a critical analysis*. *Health Policy and Planning*, 23(6), 369–375.
2. Buse K, Walt G. (2000). *The World Health Organization and global public health*. *The Lancet*, 356(9230), 1678–1680.
3. FAO, UNEP, WHO, WOA. (2022). *One Health Joint Plan of Action (2022–2026)*.
4. Haines A, Ebi KL. (2019). *The imperative for climate action to protect health*. *New England Journal of Medicine*, 380, 263–273.
5. Leaning J, Guha-Sapir D. (2013). *Natural disasters, armed conflict, and public health*. *New England Journal of Medicine*, 369(19), 1836–1842.
6. Smith KR, et al. (2014). *Human health: impacts, adaptation, and co-benefits*. In IPCC AR5 WGII.
7. WOA (OIE). (2021). *One Health: A collaborative approach to health risks*.



*The artwork is The Triumph of Death, a mid-16th century painting attributed to Pieter Bruegel the Elder (c. 1562), a major figure of the Flemish Renaissance. Executed in a Northern Renaissance style with dense detail and a moral-allegorical narrative structure, the work reflects the period's preoccupation with mortality, religious anxiety, and the fragility of human society in the face of epidemic disease.*

*The composition depicts a vast, desolate landscape overrun by skeletal figures representing Death, who indiscriminately attack and overwhelm the living. Human figures from all social strata—peasants, soldiers, nobles, and clergy—are shown collapsing, fleeing, or being led toward mass death. The scene is organized as a continuous panorama of destruction, with no clear spatial hierarchy, reinforcing the sense of total societal collapse.*

*Architectural and environmental elements, including burning towns, abandoned roads, and collapsing settlements, frame the action and emphasize the destruction of both urban order and rural stability. The visual language is highly detailed, with Bruegel's characteristic crowded composition and precise rendering of individual figures contributing to an overwhelming sense of scale and inevitability.*

*The work belongs to the tradition of memento mori and danse macabre iconography, common in late medieval and early modern European art, which served as moral reflections on death, equality in mortality, and the transient nature of earthly power. Through its allegorical structure, the painting transforms the historical experience of plague and mass mortality into a universal commentary on human vulnerability and the limits of social and political structures when confronted with catastrophic disease.*

*Source: [www.museodelprado.es](http://www.museodelprado.es)*

# CLOSING THE GAP: A BABY VET'S GUIDE TO CUTANEOUS RECONSTRUCTION



Article by Blanche Nicolle

## The Philosophy: Beyond the Pedicle

Reconstructive surgery is often defined technically by pedicles and vascularity, but a skin flap is truly a biological masterpiece. It represents the moment we stop fighting tension and begin using surgical imagination to solve a puzzle. It is about more than closing a hole; it is about restoring the beauty and function of our patients. As I prepare to graduate, my goal is to demonstrate that reconstructive surgery is not only an advanced specialty but a vital, accessible tool for every practitioner. You don't need decades of experience to start, you need a deep respect for anatomy and the courage to "think in 3D."

## Back 2 basic

The foundation of successful reconstruction lies in a thorough understanding of skin anatomy, vascularization, and tension lines.

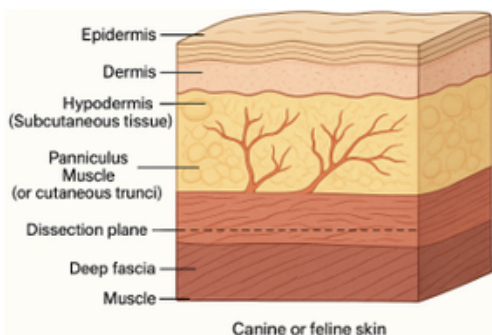


Fig.1. Cross-Sectional Anatomy and Dissection Plane (original)

- **Vascular Basis:** Flaps are classified by their blood supply, such as Random Pattern Flaps (relying on the subdermal plexus) or Axial Pattern Flaps (supplied by direct cutaneous vessels).

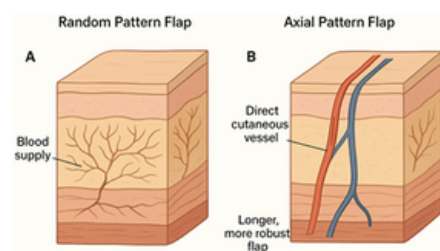


Fig.2. Vascular Basis of Skin Flap Classification (original)

- **Tension Lines:** Following established tension lines, such as those mapped in canine patients, is critical to minimizing dehiscence.

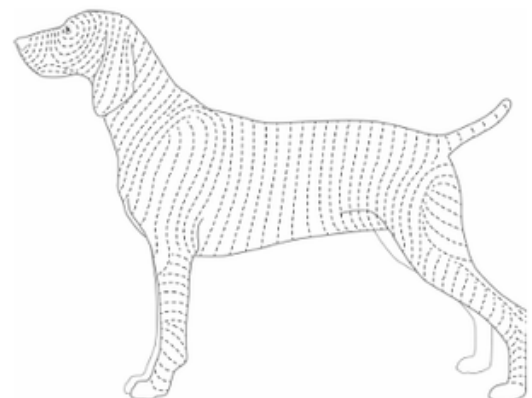


Fig.3. Canine Tension Lines  
Source: EQUUSIR

**Patient Stability:** While we treat large traumatic or oncological defects, the "deciding factor" for surgery is systemic stability. We accepted patients with managed comorbidities (e.g., *Dirofilaria*) as long as local tissue remained healthy.

### The Mandibular Challenge: Meet "Perle"

To illustrate the power of local flaps, I want to focus on a case that defined my clinical confidence: a 10-year-old, 4.9 kg female European cat named Perle.

#### *The Presentation*

Perle presented with a circular wound at the level of the left mandibular labial commissure. The defect was approximately 4.5 cm in diameter, a massive surface area for a cat of her size, involving a significant percentage of the skin over the mandible and neck. Border necrosis further complicated the challenge.

#### *The Complexity*

For a "baby vet," a hole of this magnitude in such a high-motion area is intimidating. The proximity to the oral cavity creates a triple threat:

- **Contamination:** Constant exposure to saliva and bacteria.
- **Mechanical Tension:** Every time the patient meows or eats, the suture line is stressed.
- **Lack of Donor Tissue:** There is almost zero "spare" skin on the chin.

**Now take a deep breath...and let's proceed step by step.**

### Pre-Operative Strategy: The Geometric Assessment

Before picking up the scalpel, I performed a thorough geometric assessment. Primary closure was impossible; pulling the edges together would have distorted the lower lip, preventing the cat from eating properly.

*I spent time moving the surrounding skin with my fingers, feeling for the "give."*

### The Surgical Protocol

Under general anesthesia and supported by multimodal analgesia, I followed a standardized workflow:

- **Sharp Debridement:** I removed the chronic, non-viable tissue to create fresh, bleeding margins.
- **Vascular Preservation:** I was meticulous about preserving the subdermal plexus. In cats, the skin is thin, and losing that blood supply means losing the flap.

- **Tension-Free Apposition:** By using a local advancement flap, I redistributed the tension away from the jawline and toward the neck, where the skin was more mobile.
- **Suture Technique:** Monofilament Nylon 3/0 was chosen because it does not "wick" bacteria like braided sutures.
- **Natural Drainage (clinical tip):** The most ventral aspect of the closure was deliberately left slightly open to facilitate the drainage of secretions, preventing seroma without a bothersome foreign drain.

### The Outcome Data

Managing the post-operative follow-up independently taught me that the surgery doesn't end in the surgery room. Maintaining an open, constant dialogue with owners is essential to monitor recovery closely and catch any early indicators of complication before they become failures.

- **Healing Time:** 20 days for full remodeling.
  1. At Day 7, the tissue perfusion was excellent. The "healing cascade" was in full swing.
  2. At Day 15, sutures were removed successfully.
- **Complications:** Zero. No necrosis, no dehiscence.
- **Function:** 100%. Perle was eating normally within 48 hours.
- **Aesthetics:** 4.5/5. The only trace of the surgery was a mild, localized retraction of the lip (an ectropion-like effect), which gave her a slightly "charming" lopsided smile but caused no clinical issues.



*Fig. 4. Traumatic wound debridement & extension (original)*



Fig.5. Closing of the defect with skin flap releasing tension (original)

### Discussion: Lessons from the Front Line

This case matches current literature by 90% and proves that strict adherence to Langer's Lines and sharp debridement makes these flaps the "Gold Standard". Communication with owners remains a vital component of post-operative monitoring.

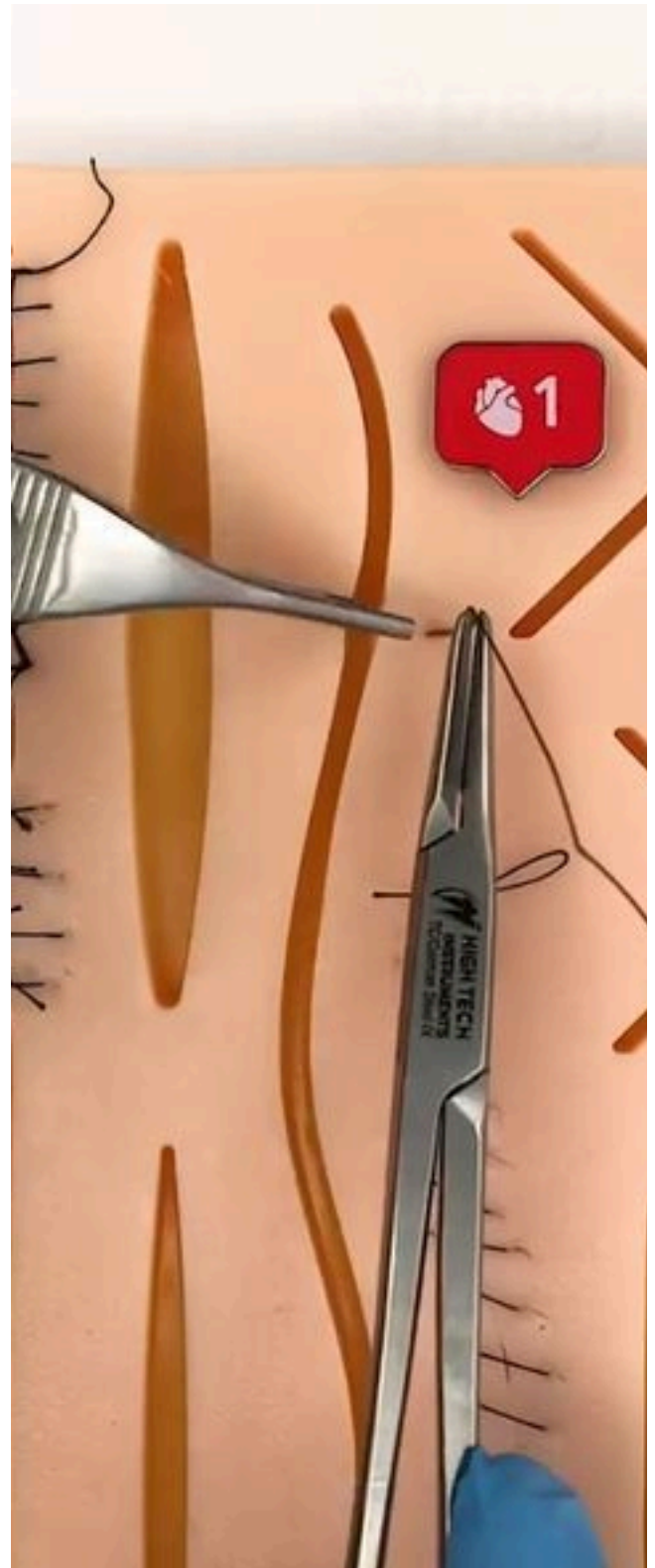
### The Final Word: Imagination is Your Best Instrument

As I close this chapter of my life as a student, I want to tell my peers: nothing is impossible with imagination and creativity. Even a complex 4.5 cm wound on a tiny mandible can be managed if you follow the rules of biology and allow yourself to be a bit of an artist. As long as the patient is systemically stable and you respect the blood supply, you have the power to "close the gap."

**Where there is a wound, there is a way.  
Don't just pull the edges, reimagine the  
tissue.**

#### References :

1. Ionascu I., Uzun S. & Peteoaca A. (2020). *Veterinary Propaedeutics Practical Handbook*. Editura EX TERRA AURIUM.
2. Kirpensteijn J. & Haar G. (2013). *Reconstructive Surgery and Wound Management of the Dog and Cat*. Manson publishing.
3. Nógrádi A. et al. (2022). Use of skin flaps for reconstructive surgery in guinea pigs (*Cavia porcellus*). *Veterinary Record*. 191(11), 1-8. DOI: 10.1002/vetr.2183.



*Every perfect closure begins  
with the right suture.*

# PULMONARY METASTATIC OSTEOSARCOMA IN A BRETON DOG: A CASE REPORT



Article by DVM Virginia Patumi



## Abstract

Appendicular osteosarcoma is the most common primary malignant bone tumor in dogs and is characterized by aggressive local invasion and a high metastatic potential, particularly to the lungs. This case report describes the clinical presentation, diagnostic approach, surgical management, and metastatic progression of advanced appendicular osteosarcoma in a 6-year-old male Breton dog raised in an outdoor cattle-farming environment. The patient was presented with a one-month history of progressive lameness and marked swelling of the right thoracic limb, initially attributed by the owner to traumatic injury following an attack by another farm dog. Clinical examination revealed moderate hyperthermia (39.2°C), regional lymphadenomegaly, severe edema involving the distal thoracic limb, pain on manipulation, and functional impairment. Radiographic examination identified extensive osteolytic and proliferative bone lesions highly suggestive of end-stage osteosarcoma. Cytological and histopathological sampling confirmed the diagnosis. Forequarter amputation with removal of the regional sentinel lymph node was performed for both therapeutic and staging purposes. Postoperative management included antimicrobial therapy, anti-inflammatory treatment, antiedematous medication, and assisted mobility support. One month after surgery, thoracic radiographs demonstrated multiple pulmonary metastatic lesions associated with progressive respiratory compromise and exercise intolerance. Palliative corticosteroid therapy was initiated; however, the patient survived only three additional weeks.

This report highlights the aggressive biological behavior of canine osteosarcoma, the importance of early diagnosis, and the prognostic significance of pulmonary metastasis despite surgical intervention.

*Keywords: canine osteosarcoma, appendicular osteosarcoma, limb amputation, pulmonary metastasis, veterinary oncology, case report*

## Introduction

Canine appendicular osteosarcoma is the most frequently diagnosed primary bone neoplasm in dogs, accounting for approximately 85% of malignant skeletal tumors. Large and giant breeds are overrepresented; however, medium-sized breeds may also be affected. Osteosarcoma typically develops in middle-aged to older dogs and preferentially affects the metaphyseal regions of long bones.

The tumor is characterized by rapid local invasion, severe osteolysis, periosteal reaction, and early metastatic dissemination, most commonly to the lungs. Clinical signs generally include progressive lameness, localized pain, swelling, and reduced limb function. Delayed presentation may significantly worsen prognosis due to advanced local destruction and systemic metastatic spread.

This case report describes an advanced appendicular osteosarcoma in a Breton dog, emphasizing the clinical findings, orthopedic examination, diagnostic imaging, surgical management, histopathological confirmation, and terminal pulmonary metastatic progression.

## Case Presentation

### *Signalment and History*

A 6-year-old intact male Breton dog weighing approximately 22 kg was presented to the veterinary teaching hospital for evaluation of progressive right thoracic limb lameness of one month duration. The dog lived in an outdoor rural environment associated with cattle farming and was managed primarily outdoors with other working dogs. According to the owner, the initial swelling and lameness had been attributed to trauma following a presumed attack by another dog within the farm environment. Due to economic limitations, veterinary evaluation had been postponed in the expectation of spontaneous recovery. However, the progressive increase in limb volume and worsening lameness prompted clinical consultation.

## Clinical Examination

### *General Physical Examination*

At presentation, the patient was bright, alert, and responsive. Rectal temperature was mildly elevated at 39.2°C. Respiratory function was initially normal, with no evidence of dyspnea or cyanosis.

Palpation revealed enlargement of the retromandibular and prescapular lymph nodes, particularly on the ipsilateral side of the affected limb. The dog demonstrated reluctance to permit manipulation of the affected thoracic limb and showed signs of pain during palpation.

### *Orthopedic Examination*

A complete orthopedic examination of the affected thoracic limb was performed. The examination revealed:

- Severe diffuse edema extending from the metacarpal region proximally to the elbow joint.
- Marked increase in limb circumference, estimated at approximately three times the normal volume.
- Increased local temperature (*calor*).
- Diffuse erythema and soft tissue swelling (*rubor et tumor*).
- Severe pain on palpation and reduced weight-bearing capacity.
- Functional impairment of the limb (*functio laesa*).
- Reduced range of motion of the elbow due to pain and soft tissue tension.

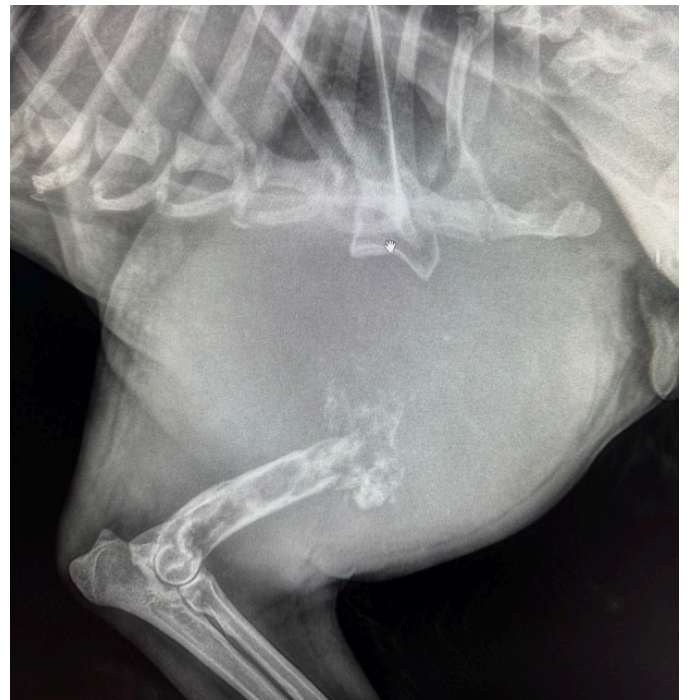
No neurological deficits were identified during examination.

## Diagnostic Imaging

Latero-lateral radiographic projections of the affected thoracic limb were obtained. Radiographs revealed an extensive aggressive bone lesion involving the distal humerus and elbow region, characterized by:

- Severe cortical bone lysis.
- Irregular periosteal proliferation.
- Loss of normal trabecular architecture.
- Mixed osteolytic and osteoproliferative patterns.
- Extensive adjacent soft tissue swelling.

The radiographic appearance was highly suggestive of advanced appendicular osteosarcoma.



*Mediolateral radiographic projection of the right thoracic limb demonstrates a severe aggressive osseous lesion centered at the distal humeral metaphysis and extending toward the elbow region. The lesion is characterized by extensive cortical lysis associated with irregular and disorganized periosteal new bone formation.*

*Marked loss of normal bone architecture is evident, with a mixed osteolytic and osteoproliferative pattern producing a moth-eaten to permeative appearance. Multifocal cortical destruction is present, with areas of cortical thinning and interruption. Irregular mineralized proliferative tissue extends into the surrounding soft tissues. A severe increase in soft tissue opacity and volume is observed surrounding the distal humerus and elbow joint, consistent with marked regional soft tissue swelling and edema. The affected limb appears diffusely enlarged compared with normal anatomical proportions.*

*The lesion margins are poorly defined, indicating aggressive biological behavior. No evidence of fracture is clearly appreciable on this projection, although cortical integrity is severely compromised. Overall radiographic findings are highly suggestive of an aggressive primary bone neoplasm, most consistent with advanced appendicular osteosarcoma.*

*Original photo by DVM Virginia Patumi*

## Diagnostic Sampling and Histopathology

Following owner consent, a diagnostic tissue sample was collected from the most accessible region of the lesion near the elbow joint. Cytological and histopathological analyses were subsequently performed.

Histopathological examination confirmed the diagnosis of osteosarcoma, characterized by malignant mesenchymal cells producing osteoid matrix with marked cellular atypia and invasive growth patterns.

## Surgical Treatment

Given the severity of the lesion, the associated pain, and the poor functional status of the limb, surgical amputation of the affected thoracic limb was elected in agreement with the owner.

A complete forequarter amputation was performed. During surgery, the regional sentinel lymph node was also identified and excised for staging purposes and evaluation of possible metastatic dissemination. Histological examination of the surgical specimen confirmed the diagnosis of appendicular osteosarcoma.

## Postoperative Management

Postoperative therapy included:

- Amoxicillin-clavulanic acid: 12.5–20 mg/kg PO BID.
- meloxicam: 0.1 mg/kg PO SID after initial loading dose
- Tramadol: 2–4 mg/kg PO TID for multimodal analgesia.
- antiedematous medication (Brospect cpr)

## Follow-Up and Metastatic Progression

One month after surgery, the patient returned for reevaluation due to progressive respiratory compromise, exercise intolerance, polypnea following minimal exertion, and generalized fatigue. Thoracic radiographs were obtained and demonstrated multiple diffuse radiopaque pulmonary nodules distributed throughout the lung fields, consistent with metastatic pulmonary dissemination.

The rapid onset of pulmonary metastasis was considered compatible with the highly aggressive biological behavior of the primary osteosarcoma.

## Palliative Therapy and Outcome

Following discussion with the owner regarding prognosis, palliative treatment was initiated.

Supportive therapy consisted primarily of corticosteroid administration:

- Prednisolone initially administered at 2 mg/kg/day.
- Subsequently tapered to 1 mg/kg/day.

The owner was informed that life expectancy was severely limited due to widespread pulmonary metastasis and progressive respiratory deterioration.

Despite supportive care, the patient survived for approximately three weeks following initiation of palliative therapy.

## Discussion

Canine appendicular osteosarcoma is an aggressive malignant neoplasm associated with rapid local progression and high metastatic potential. Pulmonary metastasis is frequently already present microscopically at the time of diagnosis, even when thoracic imaging initially appears normal.

In the present case, delayed referral likely contributed to the advanced stage of disease at diagnosis. The owner initially interpreted the swelling as traumatic in origin following interaction with other dogs on the farm. Such misinterpretation is common in rural and working dogs, where traumatic injuries are frequently encountered.

The orthopedic examination was essential in differentiating inflammatory swelling secondary to trauma from aggressive neoplastic disease. The combination of severe edema, pain, marked limb enlargement, and progressive dysfunction strongly suggested an underlying destructive process.

Radiographic findings were highly characteristic of osteosarcoma, with aggressive osteolytic and osteoproliferative changes associated with extensive soft tissue involvement. Histopathological confirmation remains the gold standard for definitive diagnosis.

Limb amputation remains the primary therapeutic option for pain control and local disease management in advanced appendicular osteosarcoma. Removal of the sentinel lymph node during surgery also provides important staging information regarding metastatic spread.

Although amputation can significantly improve quality of life temporarily, surgery alone rarely prevents metastatic progression. Median survival times are substantially improved when surgery is combined with chemotherapy protocols involving agents such as carboplatin or doxorubicin. In this case, economic limitations prevented advanced oncologic treatment.

The subsequent development of pulmonary metastases within one month confirmed the aggressive nature of the disease and indicated advanced systemic dissemination. The appearance of respiratory signs including polypnea and exercise intolerance correlated with metastatic pulmonary involvement identified radiographically.

Palliative corticosteroid therapy was chosen to improve comfort and reduce inflammation during the terminal stage of disease. However, prognosis following clinically evident pulmonary metastasis remains grave.

#### References :

1. Withrow SJ, Vail DM, Page RL. *Withrow and MacEwen's Small Animal Clinical Oncology*. 6th ed. Elsevier; 2020.
2. Dernell WS, Ehrhart N, Straw RC, Vail DM. *Tumors of the skeletal system*. In: Withrow SJ, MacEwen EG, editors. *Small Animal Clinical Oncology*. Saunders Elsevier.
3. Thrall DE. *Textbook of Veterinary Diagnostic Radiology*. 7th ed. Elsevier; 2018.
4. Fossum TW. *Small Animal Surgery*. 5th ed. Elsevier; 2018.
5. Ehrhart NP, Ryan SD, Fan TM. *Tumors of the skeletal system*. *Veterinary Surgery: Small Animal*. 2012.
6. Liptak JM, Dernell WS, Ehrhart N. *Canine appendicular osteosarcoma: diagnosis and palliative treatment*. *Compendium on Continuing Education for the Practicing Veterinarian*. 2004.

#### Conclusion

This case highlights the aggressive clinical behavior of canine appendicular osteosarcoma and underscores the importance of early diagnostic investigation in dogs presenting with persistent lameness and limb swelling.

Delayed presentation contributed to advanced local disease and rapid metastatic progression in this patient. Radiography, histopathology, and appropriate surgical management were essential for diagnosis and palliation. Despite limb amputation and postoperative supportive care, pulmonary metastasis developed rapidly and resulted in poor long-term outcome.

Early recognition, prompt referral, and multimodal oncologic treatment remain critical factors for improving prognosis and quality of life in dogs affected by osteosarcoma.



## Innovation in Veterinary Care

PhD Vet Pharma Distribution advances veterinary medicine by delivering trusted solutions.

Through innovation and education, the company fosters collaboration among professionals and promotes animal health and well-being.

DISCOVER MORE



office@vet-pharma.ro



+40 744 222 191

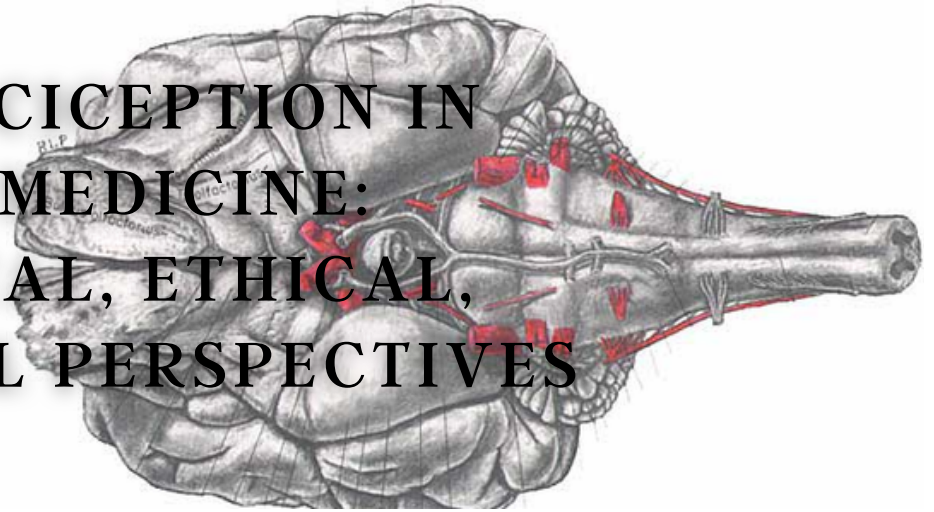
# ÉPAGNEUL BRETON

An iconic French hunting breed

The Épagneul Breton is a traditional French pointing breed developed for bird hunting in varied terrain. Known for its intelligence, agility, and strong scenting ability, it works closely with hunters by locating and indicating game birds such as partridge, quail, and woodcock. Unlike wide-ranging hunting dogs, it typically works at a moderate distance, making it highly controllable and efficient in the field. Its combination of speed, obedience, and natural pointing instinct has made it one of the most valued continental gundogs in Europe.



# PAIN AND NOCICEPTION IN VETERINARY MEDICINE: PHYSIOLOGICAL, ETHICAL, AND CLINICAL PERSPECTIVES



Article by DVM Andrea Majorino



## Abstract

Pain is a complex and multidimensional phenomenon that has been explored throughout history by physicians, philosophers, physiologists, psychoanalysts, and ethicists. In veterinary medicine, the study of pain requires a partially non-anthropocentric perspective, as clinicians must evaluate suffering in patients unable to verbally communicate their condition. According to the International Association for the Study of Pain (IASP), pain is defined as “an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage.” This definition highlights the distinction between nociception and pain itself, opening important discussions concerning animal consciousness, emotional suffering, and welfare. The present article reviews the physiological and semiological basis of pain in animals while also addressing ethical and philosophical implications related to veterinary medicine. Particular attention is given to adaptive and maladaptive pain, the neurophysiology of nociception, methods of pain assessment such as the Grimace Scale, and the recognition of emotional suffering in non-human species. Understanding pain in veterinary patients is essential not only for clinical management but also for the advancement of animal welfare and ethical responsibility toward animals.

*Keywords:* pain, nociception, veterinary medicine, animal welfare, Grimace Scale, analgesia, animal ethics.

## Introduction

Pain is one of the most complex biological and existential phenomena encountered in medicine. Throughout history, it has been investigated from multiple perspectives, including physiology, philosophy, psychology, and theology. In veterinary medicine, however, the interpretation of pain presents a unique challenge because animals cannot verbally describe their suffering.

For this reason, veterinarians are required to move beyond a strictly anthropocentric interpretation of pain and instead rely on behavioral, physiological, and semiological indicators. This shift in perspective allows veterinary medicine to contribute significantly to broader discussions regarding consciousness, suffering, emotional experience, and ethical responsibility toward non-human species.

In 2020, the International Association for the Study of Pain (IASP) redefined pain as:

“An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage.”

This definition emphasizes that pain is not simply a physiological response to tissue injury, but also an emotional and subjective experience shaped by neurological and psychological processes.

## Pain, Nociception, and Emotional Suffering

One of the central issues in veterinary medicine is the distinction between pain and nociception.

Nociception is the neurophysiological process through which harmful stimuli are detected, transmitted, and processed by the nervous system. Pain, on the other hand, represents the sensory and emotional experience associated with those stimuli.

Importantly, pain may occur even in the absence of overt tissue damage, as demonstrated in chronic pain syndromes and emotionally mediated suffering in humans. This consideration raises important questions regarding the emotional capacities of animals and the possibility that psychological distress may significantly contribute to animal suffering.

Another fundamental principle is that the inability to verbally communicate does not exclude the possibility of experiencing pain. This concept is essential when considering animals, neonates, and non-verbal human patients. The absence of language cannot be interpreted as the absence of suffering.

The recognition of emotional suffering in animals has progressively transformed the concept of animal health. Veterinary medicine is no longer focused exclusively on organic integrity, but increasingly incorporates behavioral, emotional, and ethological dimensions. Consequently, the field has become closely connected with animal welfare science and behavioral medicine.

## Physiological Basis of Pain

### *Adaptive and Maladaptive Pain*

Pain can generally be divided into adaptive and maladaptive forms.

#### *Adaptive Pain*

Adaptive pain represents a physiological protective mechanism essential for survival. It occurs following exposure to harmful mechanical, thermal, chemical, or traumatic stimuli capable of damaging tissues or organs. Its biological purpose is to prevent further injury and promote recovery.

#### *Maladaptive Pain*

Maladaptive pain, in contrast, is chronic, repetitive, and biologically non-purposeful. It persists beyond the initial injury and may itself become pathological. Chronic pain is often difficult to recognize clinically because its manifestations may be subtle, progressive, and poorly localized.

## Neurophysiology of Nociception

The perception and transmission of painful stimuli involve a complex anatomical and physiological system composed of:

- Nociceptors.
- Peripheral afferent nerve fibers.
- Ascending nociceptive pathways.
- Higher centers of the central nervous system.
- Descending modulatory systems.

From a neurophysiological perspective, the development of pain can be divided into three principal phases.

### Transduction

Noxious mechanical, chemical, or thermal stimuli are converted into electrical signals by peripheral nociceptors.

### Transmission

The electrical impulse is conducted through peripheral nerves and ascending spinal pathways toward higher nervous centers.

### Central Processing and Synaptic Transmission

Within the central nervous system, painful stimuli are processed and integrated, generating both sensory perception and emotional interpretation. This distinction further supports the concept that nociception alone does not fully explain the subjective experience of pain.

### Pain Perception in Animals

According to Varner, an animal must satisfy several criteria in order to be considered capable of experiencing pain:

- Presence of a nociceptive system.
- Presence of a brain.
- Neural pathways capable of transmitting painful stimuli from the periphery to the brain.
- Production of endogenous opioids.
- Responsiveness to analgesic drugs.
- Behavioral responses to harmful stimuli comparable to those observed in humans.

These criteria support the growing scientific consensus that many animal species are capable of experiencing both physical and emotional suffering.

### Semiological Evaluation of Pain

Pain assessment in veterinary medicine remains particularly challenging because animals cannot verbally communicate their discomfort.

One of the most practical and increasingly utilized methods for pain assessment is the Grimace Scale, a semiological tool based on the evaluation of facial expressions and behavioral indicators associated with pain in different species.

The Grimace Scale generally categorizes pain into three levels:

- Absent.
- Moderate.
- Severe.

Species-specific parameters are evaluated, including ear position, orbital tightening, whisker orientation, and facial tension. In rodents, for example, whisker positioning represents an important indicator of pain.

The rapidity, practicality, and non-invasive nature of this method have contributed to its widespread adoption in both clinical and experimental veterinary medicine.

### Ethical and Philosophical Considerations

The study of pain in veterinary medicine inevitably extends beyond physiology into ethical and philosophical domains.

Recognizing pain in animals requires acknowledging that suffering is not an exclusively human experience. This perspective challenges historical approaches that viewed animals primarily through mechanistic or utilitarian frameworks.

Modern veterinary medicine increasingly recognizes animals as sentient beings characterized by emotional and behavioral complexity. Consequently, veterinarians bear not only a medical responsibility but also an ethical obligation to recognize, prevent, and alleviate suffering whenever possible.

This evolving perspective strengthens the relationship between veterinary medicine, animal welfare science, comparative neuroscience, and ethics.

### Conclusion

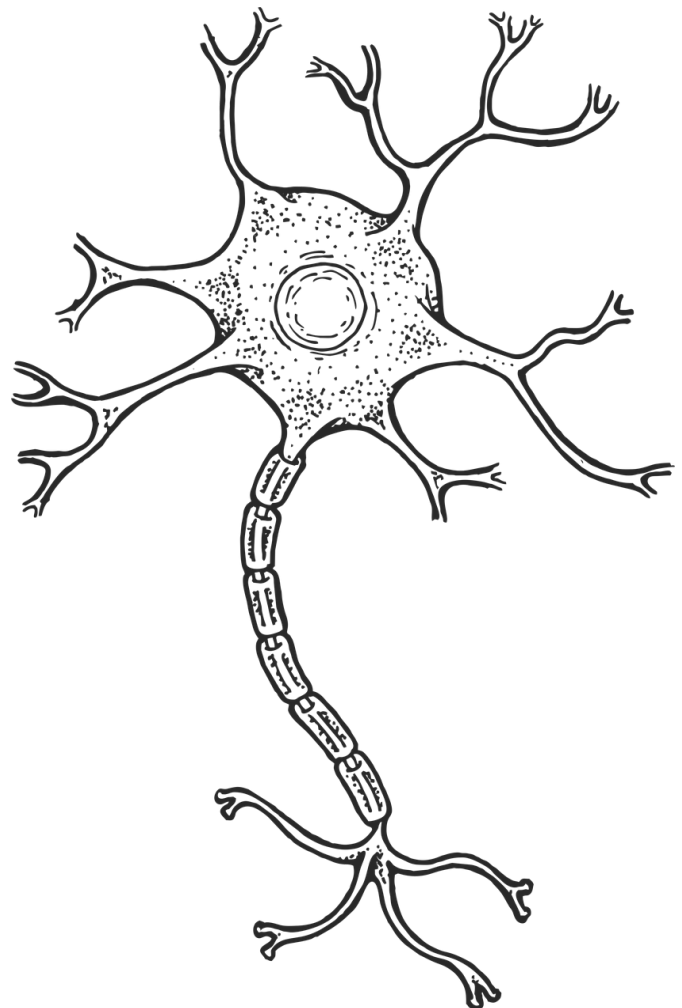
Pain remains one of the most universal and difficult aspects of biological existence. Although complete understanding or elimination of pain may never be fully achievable, recognizing suffering in both humans and animals represents a fundamental ethical responsibility.

Veterinary medicine occupies a unique position in this context, requiring clinicians to interpret pain through behavioral observation, physiological knowledge, and empathy rather than verbal communication.

Ultimately, the shared vulnerability to pain among living beings imposes a duty to approach suffering with scientific competence, compassion, and appropriate therapeutic intervention, including the use of analgesics, anti-inflammatory drugs, local anesthetics, and supportive care.

### References :

1. *International Association for the Study of Pain (IASP). IASP Terminology. 2020.*
2. *Mathews KA, Kronen PW, Lascelles D, et al. Guidelines for recognition, assessment and treatment of pain. Journal of Small Animal Practice. 2014.*
3. *Woolf CJ. What is this thing called pain? Journal of Clinical Investigation. 2010.*
4. *Sneddon LU. Comparative physiology of nociception and pain. Physiology. 2018.*
5. *Gregory NG. Physiology and Behaviour of Animal Suffering. Wiley-Blackwell; 2004.*
6. *Mogil JS. Animal models of pain: progress and challenges. Nature Reviews Neuroscience. 2009.*
7. *Flecknell P. Laboratory Animal Anaesthesia and Pain Management. Elsevier; 2015.*



# FIBROCARILAGINOUS EMBOLISM (FCE) IN DOGS



Article by Anne-Kristoffy Bluteau

## Introduction

FCE, also known as fibrocartilaginous embolic myelopathy (FCEM), is a peracute, non progressive spinal cord infarction caused by occlusion of spinal cord vasculature by fibrocartilaginous material histologically similar to nucleus pulposus. First described in the 1970s, FCE is now recognized as one of the most common cause of peracute, non-painful myelopathy in dogs, particularly in young to middle-aged large-breed dogs (De Risio, 2015). The condition is characterized by sudden onset of asymmetric neurological deficits, often occurring during vigorous activity such as running or jumping. Unlike compressive spinal cord diseases, FCE is non-progressive after the initial 24 hours, and pain typically resolves rapidly.

## Epidemiology

FCE primarily affects large-breed dogs, including Labrador Retrievers, German Shepherds and Border Collies, although it can occur in any breed. Dogs between 3 and 7 years of age are most commonly affected (Cornell University College of Veterinary Medicine). Small-breed dogs and cats can also develop FCE, but less frequently. A strong association exists between FCE and physical activity. Many affected dogs develop signs immediately after running, jumping or playing. No sex predisposition has been consistently identified. Although intervertebral disc degeneration is common in chondrodystrophic breeds, FCE is not strongly associated with disc herniation and occurs independently of Hansen type I or II disc disease (Brooks W., 2025).

## Pathophysiology

The hallmark of FCE is ischemic necrosis of spinal cord tissue caused by obstruction of spinal cord arteries or veins by fibrocartilaginous material. Histologically, the embolic material resembles nucleus pulposus, suggesting an intervertebral disc origin (De Risio, 2015).

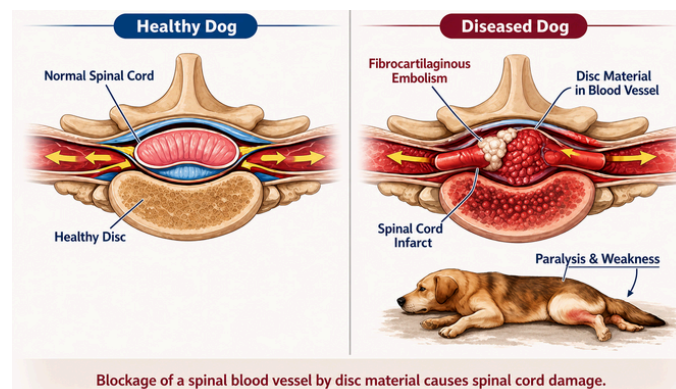


Figure 1: Intervertebral disc aspect in a healthy and a FCE diseased dog (original)

Proposed mechanism includes:

- Entry of nucleus pulposus into spinal vasculature through vertebral endplate microtears
- Migration of disc material into spinal arteries or veins during sudden increases in intradiscal pressure
- Possible congenital vascular-disc connections in some dogs

Once lodged in a vessel, the fibrocartilaginous embolus obstructs blood flow, leading to ischemia, infarction, and necrosis of affected spinal cord segments. The extent of neurological dysfunction depends on the vascular territory affected and the severity of ischemia.

**Distribution**

FCE can occur at any spinal level, but the cervical and thoracolumbar regions are most commonly affected. Unlike acute non-compressive nucleus pulposus extrusion, FCE does not have a strong predilection for specific intervertebral disc spaces (De Risio, 2015).

**Clinical presentation**

FCE is characterized by peracute onset of neurological deficits, typically occurring during activity. Clinical signs reach maximum severity within minutes to hours and are non progressive after the first 24 hours.

*Typical clinical features include:*

- Asymmetric paresis or paralysis (a hallmark feature)
- Ataxia, often asymmetric
- Loss of proprioception
- Reduced or absent spinal reflexes in affected limbs
- Urinary or fecal incontinence in severe cases
- Lack of persistent spinal pain (pain may occur only at onset) Pain rapidly subsides because the lesion is ischemic rather than compressive. Dogs often remain bright, alert and responsive.

*Differential diagnosis:*

- Acute non-compressive nucleus pulposus extrusion (ANNPE)
- Intradural/intramedullary disc extrusion (IIVDE)
- Acute compressive disc herniation
- Myelitis (infectious or immune-mediated)
- Spinal fracture or luxation

Differentiating FCE from ANNPE and IIVDE can be challenging, but MRI characteristics and clinical context are key (De Risio, 2015).

**Diagnostic approach**

*Neurological examination*

Neurolocalization is essential. FCE often produces asymmetric upper motor neuron (UMN) or lower motor neuron (LMN) signs, depending on lesion location.

*Advanced imaging*

MRI is the diagnostic modality of choice.

*Typical MRI findings include:*

- Intramedullary hyperintensity on T2-weighted images
- Lesions that are asymmetric and poorly marginated
- Absence of extradural compression
- Normal or mildly altered intervertebral disc spaces

**CSF analysis**

*CSF may show:*

- Mild protein elevation
- Mild pleocytosis

However, CSF is often normal. CSF analysis is mainly used to exclude inflammatory myelopathies.

Feature	FCE	ANNPE	IIVDE
<b>Onset</b>	Peracute	Peracute	Peracute
<b>Pain</b>	Only at onset	Painful initially	Painful
<b>Disc space narrowing</b>	No	Yes	Yes
<b>MRI tract from disc</b>	No	Sometimes	Yes
<b>Lesion symmetry</b>	Often asymmetric	Focal	Linear tract

Table 1: Differentiation between FCE, ANNPE and IIVDE (De Risio, 2015)

### Definitive diagnosis

Definitive diagnosis requires histopathology, but this is rarely pursued ante-mortem. In clinical practice, diagnosis is based on:

- Peracute onset
- Non-progressive course
- MRI findings
- Lack of pain
- Exclusion of other causes

### Treatment options

#### Supportive care

There is no specific medical therapy for FCE (Cornell University College of Veterinary Medicine).

Treatment focuses on:

- Maintaining hydration
- Preventing pressure sores
- Bladder management
- Pain control (if needed early)

#### Rehabilitation therapy

Rehabilitation is the cornerstone of recovery and includes (Brooks W., 2025):

- Physiotherapy
- Hydrotherapy (underwater treadmill)
- Assisted standing and gait training
- Neuromuscular electrical stimulation

Early, intensive rehabilitation significantly improves outcomes.

#### Medical therapy

Corticosteroids and NSAIDs have no proven benefit in FCE and are not routinely recommended.

#### Surgical intervention

Surgery is not indicated as there is no compressive lesion to remove.

### Prognosis

Prognosis depends on:

- Severity of neurological deficits
- Presence or absence of nociception
- Extent of MRI lesions
- Degree of asymmetry

Most dogs with preserved nociception show significant improvement within 2-6 weeks, and many regain functional ambulation. However, residual deficits such as mild ataxia or proprioceptive delay may persist.

### Conclusion

Fibrocartilaginous embolism is a common cause of sudden, non-progressive spinal cord dysfunction in dogs, particularly large-breed adults engaged in vigorous activity. Diagnosis relies on clinical presentation and MRI findings, as definitive diagnosis is rarely obtained ante-mortem. Although no specific medical therapy exists, supportive care and rehabilitation offer excellent outcomes for many dogs. Early recognition and appropriate management are essential to maximize recovery.

#### References:

1. Brooks, W. (2025). *Fibrocartilaginous embolism (FCE) in dogs*. *Veterinary Information Network*. Retrieved from [https://veterinarypartner.vin.com/default.aspx?pid=19239&id=4952058&utm\\_source=copilot.com](https://veterinarypartner.vin.com/default.aspx?pid=19239&id=4952058&utm_source=copilot.com)
2. Cornell University College of Veterinary Medicine. *Fibrocartilaginous embolism (FCE) in dogs*. Retrieved from <https://www.vet.cornell.edu/departments-centers-and-institutes/riney/canine-health-center/canine-health-topics/fibrocartilaginous-embolism-fce>
3. De Risio, L. (2015). *A review of fibrocartilaginous embolic myelopathy and different types of peracute non-compressive intervertebral disk extrusions in dogs and cats*. *Frontiers in Veterinary Science*, 2, 24. doi: 10.3389/fvets.2015.00024

Favorable prognostic indicators	Poor prognostic indicators
Preservation of deep pain perception	Loss of deep pain perception
Mild to moderate deficits	Extensive MRI lesions
Early improvement within 1-2 weeks	Severe LMN signs
Lesions confined to one spinal segment	Lack of improvement after 2 weeks

Table 2: Prognostic indicators



## GLOBAL VETERINARY COLLABORATION AND ONE HEALTH APPROACH

This initiative aims to unite the veterinary community by bridging cultural, economic, and social barriers. By integrating knowledge and expertise from universities across the globe, the project emphasizes the value of international collaboration. Each institution brings unique strengths and experiences while also facing distinct challenges, enabling participants from Europe to Asia to benefit from shared learning, personal development, and professional growth.



## AIMS AND KEY OBJECTIVES

The project promotes global veterinary collaboration by fostering the exchange of knowledge, expertise, and best practices across international institutions, with the aim of strengthening veterinary education, increasing awareness of emerging infectious diseases, and improving overall animal health outcomes. Through structured academic cooperation, interdisciplinary dialogue, and shared research initiatives, it supports the development of more effective prevention, diagnostic, and control strategies. By connecting veterinary professionals and students worldwide, the initiative encourages continuous learning, innovation, and harmonization of approaches to animal health management on a global scale.



May-June 2026

## **BUILD THE FUTURE OF VETERINARY MEDICINE WITH US**

This project serves as a unifying call for veterinarians and veterinary students across the globe, encouraging them to connect, exchange expertise, and collaborate beyond cultural and geographical boundaries. By fostering a strong sense of international solidarity and shared responsibility, the initiative aims to build a dynamic, interconnected veterinary community. This collaboration is intended to raise the standards of veterinary medicine while also enhancing the welfare of animals and the wellbeing of the people who care for them. Through the continuous exchange of knowledge and coordinated efforts, the project envisions a future in which veterinary care transcends borders, ensuring compassionate and high-quality treatment for animals worldwide.



# ANASARCA IN VETERINARY MEDICINE: A COMPREHENSIVE ACADEMIC REVIEW



Article by Assunta Piccolo

## Abstract

Anasarca is a severe form of generalized subcutaneous edema characterized by the diffuse accumulation of fluid in the interstitial spaces of the entire body. In veterinary medicine, this condition represents a clinically significant finding associated with a variety of underlying pathological processes, including hypoproteinemia, congestive heart failure, lymphatic dysfunction, and renal or hepatic disease. Anasarca may also occur as a congenital condition in neonatal animals, particularly in dogs and pigs, where it is often associated with fatal outcomes. This article provides a comprehensive review of the pathophysiology, etiology, clinical presentation, diagnostic approach, and treatment strategies related to anasarca in domestic animals, with particular focus on the canine species. A clinical case observed during a veterinary internship is also presented as an illustrative example.

*Key words: anasarca; generalized edema; subcutaneous edema; veterinary medicine; canine disease*

## Introduction

Edema is defined as an abnormal accumulation of fluid in the interstitial compartment of tissues, resulting from an imbalance between the forces that promote fluid filtration from the capillaries and those that favor its reabsorption (Muir, 2014). When this accumulation becomes generalized and involves the entire subcutaneous tissue of the body, the condition is termed anasarca. The term derives from the Greek words "ana" (throughout) and "sarx" (flesh), reflecting its diffuse, whole-body nature.

In clinical veterinary practice, anasarca is encountered as either an acquired or congenital condition.

The acquired form typically results from systemic diseases that compromise oncotic pressure, increase vascular permeability, or obstruct lymphatic drainage. The congenital form, in contrast, is most commonly observed in neonates of certain breeds, especially brachycephalic dogs, and is frequently lethal (Grundy, 2006). Understanding the mechanisms and clinical implications of anasarca is essential for the veterinary practitioner, as prompt diagnosis and appropriate management can be life-saving in affected animals.

This review aims to summarize current knowledge on anasarca in domestic animals, with emphasis on the pathophysiological mechanisms, clinical recognition, and evidence-based treatment approaches. Special attention is given to the neonatal form of the condition in canine patients, which represents a challenging clinical scenario requiring immediate intervention.

## Pathophysiology of Edema and Anasarca

The formation of edema is governed by the Starling forces, which describe the balance between hydrostatic and oncotic pressures across the capillary wall. Under normal physiological conditions, the net filtration of fluid from the capillaries into the interstitium is balanced by lymphatic reabsorption, maintaining tissue fluid homeostasis (Hall, 2016). Any disruption of this balance can lead to the accumulation of interstitial fluid. The four main mechanisms responsible for edema formation are:

- Decreased plasma oncotic pressure, primarily due to hypoalbuminemia.
- Increased capillary hydrostatic pressure, as seen in congestive heart failure.
- Increased vascular permeability, occurring in inflammatory states or sepsis.

- Impaired lymphatic drainage (Muir, 2014).

In many cases of generalized anasarca, more than one of these mechanisms is simultaneously active, compounding the severity of the condition.

Albumin, synthesized exclusively in the liver, is the primary determinant of plasma oncotic pressure. A reduction in serum albumin below approximately 15–20 g/L is typically the threshold at which peripheral edema begins to develop (DiBartola, 2012). Conditions such as protein-losing nephropathy (PLN), protein-losing enteropathy (PLE), severe hepatic insufficiency, and chronic malnutrition can all lead to significant hypoalbuminemia and, consequently, anasarca. Congenital anasarca represents a specific variant in which the edema is present at birth and is not secondary to systemic disease. The pathogenesis of this form is not fully elucidated, but it has been associated with abnormalities in lymphatic development, aberrant fluid regulation, and genetic factors (Dennis et al., 2010). In neonatal puppies, the excessive fluid accumulation makes natural delivery difficult and is often associated with dystocia, necessitating cesarean section.

### Etiology and Predisposing Factors

The etiological spectrum of anasarca in veterinary medicine is broad and varies by species, age, and individual patient history. In adult dogs and cats, the most common underlying causes include protein-losing enteropathy, protein-losing nephropathy, severe hepatic disease with impaired albumin synthesis, and right-sided or biventricular congestive heart failure (Nelson & Couto, 2019). Vasculitis, systemic inflammatory response syndrome (SIRS), and sepsis can also cause generalized edema through increased vascular permeability. In neonatal animals, congenital anasarca is most frequently reported in brachycephalic dog breeds such as the English Bulldog, French Bulldog, and Pug (Grundy, 2006). The reported incidence in these breeds is notably higher than in mesocephalic or dolichocephalic breeds, suggesting a genetic predisposition, although the exact molecular basis remains under investigation. Congenital anasarca has also been described in pigs, where it is referred to as "water pig" syndrome and is associated with high neonatal mortality (Friendship, 2004). Additional contributing factors in neonatal canine anasarca may include intrauterine infection, fetal hypoxia, and umbilical cord anomalies. Nutritional deficiencies in the dam, particularly insufficient protein intake during gestation, have also been proposed as risk factors, though evidence remains limited (Johnston et al., 2001).



*Fig.1. Newborn puppy presenting with congenital anasarca observed during veterinary internship. Note the marked generalized subcutaneous edema, intact umbilical cord, and placental membranes. (Original photograph, personal archive.)*

In large animal species, anasarca can be a manifestation of hypoproteinemia secondary to parasitism, particularly in ruminants with heavy gastrointestinal nematode burdens (Smith, 2015).

### Clinical Presentation

The hallmark clinical feature of anasarca is diffuse, non-painful, pitting edema of the subcutaneous tissues. Unlike localized edema, which is confined to a specific anatomical region, anasarca affects the entire body surface. In living patients, the edema is typically most pronounced in dependent areas such as the ventral abdomen, thorax, and limbs, due to the effects of gravity on fluid distribution (Muir, 2014). In neonatal puppies with congenital anasarca, the affected individuals appear markedly swollen at birth, with a characteristic "water balloon" or "sausage-like" appearance. The skin is taut, shiny, and cool to the touch, and the extremities may appear disproportionately thick. Affected neonates are often weak, unable to nurse, and display difficulty breathing due to compression of the thoracic cavity by fluid-distended tissues (Dennis et al., 2010). Body weight is significantly increased compared to littermates, sometimes by a factor of two or more. In adult animals, additional clinical signs depend heavily on the underlying etiology. Patients with hypoproteinemia may also present with ascites and pleural effusion, collectively forming a syndrome of third-space fluid accumulation. Animals with cardiac disease may show exercise intolerance, jugular distension, and muffled heart sounds. Patients with renal disease may exhibit polyuria, polydipsia, and uremic signs, while those with hepatic disease often show icterus, hepatomegaly or microhepatica, and coagulopathy (Nelson & Couto, 2019).

## Diagnostic Approach

Neonatal hypoglycemia is common, especially in small or premature puppies: Clinical signs: tremors, lethargy, seizures, coma. Immediate intervention: Administer 10–20% glucose solution orally or intravenously (carefully calculated, 0.5–1 ml/100 g body weight). Repeat blood glucose monitoring every 2–4 hours until stabilized. Prevention: frequent feeding, weight monitoring, and observation of activity.

The diagnosis of anasarca is primarily clinical, based on the observation of diffuse subcutaneous edema. However, identifying the underlying cause requires a thorough diagnostic workup. The initial evaluation should include a detailed history and physical examination, followed by laboratory investigations. A complete blood count (CBC), serum biochemistry profile with albumin measurement, and urinalysis with urine protein-to-creatinine ratio (UPC) are fundamental first-line tests (DiBartola, 2012). Serum albumin concentration is the single most important biochemical parameter in the evaluation of edematous patients. Values below 15–20 g/L are strongly associated with the development of edema and warrant immediate investigation into the cause of hypoalbuminemia (Hall, 2016). Liver function tests, including bile acids and ammonia measurements, are indicated when hepatic disease is suspected. Gastrointestinal protein loss may be assessed through fecal alpha-1 protease inhibitor assay in dogs (Willard, 2005).

Thoracic and abdominal radiography, as well as ultrasonography, are valuable imaging modalities for detecting concurrent fluid effusions, evaluating cardiac morphology, and identifying abdominal organ pathology. Echocardiography is the gold standard for diagnosing cardiac disease as an underlying cause. In cases of suspected vasculitis or immune-mediated disease, additional immunological testing may be required (Nelson & Couto, 2019). For neonatal cases of congenital anasarca, the diagnosis is generally straightforward based on the clinical appearance at birth. Post-mortem examination of non-surviving neonates can provide valuable information regarding potential underlying anatomical or lymphatic abnormalities and may assist in genetic counseling for breeders (Grundy, 2006).

## Treatment and Management

The management of anasarca requires a dual approach: addressing the immediate fluid overload and treating the underlying disease. In patients with significant hypoalbuminemia, the administration of fresh frozen plasma or human serum albumin (HSA) can provide a temporary increase in oncotic pressure and help reduce edema (Mathews & Barry, 2005). However, these treatments are costly, carry the risk of allergic reactions, and do not address the root cause. Diuretics, particularly furosemide (a loop diuretic), are commonly employed to promote fluid mobilization and reduce edema. However, their use must be judicious, as aggressive diuresis in patients with hypoalbuminemia can cause dangerous intravascular volume depletion by removing fluid from the vascular compartment without adequately mobilizing interstitial fluid (DiBartola, 2012). Monitoring of electrolytes, especially potassium, is essential during diuretic therapy. Nutritional support plays a critical role in the long-term management of patients with protein losing conditions. High-quality, highly digestible protein diets should be provided to patients with PLE, while those with PLN may benefit from protein-restricted, low-sodium diets (Willard, 2005). Patients with hepatic insufficiency require specialized hepatic diets with moderate protein content to avoid exacerbating hepatic encephalopathy. In cases of congenital anasarca in neonatal puppies, treatment options are severely limited. Manual expression of subcutaneous fluid, while providing temporary relief of compression, is rarely curative and carries significant risks of infection and tissue damage. Supportive care including warmth, assisted nursing, and close monitoring may allow some mildly affected neonates to survive the critical neonatal period, during which renal function matures and fluid balance may improve spontaneously (Johnston et al., 2001). Severely affected neonates, however, rarely survive beyond the first few days of life.

## Prognosis

The prognosis for patients with anasarca varies considerably depending on the underlying etiology, severity of edema, and availability of treatment. In adult animals where a treatable cause is identified and addressed promptly, the prognosis may be favorable. For example, dogs with PLE due to inflammatory bowel disease may achieve remission with immunosuppressive therapy, allowing albumin levels to normalize and edema to resolve (Nelson & Couto, 2019).

Conversely, anasarca secondary to end-stage renal disease, severe hepatic cirrhosis, or malignant neoplasia carries a guarded to grave prognosis. In such cases, management is largely palliative, focused on maintaining quality of life and minimizing discomfort. Congenital anasarca in neonates is associated with a high mortality rate, with most severely affected individuals dying within the first 24–48 hours of life (Dennis et al., 2010). Ethical euthanasia should be considered for neonates with severe, generalized edema and no response to supportive care.

### Conclusions

Anasarca is a clinically significant manifestation of systemic fluid imbalance encountered across multiple species in veterinary medicine. Its recognition, thorough diagnostic evaluation, and appropriate management are essential competencies for the veterinary practitioner. In both adult and neonatal patients, the underlying cause must be identified as rapidly as possible, as this fundamentally determines the treatment approach and expected outcome. Advances in diagnostic imaging, laboratory medicine, and critical care have improved the ability to manage anasarca in adult animals, but the congenital neonatal form remains a therapeutic challenge with limited effective interventions. Continued research into the genetic and developmental mechanisms underlying congenital anasarca may open new avenues for prevention and treatment in predisposed breeds. Breeders of brachycephalic dogs, in particular, should be counseled about the risk and encouraged to report affected litters to facilitate epidemiological studies.

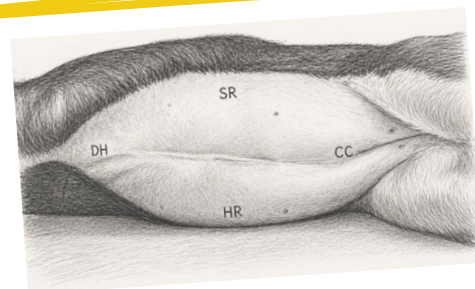
### References:

1. Dennis, M. M., McIntire, S. A., & Olivry, T. (2010). Congenital anasarca in a litter of English Bulldogs: Clinical and pathological findings. *Veterinary Dermatology*, 21(3), 217–222.
2. DiBartola, S. P. (2012). *Fluid, Electrolyte, and Acid-Base Disorders in Small Animal Practice (4th ed.)*. Elsevier Saunders.
3. Friendship, R. M. (2004). Porcine congenital anasarca: Clinical features and prevalence. *Canadian Veterinary Journal*, 45(6), 491–494.
4. Grundy, S. A. (2006). Clinically relevant physiology of the neonate. *Veterinary Clinics of North America: Small Animal Practice*, 36(3), 443–459.
5. Hall, J. E. (2016). *Guyton and Hall Textbook of Medical Physiology (13th ed.)*. Elsevier.
6. Johnston, S. D., Root Kustritz, M. V., & Olson, P. N. S. (2001). *Canine and Feline Theriogenology*. W.B. Saunders.
7. Mathews, K. A., & Barry, M. (2005). The use of 25% human serum albumin: Outcome and efficacy in raising serum albumin and systemic blood pressure in critically ill dogs and cats. *Journal of Veterinary Emergency and Critical Care*, 15(2), 110–118.
8. Muir, W. W. (2014). *Handbook of Veterinary Anesthesia (5th ed.)*. Mosby Elsevier.
9. Nelson, R. W., & Couto, C. G. (2019). *Small Animal Internal Medicine (6th ed.)*. Elsevier.
10. Smith, B. P. (2015). *Large Animal Internal Medicine (5th ed.)*. Mosby Elsevier.
11. Willard, M. D. (2005). Protein-losing enteropathies. In E. J. Hall, J. W. Simpson, & D. A. Williams (Eds.), *BSAVA Manual of Canine and Feline Gastroenterology (2nd ed., pp. 153–161)*. British Small Animal Veterinary Association

## A-FAST in Dogs

Rapid bedside ultrasound used to detect free abdominal fluid in emergency patients. Useful in trauma, shock, uroabdomen, hemoabdomen, and ascites.

**Fast scan, faster clinical decisions.**



# MYXOMATOSIS IN RABBITS: PATHOGENESIS, THERAPY AND EPIDEMIOLOGICAL CONTROL



Article by Carla Stein

## Abstract

Myxomatosis is a severe and frequently lethal viral disease affecting the European rabbit (*Oryctolagus cuniculus*), caused by the myxoma virus (MYXV), a member of the genus *Leporipoxvirus* within the family *Poxviridae*. Initially described in South America in the late nineteenth century, the disease gained global importance following the deliberate introduction of MYXV into Australia and later Europe as a biological control agent against invasive rabbit populations. Since then, myxomatosis has become one of the most studied examples of host–pathogen coevolution and viral adaptation. This article reviews the historical origins of the disease, molecular virology, mechanisms of pathogenicity, immunological interactions, clinical manifestations, diagnostic approaches, current therapeutic management, vaccination strategies, and modern epidemiological control methods. Particular emphasis is placed on recent advances in recombinant vaccines, vector control, genomic surveillance, and ecological management. The disease remains a major concern in wild and domestic rabbit populations worldwide due to high mortality rates, economic implications for rabbit farming, and ecological consequences associated with rabbit population decline.

*Key words:* myxomatosis; myxoma virus; MYXV; European rabbit; *Oryctolagus cuniculus*; *Leporipoxvirus*; *Poxviridae*

## Introduction

Myxomatosis represents one of the most historically significant viral diseases in veterinary medicine and wildlife epidemiology. The disease is caused by the myxoma virus (MYXV), a large double-stranded DNA virus belonging to the *Leporipoxvirus* genus.

In its natural hosts, primarily *Sylvilagus brasiliensis* (tapeti rabbit) and *Sylvilagus bachmani* (brush rabbit), infection generally produces localized cutaneous fibromas with minimal systemic involvement. However, when transmitted to the European rabbit (*Oryctolagus cuniculus*), MYXV causes a generalized systemic disease characterized by severe immunosuppression, mucocutaneous edema, respiratory compromise, and mortality rates historically approaching 99% in naïve populations.

The importance of myxomatosis extends beyond veterinary pathology. The intentional release of MYXV into Australia in 1950 constituted one of the largest biological control experiments ever conducted. The resulting dramatic reduction in rabbit populations profoundly altered ecosystems, agricultural systems, and the evolutionary dynamics between host and pathogen. The subsequent emergence of attenuated viral strains and genetically resistant rabbit populations provided a classical model of natural selection and coevolutionary adaptation.

Today, myxomatosis remains endemic in many regions of Europe, Australia, and the Americas. Although vaccination programs have significantly reduced mortality in domestic rabbits, outbreaks continue to occur among wild populations and unvaccinated companion animals. Modern research focuses on viral immune evasion, genomic evolution, recombinant vaccine development, and integrated epidemiological surveillance.

## Historical Origins and Global Dissemination

The first recognized cases of myxomatosis were described in 1896 by Giuseppe Sanarelli in Montevideo, Uruguay, following outbreaks among imported European laboratory rabbits. Sanarelli identified a transmissible infectious disease characterized by mucinous skin lesions and conjunctival swelling. Subsequent investigations isolated the etiologic agent, later designated myxoma virus.

In the early twentieth century, researchers recognized that MYXV caused only benign fibromatous lesions in native American lagomorphs while inducing fatal disease in European rabbits. This marked difference in susceptibility became central to later biological control strategies.

The ecological crisis generated by exploding rabbit populations in Australia motivated the deliberate release of MYXV in 1950. European rabbits, introduced during the nineteenth century, had become a devastating invasive species causing severe agricultural losses and environmental degradation. Initial outbreaks resulted in mortality rates exceeding 99%, dramatically reducing rabbit numbers within a few years.

A similar introduction occurred in France in 1952, after which the disease rapidly spread throughout Europe. The European epidemic caused extensive mortality in wild rabbit populations and significantly altered predator-prey relationships, particularly affecting species dependent on rabbits as prey, including the Iberian lynx (*Lynx pardinus*) and several raptor species.

Over time, both virus and host underwent adaptive evolution. Highly virulent viral strains were gradually replaced by moderately attenuated variants better adapted for transmission through arthropod vectors, while rabbit populations developed partial genetic resistance. Fenner and Ratcliffe later described this process as one of the clearest demonstrations of natural selection in real time.



Rabbits around a waterhole at the myxomatosis trial enclosure on Wardang Island in 1938. National Archives of Australia  
Copyright, [www.thevintagenews.com](http://www.thevintagenews.com)



Queensland State Archives 4855, Myxomatosis experiment Sherwood c. 1952  
Copyright, [www.thevintagenews.com](http://www.thevintagenews.com)

## Virology and Molecular Structure

MYXV belongs to the family Poxviridae, subfamily Chordopoxvirinae, genus Leporipoxvirus. The virion is large, enveloped, and brick-shaped, measuring approximately 250–300 nm in length. Unlike many DNA viruses, poxviruses replicate entirely within the cytoplasm of infected cells due to their possession of virus-encoded transcriptional machinery.

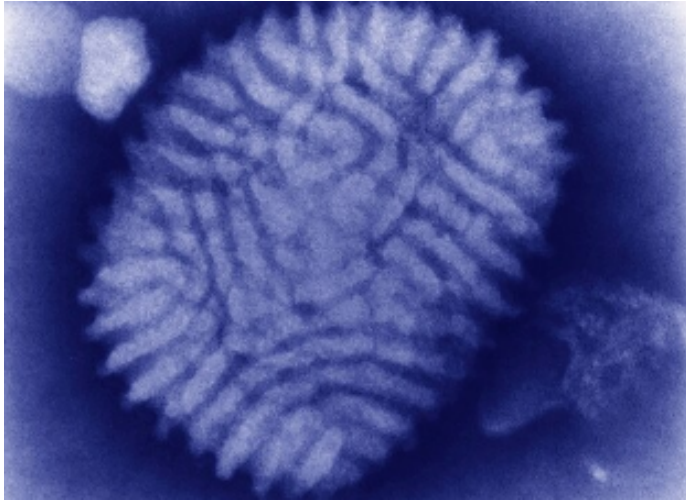
The MYXV genome consists of linear double-stranded DNA approximately 160 kilobase pairs in size and encodes more than 170 proteins. Central genomic regions primarily encode essential replication proteins, whereas terminal regions contain genes associated with host range determination, virulence, and immune modulation. One of the most remarkable characteristics of MYXV is its extensive repertoire of immunomodulatory proteins. These include:

- Serpins inhibiting inflammatory proteases.
- Cytokine receptor homologues that neutralize host cytokines.
- Anti-apoptotic proteins preventing infected cell death.
- Chemokine-binding proteins impairing leukocyte recruitment.
- Interferon antagonists suppressing innate immunity.

These mechanisms collectively enable the virus to evade immune responses and establish systemic infection.

Genomic analyses have demonstrated substantial evolutionary flexibility among MYXV strains. Unlike RNA viruses, MYXV evolves through recombination, gene loss, gene duplication, and mutations affecting virulence-associated genes.

Comparative sequencing studies from Australia and Europe have shown convergent evolution toward intermediate virulence phenotypes that optimize transmission efficiency



*Myxoma virus* (transmission electron microscope)  
Copyright, wikipedia

### Virology and Molecular Structure

MYXV belongs to the family Poxviridae, subfamily Chordopoxvirinae, genus Leporipoxvirus. The virion is large, enveloped, and brick-shaped, measuring approximately 250–300 nm in length. Unlike many DNA viruses, poxviruses replicate entirely within the cytoplasm of infected cells due to their possession of virus-encoded transcriptional machinery.

The MYXV genome consists of linear double-stranded DNA approximately 160 kilobase pairs in size and encodes more than 170 proteins. Central genomic regions primarily encode essential replication proteins, whereas terminal regions contain genes associated with host range determination, virulence, and immune modulation.

One of the most remarkable characteristics of MYXV is its extensive repertoire of immunomodulatory proteins. These include:

- Serpins inhibiting inflammatory proteases.
- Cytokine receptor homologues that neutralize host cytokines.
- Anti-apoptotic proteins preventing infected cell death.
- Chemokine-binding proteins impairing leukocyte recruitment.
- Interferon antagonists suppressing innate immunity.

These mechanisms collectively enable the virus to evade immune responses and establish systemic infection.

Genomic analyses have demonstrated substantial evolutionary flexibility among MYXV strains. Unlike RNA viruses, MYXV evolves through recombination, gene loss, gene duplication, and mutations affecting virulence-associated genes. Comparative sequencing studies from Australia and Europe have shown convergent evolution toward intermediate virulence phenotypes that optimize transmission efficiency.

### Pathogenesis

Transmission generally occurs through mechanical vectors, particularly mosquitoes, fleas, mites, and other hematophagous arthropods. The virus does not replicate within insects but survives on contaminated mouthparts.

Following inoculation through the skin, MYXV initially replicates locally within dermal fibroblasts, dendritic cells, and macrophages. Within approximately 24 hours, infected leukocytes transport the virus to regional lymph nodes, where extensive viral replication occurs.

Subsequent viremia disseminates the virus to multiple tissues including:

- Skin
- Conjunctiva
- Respiratory tract
- Genital mucosa
- Lymphoid organs
- Spleen
- Liver

A defining feature of myxomatosis is profound immunosuppression. MYXV interferes with both innate and adaptive immunity through inhibition of interferon pathways, suppression of natural killer cell activity, apoptosis blockade, and reduced lymphocyte activation.

Histopathological examination commonly reveals:

- Severe dermal edema
- Mucin deposition
- Fibroblast proliferation
- Necrosis
- Vasculitis
- Secondary bacterial infections
- Lymphoid depletion

Pulmonary edema and bronchopneumonia are common terminal findings.

Comparative sequencing studies from Australia and Europe have shown convergent evolution toward intermediate virulence phenotypes that optimize transmission efficiency



European rabbit with skin nodules caused by myxomatosis (West Yorkshire, UK)  
Copyright, wikipedia

### Pathogenesis

Transmission generally occurs through mechanical vectors, particularly mosquitoes, fleas, mites, and other hematophagous arthropods. The virus does not replicate within insects but survives on contaminated mouthparts.

Following inoculation through the skin, MYXV initially replicates locally within dermal fibroblasts, dendritic cells, and macrophages. Within approximately 24 hours, infected leukocytes transport the virus to regional lymph nodes, where extensive viral replication occurs.

Subsequent viremia disseminates the virus to multiple tissues including:

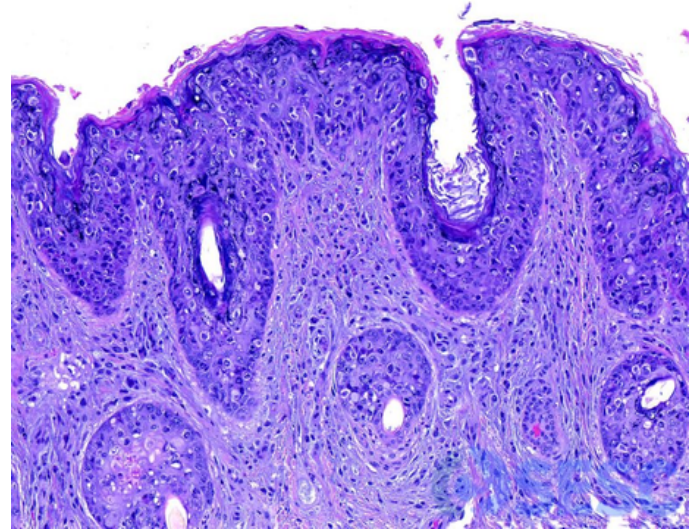
- Skin
- Conjunctiva
- Respiratory tract
- Genital mucosa
- Lymphoid organs
- Spleen
- Liver

A defining feature of myxomatosis is profound immunosuppression. MYXV interferes with both innate and adaptive immunity through inhibition of interferon pathways, suppression of natural killer cell activity, apoptosis blockade, and reduced lymphocyte activation.

Histopathological examination commonly reveals:

- Severe dermal edema
- Mucin deposition
- Fibroblast proliferation
- Necrosis
- Vasculitis
- Secondary bacterial infections
- Lymphoid depletion

Pulmonary edema and bronchopneumonia are common terminal findings.



Histologic section of the skin, in which hyperplasia of the epidermis could be seen, accompanied by hydropic degeneration of the keratinocytes and abundant intraepithelial leukocytes (performing exocytosis). These histological changes also affected the follicular epithelium. The underlying dermis shows a mixed inflammation as well as proliferation of large fibroblasts, associated with a lax and slightly amphophilic matrix (myxoid).  
Copyright, SESC case archive - sesc.cat

### Clinical Manifestations

The incubation period typically ranges from 4 to 14 days depending on viral strain, inoculum size, host immunity, and vector transmission efficiency.

#### Classical Nodular Form

The classical form is characterized by:

- Periocular swelling
- Blepharconjunctivitis
- Purulent ocular discharge
- Edematous swelling of ears and lips
- Cutaneous nodules (myxomas)
- Genital edema
- Fever
- Lethargy
- Anorexia
- Respiratory distress

As disease progresses, secondary bacterial pneumonia frequently develops. Mortality historically exceeded 95% in susceptible populations.

### *Respiratory or Amyxomatous Form*

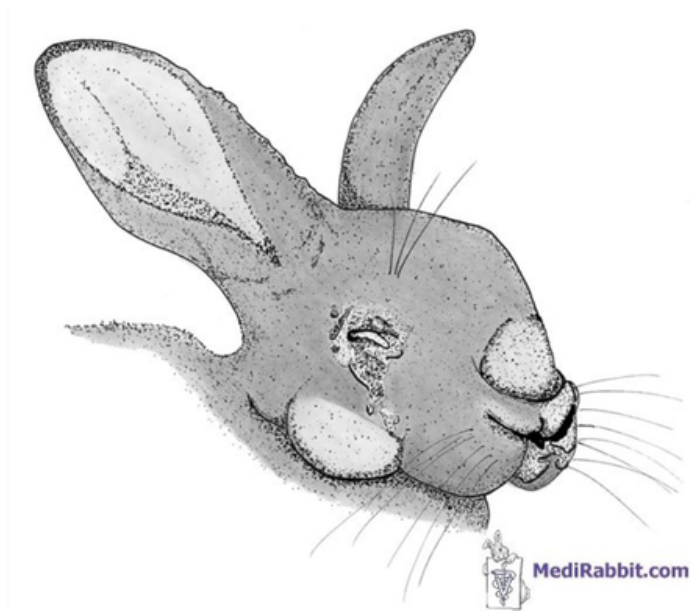
Modern field strains may produce attenuated respiratory presentations characterized by:

- Rhinitis
- Dyspnea
- Mild facial edema
- Minimal cutaneous lesions
- Chronic respiratory compromise

These strains are often more difficult to diagnose clinically and may facilitate prolonged transmission.

### *Peracute Form*

Highly virulent strains may cause sudden death before characteristic skin lesions become evident. This form is particularly associated with Californian MYXV variants.



*Rabbit suffering from an advanced stage of myxomatosis, with facial abscesses, swelling of the eyelids and lesions on the nose*  
Copyright, www.medirabbit.com

### **Immune Response and Host-Pathogen Coevolution**

The interaction between MYXV and the European rabbit constitutes one of the best documented examples of coevolution.

Early Australian outbreaks demonstrated extreme virulence because the host population lacked prior exposure and immunity. However, natural selection favored viral strains with intermediate virulence because excessively lethal strains killed rabbits too rapidly, reducing opportunities for vector-mediated transmission.

Simultaneously, rabbits possessing partial genetic resistance exhibited increased survival and reproductive success. Studies by Fenner et al. demonstrated progressive increases in host resistance over successive generations.

Protection against MYXV relies heavily on cell-mediated immunity. Neutralizing antibodies alone are insufficient for complete protection. Cytotoxic T lymphocytes and interferon-mediated responses play essential roles in viral control.

Recovered rabbits generally develop long-lasting immunity, although reinfection with heterologous strains remains possible.

### **Diagnosis**

Diagnosis relies on a combination of clinical evaluation, epidemiological context, and laboratory confirmation.

### **Clinical Diagnosis**

Characteristic edema involving eyelids, ears, and genitalia in endemic regions strongly suggests myxomatosis. However, atypical respiratory forms require differential diagnosis.

### **Histopathology**

Microscopic examination reveals:

- Stellate mesenchymal cells
- Myxoid degeneration
- Intracytoplasmic inclusion bodies
- Dermal edema
- Lymphoid necrosis

### **Molecular Diagnostics**

Polymerase chain reaction (PCR) assays represent the gold standard for confirmation. Real-time quantitative PCR enables rapid detection from skin lesions, conjunctival swabs, blood, or tissue samples.

### **Virus Isolation**

Although less commonly used today, viral isolation in cell culture remains valuable for research and epidemiological characterization.

### **Serology**

ELISA and neutralization assays may identify prior exposure or vaccine responses but have limited value during acute infection.

## Differential Diagnoses

Conditions requiring differentiation include:

- Rabbit viral hemorrhagic disease (RHD)
- Pasteurellosis
- Treponematosis
- Staphylococcal dermatitis
- Allergic dermatitis
- Dermatophytosis
- Ectoparasitic infestations
- Rabbit fibroma virus infection

## Current Therapeutic Strategies

No antiviral therapy specifically licensed for rabbit myxomatosis currently exists. Consequently, treatment remains primarily supportive.

## Supportive Care

Supportive management may include:

- Fluid therapy
- Nutritional supplementation
- Oxygen support
- Thermal regulation
- Nebulization
- Assisted feeding
- Analgesia
- Ocular lubrication

## Antibiotic Therapy

Secondary bacterial pneumonia represents a major cause of mortality. Broad-spectrum antibiotics commonly employed include:

- Enrofloxacin
- Marbofloxacin
- Trimethoprim-sulfonamides
- Doxycycline

Antibiotics do not affect viral replication but may reduce complications.

## Anti-inflammatory Treatment

Non-steroidal anti-inflammatory drugs (NSAIDs) such as meloxicam may improve comfort and reduce inflammatory edema.

## Experimental Antiviral Approaches

Several experimental therapeutic approaches have been investigated:

- Interferon therapy
- Nucleoside analogues
- Immunomodulators
- Monoclonal antibodies
- Gene-targeted antivirals

However, none have yet demonstrated consistent clinical efficacy sufficient for commercial approval.

## Prognosis

Prognosis depends heavily on:

- Viral strain virulence
- Vaccination status
- Host genetics
- Age
- Secondary infections
- Quality of supportive care

Vaccinated rabbits generally exhibit milder disease and improved survival.

## Vaccination Strategies

Vaccination remains the cornerstone of prevention.

### *Shope Fibroma Virus Vaccines*

Historically, attenuated Shope fibroma virus vaccines provided cross-protection because of antigenic similarity to MYXV. These vaccines significantly reduced mortality and became widely adopted in Europe.

### *Attenuated Live Vaccines*

Modern vaccines commonly employ attenuated myxoma virus strains capable of inducing robust cellular and humoral immunity.

Examples include:

- Nobivac Myxo-RHD
- Nobivac Myxo-RHD PLUS
- Dervaximyo SG33

### *Recombinant Vector Vaccines*

Recent developments include recombinant vectored vaccines simultaneously targeting:

- MYXV
- Rabbit hemorrhagic disease virus type 1 (RHDV1)
- Rabbit hemorrhagic disease virus type 2 (RHDV2)

These trivalent vaccines represent major advances in preventive medicine.

## Vaccination Challenges

Several issues complicate vaccine strategies:

- Emergence of novel MYXV variants
- Incomplete sterilizing immunity
- Need for booster schedules
- Maternal antibody interference
- Vaccine hesitancy among owners
- Cost considerations in wild populations

## Epidemiology

### *Geographic Distribution*

Myxomatosis remains endemic in:

- Europe
- Australia
- New Zealand
- Parts of North and South America

Disease prevalence fluctuates seasonally according to vector abundance.

### *Transmission Dynamics*

Primary vectors include:

- Mosquitoes
- Rabbit fleas (*Spilopsyllus cuniculi*)
- Mites
- Biting flies

Direct transmission may occur through close contact or contaminated fomites.

### *Reservoir Hosts*

Natural reservoir species include:

- *Sylvilagus brasiliensis*
- *Sylvilagus bachmani*
- Wild European rabbits in endemic areas

### *Ecological Consequences*

The ecological impact of myxomatosis has been profound.

Rabbit population collapse altered:

- Predator abundance
- Vegetation dynamics
- Soil structure
- Competition between herbivores
- Agricultural productivity

In the Iberian Peninsula, declining rabbit populations contributed significantly to the endangered status of the Iberian lynx.

## Epidemiological Surveillance and Control Methods

### *Vector Control*

Integrated vector management remains fundamental.

Methods include:

- Flea treatment
- Mosquito reduction
- Environmental sanitation
- Elimination of standing water
- Insect-proof housing
- Seasonal vector surveillance

### *Biosecurity Measures*

Recommended biosecurity protocols include:

- Quarantine of new rabbits
- Restriction of wild rabbit contact
- Disinfection of equipment
- Control of fomites
- Isolation of symptomatic animals

### *Vaccination Campaigns*

Mass vaccination programs have proven highly effective in domestic rabbit populations. Wild rabbit vaccination remains logistically challenging but has been explored in conservation settings.

### *Genomic Surveillance*

Modern epidemiological control increasingly incorporates genomic sequencing to monitor:

- Emergence of novel strains
- Virulence evolution
- Vaccine escape mutations
- Geographic spread patterns

Whole-genome sequencing has become an essential tool for understanding MYXV evolution.

### *Mathematical and Ecological Modeling*

Mathematical epidemiology models have been employed to predict:

- Seasonal outbreaks
- Vector-driven transmission cycles
- Evolutionary trajectories
- Vaccination thresholds
- Population recovery dynamics

Such models assist wildlife management and conservation strategies.

## Emerging Research and Future Perspectives

Contemporary research increasingly focuses on MYXV immune evasion mechanisms and translational applications.

Interestingly, MYXV demonstrates selective tropism for certain human cancer cells while sparing normal tissues. This property has generated considerable interest in the development of MYXV-based oncolytic virotherapy.

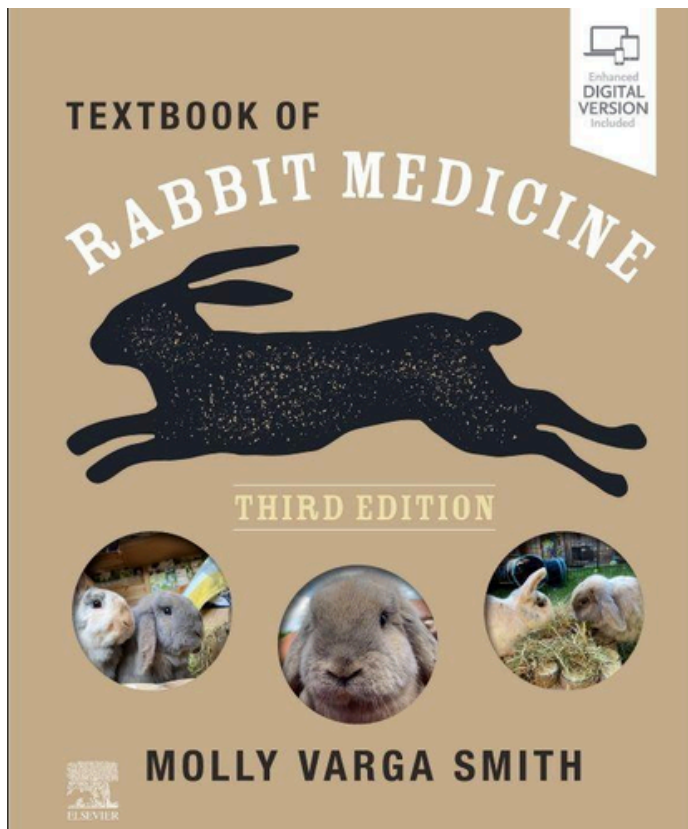
Additional areas of investigation include:

- CRISPR-based viral studies
- Recombinant multivalent vaccines
- Host genomic resistance markers
- Novel antiviral molecules
- Eco-epidemiological modeling
- Climate-driven vector ecology

Climate change may alter future epidemiological patterns by expanding arthropod vector distributions and increasing transmission seasons.

## Conclusion

Myxomatosis remains one of the most significant viral diseases affecting rabbits worldwide and represents an important model in infectious disease ecology, evolutionary biology, and veterinary medicine. Since its first identification in Uruguay in 1896, the disease has profoundly influenced rabbit populations and advanced scientific understanding of host–pathogen evolution. Although no definitive antiviral cure currently exists, progress in supportive care, vaccination, molecular diagnostics, and epidemiological surveillance has greatly improved disease management. However, the persistence of wild reservoirs, emergence of new viral strains, and complexity of vector transmission continue to challenge effective control. Continued interdisciplinary research will remain essential for improving prevention and reducing the global impact of myxomatosis.



Readers wishing to further explore the clinical, pathological, and epidemiological aspects of rabbit diseases — including myxomatosis — are strongly encouraged to consult *Textbook of Rabbit Medicine* by Molly Varga Smith. This internationally recognized reference offers a comprehensive and evidence-based overview of rabbit health, infectious diseases, diagnostics, and modern therapeutic approaches, making it an essential resource for students, clinicians, and researchers alike.

## References:

1. Barrett JW, McFadden G. Origin and evolution of poxviruses. In: Mercer AA, Schmidt A, Weber O, editors. *Poxviruses*. Basel: Birkhäuser; 2007. p. 1–28.
2. Best SM, Kerr PJ. Coevolution of host and virus: the pathogenesis of virulent and attenuated strains of myxoma virus in resistant and susceptible European rabbits. *Virology*. 2000;267(1):36–48.
3. Cameron C, Hota-Mitchell S, Chen L, Barrett J, Cao JX, Macaulay C, et al. The complete DNA sequence of myxoma virus. *Virology*. 1999;264(2):298–318.
4. Chapuis JL, Roeder PL, Chantal J. Myxomatosis in France: epidemiological trends and host resistance. *Rev Sci Tech*. 1994;13(2):441–52.
5. Fenner F, Ratcliffe FN. *Myxomatosis*. Cambridge: Cambridge University Press; 1965.
6. Fenner F, Woodroffe GM. Changes in the virulence of myxoma virus strains introduced into European rabbit populations in Australia. *J Hyg (Lond)*. 1953;51(2):192–231.
7. Kerr PJ. Myxomatosis in Australia and Europe: a model for emerging infectious diseases. *Antiviral Res*. 2012;93(3):387–415.
8. Kerr PJ, Best SM. Myxoma virus in rabbits. *Rev Sci Tech*. 1998;17(1):256–68.
9. Meredith AL. Viral skin diseases of the rabbit. *Vet Clin North Am Exot Anim Pract*. 2013;16(3):705–14.
10. OIE World Organisation for Animal Health. *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals*. Paris: OIE; 2021.
11. Reemers SS, Peeters L, van Schijndel J, Bruton B, Sutton D, van der Waart L, et al. Novel trivalent vectored vaccine for control of myxomatosis and disease caused by classical and a new genotype of rabbit haemorrhagic disease virus. *Vaccines (Basel)*. 2020;8(3):441.
12. Sanarelli G. Das myxomatogene Virus. *Zentralbl Bakteriol*. 1898;23:865–73.
13. Spiesschaert B, McFadden G, Hermans K, Nauwynck H, Van de Walle GR. The current status and future directions of myxoma virus, a master in immune evasion. *Vet Res*. 2011;42:76.
14. Stanford MM, Werden SJ, McFadden G. Myxoma virus in the European rabbit: interactions between the virus and its susceptible host. *Vet Res*. 2007;38(2):299–318.
15. Villarreal D, Kerr PJ. Evolution of myxoma virus in vaccinated rabbit populations. *Viruses*. 2017;9(9):240.
16. Willer DO, McFadden G, Evans DH. The complete genome sequence of Shope (rabbit) fibroma virus. *Virology*. 1999;264(2):319–43.
17. Xu W, Lenz SD, Evans DH. Genomic variability of field strains of myxoma virus. *Virol J*. 2013;10:233.
18. Alves JM, Carneiro M, Cheng JY, Lemos de Matos A, Rahman MM, Loog L, et al. Parallel adaptation of rabbit populations to myxoma virus. *Science*. 2019;363(6433):1319–26.
19. Kerr PJ, Cattadori IM, Rogers MB, Fitch A, Geber A, Liu J, et al. Genomic and phenotypic characterization of myxoma virus from Great Britain reveals multiple evolutionary pathways distinct from those in Australia. *PLoS Pathog*. 2017;13(3):e1006252.
20. Ferreira PG, Costa-e-Silva A, Aguas AP. Myxomatosis in companion rabbits: clinical management and preventive medicine. *J Exot Pet Med*. 2018;27(2):95–104.



# Europe's Increasing Love for Pet Rabbits

Rabbit ownership has significantly increased across Europe in recent years, making rabbits one of the most popular companion animals. Their small size, gentle temperament, and adaptability to indoor living have contributed to their growing appeal, especially in urban households. As their popularity rises, awareness of proper care and welfare needs is becoming increasingly important.



# THE FRENCH BULLDOG: WHEN SELECTIVE BREEDING BECOMES A MEDICAL ISSUE



Article by Alessia Delle Cave

## Introduction

Over the last decade, the French Bulldog has become one of the most popular companion dog breeds worldwide. Its characteristic flat face, large ears, compact body, and affectionate temperament have made it especially appreciated in urban environments. However, the same anatomical traits that define the breed's appearance are also associated with several severe health conditions. French Bulldogs belong to the group of brachycephalic dogs, a term derived from the Greek words brachy ("short") and cephalic ("head"). Among the most important medical conditions associated with brachycephaly are respiratory disorders grouped under the term Brachycephalic Obstructive Airway Syndrome (BOAS), ocular diseases related to shallow orbital anatomy, dermatological complications, and thermoregulatory impairment. In recent years, veterinarians and animal welfare organizations have increasingly questioned the ethics of breeding dogs with extreme conformational traits that predispose them to chronic disease. This article examines the French Bulldog from a pathological perspective, focusing mainly on respiratory and ocular disorders associated with brachycephaly, while also discussing the ethical implications of selective breeding.

## General Characteristics of the French Bulldog

The French Bulldog originated in the nineteenth century from crosses between small English Bulldogs and local French ratter dogs. Initially appreciated as companion animals among artisans and urban workers, they later became fashionable pets throughout Europe and North America.

The breed is characterized by:

- a shortened muzzle
- stenotic nares
- a broad skull
- a compact body
- pronounced facial skin folds

Although these characteristics contribute to the breed's distinctive appearance, they also alter normal anatomical proportions of the upper respiratory tract and orbital cavity. In many cases, the soft tissues of the airway remain relatively normal in size while the surrounding bones are shortened, creating an anatomical mismatch that predisposes affected dogs to airway obstruction. Studies have shown that French Bulldogs are among the dog breeds with the highest prevalence of brachycephalic-related disorders, especially respiratory disease.

## Brachycephalic Obstructive Airway Syndrome (BOAS)

The most clinically significant disorder affecting French Bulldogs is Brachycephalic Obstructive Airway Syndrome, commonly abbreviated as BOAS. BOAS is a multifactorial syndrome caused by anatomical abnormalities of the upper airway that obstruct airflow during respiration. The principal abnormalities include:

- stenotic nares
- elongated soft palate
- everted laryngeal sacculles
- hypoplastic trachea, and, in severe cases, laryngeal collapse.

Because of these defects, affected dogs must generate increased inspiratory effort in order to breathe. Over time, chronic airway resistance may lead to progressive inflammation and worsening obstruction.



Copyright, encrypted-tbn0.gstatic.com

**Clinical Signs**

The most common clinical signs include:

- stertorous breathing
- exercise intolerance
- inspiratory dyspnea
- cyanosis
- heat intolerance
- gagging
- episodes of syncope

Many owners perceive noisy breathing and snoring as “normal” characteristics of the breed, which can delay diagnosis and treatment. However, these signs indicate chronic respiratory distress. French Bulldogs are particularly susceptible to overheating because efficient thermoregulation in dogs depends heavily on panting. Airway obstruction compromises heat dissipation, increasing the risk of hyperthermia and heat stroke, especially during summer months or physical activity.

**Pathophysiology**

The pathophysiology of BOAS involves chronic increased negative pressure within the upper airways. During inspiration, narrowed air passages require greater respiratory effort, which progressively damages laryngeal structures and soft tissues.

This chronic mechanical stress may produce:

- mucosal edema
- tonsillar eversion
- secondary gastrointestinal inflammation
- eventual laryngeal collapse

Recent studies also suggest a strong association between BOAS and gastrointestinal disorders such as gastroesophageal reflux and hiatal hernia, due to persistent changes in thoracic pressure during breathing.

**Diagnosis and Treatment**

Diagnosis is based on:

- physical examination
- respiratory evaluation
- thoracic imaging
- upper airway examination under anesthesia.

Several grading systems have been proposed to classify disease severity.

Treatment depends on clinical presentation. Conservative management includes:

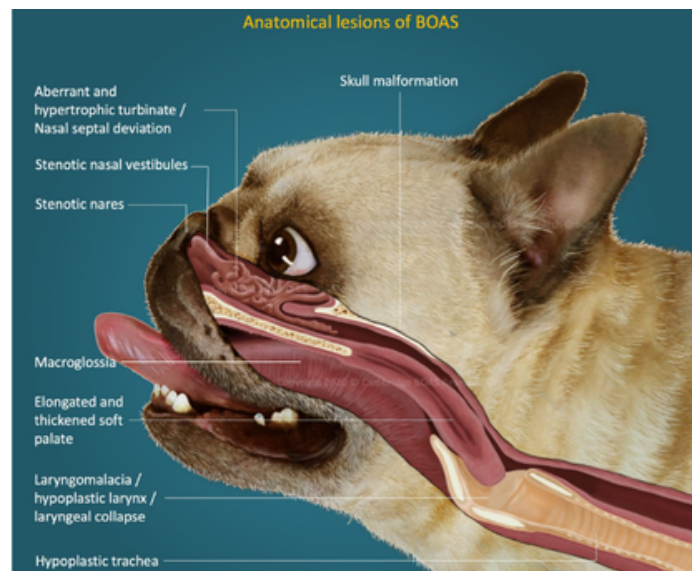
- weight control
- avoidance of heat stress
- reduction of exercise
- anti-inflammatory therapy when necessary

However, many affected dogs require surgical correction. Common surgical procedures include:

- rhinoplasty for stenotic nares
- soft palate resection
- removal of everted laryngeal sacculae

**Ocular Disorders in French Bulldogs**

In addition to respiratory disease, French Bulldogs commonly suffer from ophthalmological disorders due to their shallow orbits and prominent globes.



Copyright, Cambridge BOAS research group

The most frequent ocular conditions include:

- corneal ulcers
- chronic keratitis
- entropion
- dry eye disease
- proptosis

### Corneal Ulceration

Corneal ulcers are particularly common because the protruding eyes are more exposed to trauma and desiccation. Inadequate eyelid closure, known as lagophthalmos, further contributes to corneal damage.

Clinical signs may include:

- blepharospasm
- excessive tearing
- conjunctival hyperemia
- photophobia
- ocular discharge

If untreated, deep corneal ulcers may progress to perforation and permanent vision loss.

### Keratoconjunctivitis Sicca

Keratoconjunctivitis sicca, commonly called “dry eye,” is another frequent condition in brachycephalic breeds. Reduced tear production causes chronic irritation and predisposes the cornea to infection and ulceration. Treatment usually includes: artificial tears, topical cyclosporine, lubricants, and management of secondary infections.

### Ethical Concerns of Selective Breeding

Animal welfare organizations and veterinary associations have therefore advocated for:

- stricter breeding regulations
- selection for healthier anatomical traits
- mandatory health screening
- public education regarding brachycephalic diseases

Some countries have already introduced regulations discouraging the breeding of dogs with severe conformational defects. Veterinarians play a crucial role not only in treating affected animals but also in educating owners and promoting responsible breeding practices.

### Conclusion

The French Bulldog represents one of the clearest and most frequently cited examples of how selective breeding driven primarily by aesthetic preferences can profoundly and negatively affect animal health. Although these dogs are widely appreciated for their affectionate temperament, compact size, and distinctive morphology, the very traits that make them popular have also contributed to a dramatic increase in serious pathological conditions. Their extreme brachycephalic conformation predisposes them to chronic respiratory compromise, recurrent ocular disorders, dermatological issues, and a range of secondary complications that significantly reduce their overall quality of life.

In particular, the respiratory system is heavily burdened by structural abnormalities such as stenotic nares, elongated soft palate, and hypoplastic trachea, all of which contribute to the well-known brachycephalic obstructive airway syndrome (BOAS). Similarly, their prominent eyes and shallow orbits increase the risk of corneal ulceration, pigmentary keratitis, and traumatic injuries. These conditions are not isolated events but rather predictable consequences of exaggerated anatomical features that have been progressively reinforced through generations of selective breeding.

For these reasons, greater awareness among breeders, veterinarians, and owners is essential to improve welfare standards and reduce the prevalence of conformational diseases in brachycephalic breeds. Education must focus not only on recognizing clinical signs early but also on understanding the ethical implications of perpetuating extreme phenotypes. Future breeding strategies should prioritize functional anatomy, genetic diversity, and long-term health rather than exaggerated physical traits that compromise basic physiological functions. Only through coordinated, evidence-based efforts can we shift the trajectory of these breeds toward a healthier and more sustainable future.

#### • References:

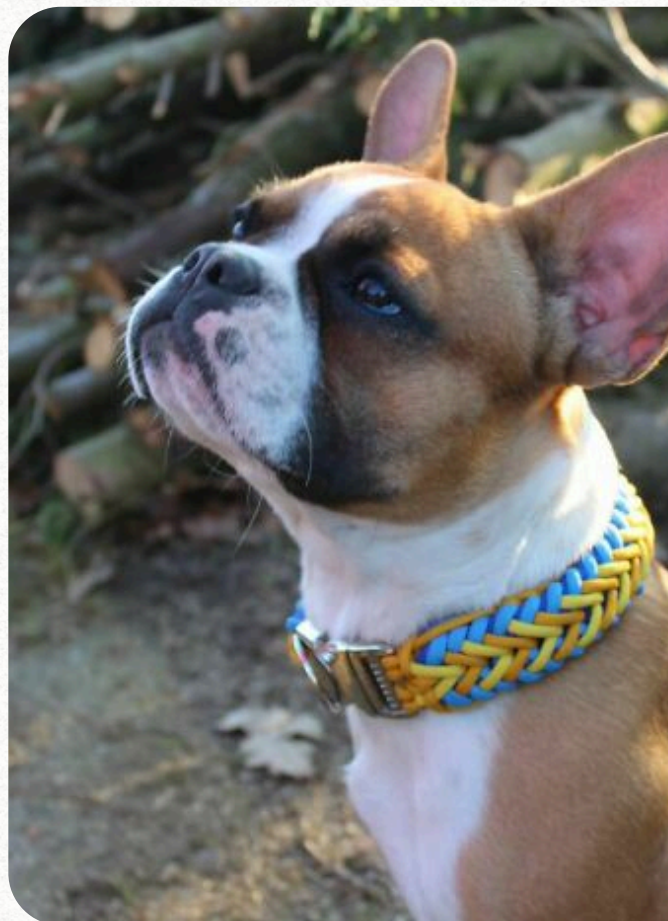
1. Packer RMA, Hendricks A, Burn CC. Impact of facial conformation on canine health: brachycephalic obstructive airway syndrome. *PLoS ONE*. 2015;10(10):e0137496.
2. Fasanella FJ, Shivley JM, Wardlaw JL, Givaruangsawat S. Brachycephalic airway obstructive syndrome in dogs: 90 cases (1991–2008). *Journal of the American Veterinary Medical Association*. 2010;237(9):1048–1051.
3. O'Neill DG, Jackson C, Guy JH, et al. Epidemiological associations between brachycephaly and upper respiratory tract disorders in dogs. *Canine Genetics and Epidemiology*. 2015;2:10.
4. Meola SD. Brachycephalic airway syndrome. *Topics in Companion Animal Medicine*. 2013;28(3):91–96.
5. Gelatt KN, Gilger BC, Kern TJ. *Veterinary Ophthalmology*. 5th ed. Wiley-Blackwell; 2013.
6. Rooney NJ, Sargan D. Welfare concerns associated with pedigree dog breeding. *Journal of Veterinary Behavior*. 2009;4(5):180–186.



# RE-SHAPING THE FRENCH BULLDOG: A NEW APPROACH TO RESPIRATORY HEALTH

In the Netherlands, breeders and welfare guidelines encourage selective breeding of French Bulldogs with longer muzzles and improved airway function to reduce severe BOAS-related respiratory problems.

**In the Netherlands, animal welfare-driven breeding guidelines encourage reducing extreme brachycephaly in French Bulldogs by selecting for longer muzzles, wider nostrils, and improved airway function, aiming to lower the risk of BOAS and other health problems while maintaining the breed.**



## Selective Breeding Against Extreme Brachycephaly

Modern breeding approaches prioritize wider nostrils, less extreme skull shapes, and healthier body structure, aiming to improve welfare while moving away from extreme flat-faced conformations.



# EMERGENCY MANAGEMENT OF HEATSTROKE IN PETS



Article by Sally Mustafa

*With the sunny seasons coming up, pets are at a greater risk of becoming victims of heatstroke, and unfortunately, many times, once the owner notices it can be a bit too advanced in the episode. So once they get into the clinic, every moment counts. Today, we will dive deeper into how to manage such cases so this summer can be as enjoyable and safe for both our little companions and us.*

## First things first: STABILIZE!

As usual, with every emergency case that walks through the door, it's crucial to make sure our patient is stable before we go into any more secondary procedures. Using ABC protocol, we should ensure the patient is provided with adequate airway patency and proper breathing, provide Oxygen should always be given. sedation, if needed, intubation, and if the respiratory damage is too severe, we can opt for mechanical ventilation. Heatstroke patients are prone to losing fluids, so it's very important we begin aggressive crystalloid therapy. We want to do balanced isotonic crystalloids in shock doses, for dogs up to 80-90 ml/kg total shock dose, for cats up to 50-60 ml/kg.

## Controlled cooling (the most important step in the initial emergency)

In heatstroke patients, the temperature can go as high as 45 °C. It's very important for us to reduce it safely to around 39.5-39.7 in this stage. We need to be very careful once we reach that point, and be very precise to not overcool, which could lead to rebound hypothermia. Some methods we can use: cool water on the body, fans, wet towels, cool IV fluids, and alcohol on paw pads. It's important for the cooling strategy to be evaporative and continuous.

When cooling down the patient, it is crucial to avoid intense cooling methods such as ice baths, heavy wet towel wrapping, immersion of the patient in really cold ice water, because these methods do more harm than good; they lead to worsened shock, reduced heat dissipation, and peripheral vasoconstriction.

## Restoring the patient and returning to a hemodynamically stable state with fluid therapy, and targeting complications

After stabilizing the temperature, it's time to do damage control internally. We want to start with planned continuous fluid therapy to restore perfusion, correct dehydration, prevent renal injury and support blood pressure. While doing this, it is very important that we monitor different parameters such as BP, urine output, electrolytes, respiratory status, ECG, lactate, and take a temperature every 5-10 minutes. These parameters help us see the bigger picture of the state of recovery the patient is in and help us identify complications common with heatstroke, such as arrhythmias, metabolic acidosis, acute kidney injury, hepatic damage, and DIC. Animals that develop coagulopathies may require plasma transfusions or additional blood products. Neurologic complications are common and may include seizures, cerebral edema, and persistent altered mentation. Seizures are typically treated with benzodiazepines such as Diazepam or Midazolam. Patients with suspected cerebral edema may benefit from mannitol or hypertonic saline administration. Gastrointestinal protection is also important because intestinal ischemia and mucosal injury may result in endotoxemia and ulceration. Antiemetics and acid suppressants such as Maropitant and Omeprazole are commonly used in supportive care.

**Prognosis and how to prevent:**

Prognosis depends largely on the duration and severity of hyperthermia before treatment begins. Early recognition and rapid intervention significantly improve survival. Poor prognostic indicators include prolonged hyperthermia, coma, persistent hypotension, DIC, hypoglycemia, and acute renal failure. Prevention remains the most effective strategy and includes avoiding exercise during extreme heat, ensuring adequate ventilation and water availability, and never leaving pets confined in parked vehicles.



Copyright, www.medvet.com



Copyright, www.dailypaws.com

**References:**

1. King LG, Boag A, editors. *BSAVA Manual of Canine and Feline Emergency and Critical Care*. 3rd ed. Gloucester: British Small Animal Veterinary Association; 2018.
2. The Lighthouse Veterinary Care. *Heatstroke in pets* [Internet]. Available from: The Lighthouse Veterinary Care
3. PetMD. *Heatstroke in dogs* [Internet]. Available from: PetMD
4. Veterinary Information Network (VIN). *Heatstroke in dogs and cats* [Internet]. Available from: VIN
5. Royal Veterinary College. *Heatstroke fact sheet* [Internet]. Available from: Royal Veterinary College
6. VetGirl. *How to treat heatstroke in dogs and cats* [Internet]. Available from: VetGirl

# HEALTHY PETS

## Simple everyday habits for a fitter and longer life

Daily walks, exercise, and interactive play are essential for keeping pets physically and mentally healthy. Regular activity helps control weight, strengthens muscles and joints, reduces stress, and prevents boredom-related behaviors.



Routine veterinary check-ups are key to preventing health problems and detecting illnesses early. Vaccinations, dental care, and regular monitoring can help your four-legged friend live a longer, healthier, and happier life.



A balanced diet is one of the most important factors for your pet's wellbeing. Providing high-quality food in the right portions helps maintain a healthy weight, supports energy levels, and reduces the risk of obesity and related diseases.



# NUTRITIONAL INFLUENCES ON CANINE CARDIAC FUNCTION: A REVIEW OF CLINICAL AND LONGITUDINAL EVIDENCE



Article by Maria Dinică

## Abstract

The intersection of canine nutrition and cardiovascular health has emerged as a critical focus within veterinary medicine. This paper provides an advanced synthesis of the literature regarding non-hereditary Dilated Cardiomyopathy (DCM) in dogs by cross-examining data from a controlled 18-month prospective feeding trial (Morris et al., 2024), a comprehensive clinical retrospective analysis (Freeman et al., 2018), an exhaustive paradigm review (Quest et al., 2023), and a recent narrative review investigating dietary predisposing factors (Mornard et al., 2025). While longitudinal data shows that properly balanced, pulse-inclusive diets can maintain baseline cardiac parameters in specific, healthy cohorts, widespread clinical evidence and multi-study reviews indicate that certain dietary profiles—specifically those with high inclusion rates of pulses—act as predisposing factors for myocardial failure. This review details the biochemical, echocardiographic, and clinical nuances defining the current understanding of diet-associated canine DCM.

*Key words:* canine nutrition; cardiovascular health; dilated cardiomyopathy (DCM); non-hereditary DCM; diet-associated DCM; grain-free diet

## Introduction: The Evolution of Non-Hereditary Myocardial Disease

Historically, Dilated Cardiomyopathy (DCM) in canine patients was classified almost exclusively as an inherited genetic disorder. It predominantly plagued large and giant breeds, such as Doberman Pinschers, Great Danes, and Irish Wolfhounds, characterized by progressive left ventricular eccentric hypertrophy and a severe reduction in systolic function.

However, a dramatic epidemiological shift occurred when veterinary cardiologists observed a distinct surge of DCM cases in atypical breeds, such as: (Golden Retrievers, mixed breeds, and small companion dogs, lacking any known hereditary predisposition (Freeman et al., 2018).

Clinical histories rapidly established a common variable: a strong correlation with the long-term consumption of commercial pet foods categorized under the "BEG" acronym (Boutique manufacturers, Exotic-ingredient profiles, and Grain-free formulations).

In these formulations, traditional cereal grains like corn, wheat, and rice are replaced with high concentrations of pulses (peas, lentils, chickpeas) or potatoes to fulfill macronutrient requirements. The sudden rise in clinical cases prompted an intense investigation into whether these alternative carbohydrate sources possess inherent cardiotoxic properties, induce subclinical nutrient deficiencies, or physically alter the structural integrity of the canine myocardium over time (Mornard et al., 2025; Quest et al., 2023).

## Experimental Evidence: The Controlled Baseline

To evaluate the isolated physiological impact of varying carbohydrate matrices, Morris et al. (2024) conducted a highly regulated, randomized, double-blind, parallel-group 18-month prospective feeding trial utilizing 60 healthy adult dogs. The animals were maintained on one of four distinct dietary profiles:

1. GF + PPo: Grain-free with peas and potatoes.
2. G + PPF: Grain-inclusive with pea protein and pea fiber.
3. G: Grain-inclusive control without pulse ingredients.
4. GF + Po: Grain-free with potatoes.

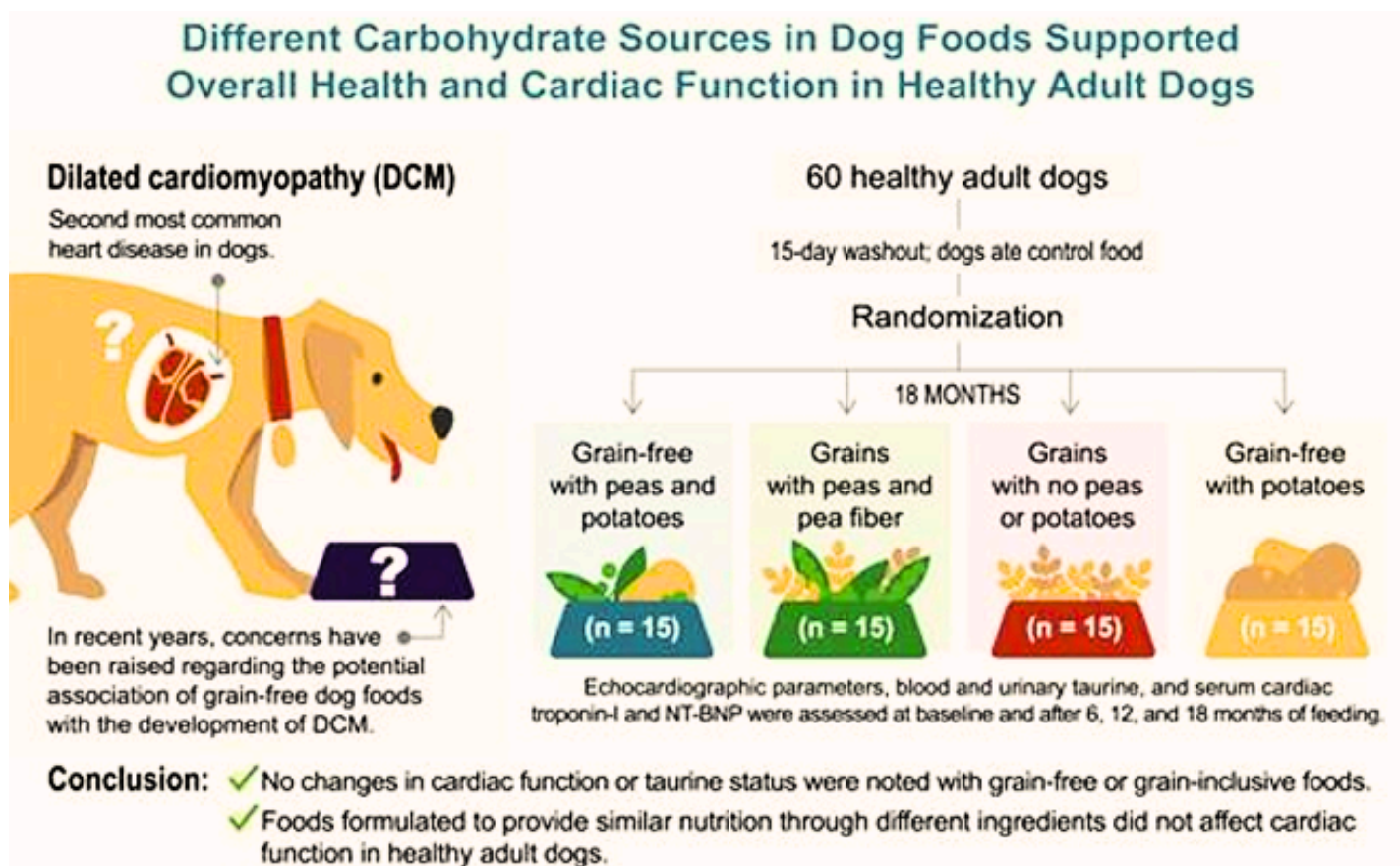


Figure 1- An image summary of the 18-month study

### Biomarker Analysis

The study utilized two primary serum biomarkers to monitor subclinical cardiac distress: serum cardiac troponin-I (cTnI) and N-terminal pro-B-type natriuretic peptide (NT-proBNP). Serum cTnI is an ultra-sensitive marker for acute cardiomyocyte injury, as its presence in blood indicates cell membrane disruption. NT-proBNP serves as a metric for chronic ventricular wall stress and stretch. Over the 18-month timeline, Morris et al. (2024) observed that neither biomarker significantly fluctuated or exceeded normal reference ranges in any of the dietary groups, indicating an absence of acute cellular necrosis or excessive physical wall strain.

### Taurine Homeostasis

Because historical nutritional DCM was heavily linked to systemic taurine deficiency, tracking plasma and whole blood taurine levels was a key parameter. The study demonstrated that all dogs maintained stable taurine concentrations well within normal reference limits, regardless of whether they were fed grain-free or high-pulse diets (Morris et al., 2024).

This confirmed that pulse-inclusive diets do not universally or rapidly deplete systemic taurine reserves in healthy adult dogs under controlled settings.

### Clinical Realities and Myocardial Reversibility

A striking discrepancy exists between the stable outcomes of controlled feeding trials and the presentations observed in veterinary hospitals. Retrospective data compiled by Freeman et al. (2018) provided some of the earliest documented evidence linking commercial diets to overt clinical heart failure.

### Echocardiographic Features of Diet-Associated DCM

Dogs presenting with diet-associated DCM exhibit classic echocardiographic hallmarks: significant left ventricular internal diameter dilation during both diastole (LVIDd) and systole (LVIDs), alongside a precipitous drop in fractional shortening (FS). Fractional shortening measures the contractility of the left ventricle.

When FS drops significantly below normal parameters (typically <25%), the heart can no longer effectively pump blood to meet metabolic demands, leading to congestive heart failure (CHF).

### The Phenomenon of Dietary Reversibility

The most defining characteristic of diet-associated DCM—and the strongest evidence for its secondary, nutritional etiology—is its capacity for clinical reversibility. Freeman et al. (2018) documented that when dogs presenting with advanced DCM were transitioned away from boutique or grain-free diets to traditional grain-inclusive diets, they demonstrated profound, measurable cardiac improvement. Over several months, echocardiograms revealed ventricular dimensions normalizing and fractional shortening increasing significantly. Many patients experienced a complete resolution of myocardial failure, allowing them to be safely weaned off potent positive inotropes and diuretics (Freeman et al., 2018). Crucially, this recovery occurred in numerous dogs whose baseline taurine levels were completely normal at the time of diagnosis, confirming that a non-aurine-dependent mechanism was driving the pathology.

### Mechanistic Perspectives: The Pulse-DCM Paradigm

To bridge the gap between longitudinal trials and clinical observations, multi-study reviews have focused on the exact composition of alternative starches. Quest et al. (2023) conducted an extensive review of the diet-DCM paradigm, establishing that the marketing designation "grain free" is secondary to the true variable: the absolute concentration and inclusion threshold of pulse ingredients.

Pulses are highly complex ingredient packages containing significant levels of native antinutrients, including phytates, lectins, saponins, and protease inhibitors. Quest et al. (2023) noted that when pulses are utilized at high inclusion rates, these antinutrients can exert complex systemic effects:

- **Nutrient Chelation:** Binding essential minerals and altering amino acid digestibility in the small intestine.
- **Gastrointestinal Alterations:** Changing the gut microbiota profile, which can accelerate the degradation of bile acids and place an indirect metabolic strain on the liver's synthesized nutrient pools.

- **Cardiomyocyte Metabolism Interference:** Disruption of the energy-intensive metabolic pathways of the canine heart, which relies heavily on efficient fatty acid oxidation and specific amino acid derivatives to maintain steady contractile force.

Expanding on these variables, Mornard et al. (2025) published a narrative review positioning diet as a critical predisposing factor for DCM. The review highlights that while a single, isolated toxic compound has not been identified, the consistency with which high-pulse diets appear in clinical case reports cannot be overlooked. Mornard et al. (2025) suggest that the etiology is likely multifactorial, involving an interaction between the high pulse concentration, potential processing effects that alter nutrient bioavailability, and individual genetic susceptibilities in certain dogs. This explains why only a fraction of dogs eating these diets develop overt failure, while others, like the cohort in Morris et al. (2024), remain subclinical within an 18-month window.

### Clinical Evidence and Retrospective Perspectives

The association between DCM and specific dietary categories is further supported by retrospective clinical reviews. Freeman et al. (2018) documented that many dogs diagnosed with DCM while consuming grain-free or pulse-heavy diets showed significant clinical and echocardiographic improvement—or even complete reversal of the disease—following a dietary change to traditional grain-inclusive products.

Furthermore, recent reviews of the "DCM-Pulse" hypothesis suggest that the concentration of pulses (specifically peas and lentils) is a more accurate predictor of cardiac risk than the mere absence of grains (Quest et al., 2023). These pulses may interfere with the bioavailability of other nutrients or contain compounds that affect myocardial metabolism over time, leading to the dilated phenotype observed in clinical settings (Quest et al., 2023).

## Conclusion

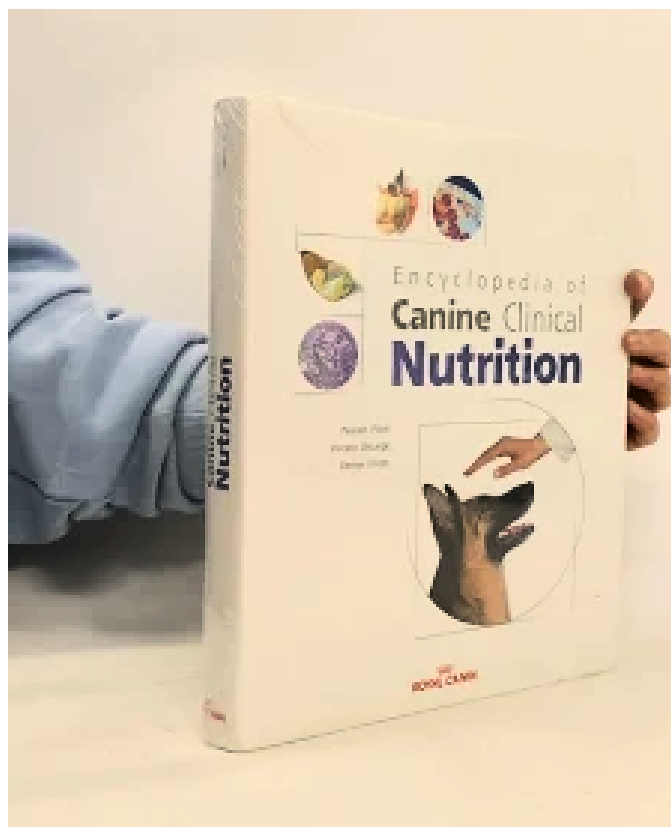
The current literature suggests a dichotomy between controlled, short-term trials and real-world clinical observations. While it is possible to formulate pulse-containing diets that maintain cardiac biomarkers for 18 months (Morris et al., 2024), the measurable reductions in systolic performance (Letter to Editor, 2024) and the clinical success of transitioning to a grain-inclusive diet (Freeman et al., 2018; Quest et al., 2023) suggest a cautious approach. Further research is required to identify the specific inclusion thresholds of pulses that may trigger myocardial remodeling.



Figure - Chest x-rays from a dog with dilated cardiomyopathy (DCM) and significant heart enlargement  
source : [vet.tufts.edu](http://vet.tufts.edu)

## References and bibliography :

- Freeman, L. M., Stern, J. A., Linder, A. L., Kaplan, J. L., & Heine, E. J. (2018). Diet associated dilated cardiomyopathy in dogs: What do we know? *Journal of the American Veterinary Medical Association*, 253(11), 1390-1394. <https://doi.org/10.2460/javma.253.11.1390>
- Morris, E. M., Stiers, C. A., Hancock, L. B., & Gross, K. L. (2024). Different carbohydrate sources in dog foods supported overall health and cardiac function: An 18-mo prospective study in healthy adult dogs. *Journal of Animal Science*, 102. <https://doi.org/10.1093/jas/skaf225>
- Quest, B. W., Leach, S. B., Mansilla, W. D., & Shoveller, A. K. (2023). A Review of the Diet-Associated Canine Dilated Cardiomyopathy Paradigm. *PubMed Central (PMC10212094)*. <https://pmc.ncbi.nlm.nih.gov/articles/PMC10212094/>
- Mornard L, Brasileiro ACM, Marcondes-Santos M. Role of Diet as a Predisposing Factor for Dilated Cardiomyopathy in Dogs: A Narrative Review. *Veterinary Sciences*. 2025; 12(11):1106. <https://doi.org/10.3390/vetsci12111106>



*Encyclopedia of Canine Clinical Nutrition (Royal Canin) is an extensive scientific reference work that focuses on the principles, applications, and clinical implications of evidence-based nutrition in dogs. Developed in collaboration with veterinary nutritionists, academic researchers, and clinical practitioners, the publication brings together a wide body of knowledge on canine physiology, metabolic requirements, and dietary management across different life stages and health conditions.*

*The work is structured to provide a comprehensive overview of how nutrition influences canine health, from growth and reproduction to aging and disease. It examines essential nutrients, energy metabolism, digestive physiology, and the impact of diet formulation on overall wellbeing. A significant portion of the content is dedicated to the role of nutrition in clinical practice, including its use as a supportive or primary component in the management of common and complex diseases such as renal disorders, cardiac conditions, gastrointestinal diseases, obesity, and endocrine disorders.*

*In addition to theoretical foundations, the encyclopedia integrates practical clinical applications, offering guidance on nutritional assessment, diet selection, and therapeutic feeding strategies. It highlights how individualized nutritional plans can be used as part of a holistic approach to veterinary care, reinforcing the idea that diet is not merely supportive but often central to treatment outcomes.*

*Rather than serving as a commercial guide, Encyclopedia of Canine Clinical Nutrition functions as an educational and scientific resource aimed at veterinary professionals, students, and researchers. It reflects the growing importance of nutrition as a key pillar of modern veterinary medicine and emphasizes the integration of nutritional science into everyday clinical decision-making.*

# CORNEAL ULCER IN ATOPIC DOG: INTEGRATED MEDICAL AND REGENERATIVE APPROACH



Article by DVM Dan-Andrei Diaconescu and Giovanni Marciano



## Abstract

Corneal ulceration is one of the most common ophthalmologic disorders in dogs and may rapidly progress toward severe complications such as corneal melting, perforation, and permanent visual impairment. In atopic dogs, chronic skin inflammation and intense pruritus significantly increase the risk of ocular self-trauma. This article presents the clinical case of “Kira,” a female French Bulldog affected by canine atopic dermatitis, who developed a traumatic corneal lesion secondary to facial scratching against a tree. Initial treatment with ofloxacin and hyaluronic acid for two weeks failed to achieve clinical improvement. A subsequent multimodal therapeutic protocol based on topical tobramycin, oral doxycycline, anti-inflammatory and supportive therapy, and Platelet-Rich Plasma (PRP) administration resulted in progressive corneal healing and clinical recovery. This paper reviews the pathophysiology of corneal ulceration in dogs, the relationship between atopic dermatitis and ocular trauma, and the pharmacological rationale behind the molecules used in therapy, with a dedicated section on the emerging role of PRP in veterinary regenerative medicine.

*Keywords: Canine corneal ulcer; canine atopic dermatitis; French Bulldog; veterinary ophthalmology; platelet-rich plasma*

## Introduction

Corneal ulcers are defined as disruptions of the corneal epithelium with varying degrees of stromal involvement. In veterinary ophthalmology, they represent a common emergency condition, especially in brachycephalic breeds such as the French Bulldog due to anatomical predispositions including exophthalmos, lagophthalmos, reduced corneal sensitivity, and increased exposure of the ocular surface.

Canine atopic dermatitis (CAD) is a chronic inflammatory and pruritic skin disease associated with environmental allergens and immune dysregulation. Ocular manifestations are frequent in atopic dogs and include conjunctivitis, periocular dermatitis, blepharitis, keratitis, and increased susceptibility to traumatic ocular lesions due to persistent scratching.

In this case, the patient was not yet receiving therapy for the underlying atopic condition, which likely contributed to excessive facial pruritus and subsequent ocular trauma.

## Clinical Case Description

“Kira,” a female French Bulldog diagnosed with canine atopic dermatitis, presented with persistent ocular discomfort following traumatic scratching of the face and eye against a tree. Clinical signs included:

- Blepharospasm
- Epiphora
- Ocular redness
- Corneal opacity
- Persistent pain and irritation

An initial therapeutic approach consisting of topical ofloxacin and hyaluronic acid for approximately two weeks failed to induce satisfactory healing.

A second therapeutic protocol was therefore initiated, consisting of:

- Topical tobramycin
- Systemic doxycycline
- Anti-inflammatory/supportive therapy
- Platelet-Rich Plasma (PRP) application

After approximately ten days, marked clinical improvement and corneal healing were observed.

## Corneal Ulcers in Dogs

### *Pathophysiology*

The canine cornea is composed of four major layers:

1. Epithelium
2. Stroma
3. Descemet's membrane
4. Endothelium

Corneal integrity is essential for transparency and vision. Any epithelial disruption exposes the underlying stroma to microbial invasion, inflammatory mediators, and proteolytic enzymes.

Traumatic ulcers are frequently caused by:

- Self-trauma
- Vegetal foreign bodies
- Scratching
- Eyelid abnormalities
- Dry eye syndrome
- Brachycephalic exposure keratitis

In atopic dogs, chronic periocular inflammation and itching increase the likelihood of repeated trauma and delayed epithelial healing.

## Canine Atopic Dermatitis and Ocular Complications

Canine Atopic Dermatitis is mediated by a complex interaction between genetic predisposition, epidermal barrier dysfunction, and hypersensitivity to environmental allergens.

Inflammatory cytokines such as IL-4, IL-13, and IL-31 contribute to severe pruritus and chronic inflammation. Ocular involvement is common and may predispose to:

- Chronic conjunctivitis
- Keratitis
- Corneal trauma
- Secondary bacterial infections

French Bulldogs are among the breeds most predisposed to severe atopic manifestations due to both genetic and anatomical factors.

## Pharmacological Analysis of the Therapeutic Protocol

### *Ofloxacin*

Ofloxacin is a second-generation fluoroquinolone antibiotic with broad-spectrum bactericidal activity against Gram-negative and several Gram-positive organisms.



Fig1. Clinical condition of the right eye (OD) at first examination

### Mechanism of Action

Ofloxacin inhibits:

- DNA gyrase
- Topoisomerase IV

thereby blocking bacterial DNA replication.

### Clinical Limitations

Although commonly used in superficial corneal ulcers, ofloxacin alone may be insufficient when:

- Deep stromal inflammation is present
- Matrix metalloproteinases (MMPs) are activated
- Resistant bacterial contamination exists
- Persistent self-trauma continues

The absence of clinical response after two weeks suggested inadequate control of inflammation and stromal degradation.

### *Hyaluronic Acid*

Hyaluronic Acid acts primarily as a tear film stabilizer and ocular lubricant.

### Therapeutic Functions

- Enhances corneal hydration
- Reduces friction
- Promotes epithelial migration
- Supports tear film stability

However, hyaluronic acid alone does not possess antimicrobial activity nor sufficient anti-collagenolytic effects to halt progressive stromal degradation.

### *Tobramycin*

Tobramycin is an aminoglycoside antibiotic widely used in veterinary ophthalmology.

#### Mechanism of Action

Tobramycin binds irreversibly to the bacterial 30S ribosomal subunit, causing:

- Inhibition of protein synthesis
- Production of dysfunctional proteins
- Bacterial cell death

#### Clinical Advantages in Corneal Ulcers

Tobramycin is particularly effective against:

- *Pseudomonas aeruginosa*
- Gram-negative pathogens commonly involved in aggressive corneal infections

This is especially relevant in brachycephalic dogs, where secondary bacterial colonization can rapidly accelerate corneal melting.

### *Doxycycline*

Doxycycline is a tetracycline-class antibiotic with antimicrobial, anti-inflammatory, and anti-collagenolytic properties.

#### Mechanisms Beyond Antibiosis

Doxycycline inhibits:

- Matrix metalloproteinases (MMPs)
- Collagenase activity
- Neutrophil-mediated tissue destruction

#### Additional Benefits

- Anti-inflammatory immunomodulation
- Reduction of neutrophilic infiltration
- Synergistic support with topical antimicrobials

### **Platelet-Rich Plasma (PRP) in Veterinary Ophthalmology**

Platelet-Rich Plasma (PRP) is an autologous biological product obtained by centrifugation of whole blood to concentrate platelets and growth factors.

PRP contains elevated levels of:

- Platelet-derived growth factor (PDGF)
- Transforming growth factor beta (TGF- $\beta$ )
- Vascular endothelial growth factor (VEGF)
- Epidermal growth factor (EGF)
- Insulin-like growth factor (IGF)

These molecules are essential mediators of tissue regeneration.



*Fig.2. Clinical appearance of the right eye (OD) seven days after initiation of therapy, showing marked improvement of the corneal lesion and reduction of ocular inflammation.*

#### *Mechanism of Action in Corneal Healing*

PRP promotes:

- Epithelial regeneration
- Stromal repair
- Cellular proliferation
- Angiogenic modulation
- Reduction of inflammation

Growth factors stimulate fibroblast migration and epithelial cell adhesion, accelerating corneal wound closure.

Additionally, PRP exerts lubricating and anti-inflammatory effects that improve ocular surface stability.

#### *Veterinary Applications of PRP*

In veterinary medicine, PRP is increasingly utilized in:

- Corneal ulcers
- Tendon injuries
- Osteoarthritis
- Ligament repair
- Chronic wounds
- Orthopedic regenerative therapies

In ophthalmology, PRP has shown promising results in:

- Indolent ulcers
- Deep stromal ulcers
- Corneal melting
- Persistent epithelial defects

The autologous nature of PRP minimizes immunologic reactions and improves biocompatibility.

### Discussion

The management of corneal ulcers in dogs requires a multimodal approach, particularly when complicating factors such as canine atopic dermatitis are present. In this case, the initial monotherapy with topical ofloxacin and hyaluronic acid was insufficient to control disease progression, suggesting that bacterial coverage and lubrication alone were not adequate to address the underlying pathophysiological mechanisms.

Corneal healing is a highly regulated process involving epithelial migration, stromal remodeling, and control of inflammatory and proteolytic activity. In complicated ulcers, excessive activation of matrix metalloproteinases (MMPs) and neutrophil-derived collagenases can lead to progressive stromal degradation and delayed healing. This is particularly relevant in brachycephalic breeds such as the French Bulldog, where ocular exposure and self-trauma significantly increase the risk of ulcer progression.

The introduction of topical tobramycin provided enhanced antimicrobial coverage against Gram-negative organisms commonly implicated in infectious keratitis. Its bactericidal mechanism, based on inhibition of the 30S ribosomal subunit, contributes to rapid reduction of microbial load and prevention of secondary infection.

Systemic doxycycline played a key role beyond its antimicrobial activity. Its ability to inhibit MMPs and reduce collagenase activity is crucial in preventing corneal melting. Moreover, its anti-inflammatory properties help modulate neutrophil activity, thereby limiting further stromal damage and promoting a more stable healing environment.

Platelet-rich plasma (PRP) represented a regenerative adjunct therapy in this case. The high concentration of growth factors such as PDGF, TGF- $\beta$ , and EGF supports epithelial regeneration, fibroblast activation, and extracellular matrix remodeling. PRP also contributes to the reduction of ocular surface inflammation and enhances epithelial adhesion, accelerating corneal repair in refractory or complicated ulcers.

Overall, the favorable clinical outcome observed in this case is likely the result of synergistic effects between antimicrobial control, inhibition of collagenolytic activity, and stimulation of tissue regeneration. This highlights the importance of early multimodal therapy in atopic dogs with traumatic corneal lesions, particularly when self-inflicted injury is involved and the underlying dermatological condition remains uncontrolled.



*Fig.3. Right eye (OD) showing complete resolution of corneal lesion two weeks after treatment.*

### Conclusion

Corneal ulcers in atopic brachycephalic dogs represent a multifactorial ophthalmologic emergency requiring rapid and integrated treatment. In this French Bulldog case, conventional therapy with ofloxacin and hyaluronic acid alone proved insufficient, whereas a multimodal protocol involving tobramycin, doxycycline, and PRP achieved successful corneal healing.

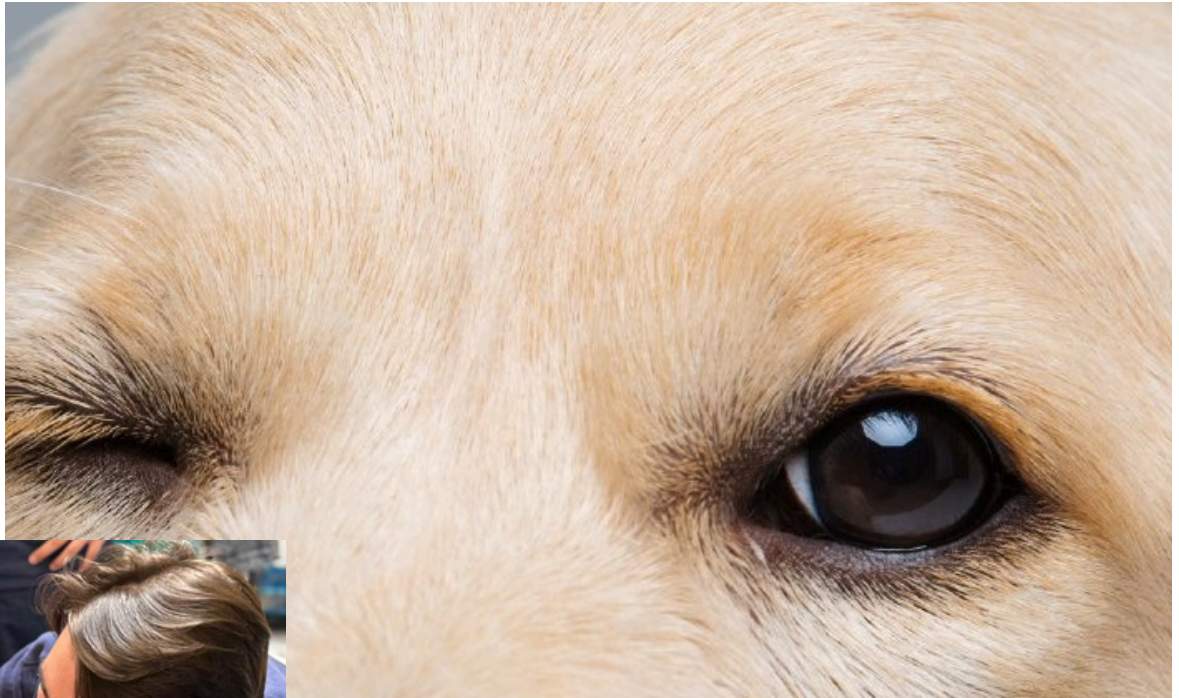
The case emphasizes the importance of:

- Early aggressive therapy
- Control of inflammation and collagenolysis
- Regenerative medicine approaches
- Long-term management of canine atopic dermatitis

Platelet-Rich Plasma represents a highly promising therapeutic adjunct in veterinary ophthalmology, particularly for complicated corneal ulcers where tissue regeneration and anti-inflammatory modulation are required.

### References:


1. Farghali HA, Abdelkader NA, AbuBakr HO, Ramadan ES, Khattab MS, Salem NY, Emam IA. Corneal ulcer in dogs and cats: novel clinical application of regenerative therapy using autologous platelet-rich plasma. *Vet Ophthalmol.* 2021;24(3):265–278.
2. Ollivier FJ, Plummer CE, Barrie KP, et al. Canine infectious keratitis: clinical findings and management. *Vet Ophthalmol.* 2007;10(2):80–90.
3. Plummer CE, Smith S, Brooks D. Doxycycline inhibition of matrix metalloproteinases in corneal disease. *Vet Ophthalmol.* 2008;11(2):131–137.



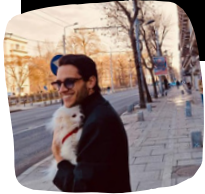
## Protecting Animal Vision

Veterinary ophthalmology focuses on the diagnosis, treatment, and prevention of eye diseases in animals. It plays a key role in preserving vision and managing a wide range of ocular conditions. Healthy vision is essential for an animal's quality of life, safety, and wellbeing.





# LEPTOSPIROSIS AS AN IMMUNE-MEDIATED AND SYSTEMIC DISEASE: BEYOND ANTIBIOTIC-CENTRIC THERAPY



Article by Irene Romanelli and Giovanni Marciano



## Abstract

Leptospirosis is traditionally regarded as an acute bacterial zoonosis effectively managed through antimicrobial therapy; however, increasing evidence from veterinary and comparative medical research suggests a substantially more complex pathogenesis in which host immune responses play a central role in determining disease severity and outcome (Greene, 2012; Sykes, 2014). Following rapid systemic dissemination, *Leptospira* spp. induce a biphasic disease characterized by an early leptospiremic phase and a subsequent immune-mediated phase, during which inflammatory cascades, endothelial dysfunction, and cytokine-driven tissue injury predominate (Levett, 2001; Bharti et al., 2003). Severe clinical manifestations, including acute kidney injury, hepatic dysfunction, and pulmonary hemorrhagic syndrome, appear more closely associated with dysregulated host immune responses than with direct bacterial cytotoxicity alone (Ko et al., 2009; Vinetz, 2001). Emerging hypotheses, including molecular mimicry and immune cross-reactivity, further support an immunopathological component in organ-specific damage (Adler & de la Peña Moctezuma, 2010). Diagnostic interpretation is complicated by vaccination-induced antibody responses, serological cross-reactivity, and prolonged antibody persistence, limiting the specificity of serology in both endemic and vaccinated populations (Ellis, 2015; WOA, 2021). Consequently, optimal clinical management requires integrated diagnostic strategies combining molecular, serological, and clinical data.

While antibiotics remain essential for pathogen clearance, severe disease may benefit from adjunctive immunomodulatory approaches targeting hyperinflammation, although evidence remains limited (Sykes, 2014).

Overall, leptospirosis should be redefined as a systemic host–pathogen interaction syndrome in which immune dysregulation is a primary determinant of clinical outcome rather than a secondary phenomenon.

*Key words:* leptospirosis; zoonosis; *Leptospira* spp.; canine leptospirosis; host–pathogen interaction; immune response; immunopathogenesis; cytokine storm

## Introduction

Leptospirosis, caused by pathogenic spirochetes of the genus *Leptospira*, is traditionally considered an acute zoonotic bacterial infection in which antimicrobial therapy is viewed as the primary determinant of clinical resolution. However, a growing body of veterinary and comparative medical literature indicates that disease severity is not solely dependent on bacterial burden, but is strongly influenced by host immune responses and inflammatory regulation (Greene, 2012; Sykes, 2014; Adler & de la Peña Moctezuma, 2010).

In both human and veterinary hosts, leptospirosis exhibits a biphasic systemic pattern characterized by an early leptospiremic phase followed by an immune-mediated phase in which endothelial injury, cytokine activation, and organ dysfunction dominate the clinical picture (Bharti et al., 2003; Levett, 2001). This has led to a conceptual shift in which leptospirosis is increasingly interpreted as a host–pathogen interaction syndrome with immunopathological amplification rather than a purely bacterially driven disease (Ko et al., 2009).

### Early Infection Dynamics and Innate Immune Activation

Following entry through skin abrasions or mucosal surfaces, *Leptospira* rapidly disseminates hematogenously, establishing a transient but clinically significant leptospiremic phase (Ellis, 2015; Greene, 2012). During this stage, innate immune recognition via pattern recognition receptors activates macrophages, neutrophils, and endothelial cells, triggering early inflammatory signaling cascades (Adler & de la Peña Moctezuma, 2010).

Clinical variability appears to depend on the balance between pathogen clearance and immune regulation. Efficient immune responses result in rapid bacterial elimination and subclinical infection, whereas dysregulated responses allow persistent renal colonization and urinary shedding (Sykes et al., 2011; Ward, 2002). In severe cases, excessive immune activation leads to endothelial dysfunction, vascular leakage, and multisystem involvement resembling septic shock syndromes (Bharti et al., 2003; Pappas et al., 2008).

### Systemic Inflammation and Cytokine-Mediated Pathology

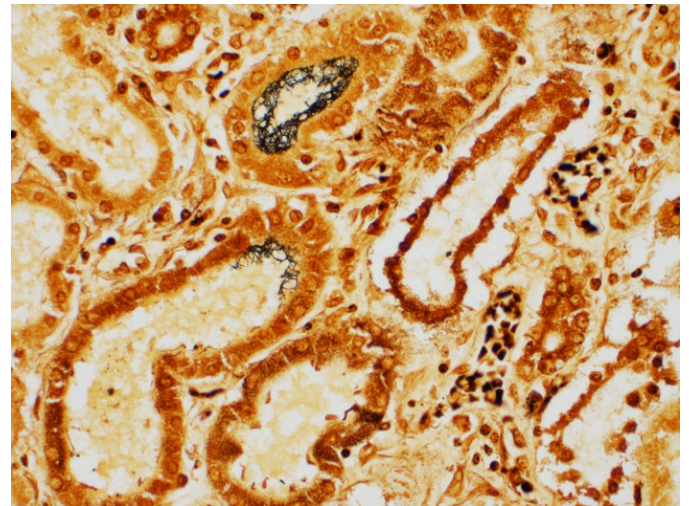
Severe leptospirosis is increasingly recognized as a cytokine-driven systemic inflammatory disorder in which host-mediated injury plays a central role in disease progression. Elevated inflammatory mediators contribute to endothelial damage, capillary leakage, and microvascular dysfunction, ultimately resulting in acute kidney injury, hepatic dysfunction, and pulmonary hemorrhage (Levett, 2001; Ko et al., 2009; Vinetz, 2001).

Importantly, organ failure severity correlates more closely with inflammatory intensity than with bacterial load, supporting the hypothesis that leptospirosis behaves as a sepsis-like immunopathological syndrome rather than a purely infectious process (Bharti et al., 2003; Ellis, 2015).

### Immunopathogenesis and Molecular Mimicry

A key hypothesis in severe disease pathogenesis involves molecular mimicry between *Leptospira* surface antigens and host extracellular structures. This may result in cross-reactive immune responses that contribute to pulmonary endothelial injury and hemorrhagic manifestations (Ko et al., 2009; Adler & de la Peña Moctezuma, 2010).

Histopathological studies in severe cases frequently demonstrate immune-mediated vascular injury with limited direct bacterial presence, supporting the concept that late-stage pathology is largely immunologically mediated (Greene, 2012; Levett, 2001).



*Kidney, dog.*

*Warthin Starry 4.0 | 400X*

*A silver stain demonstrates numerous spirochetes in proximity to the apical surface of proximal convoluted tubular epithelium.*

*Source: [www.askjpc.org](http://www.askjpc.org)*

### Immune-Mediated Complications and Post-Infectious Syndromes

Beyond acute infection, leptospirosis has been associated with secondary immune-mediated syndromes in veterinary species. These include hematological abnormalities resembling immune-mediated hemolytic anemia, reactive polyarthritis, and aseptic meningoencephalitis-like conditions (Sykes, 2014; Greene, 2012).

Such manifestations may occur after bacterial clearance, suggesting persistent immune dysregulation or aberrant immunological memory rather than ongoing infection (Ellis, 2015; Schuller et al., 2015).

### Chronic Sequelae and Long-Term Organ Damage

Emerging evidence suggests that leptospiral infection may contribute to chronic inflammatory and fibrotic remodeling in renal and hepatic tissues. Chronic interstitial nephritis with lymphoplasmacytic infiltration and progressive fibrosis has been documented in both experimental and naturally infected animals (Prescott, 2008; Greene, 2012).

Although causality remains complex, some studies suggest that prior leptospiral exposure may act as a contributing factor in chronic kidney disease development in dogs (Ward, 2002; Ellis, 2015).

Chronic hepatic inflammation has also been proposed in selected cases, although evidence remains less robust (Sykes, 2014).

### Diagnostic Complexity and Temporal Limitations

Diagnosis of leptospirosis is highly dependent on infection stage and immune response kinetics. PCR detection in blood is most useful during early leptospiremic phases, whereas urine PCR becomes more sensitive during later renal colonization stages (Levett, 2001; Greene, 2012).

Serological testing remains widely used but is limited by vaccination-induced antibodies, cross-reactivity among serovars, and prolonged antibody persistence after exposure or immunization (Ellis, 2015; WOA, 2021). As a result, serology alone is insufficient for definitive diagnosis without clinical and molecular correlation (Sykes, 2014).

### Vaccination and Serological Interpretation Challenges

Leptospira vaccination induces both IgM and IgG responses, complicating interpretation of diagnostic serology. Antibody titers may remain elevated for extended periods post-vaccination, and booster immunizations may induce secondary IgM responses (Adler, 2015; Greene, 2012).

Cross-reactivity between serovars due to shared lipopolysaccharide antigens further reduces specificity, particularly in endemic regions (Bharti et al., 2003; Pappas et al., 2008). Modern multivalent vaccines improve serogroup coverage but do not eliminate diagnostic ambiguity (WSAVA, 2020).

### Limitations of Antibody-Based Clinical Decision-Making

Antibody titers do not reliably correlate with protective immunity, as they fail to reflect cellular immune responses, mucosal immunity, or functional bacterial neutralization capacity (Sykes, 2014; Greene, 2012). Moreover, long-term antibody persistence limits their utility in distinguishing active infection from previous exposure or vaccination (Ellis, 2015).

Therefore, serological results must be interpreted in conjunction with clinical findings, vaccination history, and molecular diagnostics (WOA, 2021; Levett, 2001).

### Therapeutic Strategies Beyond Antimicrobial Therapy

Although antibiotic therapy remains essential for bacterial clearance, severe leptospirosis is increasingly understood as an immunopathological condition in which inflammatory injury contributes significantly to morbidity and mortality (Bharti et al., 2003; Ko et al., 2009).

Adjunctive therapies such as extracorporeal blood purification and cytokine adsorption (e.g., hemoadsorption devices like CytoSorb) have been proposed to reduce circulating inflammatory mediators and mitigate systemic inflammatory responses (Greene, 2012; Vinetz, 2001). While these approaches are biologically plausible, evidence specific to leptospirosis remains limited and largely extrapolated from sepsis literature (Sykes, 2014).

### Conclusions

Leptospirosis should be reconceptualized as a systemic host–pathogen interaction syndrome in which immune dysregulation plays a central role in determining disease severity and outcome. Antibiotic therapy remains necessary but insufficient in severe cases dominated by inflammatory injury.

Future research should focus on integrated diagnostic models, immunopathological stratification, and adjunctive immunomodulatory therapies aimed at controlling host-mediated damage rather than pathogen elimination alone (Greene, 2012; Adler & de la Peña Moctezuma, 2010; Bharti et al., 2003).

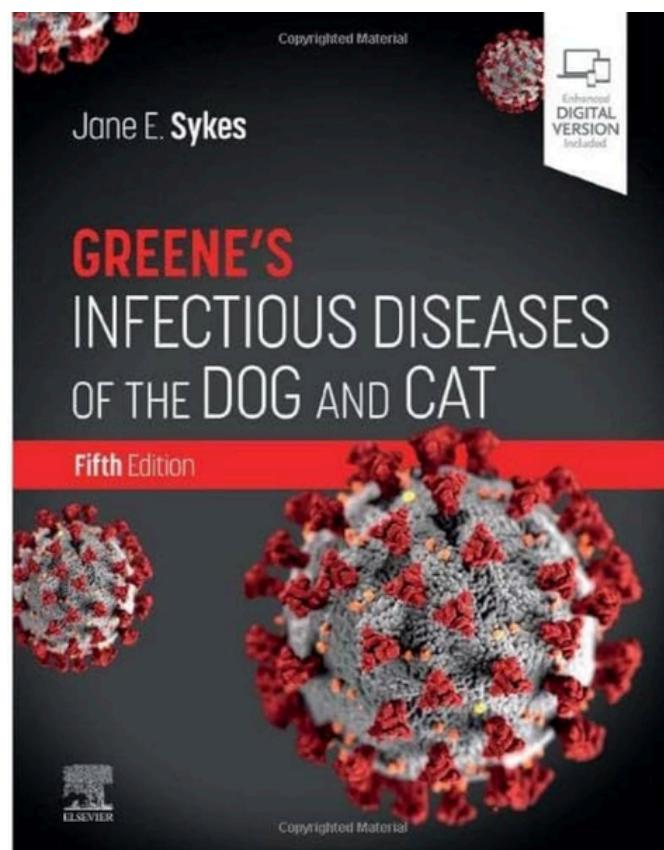


*Extracorporeal hemoadsorption device (CytoSorb®). This technology has been investigated as an adjunctive supportive therapy in severe systemic inflammatory conditions; its role in leptospirosis remains under evaluation.*

*Source: [www.gbg.md](http://www.gbg.md)*

## References:

1. Adler, B. (2014). *Leptospira and Leptospirosis*. Springer.
2. Adler, B., & de la Peña Moeztzuma, A. (2010). *Leptospira and leptospirosis*. *Veterinary Microbiology*.
3. Andre-Fontaine, G. (2006). *Canine leptospirosis: do we have a problem?* *Veterinary Microbiology*.
4. Bharti, A. R., et al. (2003). *Leptospirosis: a zoonotic disease of global importance*. *The Lancet Infectious Diseases*.
5. Costa, F., et al. (2015). *Global morbidity and mortality of leptospirosis*. *PLoS Neglected Tropical Diseases*.
6. Ellis, W. A. (1986). *Leptospirosis in dogs*. *Journal of Small Animal Practice*.
7. Ellis, W. A. (2015). *Animal leptospirosis*. In: *Leptospira and Leptospirosis*. Springer.
8. Faine, S., et al. (1999). *Leptospira and Leptospirosis*. *MediSci*.
9. Fouts, D. E., et al. (2016). *Genome analysis of pathogenic Leptospira*. *PLoS Neglected Tropical Diseases*.
10. Goldstein, R. E. (2010). *Canine leptospirosis*. *Veterinary Clinics of North America: Small Animal Practice*.
11. Greene, C. E. (2012). *Infectious Diseases of the Dog and Cat*. Elsevier.
12. Greene, C. E. (2021). *Greene's Infectious Diseases of the Dog and Cat (5th ed.)*. Elsevier.
13. Guerra, M. A. (2009). *Leptospirosis in animals*. *Journal of the American Veterinary Medical Association (JAVMA)*.
14. Haake, D. A., & Levett, P. N. (2015). *Leptospirosis in humans*. *Current Topics in Microbiology and Immunology*.
15. Hartskeerl, R. A., et al. (2011). *Emerging leptospirosis epidemiology*. *Veterinary Microbiology*.
16. Ko, A. I., et al. (2009). *Leptospira: the dawn of molecular genetics*. *Nature Reviews Microbiology*.
17. Karpagam, K. B., & Ganesh, B. (2020). *Leptospirosis: an emerging global threat*. *European Journal of Clinical Microbiology & Infectious Diseases*.
18. Levett, P. N. (2001). *Leptospirosis*. *Clinical Microbiology Reviews*.
19. Levett, P. N. (2015). *Taxonomy and diagnosis of Leptospira*. *Current Topics in Microbiology and Immunology*.
20. Murillo, A., et al. (2020). *Feline leptospirosis review*. *Journal of Feline Medicine and Surgery*.
21. Pappas, G., et al. (2008). *The globalization of leptospirosis*. *Clinical Microbiology Reviews*.
22. Prescott, J. F. (2008). *Leptospirosis in dogs*. *Canadian Veterinary Journal*.
23. Schuller, S., et al. (2015). *European consensus statement on leptospirosis in dogs and cats*. *Journal of Small Animal Practice*.
24. Sykes, J. E., et al. (2011). *ACVIM consensus statement on leptospirosis*. *Journal of Veterinary Internal Medicine*.
25. Sykes, J. E. (2014). *Canine and Feline Infectious Diseases*. Elsevier.
26. Sykes, J. E., et al. (2023). *Updated ACVIM consensus statement on leptospirosis*. *Journal of Veterinary Internal Medicine*.
27. Vinetz, J. M. (2001). *Leptospirosis*. *Current Opinion in Infectious Diseases*.
28. Ward, M. P. (2002). *Seasonality of leptospirosis in dogs*. *Preventive Veterinary Medicine*.
29. WOA (World Organisation for Animal Health). (2021). *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals: Leptospirosis*.
30. WSAVA (World Small Animal Veterinary Association). (2020). *Infectious disease vaccination guidelines*.



For anyone interested in a deeper and more practical understanding of infectious diseases in companion animals, Green's Infectious Diseases of Dogs and Cats is widely regarded as an essential and highly authoritative reference text in veterinary medicine. The book offers extensive and systematic coverage of viral, bacterial, fungal, and parasitic infections affecting dogs and cats, providing a detailed exploration of their pathogenesis, clinical manifestations, diagnostic methods, therapeutic approaches, and prevention strategies.

Beyond foundational knowledge, the text places strong emphasis on real-world clinical application. It helps readers understand how infectious agents behave in complex biological systems and how disease presentation can vary depending on host factors, environment, and co-existing conditions. Particular attention is given to epidemiology and transmission dynamics, including outbreak investigation and population-level disease control, making it especially valuable for both clinical practice and public health perspectives in veterinary medicine.

Another important strength of the book is its thorough discussion of zoonotic diseases and the implications of cross-species transmission. It highlights the importance of a One Health approach, showing how animal health, human health, and environmental factors are deeply interconnected in the context of infectious disease management. In addition, it explores the challenges posed by co-infections, antimicrobial resistance, and emerging pathogens, which are increasingly relevant in modern veterinary practice.

The content is supported by up-to-date scientific research, clinical case studies, and evidence-based recommendations, which enhance its reliability and practical usefulness. Its clear structure and detailed yet accessible explanations make it suitable for a wide audience, including veterinary students, clinicians, researchers, and professionals seeking to strengthen their diagnostic and therapeutic skills.

Overall, Green's Infectious Diseases of Dogs and Cats serves not only as a comprehensive academic resource but also as a practical clinical guide. Whether used for study, reference in daily practice, or advanced professional development, it provides a complete and in-depth overview of the complexities involved in diagnosing, treating, and preventing infectious diseases in small animal medicine.



# LEPTOSPIROSIS

## A CRITICAL ZONOTIC THREAT IN COMPANION ANIMALS

Leptospirosis remains a major zoonotic threat because it is highly transmissible through contaminated urine and water, survives for long periods in moist environments, and can cause severe multisystemic disease in dogs and other mammals—especially unvaccinated animals. Environmental exposure, rodent reservoirs, and incomplete vaccination coverage continue to drive new infections. Prevention relies on regular vaccination, environmental control, and reduction of exposure to contaminated water sources.



### 2024 guidelines for the vaccination of dogs and cats – compiled by the Vaccination Guidelines Group (VGG) of the World Small Animal Veterinary Association (WSAVA)

#### AUTHORS:

R. A. Squires<sup>1</sup>, C. Crawford<sup>2</sup>, M. Marcondes<sup>3</sup> and N. Whitley<sup>4</sup>

<sup>1</sup>Formerly Discipline of Veterinary Science, James Cook University, Townsville, QLD 4814, Australia  
<sup>2</sup>College of Veterinary Medicine, University of Florida, 2015 SW 16th Avenue, Gainesville, FL 32608, USA  
<sup>3</sup>Department of Clinical Medicine, Surgery and Animal Reproduction, São Paulo State University, Rua Sérgio 575, ap. 3, São Paulo, 01243-001, SP Brazil  
<sup>4</sup>Internal Medicine, Davies Veterinary Specialists, Manor Farm Business Park, Higham Gobion, Hertfordshire, SG5 3HR, UK  
<sup>\*</sup>Corresponding author email: [ca.squires@hotmail.com](mailto:ca.squires@hotmail.com)

## WSAVA Global Vaccination Guidelines

The World Small Animal Veterinary Association (WSAVA) emphasizes a global One Health approach to the prevention of leptospirosis in companion animals. Through evidence-based vaccination recommendations, WSAVA highlights leptospirosis as a significant zoonotic and systemic bacterial disease affecting dogs worldwide, with potential severe renal, hepatic, and pulmonary outcomes. The guidelines stress the importance of including leptospira vaccination in endemic regions, ensuring appropriate serogroup coverage, and maintaining regular booster schedules to sustain protective immunity. WSAVA also underlines the need for veterinarian and owner education regarding environmental exposure risks, particularly contaminated water and wildlife reservoirs. By promoting standardized vaccination protocols and preventive strategies, WSAVA supports a coordinated global effort to reduce leptospirosis incidence and limit both animal and human health risks.



## Excellence in Veterinary Surgery: The ESAVS Course in Bucharest

### An elite training experience led by internationally renowned specialists

From April 15 to 18, the Faculty of Veterinary Medicine in Bucharest hosted the prestigious ESAVS course, dedicated to advanced small animal surgery. This intensive program brought together professors, experienced practitioners, and motivated students in a highly stimulating and collaborative academic environment. Through a combination of theoretical lectures, case discussions, and practical insights, participants had the opportunity to deepen their knowledge, refine their surgical techniques, and gain exposure to the latest developments in the field.

The course also provided a rare chance to interact directly with internationally renowned specialists, fostering meaningful exchange of ideas and professional perspectives. For both faculty members and students, it represented not only an exceptional educational experience, but also a valuable opportunity for professional growth, networking, and inspiration within the veterinary community.

This achievement was made possible thanks to the Dean of the Faculty of Veterinary Medicine in Bucharest, Dean Assoc. Prof. Dr. Iuliana Ionascu, whose support and vision made it possible to host the ESAVS course this year and ensure its continuation in the coming years at the University of Bucharest.

- **Official Website**  
Learn more about ESAVS courses, programs, and upcoming events on the official website:  
[www.esavs.org](http://www.esavs.org)
- **Contact & Information**  
For general inquiries, course details, and registration support:  
**Email: [info@esavs.org](mailto:info@esavs.org)**
- **Stay Connected**  
Follow ESAVS for updates and upcoming events:  
**Facebook: [ESAVS – European School for Advanced Veterinary Studies](https://www.facebook.com/ESAVS)**  
**LinkedIn: [ESAVS](https://www.linkedin.com/company/esavs)**



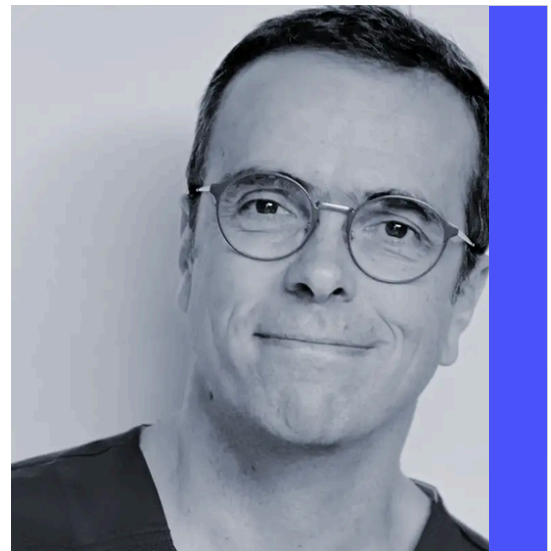
## **Univ. Prof. Dr. Gilles Dupré, Dipl. ECVS (FR/AT)**

Professor Gilles Dupré is a distinguished specialist in veterinary surgery and a Diplomate of the European College of Veterinary Surgeons (ECVS). With extensive academic and clinical experience, he has contributed significantly to the advancement of small animal surgery through both teaching and research. Over the course of his career, he has held professorships at leading European institutions and has been actively involved in postgraduate education programs, including ESAVS. His main areas of expertise include soft tissue surgery and surgical innovation, and he is widely recognized for his commitment to excellence in veterinary training.

---

## **Univ. Prof. Dr. Guillaume Chanoit, Dipl. ECVS, Dipl. ACVS (FR)**

Professor Guillaume Chanoit is an internationally recognized veterinary surgeon, holding Diplomate status in both the European (ECVS) and American (ACVS) Colleges of Veterinary Surgeons. He has built a distinguished career in both academia and clinical practice, with a strong focus on advanced surgical techniques and evidence-based medicine. Professor Chanoit has held academic positions at renowned universities and has contributed extensively to the scientific literature. His teaching activity within international programs such as ESAVS reflects his dedication to shaping the next generation of veterinary surgeons.



---

## **Dr. Ruta Noreikaite**



Dr. Ruta Noreikaite is a soft tissue surgeon and veterinary educator with extensive experience in small animal surgery. She works at DrVet Small Animal Hospital in Lithuania and has been an instructor in ESAVS Soft Tissue Courses since 2019.

She completed her PhD in Veterinary Medicine at the Lithuanian University of Health Sciences, focusing on diagnostic biomarkers in canine joint diseases, and undertook a residency in small animal surgery at the Veterinary Academy of Lithuania. Her academic career also includes teaching experience as a lecturer in small animal surgery, where she was involved in student education and surgical training.

Dr. Noreikaite is recognized for her clinical expertise and her commitment to veterinary surgical education and professional development.



## Looking Ahead: The Road to Horizon

The Faculty of Veterinary Medicine in Bucharest continues to strengthen its position as a center of academic excellence and innovation in veterinary education. As an EAEVE-accredited institution, it meets the highest European standards in veterinary training, ensuring a high-quality educational environment for its students.

Through international collaborations, advanced training programs, and a strong commitment to research, the faculty is paving the way toward new horizons in both teaching and clinical practice. Initiatives such as the ESAVS course highlight the institution's dedication to providing students and professionals with access to world-class expertise and cutting-edge knowledge.

Looking ahead, the faculty remains focused on expanding its global partnerships, enhancing educational opportunities, and shaping the next generation of veterinary professionals ready to meet the challenges of a rapidly evolving field.



## Don't Miss the Next ESAVS Course in Bucharest !

Following the outstanding success of the recent edition, the Faculty of Veterinary Medicine in Bucharest is pleased to announce that it will once again host an ESAVS course in December 2026. This event will continue the tradition of bringing world-class veterinary education directly to our academic environment, strengthening the link between international expertise and local clinical training.

The upcoming course will welcome internationally renowned specialists, experienced clinicians, and motivated students in an intensive and highly interactive learning setting. Participants will benefit from a unique opportunity to deepen their theoretical understanding, refine practical surgical skills, and engage in high-level academic discussions centered on the latest developments in veterinary medicine and surgery.

As in previous editions, the course will reflect the highest standards of ESAVS training, combining scientific rigor with clinical applicability, and fostering a collaborative atmosphere of continuous professional development.

**STAY TUNED FOR FURTHER UPDATES ON THE UPCOMING COURSE AND FUTURE ACADEMIC INITIATIVES HOSTED BY THE FACULTY OF VETERINARY MEDICINE IN BUCHAREST.**



# 10 YEARS VETS ON THE BALKANS CONFERENCE



## Vets on Balkans Conferences at the Faculty of Veterinary Medicine in Bucharest

From April 23 to 25, the Faculty of Veterinary Medicine in Bucharest proudly hosted the prestigious Vets on Balkans conferences, welcoming veterinary professionals, university professors, clinicians, and students for three days of high-level scientific exchange and professional development. The event provided an inspiring academic environment where participants could share knowledge, discuss clinical experiences, and explore the latest innovations in veterinary medicine.

Among the distinguished speakers were Assoc. Prof. Dr. Iuliana Ionașcu, PhD, Șef. lucrări Dr. Seralp Uzun, DVM, PhD, Dr. Roger Medina Serra DVM, DipECVAA, MRCVS EBVS, and Dr. Elisa Samuel Bădulescu, DVM, DipECVD, whose presentations offered valuable insights and practical expertise across different areas of the profession. Their presence contributed to the outstanding scientific quality of the conferences and created meaningful opportunities for direct interaction with internationally respected specialists.

For both students and practitioners, the event represented not only an exceptional learning experience, but also a valuable opportunity for networking, professional growth, and inspiration. Once again, Bucharest confirmed its important role as a leading center for veterinary education and collaboration in the Balkan region.

### 10 YEARS WORKSHOP "Emergency"

Pre Congress Day  
23th April 2026

Location: Faculty of  
Veterinary Medicine -  
"Aula Prof. Aurel Popoviciu"  
Bucharest, Splaiul  
Independentei 105



**Dr Seralp Uzun**

- Supplemental O2 techniques
- temporary and permanent Tracheostomy and management
- Chest tube placement
- IO catheter placement
- Vein cut down
- Esophagostomy tube placement

VETS ON THE BALKANS  
ONLINE VETERINARY JOURNAL

### 10 YEARS Vets on the Balkans Conference "All about Ophthalmology"

Pre Congress Day  
23th April 2026

Location: Faculty of  
Veterinary Medicine -  
"Aula Prof. Aurel Popoviciu"  
Bucharest, Splaiul  
Independentei 105



VETS ON THE BALKANS  
ONLINE VETERINARY JOURNAL

**Dr Iuliana Ionascu**



**INTERNATIONAL STUDENT SYMPOSIUM**

— STUDENT PERSPECTIVES IN VETERINARY SCIENCE —



## International Student Symposium at the Faculty of Veterinary Medicine in Bucharest – A Remarkable Success

On April 28, the Faculty of Veterinary Medicine in Bucharest successfully hosted the International Student Symposium, an outstanding academic event that gathered more than 200 students from both the faculty and other universities. The symposium proved to be a significant scientific and educational experience, offering a dynamic environment for learning, exchange of ideas, and professional development.

The program was organized into three main sections: Preclinical Sciences, Clinical Sciences, and Animal Production, Public Health and Food Quality. This structure allowed participants to explore a wide range of key topics in veterinary medicine, from fundamental scientific concepts to clinical applications and essential issues in public health and food safety.

The high scientific quality of the presentations and the active engagement of participants contributed to an inspiring atmosphere of discussion and collaboration. The event represented an important opportunity for students to expand their knowledge, connect with peers, and strengthen their academic interests.

Overall, the symposium once again highlighted the Faculty of Veterinary Medicine in Bucharest as a strong and growing academic center, dedicated to promoting scientific excellence and student involvement at an international level.





UNIVERSITATEA DE ȘTIINȚE AGRONOMICE ȘI MEDICINĂ VETERINARĂ DIN BUCUREȘTI  
FACULTATEA DE MEDICINĂ VETERINARĂ



# ZILELE FACULTĂȚII DE MEDICINĂ VETERINARĂ

Ediția a V-a

15-16 MAI 2026

- 🐾 Expoziție
- 🐾 Prezentări
- 🐾 Sfaturi de la profesioniști
- 📍 Campus Veterinară-Cotroceni

## Veterinary Days 2026: A Shared Success

We are pleased to reflect on the successful 5th Edition of the Faculty of Veterinary Medicine Days, held on May 15–16, 2026, at the Veterinary–Cotroceni Campus in Bucharest.

Over two enriching days, the event brought together students, academics, veterinary professionals, and animal enthusiasts in a shared celebration of veterinary medicine, education, and community. The program offered a dynamic mix of scientific knowledge and practical experience, creating an engaging environment for learning and exchange.

A series of educational lectures covered key topics such as animal care, nutrition, vaccination protocols, parasite control, and disease prevention, presented by invited experts and experienced practitioners. These sessions provided valuable insights into current developments in veterinary practice and research.

The event also featured live demonstrations, including canine training and equestrian performances by the Romanian Gendarmerie, highlighting the skill, discipline, and intelligence of working animals. Additional highlights included workshops, artistic activities, cultural performances, and an exhibition area dedicated to veterinary products and services.

Guided tours of the campus allowed visitors to explore the facilities where future veterinarians are trained, offering a closer look at the academic environment behind their education.

Overall, the Faculty of Veterinary Medicine Days once again strengthened connections within the veterinary community while inspiring future generations of professionals.





7:30 8 100% 111 819

GRADUATION

Message

Video

Decline

Accept

# Class 2020-2026

## From The Editorial Team

### Progress, not perfection.

As this special edition comes to life, we would like to dedicate a heartfelt thank you to the graduating students whose passion, talent, and determination made these pages possible.

Every article, every idea, every late-night revision, and every moment of commitment reflects more than academic achievement—it reflects character, resilience, and the courage to grow. Within these pages, we do not simply see future professionals; we see curious minds, compassionate hearts, and individuals ready to leave a meaningful mark on the world.

You arrived as students, eager to learn. You leave as colleagues, innovators, and leaders of tomorrow.

This journal stands as a testament to your effort and to the journey you have completed with discipline, sacrifice, and hope. We are proud to have witnessed your progress and honored to celebrate your voices through this publication.

May the knowledge you gained guide your decisions, may your values shape your path, and may your ambitions always remain greater than your fears.

Thank you for your dedication, your trust, and the inspiration you have given to this community.

From all of us at The Campus, congratulations on your graduation and on the beginning of everything that comes next.

Discipline builds  
expertise.  
Consistency  
transforms  
knowledge into skill.  
Small efforts,  
repeated daily, lead  
to excellence.

Success is not built  
in a single moment,  
but in the  
consistency of  
showing up every  
day, even when it  
feels difficult.

Every challenge you  
face is quietly  
shaping the person  
you are becoming,  
stronger, wiser, and  
more resilient.

Class 2020-2026

IRENE ROMANELLI

Written by me

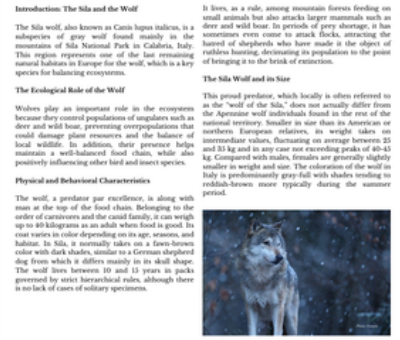


## CRESCENDO ET SCRIBENDO

As I am getting closer to graduating in Veterinary Medicine in Bucharest, I would like to mention an experience that has been very special to me during these years.

Since my fourth year, I have had the opportunity to be part of the *The Journal*, where I wrote several articles about veterinary medicine. It was a beautiful and enriching experience, because it gave me the chance to express my interest in this field in a different way, not only through studying and clinical practice, but also through writing and sharing knowledge with others.

This experience helped me grow, improve my scientific writing, and feel more involved in the academic life of the university. I am truly grateful to Dr. Uzun Seralp for giving me this opportunity and for his support and trust. It is an experience that I will always remember with great appreciation.



Class 2020-2026

BLANCHE NICOLLE



MY LAST WORDS

As I stand at the threshold between my life as a student and my professional journey as a veterinarian, I look back on these years with immense gratitude. Choosing to study outside of my home country was a challenge that pushed me to my absolute limits. While the path was often difficult and demanding, it allowed me to discover a beautiful country and meet incredible people who have shaped the person I am today. I am leaving with a heart full of nostalgia, but also with the clarity of knowing exactly who I want to be for my patients and their owners. My time with the faculty journal, though short, has been a true highlight of my final year. It provided a rewarding platform to share my passions with my peers and to celebrate the “art” within our science. I want to say a massive thank you to everyone who supported me during this adventure. I am officially “closing the gap” on my life as a student, but I am already looking forward to the day I return. For now, I step into my new life as a veterinarian, ready to share what I have learned and to continue reimagining the possibilities of healing.

Written by me



*Article by Blanche Nicolle*

**Introduction**  
In the chaos of an emergency room, the first minute is the most crucial, and one decision can alter the course of a patient's life. Triage is a critical process of sorting patients to prioritize treatment based on the severity of their condition, not the order of arrival.

**Triage assessment**  
Triage assessment involves a rapid, but thorough, physical examination combined with a classification system to prioritize patients and efficiently allocate resources. A short physical examination in all emergency patients appears to be essential in recognizing critical disease (1). To streamline this process, a standardized veterinary triage list was adapted and modified into a color-coded flow chart (Table 1). This system categorizes patients into five urgency levels, each specifying a maximum safe waiting time for medical attention:

Color	Maximum waiting time
RED: Resuscitation	Immediate medical care
ORANGE: Critical	Requires intervention in 15-30 minutes
YELLOW: Urgent	Requires intervention within 1 hour
GREEN: Non-urgent	Requires intervention within 2 hours
BLACK: Casualties	Non-emergency cases

*Table 1. Five-Level Color-Coded Triage Classification System. © Copyright.*

The criteria for each color group encompass a broad spectrum of complaints, including respiratory, cardiovascular, neurologic, gastrointestinal, obstetric, urogenital, trauma, and general illnesses.

Here is a list of some examples to help you understand what is important to focus on and which conditions can wait. Understanding the specific class of criteria is essential for rapid decision-making and optimal patient recovery.

- RED:** Patients require immediate attention for potentially fatal conditions.
  - Respiratory: Respiratory arrest
  - Cardiovascular: Shock, Profound hemorrhage
  - Generalized: Algorhythmia suspicion, Body temperature < 95°F/35°C
  - Trauma: Extremities
- ORANGE:** Patients are unstable and at high risk of rapid deterioration.
  - Gastrointestinal: Toxic ingestion, Possible foreign body ingestion, GIAB with anorexia or vomiting
  - Neurologic: Altered level of consciousness, Acute cerebral ischemia
  - Urogenital: Urinary obstruction

**Special Edition**

Jan - Dec 2023 Page 17

**A DROP OF DANGER: PERMETHRIN TOXICITY IN CATS**

*Article by Blanche Nicolle*

This article addresses the often overlooked risk of permethrin-based spot-on flea treatments for dogs in households with cats. While safe for dogs, permethrin is highly toxic to cats due to their hepatic metabolism. We review exposure scenarios, clinical signs from owners to owners, emergency management, and stress the importance of rapid treatment and owner education to prevent fatal outcomes.

While dogs possess the enzymatic pathways to safely metabolize permethrin, cats lack sufficient glucosyltransferase enzymes, leading to prolonged exposure of the nervous system to the toxin. This critical metabolic difference is often misunderstood by the public, making permethrin toxicity a tragically common and preventable veterinary emergency. This article aims to raise awareness among pet owners, veterinary students, and practitioners about the critical threat of permethrin toxicity in cats, focusing on prevention, recognition, and emergency management.

**The Permethrin Paradox: Why Cats Are Uniquely Vulnerable**  
Permethrin belongs to the pyrethroid class of insecticides, which work by disrupting sodium channel function in insect neurons, leading to hyperexcitability and paralysis. In mammals, these compounds are typically rapidly metabolized and excreted.

The vulnerability of cats stems from a metabolic limitation known as glucosylation deficiency, a crucial detoxification pathway for the toxin. This deficiency means that permethrin remains in its toxic, active form within the feline system for an extended period, accumulating to harmful levels and causing severe neurotoxic effects.

**Common Exposure Scenarios**

- Direct Application:** Accidental application of dog permethrin products directly onto a cat.
- Secondary Exposure:** Cats grooming or cuddling with a recently treated dog, absorbing permethrin through skin contact or ingestion of residues. This is the most common route of exposure.

Page 18 Jan - Feb 2024

**CLOSING THE GAP: A HIDDEN HAZARD IN OUR HOMES**

**RECONSTRUCTION**

*Article by Blanche Nicolle*

**The Philosophy Beyond the Peltic**  
Reconstructive surgery is often defined technically by peltics and vasculature, but a skin flap is truly a biological masterpiece. It represents the moment we stop fighting against and begin using surgical ingenuity to solve a puzzle. It is about more than closing a hole; it is about restoring the beauty and function of our patients. As I prepare to graduate, my goal is to demonstrate that reconstructive surgery is not only an advanced specialty but a vital, accessible tool for every practitioner. You don't need decades of experience to start; you need a deep respect for anatomy and the courage to "think in 3D."

**Back 2 Basic**  
The foundation of successful reconstruction lies in a thorough understanding of skin anatomy, vascularization, and tension lines.

**Vascular Basis of Skin Flap Classification**

- Random Pattern Flaps:** Classified by their blood supply, such as Random Pattern Flaps (relying on the subcutaneous plexus) or Axial Pattern Flaps (supported by direct cutaneous vessels).
- Tension Lines:** Following established tension lines, such as those depicted in cancer patients, is critical to minimizing dehiscence.

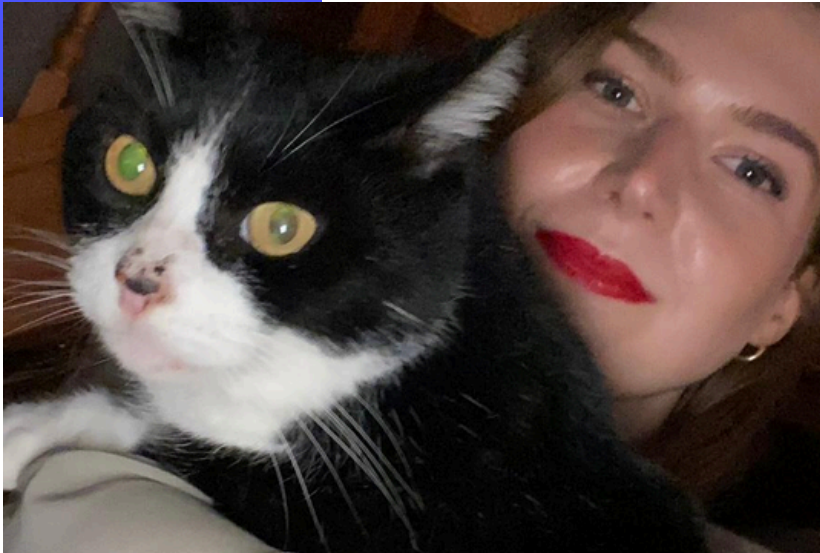
Figure 2: Cross-Sectional Anatomy and Blood Flow of Skin Flaps (original)

Figure 3: Critical Tension Lines (Source: EQUUS 118)

Class 2020-2026

ANNE-K. BLUTEAU

Written by me



## GOODBYE, WITH A SMILE 😊

As I get ready to graduate, it's time for me to say a bright little goodbye to The Campus. What started as a simple space to write between one lecture and the next slowly became a small ritual – a moment to pause, reflect, and turn the chaos of vet school into something meaningful.

These six years have been intense, hilarious, challenging and unforgettable. They were filled with early mornings, unexpected lessons, friendships built in the middle of shared panic, and stories that only a veterinary campus can produce. Writing here helped me make sense of it all and kept my curiosity alive even on the most exhausting days.

I'm leaving with gratitude, a full heart, and a collection of memories that will follow me into whatever comes next. This place shaped me more than I expected, and I hope my words added even a tiny spark to its pages. To the next writers: enjoy this space. Let it be your playground, your pause, your creative corner. Let your curiosity run wild – it's the best part of the job.

Thank you for everything.

BREEDING  
THORAX!

Article by Anne-Kristin Bluteau

**What is hemothorax?**  
To better understand what a bleeding thorax means, we need first to define the word this kind of pleural effusion (hemothorax). Hemothorax (Figure 1) in dogs and cats is a potentially life-threatening condition that is the result of blood accumulation in pleural space, which is the potential cavity between the visceral and parietal pleura surrounding the lungs. Due to this blood accumulation, there can be a reduction of lung expansion, respiratory compromise or even (in more severe cases) hypovolemic shock.

**What are the causes of hemothorax?**  
For a possible hemothorax, it is important to know the different etiologies that can lead to that. They can be grouped broadly into traumatic and non-traumatic causes. Because the list of causes is very long, in this article we will only describe a few of them.

## Traumatic causes

There are three types of traumatic causes for hemothorax:

- **Blunt thoracic trauma** (e.g. motor vehicle accident, falls...) the factors that are involved in this kind of trauma are strong that it changes the chest wall structure, lung parenchyma, intercostal or mediastinal vessels and lead to hemothorax.
- **Penetrating trauma** (e.g. bite wounds, gunshot, stab wounds) that may directly lacerate blood vessels and lead to a bleeding thorax in dogs and cats.
- **Surgical trauma** (e.g. during surgery, incorrect thoracostomy).

## Coagulopathies

Coagulopathies such as platelet disorders, clotting factor deficiencies, DIC (disseminated intravascular coagulation) or even Angiotensinogenase (A) treatment can lead to secondary hemothorax in pets, so it is important also to keep them in mind when the traumatic cause is ruled out.

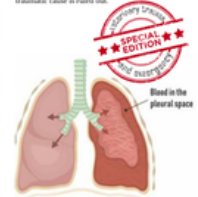


Figure 1: Healthy lung (left) and hemothorax (right)

## Neoplasia

Neoplasia can be a common cause for bleeding thorax in veterinary medicine. According to Delaney et al. (6), hemangiosarcoma growing in or near the thoracic cavity can cause hemothorax by rupture of the mass or by eroding blood vessels around it.

STOMATOLOGY:  
DENTAL TRAUMA AND  
CROWN FRACTURES

Article by Anne-Kristin Bluteau

## What is stomatology in veterinary medicine?

Veterinary stomatology is the study and clinical management of oral and dental diseases across species, covering anatomy, eruption pattern, occlusion, periodontal disease, tooth fractures, endodontics and oral trauma. It integrates clinical examination, dental radiography, anesthesia and species-specific treatments (from prophylaxis to extractions and maxillofacial surgery) to preserve oral function and patient welfare.

## Normal dentition in dogs and cats

Normal dentition in domestic species is typically heterodont and diphyodont, with a deciduous set replaced by permanent teeth according to predictable eruption schedules. Tooth structure (enamel, dentin, cementum, pulp) (Fig. 1, 2) and the supporting periodontium determine function and occlusal disease presentation. Familiarity with species-specific dental formulae, eruption timelines and radiographic appearance is essential for accurate diagnosis, age estimation, and treatment planning in clinical practice.

## Key definitions:

- **Heterodont**: different tooth types (incisors, canines, premolars, molars)
- **Diphyodont**: two successive sets of teeth (deciduous then permanent)

## Dental trauma and crown fractures:

## emergency management

Coagulopathies such as platelet disorders, clotting factor deficiencies, DIC (disseminated intravascular coagulation) or even Angiotensinogenase (A) treatment can lead to secondary hemothorax in pets, so it is important also to keep them in mind when the traumatic cause is ruled out.

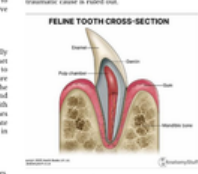


Figure 1: Feline tooth cross-section anatomy

## Clinical context and priorities

Dental trauma is common in small animal emergency practice and can range from minor enamel chipping to severe luxations. The radiographic appearance and resolution in the acute setting priorities are:

FIBROCARTILAGINOUS  
EMBOLISM (FCE) IN  
DOGS

Article by Anne-Kristin Bluteau

## Introduction

FCE, also known as fibrocartilaginous embolic syndrome (FCESM), is a peracute, non-progressive spinal cord infarction caused by occlusion of spinal cord vasculature by fibrocartilaginous material histologically similar to nucleus pulposus. First described in the 1970s, FCE is now recognized as one of the most common causes of peracute, non-painful paraparesis in dogs, particularly in young to middle-aged large-breed dogs (De Riso, 2018). The condition is characterized by sudden onset of asymmetric neurological deficits, often occurring during vigorous activity such as running or jumping. Unlike compressive spinal cord disease, FCE is non-progressive after the initial 24 hours, and pain typically resolves rapidly.

## Epidemiology

FCE primarily affects large-breed dogs, including Labrador Retrievers, German Shepherds and Border Collies, although it can occur in any breed. Dogs between 3 and 7 years of age are most commonly affected (Kareel, University College of Veterinary Medicine). Small-breed dogs and cats can also develop FCE, but less frequently. A strong association exists between FCE and physical activity. Many affected dogs develop signs immediately after running, jumping or playing. No sex predilection has been consistently identified. Although intervertebral disc degeneration is common in chondrodystrophic breeds, FCE is not strongly associated with disc herniation and occurs independently of Hansen type I or II disc disease (Brooks W, 2022).

## Pathophysiology

The hallmark of FCE is ischemic necrosis of spinal cord tissue caused by obstruction of spinal cord arteries or veins by fibrocartilaginous material. Histologically, the embolic material resembles nucleus pulposus, suggesting an intervertebral disc origin (De Riso, 2018).



Figure 2: Deposition of disc material in a healthy and a FCE affected dog (highlight)

## Proposed mechanism includes:

- Entry of nucleus pulposus into spinal vasculature through vertebral endplate microtears
- Migration of the material into spinal arteries or veins during sudden increases in intradiscal pressure
- Possible congenital vascular-disk connections in some dogs

Once lodged in a vessel, the fibrocartilaginous embolus obstructs blood flow, leading to ischemia, infarction, and necrosis of affected spinal cord segments. The extent of neurological dysfunction depends on the vascular territory affected and the severity of ischemia.

Class 2020-2026

CARLA STEIN



Written by me



## NOUVEAUX HORIZONS

As I stand at the transition between my life as a veterinary student and the beginning of my professional journey, I look back with deep gratitude. Coming from Marseille, choosing to study abroad was both a challenge and an opportunity that shaped me profoundly. My time in Bucharest through Erasmus pushed me beyond my limits, both academically and personally, while allowing me to grow in ways I never expected.

Leaving this chapter is bittersweet. Bucharest has been a place of learning, discovery, and meaningful encounters, and I carry with me the people and experiences that have defined this journey. Each moment has helped me become the veterinarian I aspire to be—guided by both knowledge and empathy.

My experience with the faculty journal, though brief, has been a highlight of my final year, offering a space to share my scientific passions with others.

I am deeply grateful to everyone who supported me along the way. I now close my student chapter and step forward with excitement into my life as a veterinarian, ready for what comes next.



bison bison !

Class 2020-2026

MARIA DINICĂ



## JOURNEY OF TRANSFORMATION

Looking back, my time at the Faculty of Veterinary Medicine in Bucharest was a profound journey of transformation, defined by the new, unique rhythm of life. It was an experience that demanded rigorous discipline, from the early, daunting days in the anatomy labs facing the complexities of animal morphology, to the adrenaline-fueled nights on duty at the university clinics. The faculty fostered a deep sense of resilience and empathy, teaching us to become the voice for those who cannot speak. It taught me that veterinary medicine values prevention over treatment and that it is such a vast field, with lots of opportunities. Graduating leaves me with an invaluable treasury of memories, and a solid foundation as I step into the noble world of veterinary medicine.

Written by me



Article by Dinica Maria

Reproductive issues represent some of the most common and potentially life-threatening medical conditions in avian medicine. Unlike their wild counterparts, who are governed by seasonal environmental cues, pet birds often live in "artificial spring" conditions. Constant food availability, stable temperatures, and extended photoperiods (artificial lighting) can keep a bird in a state of chronic reproductive stimulation.

### I. The Avian Reproductive Cycle: Cues and Triggers

Birds are oviparous, meaning they lay and incubate eggs. In the wild, the reproductive cycle is a strictly timed biological event triggered by increasing day length, temperature, and food availability.

#### Physiological Foundations

Most female pet birds possess only a left ovary and oviduct. The process of egg formation is metabolically demanding, taking approximately 24 hours. In the initial phase (follicular development), nutrients are drawn from the yolk sac, while later, the yolk is deposited into the oviduct, where calcification occurs. To support shell production, females store calcium in their bones. Hypocalcemia, a protein-driven by estrogen.

#### Capacity and Reproductive Stimulation

In household environments, several factors inadvertently signal to a bird that it is time to breed: photoperiod (12 hours of light a day), overcrowding (high in fat and calories, like seed-based diets), perceived masculine human voices or others perceived as one stimulating courtship.

### II. Behavioral Challenges and Misplaced Bonds

Behavioral problems in pet birds are frequently rooted in sexual frustration or overstimulation. Hand-raised parrots, in particular, may develop "misadaptive bonding" with their owners.

#### Manifestations of Reproductive Behavior

When a bird reaches sexual maturity and identifies its owner as a mate, it may exhibit excessive screaming while leaving the room, over-grooming or plucking driven by hormonal fluctuations in the bird to a portion of nesting site, vertically over a perceived nest site or "mate-guarding" the owner from other family members.

#### Management through Behavior Modification

Correcting these issues requires a multi-pronged approach: reducing day length to 8-10 hours, limiting getting to the food and back only. Avoid "talking" or feeding warm foods by hand-mouth, as these are viewed as courtship rituals, convincing the bird to a portion-controlled diet and encouraging foraging to redirect energy toward "working" for food rather than breeding.



Article by Dinica Maria

### Introduction

Caring for a pet bird is a joyful and deeply rewarding experience, but it comes with a unique set of responsibilities. Birds are intelligent, social, and sensitive creatures that require more than just a cage and seeds. With the right setup, diet, mental stimulation, and social care, you can help your feathered friend live a happy, healthy life—often for decades. This guide covers everything you need to know, from cage sizes and perches to nutrition, toys, and more.

### Choosing the Right Cage

Avoid round cages, as they give no safe corner for your bird to make their nest. The cage is your bird's home base and safe zone, so it should be quiet, secure, and stimulating. As a general rule, bigger is always better. Birds need enough room to fly, stretch their wings, move their legs, climb, and even fly short distances. For small birds like budgies and finches, a minimum cage size of 41 x 41 x 60 cm is recommended. Cockatiels need at least 50 x 50 x 75 cm, while medium-sized parrots like conures or Amazons require 60 x 60 cm. Large parrots such as macaws need a much bigger space—ideally 120 x 120 cm or larger.

Bar spacing is also important to prevent injuries. Small birds should have bars no more than 1 to 1.2 cm apart. For medium birds, 1.2 to 2 cm is suitable, while large birds need 2 to 2.8 cm spacing. Horizontal bars are especially helpful, as they allow birds to climb and explore more easily.

### Placement

Place the cage in a part of the home where your bird can observe daily life—but a living room—has avoid dusty areas, direct sunlight, and the kitchen, as fumes from non-stick cookware can be deadly. Covering the cage at night ensures your bird gets 10 to 12 hours of uninterrupted sleep, which is essential for their health.



Article by Dinica Maria

### Avortul reprezintă o afecțiune hormonală și cronică în specialitatea mamei alăptătoare din cauza hiperactivității glandei mamei asociată de secreție lăctată în exces în timpul perioadei de lactație. Aceasta este o afecțiune care se manifestă în primele săptămâni de viață ale puștii și este caracterizată prin secreția excesivă de lapte.

### Avortul reprezintă o afecțiune hormonală și cronică în specialitatea mamei alăptătoare din cauza hiperactivității glandei mamei asociată de secreție lăctată în exces în timpul perioadei de lactație. Aceasta este o afecțiune care se manifestă în primele săptămâni de viață ale puștii și este caracterizată prin secreția excesivă de lapte.

### Simptomele la care trebuie să fim atenți în suspiciunea de lactație nervoasă sunt următoarele:

- hiperplazia glandei mamare,
- reducerea cantității de lapte (scăderea cantității de lapte),
- reducerea apetitului,
- letargie,
- secreții roșii,
- secreții mucusoase maronii în tin.

Multe cazuri de lactație nervoasă nu necesită tratament și pot rezolva în 10-21 de zile.

### Ca tratament propriu-zis, se recomandă administrarea de iodură de potasiu sau de extracte din calopulmon, antibiotice din grupa tetraciclinelor și antibiotice cu spectru larg pentru a scădea inflamația locală.

Pentru a evita viitoare episoade, se recomandă castrarea acestora dacă nu sunt destinate reproducției.

Class 2020-2026

ESTHER CHERON

*Written by me*



# UNTIL WE MEET AGAIN

My name is Esther, and I am currently in my final year of veterinary school. I will soon begin an internship in small animal medicine at St Martin Veterinary Hospital in Allonzier-la-Caille, near Annecy. Throughout my studies, I have actively engaged in student life, serving as a class representative for my fourth year, where I developed strong leadership, organizational, and communication skills. Alongside this, my role as a volleyball coach has strengthened my ability to guide, motivate, and work within a team. Writing for the faculty journal has been a particularly enriching experience, allowing me to sharpen my critical thinking, structure scientific ideas, and communicate effectively within the veterinary community.

**POLYCYSTIC KIDNEY DISEASE IN SACRED BIRMAN CATS**  
Article by Esther Cheron

**Introduction**  
Polycystic Kidney Disease (PKD) is a hereditary condition characterized by the development of multiple fluid-filled cysts in the kidneys. It is one of the most common genetic disorders affecting cats, particularly in certain breeds. While PKD has been extensively studied in Persian and Exotic Shorthair cats, it is also reported in Sacred Birman cats, albeit less frequently. This article explores the etiology, clinical presentation, diagnosis, and management of PKD in Sacred Birman cats, emphasizing the importance of early detection and breed-specific considerations.

**Etiology and Pathophysiology**  
PKD is primarily caused by a mutation in the PKD1 gene, which plays a crucial role in kidney development and function. This mutation leads to the formation of renal cysts, which gradually increase in size, impairing normal kidney function. Over time, the progressive enlargement of these cysts can result in chronic kidney disease (CKD), a leading cause of morbidity in affected cats. In Sacred Birman cats, PKD is inherited in an autosomal dominant manner, meaning that a cat only needs to inherit one copy of the mutated gene to develop the disease. However, the penetrance and expression of the disease may vary, leading to differences in severity among individuals.

**Clinical Presentation**  
Common symptoms include:  
• Increased thirst and urination (polydipsia and polyuria)  
• Loss of appetite  
• Weight loss  
• Vomiting  
• Lethargy  
These signs typically appear late in life, often between 3 and 10 years of age, as the cysts gradually impair kidney function.

**Diagnosis**  
Early diagnosis of PKD is crucial to managing the disease effectively. The primary diagnostic tools include:  
• Ultrasound: This is the most reliable method for detecting renal cysts. It can identify cysts as early as 6 to 8 weeks of age.  
• Genetic Testing: A DNA test can confirm the presence of the PKD1 mutation, even in cats that do not yet show clinical signs or have detectable cysts on ultrasound. Routine screening of breeding cats is essential to prevent the transmission of the disease to offspring.

**Treatment and Management**  
Currently, there is no cure for PKD. Management focuses on slowing the progression of CKD and alleviating symptoms. Key aspects of treatment include:  
• **Dietary Management:** A renal-specific diet low in phosphorus and protein helps reduce the workload on the kidneys.  
• **Fluid Therapy:** Providing subcutaneous fluids can help maintain hydration in cats with advanced CKD.  
• **Medications:** Phosphate binders, antihypertensive drugs, and antiemetics may be used to manage specific symptoms. Regular monitoring of kidney function through blood tests and ultrasound is essential to adjust the treatment plan as the disease progresses.

**Prognosis**  
The prognosis for cats with PKD varies depending on the severity of kidney involvement and the stage at which the disease is diagnosed. Early detection and proactive management can significantly improve the quality of life and lifespan of affected cats. However, once CKD becomes advanced, the prognosis is guarded.

**CYSTOTOMY IN DOGS AND CATS: INDICATIONS, SURGICAL TECHNIQUE, AND POSTOPERATIVE MANAGEMENT**  
Article by Esther Cheron

**Introduction**  
Soft tissue surgery plays a crucial role in veterinary medicine, particularly in the management of abdominal and urinary tract disorders. Among these procedures, cystotomy is one of the most frequently performed surgeries in small animal practice. It is considered a fundamental surgical technique for both veterinary students and practitioners. In dogs and cats, cystotomy is most commonly indicated for the removal of urinary bladder uroliths. Although medical dissolution and dietary management are preferred whenever possible, surgical intervention becomes necessary when conservative treatment fails or when complications such as urinary obstruction, recurrent infections, or bladder trauma occur. When performed correctly, cystotomy is associated with a high success rate and a favorable prognosis.

**Indications for Cystotomy**  
Cystotomy is indicated in a variety of urinary bladder conditions in dogs and cats. The most common indications include:  
• Removal of uroliths that cannot be medically dissolved  
• Chronic or recurrent lower urinary tract disease  
• Urinary bladder rupture or penetrating trauma  
• Removal of blood clots or foreign material  
• Collection of full-thickness bladder biopsies  
• Suspected bladder neoplasia

**In cats, cystotomy is often associated with obstructive lower urinary tract disease, while in dogs it is frequently performed due to urolithiasis. A thorough diagnostic workup is essential to determine whether surgical intervention is necessary and to rule out alternative treatment options.**

**Surgical Anatomy and Preoperative Consideration**  
The urinary bladder is a hollow muscular organ with four layers. The thick muscular wall is highly sensitive and must be avoided surgically to preserve continence.

**Preoperative Evaluation**  
Before performing a cystotomy, a complete clinical evaluation is required, including:  
• Physical examination  
• Urinalysis and urine culture  
• Abdominal radiography and/or ultrasonography  
• Complete blood count and serum biochemistry  
Patients with urinary obstruction or electrolyte imbalances should be stabilized prior to surgery. Appropriate antibiotic therapy should be selected based on culture and sensitivity results whenever possible.

**Surgical Technique**  
1. **Surgical Approach**  
Cystotomy is performed under general anesthesia using a ventral midline celiotomy approach.

**Conservation Initiatives for Endangered Species**  
Article by Esther Cheron

Animals species constitute a precious natural heritage that enriches our planet with its diversity. However, many species are facing serious threats such as habitat loss, poaching, pollution, and climate change. In response to this biodiversity crisis, conservation and protection initiatives for endangered species are emerging worldwide, reflecting the growing commitment to preserving our living heritage.

**In situ and Ex situ Conservation**  
Within the framework of in situ conservation, concrete actions are taken to protect the critical habitats of endangered species. For example, the reintroduction project of wolves in Yellowstone National Park in the United States has restored ecological balance by regulating deer populations and preventing overpopulation.

As for ex situ conservation, efforts are made to safeguard endangered species in controlled environments. For instance, the captive breeding program for giant pandas led by the China Conservation and Research Center for the Giant Panda in Wolong has helped increase the panda population and enhance their genetic resilience.

**International Collaboration**  
Protecting endangered species often involves international collaboration. For example, the agreement among southern African countries to establish transboundary corridors for elephants allows them to migrate safely across borders and preserve their traditional migratory routes.

Similarly, cooperation among Kenya, Tanzania, and Uganda for the protection of mountain gorillas in the Virunga region includes joint patrols to combat poaching and coordinate transnational development programs for local communities.

**Education and Awareness**  
Education and public awareness play a crucial role in protecting endangered species. For example, educational programs by the WWF in African schoolchildren highlight the importance of wildlife conservation and encourage them to become ambassadors of nature in their communities.

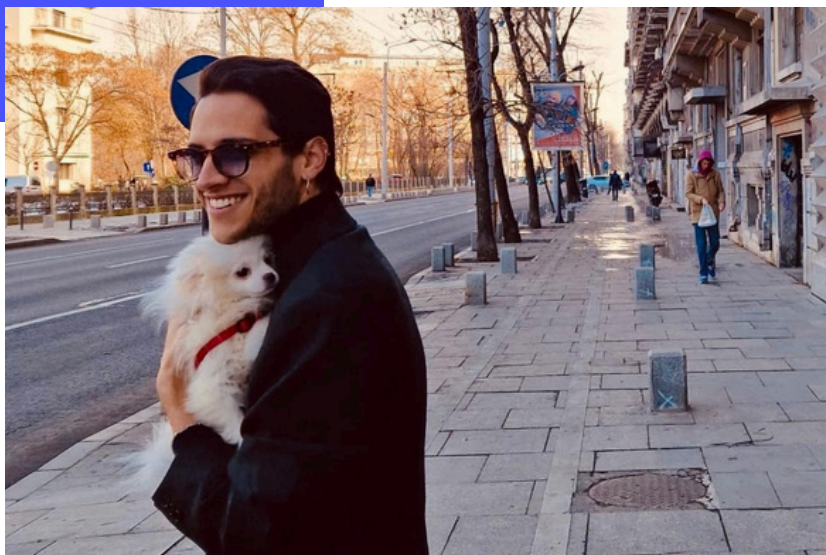
Likewise, the "Save the Sea Turtle" awareness campaign led by local organizations in Madagascar raises awareness among residents and tourists about the threats facing sea turtles and promotes sustainable fishing practices and marine pollution reduction.

In conclusion, these concrete examples illustrate the various strategies and initiatives for the conservation of endangered species worldwide. By working together to protect living heritage, we can ensure a sustainable future for all life forms on Earth.

Class 2020-2026

GIOVANNI MARCIANO

Written by me



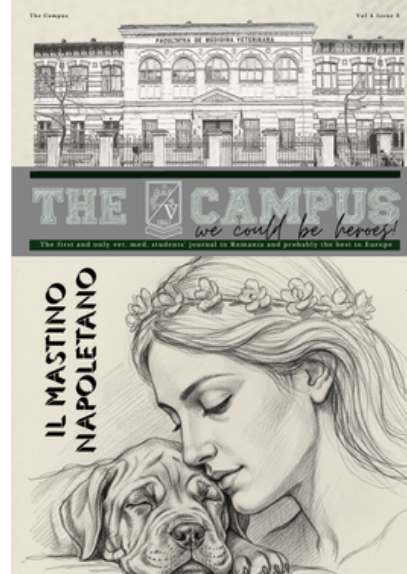
## ITER MEUM

The campus has been an extremely important and meaningful experience for me. Starting as a shy editor, I have grown over the course of a few years to become the chief editor. This journey has allowed me to develop not only academically, but also personally and professionally.

Through this journal, I discovered a true passion for writing and for the dissemination of knowledge in the field of veterinary medicine. It became a space where I could express my interests, improve my skills, and share scientific content with others.

This marks the conclusion of the first chapter of this adventure. As a student and editor, I will now continue my path as a DVM and chief editor, embracing what I believe will be an extraordinary journey. I will do my very best to help this remarkable journal grow and to develop it into something that does will represent the Faculty of Veterinary Medicine of Bucharest.

I would like to express my sincere gratitude to Professor Seralp Uzun for introducing me to the journal, for guiding me, and for continuously supporting my ideas. I am confident that he will continue to do so in the future, and I am deeply thankful for that.



THE  CAMPUS  
*we could be heroes!*

