FIRST CASE OF ENDEMIC EHRLICHIA CANIS INFECTION IN A DOG FROM IRELAND: ONE HEALTH PERSPECTIVES

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BACKGROUND

- *Ehrlichia canis* is an intracellular gram-negative bacterium (family *Anaplasmataceae)*. It infects circulating monocytes and develops as cytoplasmic membrane-bound morulae. Dogs (*Canis familiaris*) act as a reservoir, while the *Rhipicephalus sanguineus tick* is the main vector responsible for disease transmission (1)
- Acute, subclinical and chronic disease phases exits. Clinical manifestations include fever, lymhadenomegaly, polyarthropathies, thrombocytopenia, thrombocytopathia, anaemia, hyperglobulinemia, ocular lesions and polyuria/polydipsia. Chronic ehrlichiosis is also associated with pancytopenia (2)
- This pathogen has been reported in the United States of America (southern states), South America, Asia, Africa, Australia and Southern Europe (Mediterranean countries) but never in Ireland (2)(3). Recent research explored potential under-recognised infectious causes of disease in dogs in Ireland. Serologic analysis for *Ehrlichia spp.* was negative in all 500 dogs (3)
- Although primarily a canine disease, *E. canis* has also been associated with clinical illness in cats (*Felis catus*) and poses a zoonotic risk to humans (*Homo sapiens*), where infection can lead to significant health complications (4)(5). Humans with *E. Canis* infection present with a similar syndrome to dogs. Common manifestations include fever, headache, myalgia, malaise, nausea, gastrointestinal signs, musculoskeletal pain, rash, anaemia, thrombocytopenia and pancytopenia (6)
- Global warming, population growth, deforestation, and international pet travel have altered and intensified the global spread of vector-borne pathogens
- This is the first confirmed endemic case of *E. canis* in Ireland and raises concerns for the apparition of new endemic pathogens as well as potential One Health concerns

CASE DESCRIPTION

- A 6.5-year-old, female spayed dog (lurcher) from Wicklow was referred to the UCD Veterinary Hospital for investigation of a 6-month history of chronic polyuria, polydipsia, lymphadenomegaly, weight loss and lethargy with intermittent pyrexia and lameness
- Sequential haematology and biochemistry panels had documented persistent thrombocytopenia and non regenerative anaemia despite an immunosuppressive regimen of steroids for suspected immune thrombocytopenia
- Overall, the clinical signs and clinicopathological abnormalities had been poorly responsive to chronic prednisolone and amoxicillin clavulanic acid therapy
- Physical examination identified generalised lymphadenomegaly and a suboptimal body condition score. The remainder of the general physical examination including joint assessment was unremarkable
- Haematology identified a non regenerative anaemia and thrombocytopenia. Biochemistry revealed hyperglobulinemia and serum protein electrophoresis was consistent with an oligoclonal gammopathy
- C-reactive protein concentration was markedly increased
- Urinalysis identified proteinuria (3+) with an elevated urine protein creatinine ration (4.7) consistent with a protein-losing nephropathy
- Rapid screening test for tick borne diseases (4Dx Plus, IDEXX) was positive for *E. canis* and the infection was confirmed upon quantitative serology and PCR on blood
- A previous study also using LABOKLIN laboratory described the TaqMan® real-time PCR technique targeting the disulphide-oxidoreductase gene, distinct from other vector-borne pathogens (7). The primer sequence (5'–3') was:
  - F: CCCTCAAAAAGTGATAGATCTGCTCA
  - R: TCCAATTCAGATTTGTATTTTTTTATGTTTTGACTCA
- Given the presence of an oligoclonal gammopathy, bone marrow biopsy was performed for exclusion of alternative aetiologies, such as multiple myeloma or leukemia, which have similar clinical presentations. Cytology and histopathology provided no such evidence of these diseases. Moreover, there was no cellular hypoplasia which typifies the severe chronic disease form of *E.canis*. The most pertinent cytopathology was plasmacytosis
- PCR for *E.canis* on bone marrow, performed to investigate for medullary infiltration of the disease, was negative
- Ophthalmological examination by a specialist veterinary ophthalmologist revealed bilateral partial retinal detachments, chorioretinitis and anterior uveitis

	PRE TREATMENT	DURING TREATMENT (10 DAYS)	END OF TREATMENT (30 DAYS)	ONE MONTH POST TREATMENT
Haematocrit *(ref. interval 0.37 - 0.55 L/L)*	0.20 L/L	0.24 L/L	0.38 L/L	0.43 L/L
Reticulocytes *(ref. interval 0 - 60 x 10^9/l)*	14.10 x 10^9/l	103.90 x 10^9/l	24.20 x 109/l	43.30 x 109/l
Platelets *(ref. interval 150 - 500 x 10^9/l)*	117 x 10^9/l	122 x 10^9/l	787 x 10^9/l	235 x 10^9/l
Globulins *(ref. interval 28 – 42 g/l)*	70.60 g/l		27.60 g/l	29.90 g/l
C – Reactive protein *(ref. interval 0 – 10 mg/l)*	68.8 mg/l		1.6 mg/l	
Ehrlichia canis PCR blood	Positive		Negative	Negative
Ehrlichia canis PCR bone marrow	Negative			
Ehrlichia canis - antibodies (ELISA) *(ref. interval < 14 TE)*	110.81 TE			

Figure 1. Clinicopathological abnormalities

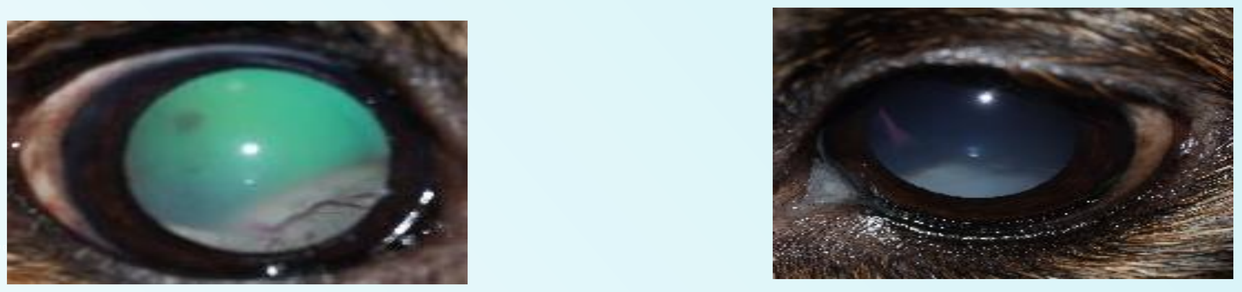

Figure 2. Ocular lesions: bilateral partial retinal detachments, chorioretinitis and anterior uveitis

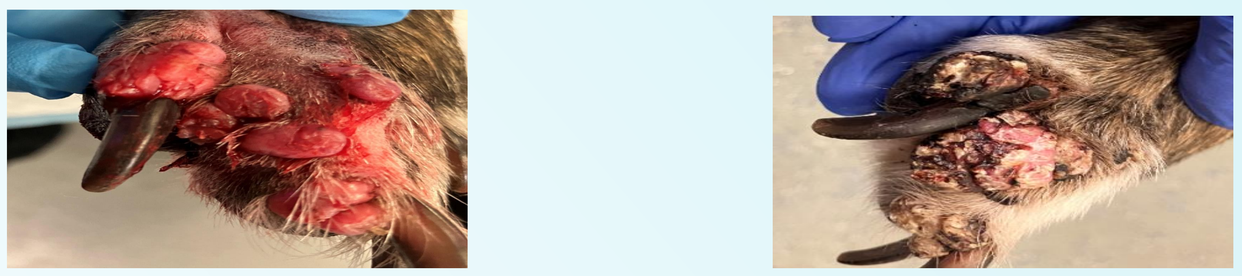

Figure 3. Viral papillomatosis on the paws

RESULTS

- A 30-day course of doxycycline, anti-inflammatory doses of systemic glucocorticoid steroid and topical ocular ketorolac trometamol drops were prescribed
- The associated clinical signs, including the ocular lesions and clinicopathological abnormalities resolved
- During therapy, the dog developed viral papillomatosis on her paws, which was confirmed with histopathology and resolved following steroid discontinuation
- A PCR on blood at cessation and one month post antimicrobial therapy discontinuation was negative

DISCUSSION

- This is the first confirmed case of *E.canis* in a dog that had no travel history. She was mostly walked off leash in the Wicklow mountains and had not received prophylactic ectoparasite treatment
- In a prior study of seven dogs experimentally infected with *E. canis* and immunosuppressed during acute or subclinical phases, three developed paw-localized viral papillomatosis. Lesions resolved after cessation of prednisolone and ciclosporin, mirroring the present case (8). Comparable manifestations have not been reported in humans, where monotherapy with tetracycline antibiotics—primarily doxycycline—is typically effective, except in rare instances involving immune-mediated complications (6)
- Previous work in companion animal parasitology identified a single *R. sanguineus tick* on a dog from county Dublin and there were two unconfirmed records of *R. sanguineus* from Belfast in 1968 and 1981 (9)
- Evidence suggests that co-infections with tick-borne pathogens can occur in both dogs and humans due to shared arthropod vectors. In addition to *E.canis, R. sanguineus* is also the primary vector for *Anaplasma platys*, the agent of canine thrombocytic anaplasmosis. Human *A. Platys* infections, including a case in a veterinary professional, has been reported, highlighting the occupational zoonotic risks inherent to this work (10). The potential establishment and increasing prevalence of *R. sanguineus* in Ireland necessitates vigilance for the emergence of additional tick-borne pathogens and co-infections, including *E. canis* and *A. platys*, in both canine and human populations

CONCLUSION

This case report underscores the emergence of novel zoonotic pathogens in Ireland.
One Health impact of animal movement and climate change: spread of infectious diseases to previously non-endemic regions.

1. *Aziz MU, Hussain S, Song B, Ghauri HN, Zeb J, Sparagano OA. Ehrlichiosis in Dogs: A Comprehensive Review about the Pathogen and Its Vectors with Emphasis on South and East Asian Countries. Vet Sci. 2022;10(1).*
2. *Côté E. Textbook of Veterinary Internal Medicine. (9th Edition): Elsevier - OHCE; 2024.*
3. *Ramos DPJG. An exploration of potential underrecognised infectious causes of disease in dogs in Ireland: University College Dublin; 2023.*
4. *Braga Í A, dos Santos LG, de Souza Ramos DG, Melo AL, da Cruz Mestre GL, de Aguiar DM. Detection of Ehrlichia canis in domestic cats in the central-western region of Brazil. Braz J Microbiol. 2014;45(2):641-5.*
5. *Perez M, Bodor M, Zhang C, Xiong Q, Rikihisa Y. Human infection with Ehrlichia canis accompanied by clinical signs in Venezuela. Ann N Y Acad Sci. 2006;1078:110-7*
6. *Andrić B. Diagnostic evaluation of Ehrlichia canis human infections. Open Journal of Medical Microbiology. 2014;4(2):132-9..*
7. *Villanueva-Saz S, Martínez M, Nijhof AM, Gerst B, Gentil M, Müller E, et al. Molecular survey on vector-borne pathogens in clinically healthy stray cats in Zaragoza (Spain). Parasit Vectors. 2023;16(1):428.*
8. *Sato M, Veir JK, Shropshire SB, Lappin MR. Ehrlichia canis in dogs experimentally infected, treated, and then immune suppressed during the acute or subclinical phases. J Vet Intern Med. 2020;34(3):1214-21.*
9. *de Waal T, Lawlor A, Zintl A, Cowley B, Bagha A. A Survey of Ticks Infesting Dogs and Cats in Ireland. Animals (Basel). 2020;10(8).*
10. *Maggi RG, Mascarelli PE, Havenga LN, Naidoo V, Breitschwerdt EB. Co-infection with Anaplasma platys, Bartonella henselae and Candidatus Mycoplasma haematoparvum in a veterinarian. Parasites & Vectors. 2013;6(1):103.*