Acta Scientiae Veterinariae, 2025. 53(Suppl 1): 1040.

CASE REPORT
Pub. 1040

ISSN 1679-9216

Hypertrophic Osteodystrophy and Concurrent Presumptive Autoimmune Disorders in a Jindo Dog - Successful Treatment

Joon-Ryul Choi, Kun-Ho Song & Joong-Hyun Song

ABSTRACT

***Background*:** Hypertrophic osteodystrophy is an orthopedic disorder that primarily affects rapidly growing dogs. Although the exact etiology remains unclear, an autoimmune origin has been proposed. This condition is usually self-limiting and treated with non-steroidal anti-inflammatory drugs to alleviate pain and inflammation. It is rare for hypertrophic osteodystrophy to occur with other autoimmune diseases, and established treatment protocols for these concurrent conditions are lacking, complicating management. This report details the clinical observations and successful treatment of a patient with hypertrophic osteodystrophy along with concurrent ischemic dermatopathy and lymphoplasmacytic enteritis.

***Case*:** A 1-year-old neutered male Jindo dog was presented with a 2-month history of lameness, chronic diarrhea, and repeated ulcerative skin lesions with delayed wound healing. On the gross examination, multifocal cutaneous signs, including alopecia, crusts, and ulcers, were observed on the ear pinnae, nose and elbow. Soft-tissue swelling was identified in right carpi and severe pain were elicited on palpation, flexion, and extension of right carpi. Radiographic examination revealed multifocal hypertrophic osteodystrophy and a pathologic fracture of the distal right radius with angular limb deformity, leading to its surgical correction. Additional skin biopsy confirmed ischemic dermatopathy, and endoscopic gastrointestinal biopsy confirmed lymphoplasmacytic enteritis. Initially, the treatment included immunosuppressive therapy with prednisolone and cyclosporin. However, the response to this treatment was insufficient. Consequently, the treatment was adjusted to incorporate a hydrolyzed diet specifically designed to manage lymphoplasmacytic enteritis, and oclacitinib to address ischemic dermatopathy. After this adjusted treatment strategy, the clinical symptoms totally improved over 4 weeks. The patient remained clinically stable throughout the six-month follow-up period, with no reported side effects or recurrence of symptoms.

***Discussion*:** In veterinary medicine, reports of concurrent autoimmune diseases are occasionally noted, but the coexistence of hypertrophic osteodystrophy with autoimmune diseases is very rare. To date, only two cases of hypertrophic osteodystrophy with concurrent autoimmune diseases have been reported, making this the first documented instance of hypertrophic osteodystrophy with lymphoplasmacytic enteritis and ischemic dermatopathy. Management of hypertrophic osteodystrophy typically involves symptomatic treatment and immunomodulatory therapy. However, in this case, glucocorticoid treatment showed no effect over six months. Instead, an individualized approach targeting each condition led to full resolution of lesions, and the patient maintained a stable condition. This suggests that disease-specific treatment strategies may be effective, although hypertrophic osteodystrophy's self-limiting nature indicates the possibility of spontaneous recovery of concurrent conditions such as ischemic dermatopathy, and lymphoplasmacytic enteritis. Thus, treatment approaches for hypertrophic osteodystrophy with concurrent autoimmune diseases should consider both disease-specific strategies and the potential for spontaneous recovery. Further studies are required to deepen our understanding of the etiology and treatment options for hypertrophic osteodystrophy and concurrent autoimmune diseases.

Keywords: dog, hypertrophic osteodystrophy, lymphoplasmacytic enteritis, ischemic dermatopathy.

DOI: 10.22456/1679-9216.143677

Received: 15 December 2024 Accepted: 21 May 2025 Published: 30 June 2025

Department of Veterinary Internal Medicine, College of Veterinary Medicine, Chungnam National University (CNU), Daejeon, Republic of South Korea. CORRESPONDENCE: J.-H. Song [jh.song@cnu.ac.kr]. Department of Veterinary Internal Medicine, College of Veterinary Medicine - CNU. Daejeon 34134, Republic of South Korea.

INTRODUCTION

Hypertrophic osteodystrophy (HOD) is an orthopedic disorder affecting rapidly growing, medium- to giant-breed dogs between 2 and 15 months of age [16]. Although the exact cause is unclear, immune dysregulation and autoinflammatory mechanisms are proposed factors [6,16,17]. Existing evidence includes cytokine dysregulation and positive responses to immunosuppressive therapy [15,16]. The autoimmune nature of HOD suggests a predisposition for other autoimmune diseases [3,5,18]. Approximately 25% of human patients with one autoimmune disease develop another, and similar occurrences are noted in veterinary medicine [3,8,10,12]. However, concurrent cases of HOD and other immune-mediated diseases in dogs are poorly documented, leaving their association unclear. In humans, chronic recurrent multifocal osteomyelitis (CRMO), a sterile inflammatory bone disease, resembles HOD and often affects children, causing pain and lameness. CRMO cases have also included autoimmune comorbidities such as acne fulminans, ankylosing spondylitis, and inflammatory bowel disease (IBD) [7,19].

HOD is generally self-limiting and treated with non-steroidal anti-inflammatory drugs (NSAIDs) to manage pain and inflammation. For cases unresponsive to NSAIDs, immunosuppressive corticosteroids may be used. Most patients fully recover, although severe cases with recurrent inflammation or bone deformities may develop angular limb deformities (ALD) [5,16].

Concurrent HOD and autoimmune diseases are extremely rare, and treatment protocols are limited, making management challenging [4,13]. This study presents clinical observations and successful treatment of a dog with HOD, ischemic dermatopathy (ID), and lymphoplasmacytic enteritis (LPE).

CASE

A 1-year-old neutered male Jindo dog was referred to the Veterinary Medicine Teaching Animal Hospital of Chungnam National University (CNU), Republic of South Korea. The patient had a history of lameness, chronic diarrhea, and ulcerative skin lesions for 2 months prior to presentation. The owner reported persistent diarrhea with a fecal score (FS) of 6 (7-point Nestlè Purina Fecal Scoring System). On gross examination, multifocal cutaneous signs, including alopecia, crusts, and ulcers, were observed on the ear pinnae, nose, and elbows. Soft tissue swelling was identified in the right carpi, and severe pain was elicited upon palpation, flexion, and extension of the right carpi. The neurological examination results were normal. Radiography[1] revealed moth-eaten bone lysis and irregular periosteal reactions bilaterally in the metaphysis of the distal radius and ulna (Figure 1B). ALD was present in both forelimbs, with a more severe change observed on the right side (Figure 1A). Bone biopsies were performed on the right tarsal and right and left carpal bones using a 9G Jamshidi bone marrow biopsy instrument. Cytological evaluation of the bone samples revealed no infectious agents or neoplastic cells. Arthrocentesis of the right stifle and left elbow joints revealed no evidence of infection in either joint, although inflammatory changes were observed in the right stifle. These examinations, along with the patient's medical history and signs, confirmed the diagnosis of late-phase HOD.

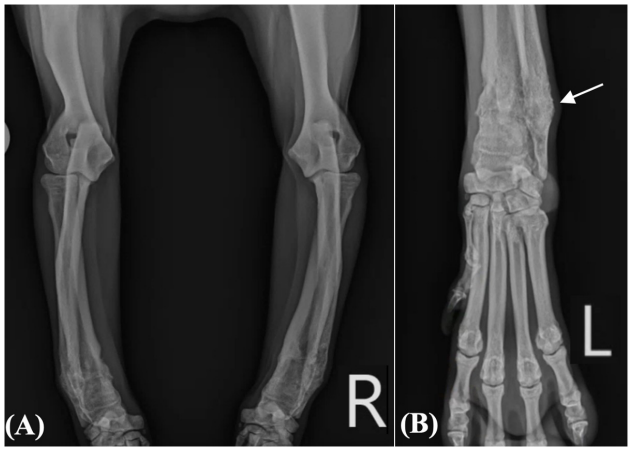

Figure 1. Cranial-caudal radiographic views of (A) both forelimbs and (B) right carpi. A- Angular limb deformity is seen in both limbs. B- Moth-eaten bone lysis and irregular periosteal proliferation are presented at the distal physis of right radius and ulna.

The patient underwent surgical correction of the right limb deformity 2 months after the initial presentation. Chronic diarrhea and dermatological conditions were managed using a hypoallergenic diet[2]. Following these treatments, the patient exhibited alternating periods of improvement and deterioration over the course of a month, with delayed wound healing at the surgical site. The patient underwent gastrointestinal endoscopy and skin biopsy for further diagnostic evaluation after two months after the surgery. Gastrointestinal endoscopy[3] revealed no abnormalities in the stomach or duodenum; however, diffuse ulcerative lesions with erythema and edema of the mucosa were observed in the ileum and colon (Figure 2A). Multiple biopsies were obtained

from the descending and ascending colon and ileum. Histological examination confirmed the diagnosis of LPE and colitis (Figure 2B & C). Skin biopsies and aerobic cultures of skin swabs were obtained from the areas with scarring alopecia, an ulcer on the left carpus, and a patch of alopecia on the nasal planum. No bacterial infections were observed at any site. Histological examination revealed moderate-to-marked cell-poor vasculopathy with dermal ischemia, consistent with a diagnosis of ID (Figure 3).

The patient received additional treatment using vitamin E[4] [Grandpherol - 400 IU/dog, PO, BID] and pentoxifylline[5] [Trental - 15 mg/kg, PO, BID] for ID and an immunosuppressive dosage of prednisolone[4] [Solondo - 1 mg/kg, PO, BID] and cyclosporine[6] [Cipol-N - 5 mg/kg, PO, BID] for ID and LPE. Despite 2 months of treatment, the patient showed only mild improvement. The surgical site showed poor wound healing and developed a deep infection with *Staphylococcus pseudintermedius*. Cefixime[7] [Nelsoncefixime - 5 mg/kg, PO, BID] was administered for 1 month. However, the patient did not show any significant improvement. Consequently, amputation was performed because of persistent bacterial infection and nonunion of the right forelimb.

Following the amputation, prednisolone and cyclosporine were discontinued. Oclacitinib[8] [Apoquel - 0.5 mg/kg, PO, BID] was added for ID and dressings were changed daily at the surgical site [15]. After 2 weeks of adjusted treatment, complete wound closure was observed, and after 3 weeks, the patient's skin lesions had resolved completely. For the management of LPE, the diet was transitioned to another hydrolyzed formula[9] with additional supplementation of psyllium husk powder[10] [Botanicfiberplus] and commercial synbiotics[11] [Tripleome]. Over 4 weeks of dietary modification, the patient gradually improved and achieved a normal FS. The patient remained clinically stable without recurrence at 6 months.

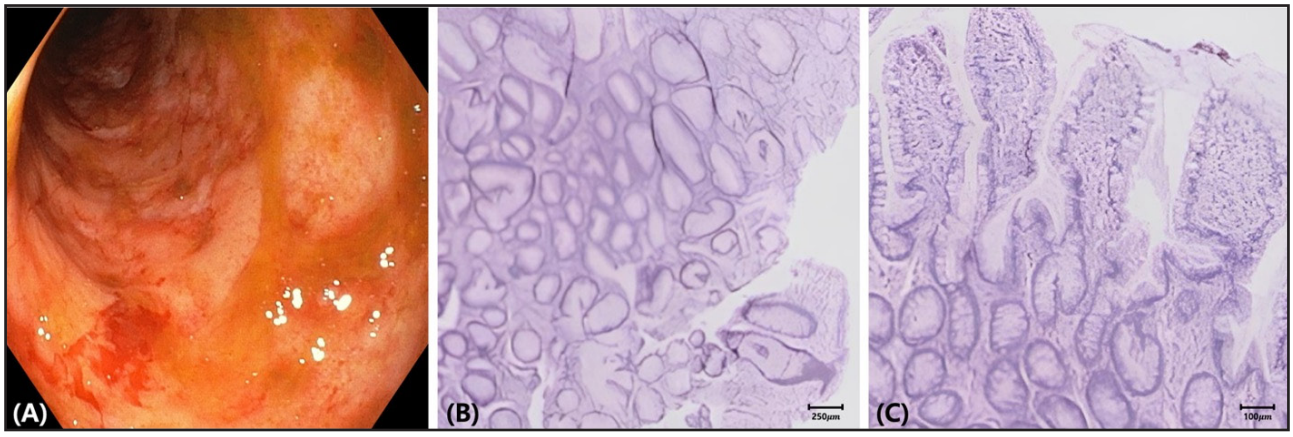

Figure 2. Endoscopic image of (A) colon, and histopathology results from the endoscopic biopsy of (B) the ileum and (C) colon. A- Endoscopic appearance, showing increased mucosal granularity, accumulation of exudate, and diffuse ulcerative lesions. B- Mild to moderate, chronic, lymphoplasmacytic, sparsely histiocytic, eosinophilic and neutrophilic colitis [HE; scale bar = 250 μm]. C- The lamina propria was mildly to moderately expanded by lymphocytes and plasma cells [HE; scale bar = 100 μm].

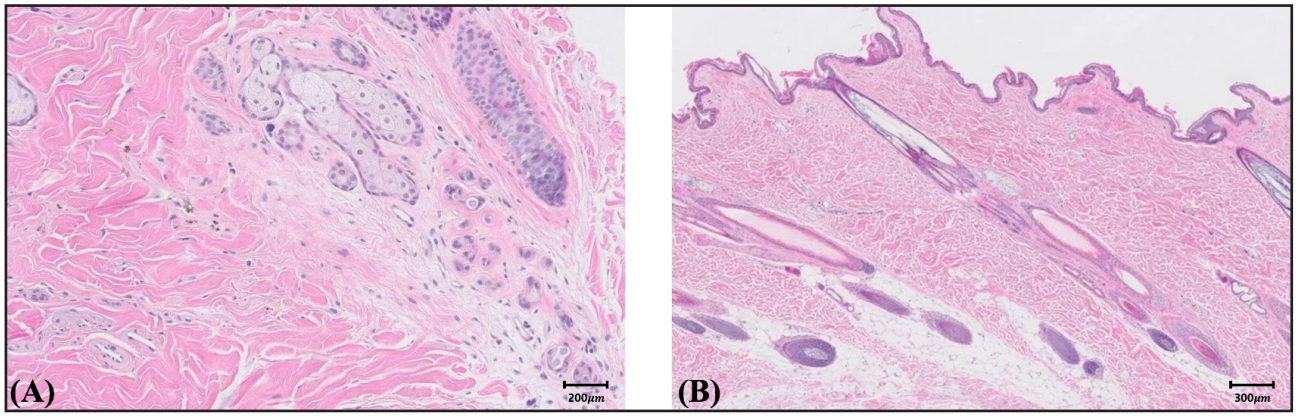

Figure 3. Histopathology results from the endoscopic biopsy of (A) the right carpal and (B) nasal planum. A- Minimal to mild superficial perivascular mast cell dermatitis with mild edema and mild perifollicular adipose degeneration [HE; scale bar = 200 μm]. B- Moderate to marked cell poor vasculopathy with evidence of dermal ischemia [HE; scale bar = 300 μm].

DISCUSSION

The present case report describes a patient with HOD, concurrent autoimmune disease, LPE, and ID. To the best of our knowledge, only 2 cases of HOD with concurrent autoimmune diseases have been previously reported. One case involved HOD with polyradiculoneuritis and polyarthritis [4], while the other was related to juvenile canine cellulitis [18]. This is the 1st. report on the co-occurrence of IPE, ID, and HOD in a canine patient.

HOD is an autoimmune disease mediated by several cytokines that are involved in innate immunity [15]. This is supported by the success of anti-inflammatory and immunomodulatory therapies as well as elevated levels of proinflammatory cytokines such as interleukin-1β, interleukin-6, interleukin-18, and tumor necrosis factor-α observed in affected cases both with and without recovery status [15]. In the 2 cases of HOD with concurrent autoimmune diseases, glucocorticoid immunosuppressive therapy led to the resolution of both conditions. The patients in these cases remained stable after treatment without requiring further immunosuppressive medication and no recurrence of HOD or autoimmune disease was observed [4,16,18]. These results indicate that immunomodulatory therapy may be effective in treating autoimmune diseases concurrent with HOD. This is consistent with the findings from isolated HOD cases, in which immunomodulatory therapy led to clinical improvement [16]. In the present case, immunomodulatory therapy was ineffective in treating ID and LPE concurrent with HOD, and recovery was achieved through various treatments targeting each disease individually. However, owing to the self-limiting nature of HOD, the possibility of spontaneous recovery of ID and LPE concurrent with HOD cannot be excluded.

ID is a group of canine syndromes caused by impaired blood flow through damaged vessels, leading to skin atrophy due to an insufficient nutrient supply [2,11]. ID can present with cutaneous signs, whether generalized or localized, include alopecia, pigmentary changes, scaling, crusts, and ulcerations, which primarily affect the distal extremities, such as the pinnal margins, tail tips, and pressure points. The standard treatment for ID typically includes immunosuppressive agents such as glucocorticoids, and adjunct therapies such as vitamin E and pentoxifylline to enhance peripheral blood flow [2]. However, these therapies may have limited efficacy in severe cases, whereas immunosuppressive therapies show more positive treatment responses [2,9,11]. In the present case, the patient's clinical presentation was consistent with typical ID findings and histopathological analysis confirmed the diagnosis. No significant response was observed despite treatment with pentoxifylline, vitamin E, and immunosuppressive drugs. Wound healing remains poor following corrective surgery for ALD secondary to HOD, likely due to inadequate blood flow to the affected skin. Impaired healing results in an imbalance in tissue structure, combined with inflammation and secondary bacterial infection, which contribute to bone nonunion. Based on previous cases in which oclacitinib was successfully used in patients unresponsive to immunosuppressive therapy, oclacitinib was added to the treatment regimen in this case, leading to full resolution of the skin lesions [9]. Although the precise mechanism by which oclacitinib treats ID is not fully understood, it has been proposed that oclacitinib controls the condition by inhibiting type I interferons through its action on Janus kinase 1 receptors [9]. These mechanisms and clinical cases suggest that oclacitinib is a valuable therapeutic option for refractory ID.

HOD presents a wide spectrum of clinical manifestations, ranging from self-limiting to severe systemic involvement, which can result in significant morbidity or mortality [16]. The management of HOD typically involves a combination of symptomatic treatment and immunomodulatory therapy aimed at reducing inflammation and controlling clinical signs [5,14,16]. When HOD occurs concurrently with other immune-mediated diseases, treatment typically consists of symptomatic management using immunosuppressive agents such as prednisolone. This approach has led to complete remission for patients, including the resolution of their concurrent conditions [4,18]. However, there are no standardized treatment guidelines for HOD with concurrent autoimmune diseases. In this case, the patient received glucocorticoids as immunosuppressive therapy along with an elimination diet, vitamin E, and pentoxifylline. However, no significant clinical improvement was observed after 6 months. The treatment was then modified to specifically address each comorbid condition, with LPE being managed using synbiotics and an elimination diet, while ID was treated with vitamin E, pentoxifylline, and oclacitinib. This disease-specific approach led to the complete resolution of the lesions, and the patient remained stable at 6-months final follow-up without recurrence. Similarly, CRMO shares similarities with

HOD and has established treatment protocols [1,7]. In cases of CRMO with concurrent autoimmune diseases, 1st-line treatment typically includes NSAIDs or corticosteroids. If these treatments are ineffective, 2nd-line options like anti-TNF alpha agents or pamidronate are used to manage inflammation, demonstrating improvement in patients who did not respond to initial therapies [1]. This highlights the importance of disease-specific treatment strategies for managing HOD in patients with concurrent autoimmune diseases.

In conclusion, this case report describes the clinical features and successful treatment strategies for a dog with HOD concurrent with ID and LPE. When HOD coexists with other autoimmune diseases, the response to conventional treatments may be poor, requiring diverse therapeutic approaches. However, due to the self-limiting nature of HOD, it is possible that autoimmune diseases concurrent with HOD also resolve spontaneously, which may have extended the patient's recovery period. Further studies are needed to better understand the etiology and treatment options for HOD in dogs.

MANUFACTURERS

[1]Medien International Co. Ltd. Seongnam, Republic of South Korea.

[2]Royal Canin. Aimargues, France.

[3]Olympus corp. Tokyo, Japan.

[4]Yuhan Corp. Seoul, Republic of South Korea.

[5]Handok Inc. Pangyo, Republic of South Korea.

[6]Chong Kun Dang Pharmaceuticals. Seoul, Republic of South Korea.

[7]Nelson Pharm Co. Ltd. Seoul, Republic of South Korea.

[8]Zoetis Inc. Parsippany, NJ, USA.

[9]Natural F&P Co. Ltd. Seongnam, Republic of South Korea.

[10]Ahw Co. Ltd. Seoul, Republic of South Korea.

Acknowledgments. This study was supported by the National Research Foundation of Korea and was funded by a grant from the Korean Government (NRF-2022R1G 1A1003682113148209264 0101). This study was supported by the Basic Science Research Program through the NRF, funded by the Ministry of Education (RS-2023-002197 1031482092640001).

Declaration of interest. The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. The authors alone are responsible for the content and writing of paper.

REFERENCES

1 **Audu G.K., Nikaki K., Crespi D., Spray C. & Epstein J. 2015.** Chronic recurrent multifocal osteomyelitis and inflammatory bowel disease. *Journal of Pediatric Gastroenterology and Nutrition*. 60(5): 586-591.

2 **Backel K.A., Bradley C.W., Cain C.L., Morris D.O., Goldschmidt K.H. & Mauldin E.A. 2019.** Canine ischaemic dermatopathy: A retrospective study of 177 cases (2005–2016). *Veterinary Dermatology*. 30(5): 403-e122.

3 **Cojocaru M., Cojocaru I.M. & Silosi I. 2010.** Multiple autoimmune syndrome. *Maedica*. 5(2): 132.

4 **Cuthbert R., Morton M. & Lowrie M. 2016.** Immunodeficiency syndrome in a Weimaraner involving the peripheral nervous system. *Veterinary Record Case Reports*. 4(1): e000311.

5 **Franklin M.A., Rochat M.C. & Broaddus K.D. 2008.** Hypertrophic osteodystrophy of the proximal humerus in two dogs. *Journal of the American Animal Hospital Association*. 44(6): 342-346.

6 **Grŏndalen J. 1976.** Metaphyseal osteopathy (hypertrophic osteodystrophy) in growing dogs: A clinical study. *Journal of Small Animal Practice*. 17(11): 721-735.

7 **Hofmann S.R., Kapplusch F., Girschick H.J., Morbach H., Pablik J., Ferguson P.J. & Hedrich C.M. 2017.** Chronic recurrent multifocal osteomyelitis (CRMO): Presentation, pathogenesis, and treatment. *Current Osteoporosis Reports*. 15: 542-554.

8 **Lee M.A., Hulsebosch S.E., Affolter V.K., Dear J.D., Knipe M.F., Maggs D.J., Moore B.A., Outerbridge C.A. & Marsilio S. 2023.** Polyautoimmunity manifest as inflammatory myopathy, uveitis, and progressive cutaneous depigmentation in a mixed breed dog: A case report. *BMC Veterinary Research*. 19(1): 198.

9 **Levy B.J., Linder K.E. & Olivry T. 2019.** The role of oclacitinib in the management of ischaemic dermatopathy in four dogs. *Veterinary Dermatology*. 30(3): 201-e263.

10 **Levy B.J., Linder K.E., Mamo L.B., Herrmann I. & Bizikova P. 2020.** Cutaneous polyautoimmunity in two unrelated dogs: Pemphigus foliaceus and generalized discoid lupus erythematosus. *Veterinary Dermatology*. 31(4): 325-e384.

11 **Morris D.O. 2013.** Ischemic dermatopathies. *Veterinary Clinics of North America: Small Animal Practice*. 43(1): 99-111.

12 **Pedersen N.C., Liu H., Greenfield D.L. & Echols L.G. 2012.** Multiple autoimmune diseases syndrome in Italian Greyhounds: Preliminary studies of genome–wide diversity and possible associations within the dog leukocyte antigen (DLA) complex. *Veterinary Immunology and Immunopathology*. 145(1-2): 264-276.

13 **Perry K.M., Enders B.D. & Negrão Watanabe T.T. 2023.** Refractory shock, hypercoagulability, and multiorgan thrombosis associated with hypertrophic osteodystrophy in a dog. *Journal of Veterinary Emergency and Critical Care.* 33(2): 257-262.

14 **Safra N., Johnson E.G., Lit L., Foreman O., Wolf Z.T., Aguilar M., Karmi N., Finno C.J. & Bannasch D.L. 2013.** Clinical manifestations, response to treatment, and clinical outcome for Weimaraners with hypertrophic osteodystrophy: 53 cases (2009-2011). *Journal of the American Veterinary Medical Association*. 242(9): 1260-1266.

15 **Safra N., Hitchens P.L., Maverakis E., Mitra A., Korff C., Johnson E., Kol A., Bannasch M.J., Pedersen N.C. & Bannasch D.L. 2016.** Serum levels of innate immunity cytokines are elevated in dogs with metaphyseal osteopathy (hypertrophic osteodytrophy) during active disease and remission. *Veterinary Immunology and Immunopathology*. 179: 32-35.

16 **Selman J. & Towle M.H. 2022.** Hypertrophic osteodystrophy in dogs. *Journal of Small Animal Practice*. 63(1): 3-9.

17 **Tobias K.M. & Johnston S.A. 2018.** In: *Veterinary Surgery: Small Animal*. Cambridge: Elsevier, pp.1305-1307.

18 **Wentzell M.L. 2011.** Hypertrophic osteodystrophy preceding canine juvenile cellulitis in an Australian shepherd puppy. *The Canadian Veterinary Journal*. 52(4): 431.

19 **Zhao D.Y., McCann L., Hahn G. & Hedrich C.M. 2021.** Chronic nonbacterial osteomyelitis (CNO) and chronic recurrent multifocal osteomyelitis (CRMO). *Journal of Translational*. 4: 100095.