Canine sterile neutrophilic dermatosis (resembling Sweet's syndrome) with severe extracutaneous manifestations

K. Hammes[1], I. Vannini[1], D. Nitzl[1], I. B. Veiga[2], D. J. Wiener[3], B. Wenger-Riggenbach[1]

[1] Bessy's Kleintierklinik AG, Watt/Regensdorf, Switzerland; [2] Institute of Animal Pathology, Vetsuisse Faculty, University of Berne, Berne; [3] Department of Veterinary Pathobiology, College of Veterinary Medicine, Texas A&M University, USA

https://doi.org/10.17236/sat00203

Received: 03.10.2018
Accepted: 28.02.2019

Summary

Sterile neutrophilic dermatosis is a rare disease in dogs, similar to Sweet's syndrome in humans. This case report describes the treatment of a 2-year old Bearded Collie that was presented with a 3-week history of fever, hindlimb weakness, peripheral lymphadenomegaly and leucocytosis. Blood tests revealed severe leukocytosis, renal azotaemia, elevated liver enzymes and bilirubinaemia. Skin lesions started to appear in week four. Histology revealed a sterile neutrophilic dermatitis resembling Sweet's syndrome. The dog displayed extracutaneous manifestations, including fever, polyarthritis, a severe leukemoid reaction, anaemia, hepatopathy and nephropathy. Issues regarding the use of criteria for the diagnosis of Sweet's syndrome in humans that are used for dogs with sterile neutrophilic dermatosis, are discussed in this case report. The condition resolved with dexamethasone and mycophenolate mofetil as a novel steroid-sparing therapy. Three months later the dog relapsed, which rapidly responded to short-term dexamethasone treatment and temporarily increased mycophenolate mofetil dosage.

Keywords: autoimmune mediated, extracutaneous manifestations, dog, sterile neutrophilic dermatosis

Sterile, neutrophile Dermatose mit schweren extrakutanen Manifestationen beim Hund (vergleichbar dem Sweet-Syndrom)

Sterile neutrophile Dermatose ist eine seltene Erkrankung bei Hunden, vergleichbar dem Sweet'schen Syndrom beim Mensch. Dieser Fallbericht beschreibt die Behandlung eines zweijährigen Bearded Collie mit einer 3-wöchigen Vorgeschichte von Fieber, Schwäche der hinteren Gliedmaßen und peripherer Lymphadenomegalie und Leukozytose. Die Laborwerte wiesen eine schwere Leukozytose, renale Azotaämie, erhöhte Leberenzyme und Bilirubinämie auf. Hautveränderungen zeigten sich ab der vierten Woche. Die Histologie ergab eine sterile neutrophile Dermatitis, die dem Sweet'schen Syndrom ähnelt. Zusätzlich wurden extrakutane Manifestationen festgestellt, einschließlich Fieber, Polyarthritis, eine schwere Leukozytose, Anämie, Hepatopathie und Nephropathie.
Der vorliegende Fallbericht diskutiert Fragen inwieweit Kriterien für die Diagnose des Sweet-Syndroms beim Menschen bei Hunden mit steriler neutrophiler Dermatose verwendet werden können. Eine steroidschonende Therapie mittels Dexamethason und Mycophenolat-Mofetil führte zu einer Abheilung. Drei Monate später erlitt der Hund einen Rückfall, der rasch und kurzfristig auf die Behandlung mit Dexamethason und einer erhöhten Mycophenolat-Mofetil-Dosierung reagierte.

Schlüsselwörter: Autoimmun-vermittelt, extrakutane Manifestationen, Hund, sterile neutrophile Dermatose

Canine sterile neutrophilic dermatosis (resembling Sweet's syndrome) with severe extracutaneous manifestations

K. Hammes et al.

Introduction

Sterile neutrophilic dermatosis (SND) in dogs is similar to acute febrile neutrophilic dermatosis in humans, otherwise known as Sweet's syndrome (SS).[1,2] Characteristics of SND and SS include neutrophilic leukocytosis, mature neutrophils in the upper dermis, pyrexia and improvement of symptoms with corticosteroid treatment.[1,3] Typical skin lesions include erythematous papules, plaques and nodules.[1] Reports of SND in veterinary medicine are rare, and only eight cases have been published in dogs to our knowledge (Table 1).[2-8] General illness and extracutaneous signs may appear much earlier than the dermatological signs of this disease complex.[1,2] Systemic corticosteroids are the therapy of choice for SND in humans and dogs, rapidly improving clinical signs, supporting the idea that the multifactorial pathogenesis involves immune complexes, circulating antibodies and pro-inflammatory cytokines.[1] This report describes severe SND with extracutaneous manifestations in a Bearded Collie that was treated successfully with dexamethasone and mycophenolate mofetil (MMF, Cellcept®, Roche Pharma AG). To our knowledge, this is the first case of SND in dogs treated with MMF as steroid-sparing agent.

Case report

A two-year old male intact Bearded Collie was presented to the primary care veterinarian with apathy, hind-limb weakness and possible polyuria/polydipsia for three days. The dog was limping after playing a few days earlier. The owner administered robenacoxib (Onsior® Elanco Tiergesundheit AG) once off, however this did not improve the condition. The dog was properly vaccinated and healthy up to that stage. It had never been out of the country. The dog was febrile and the right tarsal joint was swollen. The subscapular and popliteal lymph nodes were enlarged. Initial blood tests showed slight hyperbilirubinaemia. The antinuclear antibody titre was positive. The dog was treated with metamizol (Vetalgin®, MSD Animal Health GmbH) once off, doxycycline (Doxycyclin®, Spirig Healthcare AG) for eight days and prednisolone (Spiricort®, Spirig Healthcare AG). The prednisolone dosage was tapered over 11 days from 20 mg/kg to 5 mg/kg (Table 2). The treatment reduced the swelling of the tarsal joints and the dog's hind-limb weakness improved. One week later the dog showed renewed apathy and anorexia and was admitted to our clinic.

Table 1: Overview of reported cases of canine sterile neutrophilic dermatosis

Reference (n = number of cases)	Skin lesions location	Extracutaneous manifestations/ organs affected
Vitale et al., 1999 (n = 2)	Pustules on abdomen and limbs; crust, erosions on the lips	Fever, polyarthritis, peripheral lymphadenomegaly
	Erythematous macules ventral thorax; pustules on dorsal thorax	Fever, polyarthritis, peripheral lymphadenomegaly
Okada et al., 2004 (n = 1)	Ulceration in oral cavity, oedema on neck, erythematous plaques on groin, head, and pinnae	Fever, uveitis, arthritis
Mellor et al., 2005 (n = 1)	Erythema, hair loss and multiple target lesions with peripheral scale on ventrum, anogenital region, maxillary labial mucocutaneous junction, all four limbs, including interdigital areas	Lethargy, weakness, thin, Otitis externa, peripheral lymphadenopathy
Johnson et al., 2009 (n = 1)	Multifocal to coalescing erythematous papular to pustular eruptions on all four limbs, periocularly, ventral and lateral thorax and abdomen	Fever, arthritis, lymphadenomegaly, inflammation of heart, lungs, esophagus, and synovium
Gains et al., 2010 (n = 1)	Multifocal erythematous papules affecting the ventral abdomen, axillae, and groin	none
Cochet-Faivre et al., 2012 (n = 2)	Erosive, pustular and crusty lesions on face, head, neck, lateral hind legs, back. Erythematous nodules with central ulceration	Fever, lymphadenomegaly, gastroenteritis
	Erythematous pustules on face, limbs including extremities	Fever, lameness
Schoellhorn et al., 2012 (n = 1)	Skin of the entire ventral abdomen extending to both flanks was erythematous, swollen and painful on palpation, ulcerations in the centre of the lesions, superficial vesicles	Fever, gastrointestinal haemorrhage, diarrhoea, lymphadenomegaly
Sharpe et al., 2017 (n = 1)	Multiple cutaneous exudative plaques on the feet and tail base	Right- sided periorbital swelling, exophthalmos with pain on retropulsion. Mild left-sided exophthalmos with decreased, nonpainful retropulsion
This case report (n = 1)	Erythema, erosions on lips, nose, hind legs, ventral abdomen, whole thorax. Lesions on hind legs developed into large ulcerations, erythema and multifocal crusts. Abdomen and thorax: smaller erosions, maculae and crusts.	Fever, polyarthritis, a severe leukemoid reaction, hepatopathy, nephropathy.

The dog lost 3 kg bodyweight in three weeks (body-scoring index 3/9), had mild-icteric mucous membranes and warm, swollen tarsal joints. Cytological examination of synovia from the right tarsal joint, revealed a cell count of 17'090/µl, several erythrocytes, abundant non-degenerated neutrophils (92%), monocytes, some lymphocytes, and no bacteria. These results are compatible with an immune-mediated arthritis.

Follow-up haematology revealed a mild leukocytosis with neutrophilia (Figure 1), while the chemistry profile showed mild renal azotaemia (UREA 23.2 mmol/l, CREA 226 µmol/l), elevated liver enzymes (ALT 39 U/l, AP >120 U/l, GGT 5 U/l) and hyperbilirubinemia (78 µmol/l). The coagulation profile was normal. The packed cell volume (PCV) was normal initially, but nine days later the PCV started to fall, resulting in a normocytic, normochromic, regenerative anaemia. (Figure 1). The leukocytes increased massively (92.7×10^9/L three weeks after initial presentation, Figure 1), coinciding with the appearance and worsening of the skin lesions and the lowest level of PCV. Serological tests for *Dirofilaria immitis*, *Babesia canis*, *Ehrlichia canis*, *Anaplasma phagozytophilum*, *Leishmania infantum*, and Leptospirosis spp were negative. Chest radiographs were unremarkable. Abdominal ultrasonographic examination suggested presence of an acute, diffuse hepatic inflammatory process, reactive lymphadenopathy and mild bilateral chronic nephropathy.

Three weeks after the first symptoms, macroscopic erosive skin lesions and erythema started to appear around the dog's lips. Soon more lesions appeared on the nose, hind legs, ventral abdomen and the whole thorax (Figure 2A). Macroscopically, the lesions on the hind legs showed large ulcerations, erythema and multifocal crusts. The abdomen and thorax displayed smaller erosions, maculae and crusts. In-house cytology on impression smears of some affected skin areas showed neutrophils, macrophages and signs of secondary pyoderma with intracellular bacteria and *Malassezia*. Prescapular and popliteal lymph nodes showed a heterogenic population of lymphatic cells with numerous small lymphocytes, few plasma cells and macrophages, corresponding to reactive hyperplasia. Analysis of fine needle aspirate (FNA) samples of the spleen revealed a heterogenic population of leukocytes with numerous non-degenerative neutrophils, small and large lymphocytes, monocytes and macrophages. The FNA of the liver revealed normal hepatocytes and pronounced intracanalicular bile plugs. These findings are unspecific for many hepatopathies.

Aetiology	Laboratory abnormalities	Treatment	Outcome
Drug-induced (carprofen)	Neutrophilia, lymphopenia, hypoalbuminemia, elevated AP and ALT	Immunosuppressive therapy (details not available)	Lethal
Drug-induced (carprofen)	Neutrophilia, lymphopenia, hypoalbuminemia, elevated AP and ALT	Immunosuppressive therapy (details not available)	Lethal
Immune-mediated	Haemolytic anaemia, thrombocytopenia	Prednisolone (details not available)	Complete remission (time frame not available)
Drug-induced (carprofen)	Anaemia, thrombocytopenia, positive agglutination, haemoglobinuria	Prednisolone, Azathioprine, Bovine haemoglobin glutamer-200, Enrofloxacin (dosages: see paper)	Complete remission after 7 months
Drug-induced (firocoxib)	Neutrophilia, thrombocytopenia, elevated AP	Famotidine, Dobutamine, Cefazolin, Doxycycline, Metoclopramide (details not available)	Lethal
Immune-mediated	Elevated AP, hypoalbuminemia	Dexamethasone, Prednisolone, Doxycycline (dosages: see paper)	Complete remission within seven days
Immune-mediated	Leucocytosis with neutrophilia	Amoxicillin-clavulanic acid, Meloxicam after relapse: Prednisolone (dosages: see paper)	Remission after 48 h, relapse after three months
Immune-mediated	Leucocytosis with neutrophilia	Cefalexine, Fentanyl patch), Morphine (dosages: see paper)	Remission after five days, relapse after two months
Localised subcutaneous form	Leucocytosis with neutrophilia and left shift, hypoalbuminemia	Dexamethasone, prednisolone, Omeprazole, Sulcrafate, Metoclopramide, Dolasetrone, Fentanyl, Ketamine, Buprenorphine, Tramadol, Enrofloxacin, Amoxicillin-clavulanic acid, metronidazole (dosages: see paper)	Complete remission after 12 weeks
Immune-mediated	Neutrophilia	Prednisone, -Meloxicam, Fluconazole, Famotidine, Voriconazole, Cyclosporine (dosages: see paper)	Complete remission after one year
Immune-mediated	Mild leukocytosis with neutrophilia, normocytic, normochromic, regenerative anaemia, mild renal azotaemia, strongly elevated liver enzymes, severe hyperbilirubinemia	Gastric protection therapy, Doxycycline, Enrofloxacin, Amoxicillin, Clindamycin, Prednisolone, Dexamethasone, Mycophenolate mofetil (dosages: see Supplementary Table 1)	Remission after 2.5 months, relapse after 5 months, complete remission 8 months after initial presentation

Histological analysis of various skin biopsies revealed a moderate to severe, interstitial neutrophilic infiltration extending from the superficial to the deeper dermis (interstitial neutrophilic dermatitis, Figure 3A and B). Additionally, a moderate to severe, periadnexal lymphoplasmacytic infiltration was present (Figure 3B). Multifocal haemorrhages and a moderate oedema were observed in the superficial dermis. The skin biopsy from the right knee displayed a multifocal necrotic epidermis associated with a severe compact parakeratotic hyperkeratosis, multifocal intraepidermal neutrophilic pustule formation and occasional swollen keratinocytes (Figure 3B). In some biopsies occasional furunculosis was present, characterized by foamy macrophages surrounding keratin scales and free hair shafts.

Prednisolone treatment (0.25 mg/kg) was continued for three days but was discontinued because the dog panted heavily. Before treatment was resumed with dexamethasone seven days later, skin biopsies were taken for histological analysis as discussed above. Dexamethasone was started on 0.28 mg/kg once daily (Dexadreson®, MSD Animal Health GmbH), and the skin lesions started to improve (Figure 2B, 2C). MMF was added as steroid-sparing agent to reduce the steroid dosage, and tapered over time (from 10 mg/kg once daily to 10 mg/kg every four days). Auxiliary systemic and local skin treatments were also applied (Table 2). The dog was pretreated with doxycycline. Due to the critical condition of the dog on presentation in our clinic, and while Leptospirosis and Leishmaniosis had not been excluded as differential diagnoses, the decision

Table 2: Drugs administered during the treatment of the dog since admission in our clinic (s = stationary, a = ambulatory)

Active drug ingredient	Dose and mode of application	Time frame of application (day)
Non-steroidal anti-inflammatory drugs		
Robenacoxib[a]	1 mg/kg PO	- 4 (a)
Metamizole[b]	0.1 mg/kg IV	1 (a)
Antibiotics		
Doxycycline[c]	20 mg/kg PO q 12 h	1 – 8 (a)
Enrofloxacin[d]	10 mg/kg IV q 24 h	12 – 57 (s, a)
Amoxicillin[e]	20 mg/kg IV q 8 h	12 – 23 (s)
Clindamycin[f]	5.5 mg/kg PO q 12 h	17 – 50 (s, a)
Immunosuppressants		
Prednisolone[g]	1 mg – 0.25 mg/kg PO q 24 h	2 – 5 (a) 13 – 16 (s)
Dexamethasone[h]	0.28 mg/kg IV q 24 h	24 – 28 (s)
	0.28 mg/kg PO q 24 h – 0.05 mg/kg PO q 3 d	29 – 126 (s, a) 127 – 150 (a)
	0.28 mg/kg PO q 24 h	after relapse
Mycophenolate mofetil[i]	10 mg/kg PO q 24 h – 10 mg/kg q 4 d	54 – 148 (a) 149 – 234 (a)
	10 mg/kg PO q 24 h	after relapse
Gastric protection		
Ondansetron[j]	0.1 mg/kg IV q 8	12 – 27 (s)
Liver protection		
S-Adenosylmethionine (SAM)[k]	10 mg/kg PO q 12 h	17 – 84 (s, a)
Ursodiol[l]	15 mg/kg PO q 24 h	17 – 148 (s, a)
Fluid therapy		
Ringer's Lactate	4 – 8 ml/kg/h	12 – 25 (s)
Local skin treatment		
Silver sulfadiazine (Flammazine®)		1 – 10
Dexpanthelonum, Chlorhexidine (Bepanthen plus™)		10 – 97 as needed
Fatty acids, ceramides (Allerderm®)		41 – 97 as needed

[a] Onsior® Elanco Animal Health AG
[b] Vetalgin® N MSD Animal Health GmbH
[c] Doxyclin® forte, Spirig Healthcare AG
[d] Baytril® 5 %, Provet AG
[e] Clamoxyl, Zoetis GmbH
[f] Antirobe®, Zoetis GmbH
[g] Prednisolon, Vetoquinol AG
[h] Dexadreson, MSD Animal Health GmbH
[i] Cellcept®, Roche Pharma AG
[j] Ondansetron Fresenius Kabi AG
[k] Denosyl®, New Vetline Sagl
[l] Ursochol®, Zambon AG

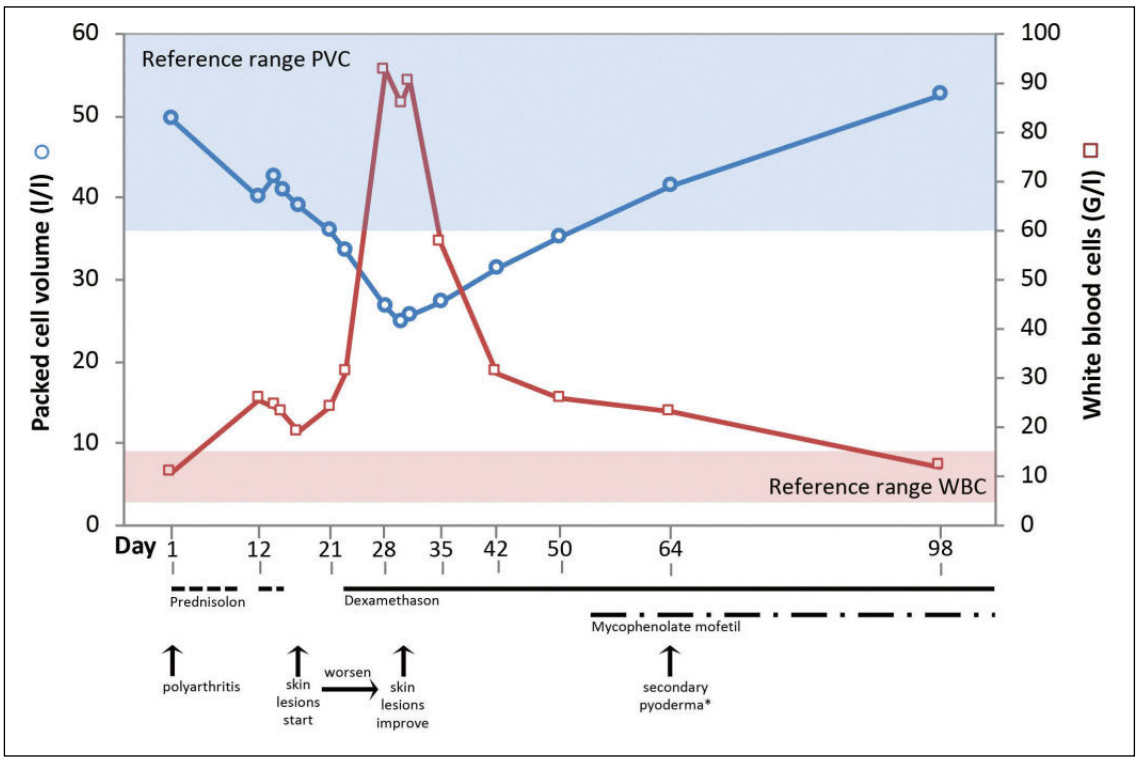

Figure 1: Development of haematology results (packed cell volume, PVC; white blood cells, WBC) in a two-year old Bearded Collie with sterile neutrophilic dermatosis over time. Day 1 denotes the first day of presentation at the primary veterinarian. Day 12 denotes the first day of presentation in the referral clinic. Glucocorticoid therapy (prednisolone and dexamethasone) as well as steroid-sparing therapy (Mycophenolate mofetil, MMF) is portrayed in relation to the appearance of skin lesions. *At this stage (day 64) the skin was somewhat more inflamed but there were signs of a secondary pyoderma, including pustules, possibly because of the immune suppressant effect of the glucocorticoid therapy.

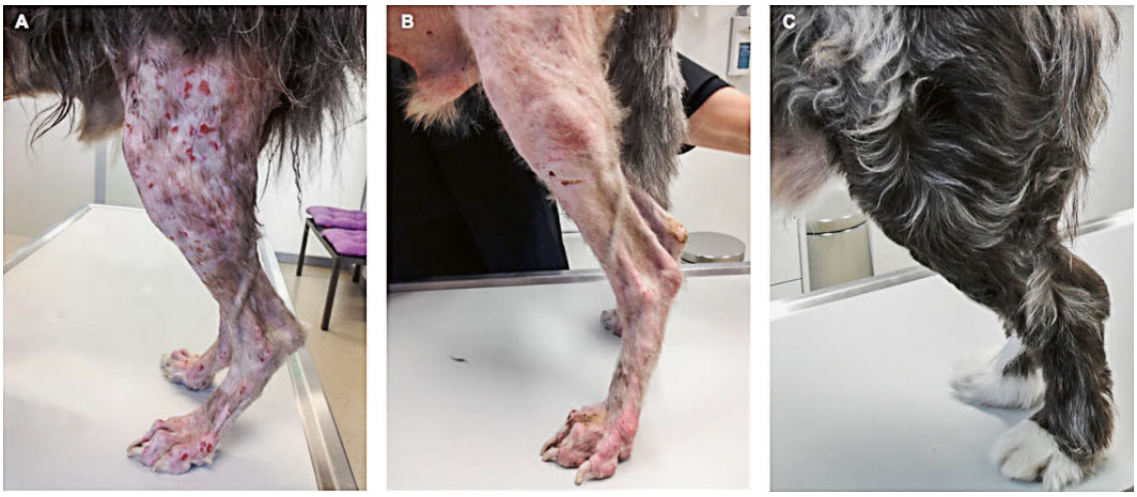

Figure 2: Macroscopic skin changes on the hind legs of a two-year old Bearded Collie with sterile neutrophilic dermatosis over time, including large ulcerations, erythema and multifocal crusts. The abdomen and thorax displayed smaller erosions, maculae and crusts. **A**. Two weeks after initial skin lesions started, nine days after initial dexamethasone treatment. **B**. Four weeks after initial skin lesions started, three weeks after initial dexamethasone treatment. **C**. Eighteen weeks after initial skin lesions started, three weeks after dexamethasone treatment was ceased.

was made to add different antibiotics to the treatment plan to cover the four quadrants. While the dog's condition did not improve initially, amoxicillin was replaced with clindamycin to better cover anaerobic bacteria. At this stage, antibiotic culture and sensitivity testing was not performed while it was suspected that bacterial growth would be unlikely under triple antibiosis.

The skin lesions improved over time, and two and a half months after initial presentation the syndrome went into remission. A secondary mild pyoderma with pus-

tules covering the abdomen and upper hind legs remained for weeks. The pyoderma resolved after the glucocorticoid therapy was discontinued. The dog was symptom-free for just over five months, when a new skin lesion was noticed on the inguinal region. Cytology confirmed the presence of numerous non-degenerative neutrophils. This lesion disappeared after five days of dexamethasone treatment (0.28 mg/kg), which was then tapered off. The MMF treatment was temporarily increased to a daily dose. Eight months after initial presentation, the syndrome went into remission with MMF 250 mg every third day.

Discussion

Sweet's syndrome in humans is divided into four etiological categories: 1) classical, 2) malignancy-associated, 3) drug-induced and 4) localised acute febrile neutrophilic dermatosis.[1,9] Major criteria include, 1) acute onset of erythematous cutaneous lesions including papules, plaques and nodules, and, 2) histopathological findings corresponding to a neutrophilic dermatitis with no infectious agents present. Minor criteria include 1) fever, 2) associated underlying disease/vaccination or pregnancy, 3) leukocytosis with neutrophilia and, 4) rapid response to glucocorticoid therapy.[1] Other laboratory abnormalities may be present, depending on which organs are also affected. They are however not part of the formal criteria for this disease complex. Both major criteria, and two of four minor criteria are required for the diagnosis SND. A summary of the published cases is given in Table 1. Classical SND was reported in a Dachshund with no extracutaneous manifestations. The skin lesions resolved within a week of treatment with glucocorticoids and doxycycline.[3] Two cases of SND in dogs with gastroenteritis and arthritis, respectively, were also reported. One case resolved after glucocorticoid treatment, while the other was treated with meloxicam and fentanyl.[7] Other cases include localised subcutaneous acute febrile ND that responded to glucocorticoid treatment[2] and three dogs with drug-induced SND that died despite treatment.[4,5] No malignancy-associated SND has been reported for dogs.

The six criteria can be generally applied to diagnose SND in dogs, however, no formal criteria have been published[3]. Schoellhorn et al.[2] argued that up to 2012, of the five published cases of SND in dogs only three out of six dogs survived the disease with glucocorticoid treatment. It was unclear if the criterion of response to glucocorticoid treatment can be used in dogs. Three new cases have been published since, where all dogs survived the disease. Two were treated with glucocorticoids and one with analgesia and a non-steroidal anti-inflammatory drug.[7,8]

The criteria for classical SS were fulfilled in our case and SND diagnosed. The relapse in symptoms during dose

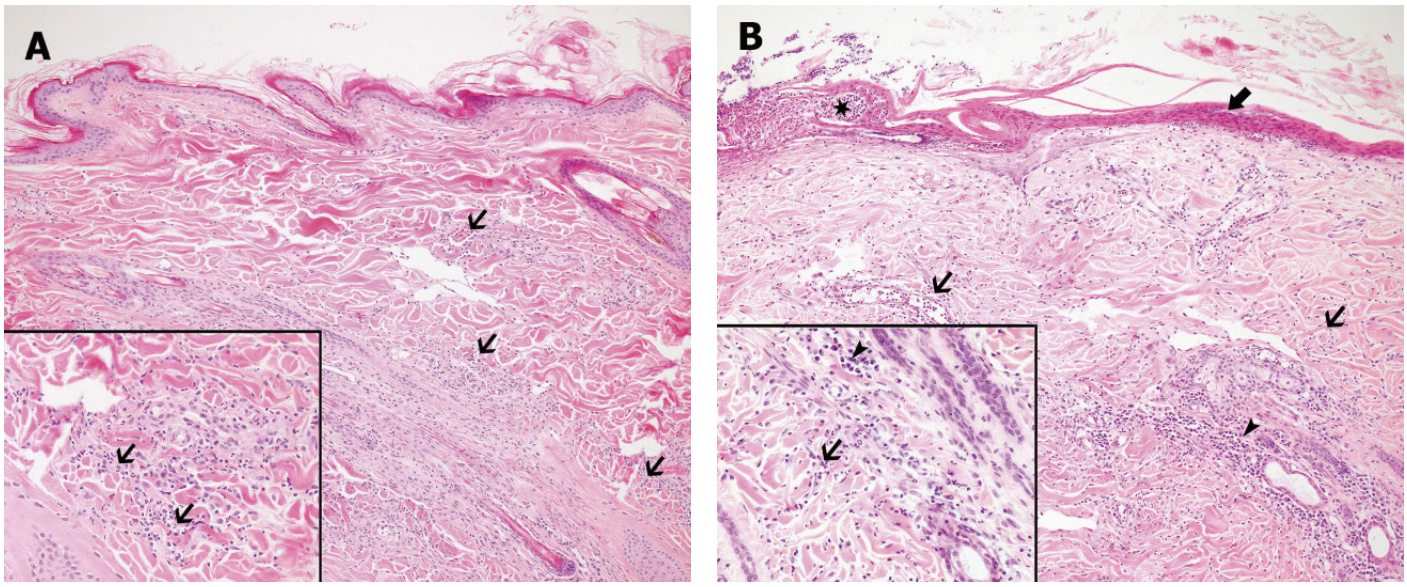

Figure 3: Histological changes from skin biopsies taken 7 days after onset of skin lesions of a two-year old Bearded Collie with sterile neutrophilic dermatosis over time.
A. Skin biopsy from the right elbow: a large number of neutrophils (thin arrows) can be observed both in the superficial and deep dermis. Haematoxylin and eosin stain, 100× magnification. **Inset:** Detail of the above-mentioned neutrophilic infiltrate. Haematoxylin and eosin stain, 200× magnification.
B. Skin biopsy from the right knee of a two-year old Bearded Collie with sterile neutrophilic dermatosis over time: a large number of neutrophils (thin arrows) can be observed both in the superficial and deep dermis and intravascularly. Multifocal to coalescing, severe periadnexal lymphoplasmacytic infiltrates are present (arrowheads). The overlying epidermis displays a severe parakeratotic hyperkeratosis (arrow) and an intraepidermal pustule filled with neutrophils (star). Haematoxylin and eosin stain, 100× magnification. **Inset:** Detail of the above mentioned neutrophilic and lymphoplasmacytic infiltrates. Haematoxylin and eosin stain, 200× magnification.

reduction and without any know trigger indicates it was autoimmune induced, i.e. idiopathic. Extracutaneous manifestations are also associated with the SND disease complex, but do not always occur.[9] In dogs, joints and the digestive tract seem to be the most afflicted locations apart from cutaneous lesions.[2,7,10] The dog reported here also presented initially with polyarthritis, fever, diarrhoea, hepatopathy and nephropathy. Cutaneous lesions can precede or occur simultaneously with or later than extracutaneous signs. In this case the skin lesions appeared three weeks after the initial presentation with fever and polyarthritis.

In this case report, the dog initially displayed a not yet regenerative anaemia three weeks after initial presentation at the primary care veterinarian (Figure 1). This is presumably linked to the primary disease of SND. In one case, a dog had immune-mediated haemolytic anaemia associated with SND.[6] Another dog displayed a mild non-regenerative anaemia.[10] A leukemoid reaction with severe neutrophilia like in our case occurs rarely, and coincided with appearance and worsening of the skin lesions. In most other case reports on dogs, the neutrophilic leukocytosis was mild (15.7 – 31.8 × 10^9/L),[2,5,7,8] and in one case a massive neutrophilia was measured (54.0 × 10^9/L).[6]

The treatment of choice for SND is glucocorticoids initially applied at an immunosuppressive dosage.[1] In most cases, it improved the skin lesions.[3,5,7,8] Here MMF was used as a steroid-sparing agent. This is to our knowledge the first report of MMF being used together with a glucocorticoid against SND. Other steroid-sparing agents used in the treatment of SS include immunoglobulin, chlorambucil, clofazimine, azathioprine and cyclosporine.[1,11] In a case of exophthalmos related to SND, cyclosporine was successfully used in combination with dexamethasone and prednisolone.[8] Advantages of MMF in dogs compared to other steroid-sparing agents include low renal or hepatic toxicity, rapid onset of action and the option of parenteral formulation.[11-13] Adverse reactions in dogs with pemphigus treated with MMF include pyoderma and *Malassezia*, diarrhoea and leucocytosis.[11] In our case, a mild secondary pyoderma was noted after the MMF treatment started, due a temporary side effect to the immunosuppressive action of the glucocorticoid and MMF therapy.

Two-and-a-half months after initial presentation and treatment with glucocorticoids and MMF, the syndrome went into remission. A minor relapse after five months was brought under control with dexamethasone treatment for nine days. Eight months after initial presentation, the syndrome was kept under control with MFF 250 mg every third day. While the disease complex is very rare, practitioners should include it in their list of differential diagnoses when faced with a patient with skin lesions of this kind and typical haematological changes. Extracutaneous signs are not always present, but can be severe.

Acknowledgements

The authors wish to thank the Institute for Veterinary Pathology, University of Zurich, Switzerland for analysis of the cytology samples, the Institute for Parasitology, University of Zurich, Switzerland for the analysis of faecal samples, the Institute for Veterinary Bacteriology, University of Bern, Switzerland for analysis of blood samples.

Dermatose neutrophilique stérile chez le chien (ressemblant au syndrome de Sweet) avec manifestations extracutanées graves

La dermatose neutrophilique stérile est une maladie rare chez le chien, semblable au syndrome de Sweet chez l'homme. Ce rapport de cas décrit le traitement d'un Bearded Collie de 2 ans présentant des antécédents de fièvre pendant 3 semaines, une faiblesse des membres postérieurs, une lymphadénomégalie périphérique et une leucocytose. Les analyses de sang ont révélé une leucocytose grave, une azotémie rénale, une élévation des enzymes hépatiques et une bilirubinémie. Des lésions cutanées ont commencé à apparaître à la quatrième semaine. L'histologie a révélé une dermatite neutrophilique stérile ressemblant au syndrome de Sweet. Le chien

Dermatosi neutrofila canina sterile (simile alla sindrome di Sweet) con gravi manifestazioni extracutanee.

La dermatosi neutrofila sterile è una malattia rara nei cani ed è simile alla sindrome di Sweet negli esseri umani. Questo studio descrive il trattamento di un bearded collie di 2 anni che è stato presentato con una storia di febbre di 3 settimane, debolezza degli arti posteriori, linfoadenomegalia periferica e leucocitosi. Gli esami del sangue hanno rivelato grave leucocitosi, azotemia renale, enzimi epatici elevati e bilirubinemia. Le lesioni cutanee sono apparse alla quarta settimana. L'istologia ha rivelato una dermatosi neutrofila sterile simile alla sindrome di Sweet. Il cane mostrava delle manifestazioni extracutanee, compresa febbre, poliartrite, una reazione leucemoide severa, anemia, epatopatia e nefropatia.

présentait des manifestations extracutanées telles que fièvre, polyarthrite, réaction leucémoïde sévère, anémie, hépatopathie et néphropathie. Les questions relatives à l'utilisation des critères de diagnostic du syndrome de Sweet chez l'homme chez les chiens atteints de dermatose neutrophilique stérile sont abordées dans le présent rapport de cas. La maladie a été traitée avec la dexaméthasone et le mycophénolate mofétil en tant que thérapie innovante permettant d'économiser des stéroïdes. Trois mois plus tard, le chien a rechuté mais a rapidement répondu à un traitement de courte durée à la dexaméthasone et à une augmentation temporairement la dose de mycophénolate mofétil.

Mots clés: médiation auto-immune, manifestations extracutanées, chien, dermatose neutrophilique stérile

In questo studio viene discussa la questione dell'uso dei criteri per la diagnosi della sindrome di Sweet negli esseri umani che vengono utilizzati per i cani affetti da dermatosi neutrofila sterile. La patologia si è risolta con l'assunzione di desametasone e micofenolato mofetile come nuova terapia a effetto di risparmio di steroidi. Tre mesi dopo il cane ha avuto una ricaduta. Il cane ha reagito rapidamente al trattamento a breve termine con desametasone e un dosaggio aumentato temporaneamente di micofenolato mofetile.

Parole chiave: autoimmune mediata, manifestazioni extracutanee, cane, dermatosi neutrofila sterile

References

[1] Cohen PR. Sweet's syndrome – a comprehensive review of an acute febrile neutrophilic dermatosis. *Orphanet J Rare Dis* 2007; 2: 34.

[2] Schoellhorn K, Gurtner C, Roosje PJ, Suter MM, Schoellhorn B, Rytz U, Timm K. Localized subcutaneous acute febrile neutrophilic dermatosis in a dog. *Case Report Vet Med 2012*; doi:10.1155/2012/231751.

[3] Gains MJ, Morency A, Sauvé F, Blais M-C, Bongrand Y. Canine sterile neutrophilic dermatitis (resembling Sweet's syndrome) in a Dachshund. *Can Vet J* 2010; 51: 1397-1399.

[4] Vitale CB, Zenger E, Hill J. Putative Rimadyl-induced neutrophilic dermatosis resembling Sweet's syndrome in two dogs. In *Proceedings of the 15th Annual Meeting of the American Academy of Veterinary Dermatology and American College of Veterinary Dermatology*. Maui, USA: 1999; 69-70.

[5] Mellor PJ, Roulois AJA, Day MJ, Blacklaws BA, Knivett SJ, Herrtage ME. Neutrophilic dermatitis and immunemediated haematological disorders in a dog: suspected adverse reaction to carprofen. *J Small Anim* Pract 2005; 46: 237-242.

[6] Johnson CS, May ER, Myers RK, Hostetter JM. Extracutaneous neutrophilic inflammation in a dog with lesions resembling Sweet's Syndrome. *Vet Dermatol* 2009; 20: 200-205.

[7] Cochet-Faivre N, Ponce OM, Guaguère E, Muller A, Degorce-Rubiales F. Dermatose neutrophilique s'apparentant au syndrome de Sweet: description chez le chien à partir de deux cas. *Prat Méd Chir l'Anim Comp* 2012; 47: 119-127.

[8] Sharpe EK, Meekins JM, Bagladi-Swanson M, Rankin AJ. Exophthalmos due to sterile neutrophilic dermatosis in a dog. *Vet Ophthalmol* 2017; doi: 10.1111/vop.12467.

[9] Anzalone CL, Cohen PR. Acute febrile neutrophilic dermatosis (Sweet's syndrome). *Curr Opin Hematol* 2013; 20(1): 26-35.

[10] Okada K, Saegusa S, Yamaoka A, Nagasawa A, Yamamura H, Sekiguchi M, Iwasaki T. P-55 Febrile neutrophilic dermatosis in a miniature schnauzer resembling Sweet's syndrome in humans. *Vet Dermatol* 2004; 15(s1): 58-58.

[11] Ackermann AL, May E, Frank L. Use of mycophenolate mofetil to treat immune mediated skin disease of dogs: a retrospective evaluation. *Vet Dermatol* 2017; 28: 194-e44.

[12] Langman LJ, Shapiro AJ, Lakey JR, LeGatt DF, Kneteman NM, Yatscoff RW. Pharmacodynamic assessment of mycophenolic acid-induced immunosuppression by measurement of inosine monophosphate dehydrogenase activity in a canine model. *Transplantation* 1996; 61: 87-92.

[13] Whitley NT, Day MJ. Immunomodulatory drugs and their application to the management of canine immune-mediated disease. *J Small Anim Pract* 2011; 52: 70-85.

Corresponding author

Karen Hammes
Bessy's Kleintierklinik AG
Eichwatt 3
8015 Watt/Regensdorf
Switzerland
telephone number: +41 44 871 60 60
E-Mail: karen.hammes@gmail.com