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Management of demodicosis (*Demodex canis*) associated with secondary bacterial infections in Dog

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Abstract

An one and half year old male Doberman dog weighing 22 kg was presented to the TVCC, OUAT Bhubaneswar with papular and pustular skin rashes in both limbs, head and abdomen. There is itching, fowl body odour, lacrymation, loss of appetite and dullness. The dog was previously treated with variety of antibiotics, antinflammatory and antifungal drugs but infection was reverted to original form few weeks after the withdrawal of drugs. Skin Scrapping Test revealed the infection of *Demodex canis* and Antibiotic Sensitivity Test showed the colonized bacteria to be more sensitive towards the specific antibiotic (Linezolid and Azithromycin). Semi resistance for Cefepodoxime, Cefexime and resistance for Cefalexin, Althrocin and Ceftriaxone with tazobactam. The dog was treated with oral antibiotic Linezolid with Amitraz. Chloramphenicol mixed with glycerin was used as tropical ointment. The lesions gradually healed with complete recovery of the animal and returned to its original form.

Keywords: doberman, demodicosis, skin lesions, linezolid

Introduction

Canine demodicosis is a common inflammatory parasitic dermatosis characterized by excessive proliferation of the commensal mite, *Demodex* within the hair follicles and sebaceous glands [1]. *Demodex canis* was the first species to be reported in dogs and is the main causative agent of canine demodicosis [2]. Presence of demodectic mites on the skin may not be initially pathogenic but may revert to pathogenic form when the general health condition of the animal is deteriorated [3]. Immunosuppression or a defect in the skin immune system allows for mites to proliferate in hair follicles, resulting in clinical signs [4]. The lesions may be localized or generalized in dogs. A localised form involves 4 or fewer areas, often including the face and forelegs, with lesion diameter of < 2.5 cm. However, dogs with generalized demodicosis usually have lesions in more than 4 areas of the body, with 2 or more feet affected or where an entire body region is involved [5]. As the pathogenesis is incompletely understood generalized demodicosis is a type of disease which is difficult to treat successfully [6].

Casehistory and Observations

A one and half year old male Doberman dog weighing 22 kg was presented to the Teaching Veterinary Clinical Complex of College of Veterinary Science and Animal Husbandry, Orissa University of Agriculture and Technology, Bhubaneswar, Odisha with papular and pustular skin rashes in the limbs and abdomen with symptoms of itching skin, fowl body odour, alopecia, lacrymation, loss of appetite and dullness. Clinical examination revealed the body temperature of affected dog was found to be 101.5°F with tachycardia, labored breathing and salivation.

Previous Treatments

The skin lesions were persistent since last three months. The dog was initially treated with with Antibiotic Cefepodoxime 200mg at the rate 5-10 mg per kg body weight after food and anti allergy drug Cetrizine 10mg @ 0.5-1.0 mg per kg body weight for a period of seven days with Ivermectin inj subcutaneously weekly once. The animal was also administered corticosteroids orally daily for a period of five days. Tropical application of an ointment with 0.025% w/w Clobetasol Propionate, 2% gentamicin and 1% miconazole as its main composition was applied over the lesions. A shampoo with Chlorhexidine was applied weekly once with supportive therapy, liver extract and multivitamins. The animal recovered upto some extent however, after a period of 45 days the dog again developed similar lesions.

The second round of treatment before the dog was presented to the TVCC included treatment with an antibiotic Cefalexin 300mg tablet @ 10-15 mg per kg body weight anti allergy drug with phexophenadine 180 mg @ 5-10 mg per kg body weight for a period of seven days with tropical application of an ointment containing Ofloxacin 0.1% w/v, Miconazole 2% w/v and zinc sulphate as its primary components and bathed with antifungal and anti bacterial shampoo. The dog showed some signs of recovery, however, the condition again revived after 30 days.

**Treatment
Diagnostic approach**

Table 1: CBC of the dog before treatment, during treatment and after recovery.

	Hb (gm %)	TLC (per µL)	Neutrophil (%)	Lymphocyte (%)	Eosinophil (%)	Basophil (%)	Monocyte (%)
Before treatment	12	17,500	68	25	05	00	02
During treatment	13.2	13,750	64	30	04	00	02
After recovery	13.4	10,500	62	34	03	01	00

2. Fecal Sample examination: revealed the absence of any parasitic ova.

3. Skin Scrapping Tests: Skin Scrapping Tests concluded the infection of Demodicosis (+++ for Demodex canis). The microscopic view of Demodex canis is shown in Figure 1.



Fig 1: Microscopic view (10x) of Demodex canis taken from Skin Scrapping Test

4. Antibiotic Sensitivity Test: The samples were also collected for Antibiotic Sensitivity Test which reported highly sensitive for Linezolid and Azithromycin. The details of the sensitive, semi resistant and resistant antibiotics are listed in Table 2

Table 2: Results of Antibiotic Sensitivity Test.

Sensitive	Semi-resistant	Resistant
Linezolid	Cefepodoxime	Cefalexin
Azithromycin	Cefexime	Ceftriaxone with tazobactam
	Ciprofloxacin	Cefotaxim
	Gentamycin	Althrocin
	Amikacin	

The animal was first supplemented with the fluid therapy (DNS 5%) taking in account the inactivity and anorexic condition when presented to the clinical complex. The dog was bathed with a shampoo with benzoyl peroxide as an active component twice weekly and another shampoo containing Amitraz 12.5 % w/v diluted @ 4 ml/ liter of water applied tropically once a week till the recovery. Linezolid 600 mg tablets @ 1 tablet daily with anti allergy drug phexophenadine 180 mg tablets @ 1 tablet daily for a period of 14 days. To control the mite infestation Ivermectin 10mg tablets @ 1 ½ tablets each day for a period of 14 days. Chloramphenicol powder 500 mg (Paraxin 500) properly

The animal was first subjected to a series of diagnostic tests suspecting to be an infection of bacterial, viral, fungal or parasitic origin. The tests are routine Complete Blood Count, Fecal Sample Examination, Skin Scrapping Test and Antibiotic Sensitivity Test.

1. Complete Blood Count: Haematological tests for Hb concentration, Total Leucocyte Count and Differential Count were done to reveal the general health status. The values for the haematological parameters when the dog was presented to clinic, 30 days after treatment and after recovery are shown in Table 1. Blood test did not show any incidence of *Dirofilaria immitis* infection.

mixed with glycerol (2.5 ml of Glycerol mixed in a proportion of 500mg Chloramphenicol) is applied tropically over the skin lesions. Herbal liver extract syrups (containing Ashwagandha, Punarnava, Silymarine, Giloe etc.)@ 5 ml twice a day was given to enhance appetite. To enhance the immunity, herbal immune modulator drugs given @ 5 ml twice daily after food. Dog hair serum containing vitalized with almond oil weekly thrice.

After 30 days of treatment

The dog showed gradual signs of recovery and after a period of 30 days of treatment the animal was again subjected to a series of diagnostic tests as performed earlier. There was good recovery in blood parameters (Table 1). There was a marked decreased in magnitude of Demodex infection (+ for Demodex canis) in the skin. Taking in account of the rate of recovery the animal was again treated with the same set of drugs as described above for a period of more 14 days.

After 60 days of treatment

After 30 days of the second set of treatment the animal was subjected to Skin Scrapping Test and the report concluded the animal is negative for any mite infestation and other clinical signs.

Photos of the dog when presented to the clinic.



Fig 2: Papular and pustular rashes in the (Clockwise) in body, head and ear region, forelimb, neck region.

After 30 days of treatment



Fig 3: Signs of recovery after 30 days of initial treatment (clockwise) body, head and ear region, extremities.

Recovery photos after 60 days of treatment



Fig 4: Complete recovery of animal with smooth body hair coat free from any mite infestation.

Discussion

Amitraz associated with the antibiotic therapy is highly effective for treating generalized demodectic mange [7-8]. Application of Amitraz should be preceded by a shampoo such as benzoyl peroxide applying some hours before in order to remove crust, debris, and bacteria and the dipping should be continued for at least two treatments after negative scrapping have been obtained [9]. Amitraz acts by inhibiting monoamine oxidase and prostaglandin synthesis and by stimulating α 2-adrenergic receptors of arthropod nervous system [8]. Moreover, Antibacterial shampoos like benzoyl peroxide and chlorhexidene are beneficial when treating demodicosis [10]. Ivermectin given orally for generalised demodicosis selectively binds to glutamate-gated and gamma-aminobutyric acid (GABA) gated chloride channels in mite's nervous system, resulting in hyperpolarization of cell, paralysis and finally death of mites [11]. The goal behind Antibiotic Sensitivity Test is to detect possible drug resistance in common pathogens and to assess the drugs of choice for particular infections [12]. In the current case Linezolid is administered being the most sensitive antibiotic for the colonized bacteria. Linezolid is an antibiotic used for treatment of gram positive bacteria [13] and it interferes with protein synthesis by binding to the bacterial 50S ribosomal subunit [14]. Administration of antibiotic was also indicated due higher TLC in blood which may be due to secondary bacterial infection to demodicosis. Cephalosporins are broad spectrum, bactericidal β -lactam antibiotics [15]. Topical application of Cephalosporin with glycerol acts as localized antibiotic therapy for lysis of the colonial bacteria. Demodicosis in dogs cause immune suppression [16]. Corticosteroids are immune suppressors [17]. The failure of the

treatments before presented to the TVCC is due to administration of corticosteroids which further suppressed the immune system of the animal. To boost immunity herbal immune boosters has been given to the dog which indicated good results.

Conclusion

Causes of dermatosis in dogs are multifactorial i.e. may be of Bacterial, Viral, Parasitic origin or may be due to effect of allergens. Inefficient treatment protocols leads to prolongation of diseased stage and sufferings of the animals. Blind fold administration of antibiotics may result in antibiotic resistance. Therefore, in such situation the animal must be subjected to various diagnostic aids to ascertain the cause of the infection. The first step that was taken into consideration while treating the case was to know the cause of the infection. The treatment directed towards the cause of infection (*Demodex canis*) lead to complete recovery of the animal.

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