RESEARCH ARTICLE

Secondary or Concurrent Infections in Skin of Atopic Dogs

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Abstract

In the present study, twenty atopic dogs were investigated for secondary skin infections using different diagnostic techniques. The majority of dogs were suffering from bacterial infections, especially Staphylococcal infection (90 %). Different commensals on skin like *Staphylococcus* spp., *Aspergillus* spp. (50 %), *Malassezia* spp. (45 %), *Demodex* spp. (25 %) etc. caused secondary or concurrent infections in many atopic dogs indicating the importance of atopy in recurrent or non-responding dermatitis with those commensal organisms.

Keywords: Atopy, Commensal, Demodex, Dogs, Secondary skin infections.

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Introduction

Skin being the largest organ of body, many dermatitis cases in canine are common and recurrent in nature, wherein commensal organisms play a major role in its' causation. Commensals on skin can flare up by many underlying diseases leading to dermatitis. Atopy is one of the underlying disease predisposing to dermatitis. It is a multifaceted disease associated with exposure to various offending agents such as environmental and food allergens (Favrot *et al*., 2010). Atopy reduces the diversity of the microbiome of the skin, causing some of the bacteria to multiply and severing the lesions. Like bacteria, yeast also multiplies in atopic lesions causing increasing the severity of lesions. Flea allergy is also a concurrent observation noticed in atopic animals. The present investigation was aimed to find out the different secondary or concurrent infections in the affected skin of atopic dogs.

Materials and methods

The present investigation was carried out at the Veterinary Clinical Complex of the College in Junagadh during the period from May 2018 to April 2019. Canine patients presented to VCC with dermatitis were included in the study. Twenty animals with skin conditions not responding to rational treatment fulfilling any five Favrot's criteria (Favrot *et al*., 2010) were diagnosed as atopic dogs. Different criteria screened were: age at onset <3 years, mostly indoor, corticosteroid-responsive pruritus, chronic or recurrent yeast infections, affected front feet, affected ear pinnae, non-affected ear margins, and non-affected dorsolumbar area. All 20 atopic dogs identified were examined for secondary or concurrent infections using different dermatological techniques. They were checked for external parasites or flea feces by direct examination or brushing the hair coat (flea combing). Deep skin scrapings of lesions were taken after clipping the hairs of affected area and application of a drop of mineral oil on the lesions. Multiple scrapings were performed in the direction of the hair growth until capillary bleeding occurred. Skin was squeezed during or between scrapings to extrude the mites from the deep follicles to the surface. Debris was then transferred to a slide, mixed with mineral oil, and was examined with a coverslip under the microscope at low power magnification (100 x).

In those areas which were difficult to scrape, trichograms were preferred. For that, hairs from affected skin were plucked with forceps in the direction of the hair growth and were placed in a drop of mineral oil on a slide. It was then examined under low power magnification (100 x) after the application of coverslip. Impression smears from affected lesions were checked for *Malassezia* spp. after staining with

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Giemsa stain and examined under oil immersion (1000 x).

Sterile swabs from lesions were inoculated on brain heart infusion (BHI) agar for bacterial culture and media were incubated at 37°C for 48 hours. Skin scrapings collected from the lesions under sterile precautions were also inoculated on dermatophyte test medium (DTM) added with dermato supplement or Sabouraud dextrose agar and were incubated at room temperature for 5 days. Morphological and microscopical examination of both microbial colonies were performed for the identification of microbes.

Results and Discussion

The highest number of infectious agents (5) was isolated from one dog, four infectious agents from 6 dogs, 3 from 7 dogs, 2 from 3 dogs and one from 2 dogs, and no infectious agent could be isolated from one dog. The majority of atopic animals were suffering from multiple infections instead of a single infection. Different infectious agents isolated from the skin of atopic dogs are enlisted in Table 1.

Bacterial Infection

Staphylococcus spp. (Fig. 1) was the most common finding as secondary infection. This bacteria is a commensal on the skin and flare up during favorable conditions. *Micrococcus* spp. also could be isolated along with *Staphylococcus* spp. in one dog. These results indicate the chance of occurrence of atopy as an underlying factor for recurrent pyoderma. Maruti (2015), Sharma *et al*. (2015), and Chermprapai *et al*. (2019) also noticed a higher infection of *Staphylococcus* spp. in atopic dogs. Mammalian skin consists of antimicrobial peptides such as β-defensins and cathelicidins produced by keratinocytes in the skin, which disrupt the membrane of the target microbe or penetrate the microbial membrane, interfering with intracellular functions. These peptides are found lesser in atopic animals, making the animal susceptible to infection of microbes (Ong *et al*., 2002). It could be the reason for recurrent pyoderma in atopic dogs.

Fungal Infection

Major fungus observed in the skin lesions collected from atopic dogs was *Aspergillus* spp. (Fig. 2), which were isolated from 10 dogs. *Malassezia pachydermatis* (Fig. 3) was observed

Table 1: Secondary infection/Concurrent infection observed in atopic dogs

Sr. No.	*Infectious agent*	*Number of animals infected (Out of 20 atopic animals)*	*Percentage*
1	*Staphylococcus* spp.	18	90
2	*Micrococcus* spp.	1	5
3	*Aspergillus* spp.	10	50
4	Malassezia pachydermatis	9	45
5	*Absidia* spp.	4	20
6	Dermatophyte	4	20
7	*Alternaria* spp.	2	10
8	*Rhizopus* spp.	1	5
9	Demodex canis	5	25
10	Flea	1	5

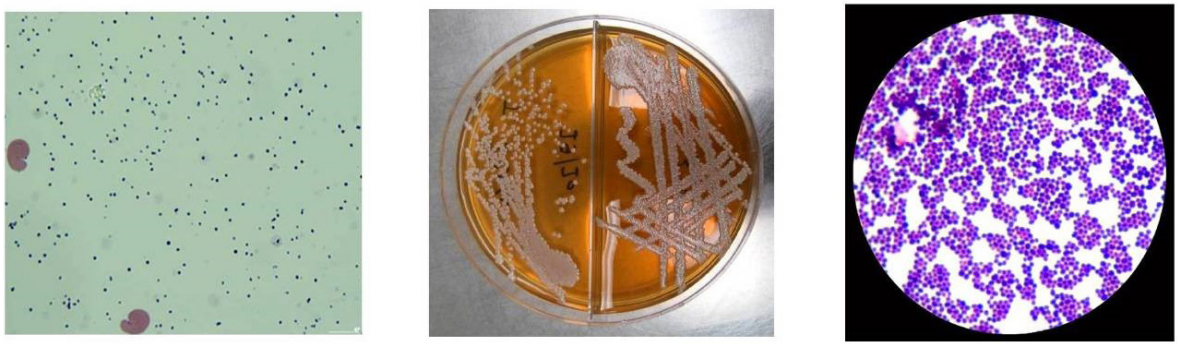

Fig. 1: Staphylococcal organisms in impression smear, culture and microscopy

Fig. 2: Aspergillus organisms in impression smear, culture and microscopy

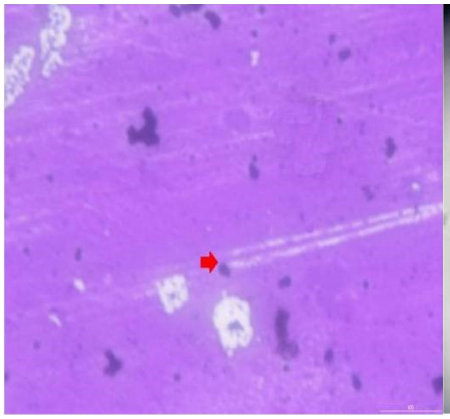

Fig. 3: *Malasezia* spp. (1000 x)

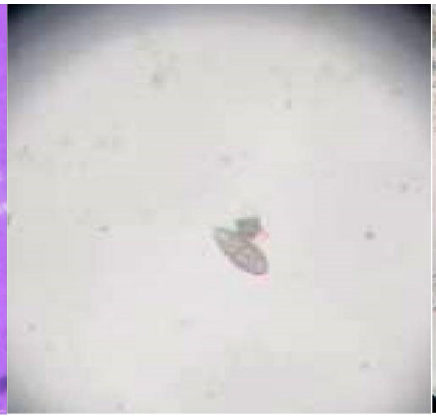

Fig. 4: Macroconidia of *Alternaria* spp.

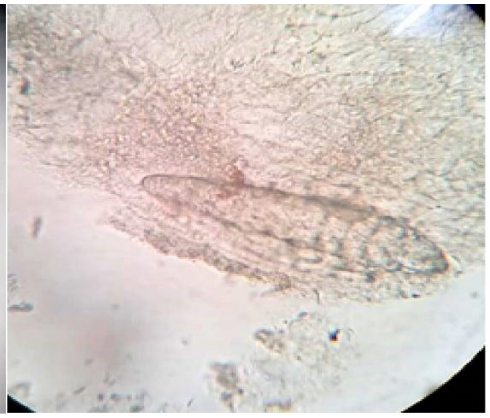

Fig. 5: *Demodex canis* organisms (100 x)

in the skin lesions of nine atopic dogs, *Absidia* spp in four dogs, macroconidia of *Alternaria* spp. (Fig. 4) in two dogs, *Rhizopus* spp. in one dog. Dermatophytes were concurrent infections with atopic dermatitis in four dogs. Many scientists reported that animals/people show allergy to these commensal or airborne fungi like *Aspergillus* spp., *Malassezia* spp. and *Alternaria* spp., which can result in dermatitis. Also, the skin is the barrier that protects from such commensal fungi. Since the epidermal barrier is not well-functioning in atopic animals, it further results in the sensitization of allergens of these commensal fungi causing atopic dermatitis (Celakovska *et al*., 2018). Many scientists (Nuttall and Halliwel, 2001; Maruti, 2015) have reported Malassezia in atopic dermatitis in accordance with results of the present study.

Parasitic Infestation

Demodex canis ova/organisms (Fig. 5) were noticed in 5 atopic dogs (they didn't respond to ectoparasiticidal treatment). This organism is a commensal on skin of dog. *Demodex canis* might have flared up due to earlier improper treatment for atopic dermatitis. Also, in case of recurrent or non-responding demodicosis, atopy has to be ruled out. Later this case responded to treatment for atopy. Agreeing with results of the study, demodicosis was also noticed in atopic dogs by Lockwood *et al*. (2017).

The results of the present study indicated that recurrent or non-responding dermatitis, especially due to commensal organisms, could be due to primary diseases like atopic dermatitis. So in such conditions, atopy has to be ruled out, and further treatment measures should be considered.

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