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Structural Histopathological Changes in The Skin of Dog with Mange

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ABSTRACT

One of the most common parasite illnesses in animals is mange, which decreases animal productivity and puts human health at risk. The two main kinds of mange in dogs are sarcoptic mange (also known as scabies) and demodectic mange (also known as red mange or demodex), each of which is brought on by a different mite. In this work, an article that summarizes the state of knowledge on structural histopathological changes in the skin of dogs with mange was evaluated.

Keywords: Demodicosis, Dog, Histopathological, Mange, Sarcoptic

Aims Research Journal Reference Format:
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1. INTRODUCTION

The skin is the largest organ in the body, accounting for around 15% of total adult body weight. It performs a variety of critical functions, including protection against external physical, chemical, and biologic dangers, vitamin D generation, sensory observation, prevention of excessive water loss from the body, and thermoregulation (Kanitakis, 2002). The skin is made up of three anatomical layers: the epidermis (the outermost layer), the dermis (the middle layer), and the subcutis (the innermost layer). In comparison, the dog's skin is the biggest organ in its body. It protects dog from the elements, regulates temperature, and offers your dog a sensation of touch. The skin may account for 12 to 24% of a dog's overall weight, depending on the species and age. The skin is divided into three layers: the epidermis,), dermisand the subcutis. Skin appendages (such as hair and claws) and subcutaneous muscles and fat are also key components of the skin (Moriello, 2020).

Uzuegbu (2015) remarked that there is no other animal species that can match to dogs' special status in the majority of human society. However, there are illnesses that may harm dogs and are also communicable to people. Dog skin illnesses can be caused by a variety of factors, including ringworm, fleas, ticks, dog lice, mange, and alopecia. Mange is the most frequent skin disease in dogs. Bovsun (2019) defined mange as a skin illness in stray, neglected, or mistreated dogs in her essay for the American Kennel Club. These canines appear to be hopeless, with hairless skin covered in sores or thickened, hard, crusty areas. Such canines are frequently characterized as having skin that looks to be stone.

Mange, a skin condition produced by tiny mites inside the skin layers and/or hair follicles, is classified into two types: Demodectic Mange caused by the mite Demodex canis, and Sarcoptic Mange, caused by the mite Sarcoptes scabiei. It is a contagious cutaneous illness that affects many different species of animals and is a scourge that threatens both human and animal life, which is why it is designated as a disease of important veterinary and public health concern (Daszakamet al., 2000).

2. MATERIALS AND METHOD

This study adopted qualitative review of four (4)empirical study on histopathological changes in the skin of dog with mange.

2.1 Structure of Skins in Dogs

The skin of a dog is composed of three layers, the outermost of which is the epidermis. It protects against foreign chemicals. Keratinocytes, which form a protective layer that keeps fluids, salts, and nutrients in while keeping infectious or noxious substances out, are among the cells that make up the epidermis. Melanocytes are cells that create melanin, which is used to colour the skin and hair. Langerhans cells, which are part of the immune system and play an important role in the skin's reaction to external substances, and Merkel cells, which offer sensory information to animals. The blood vessels in the dermis supply nutrients and regulate skin and body temperature, immune cells protect against infectious agents that pass through the epidermis, sensory and motor nerves in the dermis detect and respond to threats such as pain or heat, and it secretes collagen, a protein that supports the skin. The dermis layer serves as a support mechanism for the epidermis.

The subcutis is the skin's deepest layer. It is made up of subcutaneous fat and muscles. (The term "subcutaneous" refers to "below the skin.") The twitch muscle is the primary muscle located immediately beneath the skin. Insulation, a storage for fluids, electrolytes, and energy, and a shock absorber are all roles of subcutaneous fat. Skin condition diagnosis is frequently the most difficult aspect in dermatology (Moriello, 2020).

2.2 Mange in Dogs

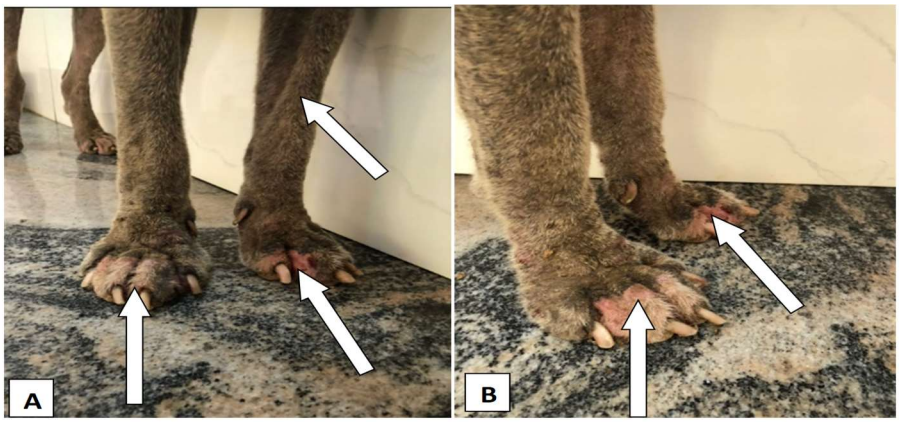

Fig 1: Alopecia resulting from mange at extremities of forelimbs (A & B),

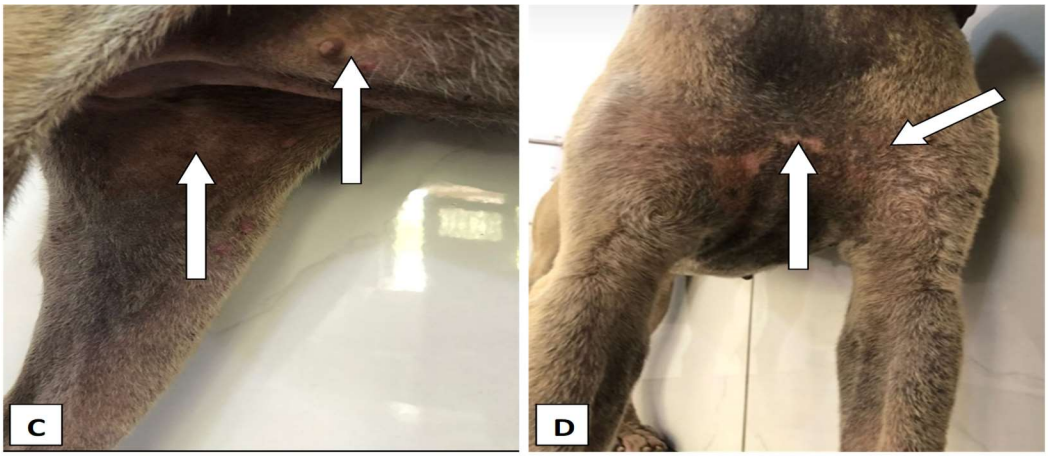

Fig 2: Ventral abdomen and medial upper hindlimb (C) and sternal region (D)

Mange is one of the most prevalent parasite infections in animals; it reduces animal output and poses a risk to human health. Sarcoptic Mange (also known as scabies) and Demodectic Mange (also known as red mange or demodex) are the two principal types of mange in dogs, each caused by a distinct mite.

Burrowing mites are the cause of scabies or sarcoptic mange. Worldwide reports of Sarcoptesscabiei in domestic and wild animals make the latter a danger to conservation because of its clear impact on population dynamics (Turchettoet al., 2020). The parasitic organism Sarcoptic scabiei is still responsible for scabies in humans and sarcoptic mange in animals (Pence & Ueckermann, 2002). It is a highly infectious skin illness in which both male and female mites, as well as their larvae and nymphs, scurry across the skin surface of hosts.

Sarcoptic mange in dogs is characterized by severe itching. As the problem worsens, the itching can cause secondary symptoms such as hair loss, dandruff, redness, tiny bumps, and scabs.These symptoms are typically observed on the caudal extremity of the abdomen, as well as the elbows, ankles, and ear margins. In extreme circumstances, these symptoms may extend throughout the body. Aside from these symptoms, some dogs may be sluggish, have swollen lymph nodes, and develop secondary skin infections as a result of biting, scratching, and chewing. Extreme pain can cause a decrease of appetite, which might result in weight loss.

Demodicosis (also known as red mange, follicular mange, or acarus mange) is a rather frequent condition that affects dogs. It develops when an abnormal immune response permits an excessive mite population, which then causes the onset of clinical indications. The mite spends the entirety of its life cycle on the dog, living in the sebaceous and epitrichial sweat glands sporadically as well as the hair follicles. Depending on the level of mite proliferation, clinical indications appear after mite proliferation has taken place. A non-inflammatory hypotrichosis/ alopecia and/or an inflammatory dermatitis with moderate erythema, comedown development, scaling, and concomitant hypotrichosis/ alopecia may both appear at first. (Sivajothiet al., 2015).

It has been noted that demodectic and sarcoptic mange differ greatly from each other. Sarcoptic mange is extremely contagious to people and other mange-free dogs, but demodectic mange is not communicable to other dogs, cats, or humans. Both mites are small, however the demodex mite is often abundant and simple to identify whereas the sarcoptic mite is uncommon and challenging to locate. Both conditions are identified by the veterinarian using a skin scrape and a microscope to examine living or dead mites.

3. RESULTS AND DISCUSSION

3.1Empirical Review on Structural Histopathological Changes in the Skin of Dog with Mange

3.1a Arlianet al. (1995) studied the pathology of scabies-infested dogs in order to evaluate the impact of infection with Sarcoptesscabiei var. canis. During an 8-week infection with S. scabiei, the disease's course was monitored weekly using skin scrapings, clinical examinations, and blood analysis. At 8 weeks, chosen organs were examined microscopically for histology. In addition, all afflicted canines by 8weeks had advanced scabies infestations. Of all the 36 blood parameters analyzed, only the erythrocyte sedimentation rate (ESR) results strayed considerably from the normal ranges for dogs. Infested dogs, on the other hand, had considerably ($p< 0.01$) lower average hemoglobin and hematocrit concentrations after 8 weeks of infestation compared to their pre-infestation values or the control dogs' values.

By week 8, red blood cell levels in infected canines had reduced considerably ($p<0.01$) from pre-infestation values. Total white blood cell and neutrophil concentrations, on the other hand, were considerably ($p<0.01$) higher than uninfested controls after 8 weeks. Furthermore, whereas average eosinophil concentrations in infested dogs were not statistically different from controls, several individual infested dogs displayed eosinophilia 4-8 weeks after infestation.At weeks 6 and 8, the ESRs of infested dogs were considerably ($P>0.01$) higher than those of experimental dogs prior to infestation or control dogs. By 2 weeks following scabies treatment, all indicators except neutrophils had reverted to preinfestation values. By 4 weeks after therapy, neutrophil concentrations were no longer substantially different. Serum enzyme, biochemical, and electrolyte concentrations did not change significantly between infected and control dogs. Also, the skin histoarchitecture of the organs was largely normal, with no evidence of scabies infection.

3.1b The histological categorization of skin affections and their incidence in various dog and cat breeds were determined by Tawfiket al. (2020). A total of 33 instances of animals, including 29 dogs and 4 cats, ranging in age from 1.5 months to 4.7 years with sex distribution of 16 females and 17 maleswere gathered between February 2018 and February 2020. The cases were looked at in the private clinics and the Alexandria Veterinary Medicine Directorate in Alexandria, Egypt. According to the findings, there are two categories of skin affections: infectious and non-infectious (other).Flea allergy dermatitis (dogs 24.14%, cats 75%) had the highest percentage of infectious skin affections, followed by juvenile onset canine localized demodicosis (dogs 17.24%), juvenile onset canine generalized demodicosis (dogs 3.45%), dermatophytosis (dogs 3.45%), and feline gangrenous mastitis (cats 25%). Primary irritant contact dermatitis (31.03%) was reported to have the largest percentage of various skin affections, followed by food allergic dermatitis (13.79%), epidermal necrolysis (dogs 3.45%), and thermal burns (dogs 3.45%).

Finally, the results showed that skin problems were more common in dogs than in cats. Infectious skin affections were the most often rated afflictions, followed by other skin affections. Infectious skin affections were primarily represented as flea allergy dermatitis, whereas miscellaneous affections were primarily represented as primary irritating contact dermatitis.

3.1c The experimental transmission patterns involved in the formation of mange in dogs were investigated in order to determine the most efficient infestation model for mange research in dogs. Eighteen (18) canines were employed in total, three (3) of whom were naturally afflicted with Sarcoptes scabie var canis. For direct contact transmission, five (5) healthy dogs were mixed up with three (3) donor dogs. Another five (5) mange-free dogs were gathered in a kennel recently vacated by mange-infested dogs for environmental and formite transmission, while the final five (5) healthy dogs had scrapings from a nearby area of mange lesion sites transferred into each dog's pinnae for experimental and indirect contact transmission.Co-mingling of mange naive and mange infected dogs resulted in successful mite transmission with concomitant clinical characteristics of pruritus, alopecia, erythema, papules, and crusts.

These clinical characteristics also varied (p 0.05) from dogs experimentally infected, indicating that this form of transmission was mainly ineffective. The environmental and formite transmission models are closely following the success of the direct contact paradigm. Healthy dogs were kept in freshly departed mange-infested cages here. In dogs, the direct contact model differed from the environmental model only in the development of erythema and papules ($p<0.05$).Although mixing infected and mange-free dogs ensures effective direct contact transmission, exposing healthy dogs to an infested facility will also result in infection. This study demonstrated that comingling is still an excellent infestation model for mange investigations in dogs. (Nwufoh, Sadiq &Emikpe, 2022).

3.1d Moog, Brun, Bourdeau, and Cadiergues (2021) documented the clinical, parasitological, and serological follow-up of an eight-adult Saint Bernard dog cohort treated orally with lotilaner for proven sarcoptic mange. Skin lesions, pruritus intensity, parasite presence, and Sarcoptes-IgG levels were assessed in dogs at 14 days, 1, 2, 3, 4, 6, and 12 months. A serological indoor allergy panel (IgE) was acquired for seven dogs on day one and was repeated in five dogs 12 months later to determine possible cross-reactivity between S. scabiei and allergies in the environment Lotilaner was given to each dog according to the manufacturer's recommendations, and it was given again after one and two months with no further therapeutic measures or changes in the husbandry circumstances.After two weeks, the itchiness subsided.

The cutaneous score was lowered by 47%, and all but three animals had negative skin scrapings. After one month, all skin scrapings were negative. After two months, the lesions had vanished. Serological levels eventually declined, albeit more slowly than skin lesions, and two dogs out of six remained positive in the absence of skin lesions or symptoms. All of the canines tested positive for dust mites and/or storage mites at first. The IgEtitres in the five examined canines were unaltered 12 months later. The effectiveness of lotilaner against scabies in a cohort of infected dogs under natural settings is demonstrated in this case report, as is the possible antigenic cross-reaction of S. scabiei, as well as home dust and storage mites.

4. CONCLUSION

Mange is one of the most prevalent parasite infections in dogs and other animals. It reduces animal output and poses a risk to human health. The histological categorization of general skin affections and their incidence in various dogs among other animals has been highlighted in this study.

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