

Prevalence and Evaluation of Three Acaricides of Canine Sarcoptic Mange

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ABSTRACT

Sarcoptes scabiei var canis infest different dog breeds and human. Three hundred ninety five dogs were clinically and parasitologically examined for the detection of *Sarcoptes scabiei var canis*. Twenty four infested dogs were classified into three groups (8 dogs per group), each group was treated separately with ivermectin oral tablets (Ivactin®) or selamectin pour on (Revolution®) or doramectin injection (Dectomax®). The prevalence of *Sarcoptes scabiei var canis* in totally examined dogs was 6.08%. The prevalence was highest in German Shepherd dogs and lowest in St. Bernard dogs. Three acaricides have the same successful treatment rate (100%) at the fourth weeks post treatment. It could be concluded that ivermectin tablets is the cheapest and easiest to administer and more preferable to be used for treatment of *Sarcoptes scabiei var canis* infested dogs.

Introduction

Sarcoptes scabiei var. canis infest both dog and human where causes sarcoptic mange (Scabies). *S. scabiei var. canis* destruct the skin, which result discomfort and dermatitis, and can be complicated by secondary bacterial infections leading to mortality (The Center for Food Security and Public Health, 2012).

Sarcoptes scabiei var. canis are burrowing mites that live in tunnels into the skin. They complete their whole life cycle on the host but not surviving for long periods in the environment. *Sarcoptes scabiei* mites burrow in the stratum corneum of the

skin. Female mites live for 1 to 2 months, construct the characteristic long serpentine tunnels and deposit their eggs as they move through the skin. Hatched larvae migrate to the surface of the skin. Molting to the nymphal and adult stages takes place in short burrows called molting pouches. *S. scabiei* is very sensitive to desiccation and can survive outside the host for up to 2 to 3 weeks (The Center for Food Security and Public Health, 2012).

It could be diagnosed by applying topical tetracycline, which is retained by the burrows and fluoresces under a Woods lamp. They may also be localized with ink. This disease can be confirmed by the demonstration of the mites, their eggs or their feces in a skin scraping under microscope with 40X magnification lens.

Canine sarcoptic mange could be treated either

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by topical application of acaricide lotions such as permethrin, crotamiton and benzyl benzoate or by systemic acaricide preparations such as oral ivermectin, pour on selamectin and doramectin injection. the systemic acaricides are more preferable than topical acaricides for treatment of canine sarcoptic mange because the disadvantages of topical acaricides that is summarized in its need to adjunct therapies to improve the penetration of topical acaricides to skin crusts to reach tunnels invading mites and may cause exposure of vet or owner to risk of mites infestation.

Molecular analysis has revealed that *Sarcoptes* mites belong to a genus consisting of a single heterogeneous species (Zahler *et al.*, 1999). Sarcoptic mange may be transferable to other species (Arlian *et al.*, 1984; Folz *et al.*, 1984). This study aimed to investigate *Sarcoptes scabiei var. canis* infestation among different dogs breeds and evaluate three acaricides for the treatment of infested dogs.

Materials and methods

Three hundred ninety five dogs were examined clinically for detection of skin lesions and parasitologically by skin scraping for detection of *Sarcoptes scabiei var canis* at the teaching hospital of Department of Medicine and Infectious Diseases, Faculty of Veterinary Medicine, Cairo University. The infested dogs were classified into three groups where each group (8 infested dogs) was separately treated with one of the acaricides. Ivermectin tablets ((Ivactin®, Delta pharm co., Egypt), Selamectin pour-on ((Revolution®, Pfizer, USA), Doramectin injection(Dectomax®, Pfizer, USA) were evaluated as acaricides for treatment of the infested dogs that were examined weekly post treatment by clinical and skin scrapings examinations. The clinical improvements and results of skin scrapings examinations were recorded.

Skin scrapings from the examined dogs were collected (Alasaad *et al.*, 2009; Fain, 2009; Deger and Ural, 2013) from the adjunctive sites to healthy tissues where believed to be most likely to yield mites and to those of visible suspected lesions. Hair was clipped thoroughly the affected areas of skin from the examined dogs were deeply scraped with scalpel till blood oozing then the collected skin crusts and tissues were placed in universal bottles containing 70% ethanol and transported to the laboratory. A portion was removed from the alcohol

and subjected to KOH to recover parasites for microscopy. The collected mites were identified as *Sarcoptes scabiei var canis* on the basis of known morphological criteria. The data were recorded on the presence or absence of live mites(larva, nymph and adult) within skin scrapings. The scrapings were performed (on days 0, 7, 14, 21 and 28) post-treatment at those sites.

Three acaricides were administered twice for the treatment of *Sarcoptes scabiei var canis* infested dogs, the first dose was applied at the beginning of treatment and the second dose was administered two weeks later. Then they were evaluated by clinical improvements and parasitological examinations.

Ivermectin tablets ((Ivactin®, Delta pharm co., Egypt) was administered (Elmogly *et al.*, 1999) in a dose of 200 micrograms/kg bwt per os.

Selamectin pour-on ((Revolution®, Pfizer, USA) is topical parasiticide that is formulated to provide a minimum of 6 mg/kg body weight. It is applied on the skin of neck of the infested dogs.

Doramectin injection(Dectomax®, Pfizer, USA) is 1% injectable solution (10mg/ml). Its dose 1 ml/50kg body weight. It is injected subcutaneous.

Results

The results were illustrated in Tables 1 and 2, and in Figures 1-3.



Fig.1. Two months old German shepherd puppy infested with *Sarcoptes Scabiei* mites.

The recorded clinical signs in the infested dogs were summarized in alopecia, severe pruritus, skin crusts, skin thickening, cracks of skin and bleeding form skin fissures. The owner is usually suffering from severe itching.

Table 1. Numbers and percentages of *Sarcoptes scabiei* infested and non infested dogs

Dogs breeds	<i>Sarcoptes scabiei</i> infested		Non infested		Total
	No ^r	%	No ^r	%	
German Shepherd	9	2.27	126	31.89	135
Black Jack	7	1.77	110	27.84	117
Pit bull	3	0.76	50	12.65	53
Griffon	2	0.50	70	17.72	72
Dalmatian	2	0.50	10	2.53	12
St. Bernard	1	0.25	5	1.26	6
Total	24	6.08	371	93.92	395

Table 2. Evaluation of three acaricides in *Sarcoptes scabiei* infested dogs

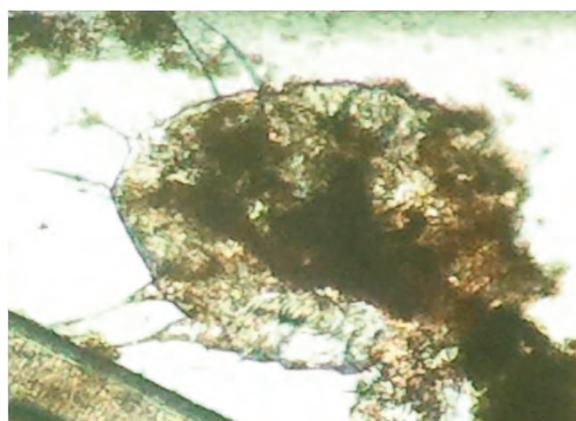
Treated dogs	Ivermectin tablets (Ivactin®)		Selamectin pour-on (Revolution®)		Doramectin injection (Dectomax®)	
	No ^r of dogs/group		No ^r of dogs/group		No ^r of dogs/group	
	Recovered	%	Recovered	%	Recovered	%
1 st week	3	37.5	2	25	4	50
2 nd week	2	25	4	50	1	12.5
3 rd week	2	25	1	12.5	1	12.5
4 th week	3	37.5	1	12.5	2	50
Total (at the end of 4 th week)	8	100	8	100	8	100

Morphologically, the mature female *S. scabiei* were approximately 500 µm long, with fingerprint-like striations on the cuticle, short and stubby legs. The males are similar but smaller (about 275 µm). The anus is posterior in both sexes, and the first pair of epimeres is fused in a midventral Y-shape. Long-stalked, un-jointed pre-tarsal suckers occur on legs I and II in both sexes and on legs IV in males. The remaining legs all terminate in long, hair-like setae. In addition, each tarsus bears at its tip one or two highly modified setae in the form of short spurs. Nymphs resemble females but are smaller and lack an ovipore. Larvae are similar but smaller still and have only six legs (OIE, 2013).

The prevalence *S. scabiei var canis* in totally examined animals was 6.08%.

The highest prevalence was recorded in German Shepherd dogs (2.27%) while the lowest was in St. Bernard dogs (0.25%).

The three acaricides have the same successful treatment rate (100%) at the fourth weeks post treatment. While it is clear that Doramectin injection (Dectomax®) can cure 4 (50%) of the treated dogs at the end of the first week post treatment. From the economic point of view, Ivermectin tablets (Ivactin®) is the cheapest and he is also easily administered when compared with the other two acaricides.

Fig. 2. One year old Griffon dog infested with *Sarcoptes Scabiei* mites.Fig. 3. Adult *Sarcoptes Scabiei* mite (X400)

Discussion

Canine scabies is a severely contagious, non-seasonal and intensely pruritic skin disease caused by *Sarcoptes scabiei var. canis* (Deger and Ural, 2013). The life cycle of *Sarcoptes scabiei var. canis* required from the development of egg to adult about 9-13 days (Arlan, 1989; Arlian *et al.*, 1989).

Maturation of the egg takes 3-4 days, following which the larva hatches from the egg (Wall and Shearer, 2001). It is also known that survival off the host is up to 10 days or less, and greatly dependent on moderate conditions (Arlan, 1989; Arlian *et al.*, 1989).

The most observable clinical signs of canine sarcoptic mange is pruritus, alopecia, skin encrustation and skin fissures accompanied by bleeding. These signs could be explained by female *Sarcoptes scabiei var canis* mites make deep tunnels that cause skin damage and release of histamine and other inflammatory mediators. The skin inflammation is usually associated by loss of hair and formation of skin crusts. The skin is also lost its elasticity so the fissures were formed and bleed (Shelly *et al.*, 2010), they mentioned that the predominant disease manifestations are mediated through inflammatory and allergic-like reactions to mite products, leading to intensely pruritic skin lesions.

The prevalence of *Sarcoptes scabiei var canis* in totally examined dogs was 6.08% while that was previously recorded by Mosallanejad *et al.* (2012) as 5.56% in Iran, by Gakuya *et al.* (2012) as 4.7% in dogs in Kenya, by Xhaxhiu *et al.* (2009) as 4.4% in Albania.

The variant prevalences of *Sarcoptes scabiei var canis* in the examined different dog breeds could be explained by the different immune responses and susceptibility of each dog breed against that mite as previously reported by Feather *et al.* (2010), they mentioned that the disease predominantly affects young dogs, of all breeds and both sexes, implicating age-related immunity.

Mode of action of the three systemic acaricides (ivermectin, selamectin and doramectin) is the same (Junquera, 2014) because they are from macrocyclic lactones.

They act as acaricides by (i) blocking the transmission of neuronal signals of mites, which are either paralyzed or starved and died. That could be done by two effects, firstly they act as agonist of

the GABA (gamma-aminobutyric acid) neurotransmitter in nerve cells, and secondly they binds to glutamate-gated chloride channels in nerve and muscle cells of mites. (ii) affecting the reproduction of mites by diminishing ovi-position or inducing an abnormal oogenesis. They have no ovicidal activity on the eggs of mites (Pan *et al.*, 2006) so the repeated dose is required to kill the hatched larvae from eggs of mites found at time of treatment.

The systemic acaricides cure the *Sarcoptes scabiei var canis* infested dogs one month post treatment so they are better than topical acaricides which need 3 months to eliminate *Sarcoptes scabiei var canis* as previously described by Stanneck *et al.* (2012), they mentioned that topical midacloprid/flumethrin collar eliminated *Sarcoptes scabiei* within 3 months.

The three acaricides were applied twice and have the same rate of treatment success (100%) at end of the fourth week from the beginning of treatment, but they are different in the ease of administration and the cost of treatment so we concluded the ivermectin tablet is more preferable because it is administered orally and the cheapest.

Conclusion

It could be concluded that *Sarcoptes scabiei var canis* is more prevalent in German Shepherd dogs and ivermectin tablets is the cheapest and easiest to administer and more preferable to be used for treatment of *Sarcoptes scabiei var canis* infested dogs.

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