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SHORT COMMUNICATION

Treatment of Sarcoptic mange infestation in rabbits with long acting injectable ivermectin

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Abstract Sarcoptic mange infestation is one of the major constrains in commercial rabbit rearing due to their ability to produce negative impact on the growth rates and feed conversion efficiency. Ten adult rabbits presented with the history of anorexia, pruritis and crusty lesion in ear, face and legs were selected for the study. Skin scraping examination revealed presence of *Sarcoptes scabiei*. The subcutaneous administration of single dose long acting injectable Ivermectin (3.15% w/v) formulation at a dose rate of 700 mcg/kg body weight was found to be safe, effective and less time consuming for the management of Sarcoptic mange in naturally infested rabbits. The skin scrapings collected from all the rabbits under study on days 14 and 28 were negative on both instances indicating rapid elimination of *S. scabiei* with a single dose of long acting ivermectin. No relapse of infestation was observed in any of the rabbits under treatment during the 6 month observation period following the treatment.

Keywords Sarcoptic mange · Rabbit · Ivermectin · Long acting

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Introduction

Parasitic infestation is a common problem faced by majority of the rabbit breeders. Sarcoptic mange infestation due to *Sarcoptes scabiei* is one of the major constrains in commercial rabbit rearing (Darzi et al. 2007). Chronic cases of Sarcoptic mange leads to anorexia, lethargy, emaciation and can even cause death in rabbits (Scott et al. 2001). Increased housing density and poor hygiene are the most important predisposing factors in case of Sarcoptes scabiei infestation (McCarthy et al. 2004).

In Sarcoptic mange, lesions are commonly seen in ears, nose, feet and perineal area (Kachhawa et al. 2013). Davies et al. (1991) reported that the clinical signs of Sarcoptic mange includes pruritis, seborrhea, alopecia, hypersensitivity reaction, crusting and hyperkeratosis. Dry crusty lesions are commonly seen in the ear margins (Reddy et al. 2016). Ivermectin is the drug commonly used for the treatment of Sarcoptic mange in rabbits. Subcutaneous route is the most efficient and preferred route of administration of macrocyclic lactones like Ivermectin and moxidectin in terms of bioavailability when compared with oral and topical administration (Alvinerie et al. 1993, 1998).

The purpose of the present study was to evaluate the efficacy and safety of single dose of commercially available long acting injectable Ivermectin formulation (3.15% w/v) in eliminating *Sarcoptes scabiei* mite from naturally infested rabbits.

Materials and methods

Ten adult crossbred rabbits (six adult male and four adult female) were presented to Veterinary Polyclinic, Mannarkkad, Palakkad with a history of anorexia, pruritis and

crusty lesion in ear, face and legs. Skin scrappings were collected and processed based on the standard protocol (Soulsby 1982).The skin scrapings were examined on 0th, 14th, and 28th day of presentation.

Treatment was initiated with single dose of long acting injectable Ivermectin formulation 3.15% w/v (Neomec LA, Intas Pharmaceuticals Ltd.) subcutaneously at a dose rate of 700 mcg/kg body weight. For the supplementation of elemental zinc and essential vitamins, Zincovit (Apex laboratories Pvt. Ltd.) syrup was also administered orally five drops twice daily for 2 weeks. Adverse reactions in rabbits under treatment with Ivermectin were analyzed by examination during 14th and 28th day of presentation. The owner was also advised to keep the rabbits under observation for any signs of toxicity. All of the rabbits were kept under observation for 6 months post treatment for identification of recurrent infestation with Sarcoptes scabiei.

Results and discussion

Clinical examination revealed dried crusted scabs distributed in the ear margins, nose, face and legs (Fig. 1a, b). Self-induced excoriations in the skin was also observed. The skin was thickened and erythematous with patchy loss of hair.

Examination of skin scraping on 14th and 28th day of presentation revealed absence of *Sarcoptes scabiei* in all of the rabbits under treatment (Fig. 2a, b). Due to the consecutive negative results of skin scrapping examination further examinations were found to be unnecessary. No relapse of infestation was observed in any of the rabbits under treatment during the 6 month observation period following the treatment. A single dose of long acting injectable Ivermectin (3.15% w/v) formulation at a dose rate of 700 mcg/kg bodyweight was found to be sufficient in completely eliminating *Sarcoptes scabiei* mites in naturally infested rabbits. All the rabbits were free from any clinically observable adverse reaction due to treatment with Ivermectin throughout the period of study.

Mange infestation caused by *Sarcoptes scabiei* is common in rabbits, which is characterized by presence or absence of pruritis, specific morphology of mite and pattern of lesion distribution (Bhardwaj et al. 2012). In the present case, the lesions were distributed in the ear margins, nose, face and legs. Similar distribution of lesions was also observed by Prakash et al. (2017). Using injectable macrocyclic lactones like Ivermectin, doramectin, and moxidectin instead of dips have many advantages like they are quicker and safer, cause the least stress to the rabbit, does not require any special handling facilities and they are also having broad spectrum anthelminthic activity (Voyvoda et al. 2005). Both Ivermectin and eprinomectin are highly effective in managing Sarcoptic mange infestation when used topically (Nazir et al. 2016). Subcutaneous administration of Ivermectin is effective in mixed mange infestation involving Sarcoptes, Notoedres, and Psoroptes in rabbit (Panigrahi et al. 2016). Several authors have used parentral Ivermectin at different dose rates for the treatment of mange in rabbit. Among them, most of the treatment protocols involves a 7 day gap between subsequent injections of ivermectin (Kumar et al. 2018a; Singh et al. 2017; Panigrahi et al. 2016).

But all of the Ivermectin injectable treatment protocols for treating Sarcoptic mange involves multiple dosing. This is because mite eggs are resistant to acaricidal products and thus multiple treatments at various intervals are required to ensure presence of active drug during the time of hatching (Arends et al. 1999). Gokbulut et al. (2010) conducted pharmacokinetic study of subcutaneously administered Ivermectin in rabbits and reported the need of two doses of Ivermectin separated by 15–20 day interval between the doses to provide sufficient levels of Ivermectin in the circulation that maintains therapeutic efficacy. The introduction of novel long acting (3.15% w/v) formulation of Ivermectin favors a slow absorption from the subcutaneous

Fig. 1 **a** Rabbit presented with lesions in the ear, face and legs. **b** Dried crusty scabs distributed in the ear margins

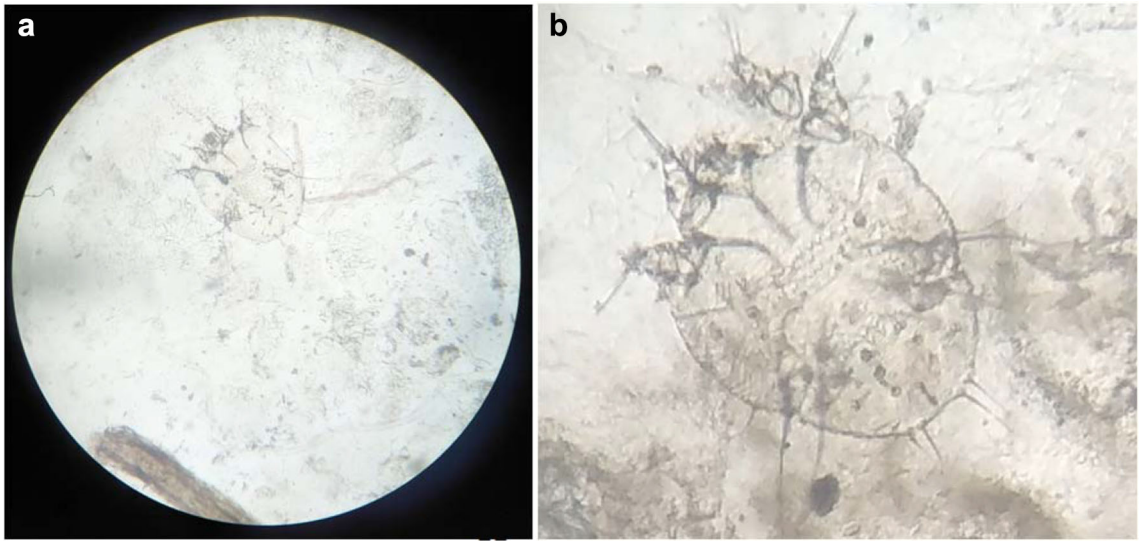

Fig. 2 **a** *Sarcoptes scabiei* mite under microscope. **b** *Sarcoptes scabiei* ventral view

site that prolongs the presence of Ivermectin in the blood circulation (Lifschitz et al. 2007).

Kumar et al. (2018b) reported that supplementation of vitamins with Ivermectin augments the parasitological and clinical recovery in rabbits infected with *Sarcoptes scabiei* when compared to that of Ivermectin alone. Dietary supplementation of vitamins like vitamin A helps to correct the imbalance between oxidants and antioxidants by providing more of antioxidants. This is helpful in managing drug induced oxidative stress (Omshi et al. 2018). Hence elemental zinc and vitamin supplementation can be used as an adjunct in rabbits undergoing Ivermectin therapy.

The use of long acting Ivermectin helps to reduce the number of doses required in treatment of Sarcoptic mange in rabbits to a single dose. By reducing the number of doses, the high cost of treatment due to multiple dosing can be considerably reduced making the single dose regimen the most economic treatment protocol against *Sarcoptes scabiei* in rabbits. The single dose regimen of long acting Ivermectin followed in the present study will also be helpful in reducing the stress associated with multiple subcutaneous injection of 1% w/v ivermectin treatment regimen. The slow release and prolonged presence of Ivermectin in the circulation helps to prevent toxicity and also provide prolonged biological activity against the mites. Thus long acting injectable Ivermectin (3.15% w/v) preparations are superior to that of conventional Ivermectin preparations (1% w/v) in managing Sarcoptic mange infestations in rabbits.

Conclusion

This study indicates that a single dose of long acting injectable Ivermectin (3.15% w/v) formulation at a dose rate of 700 mcg/kg bodyweight through subcutaneous route is sufficient in completely eliminating *Sarcoptes scabiei* mites in naturally infested rabbits. Oral supplementation of elemental zinc and vitamins helped in the early clinical improvement within a period of 2 weeks. The complete clinical and parasitological cure produces by a single dose of long acting injectable Ivermectin in naturally infested rabbits along with the absence of adverse effect suggest that the long acting Ivermectin formulations (3.15% w/v) are the most effective, safest, economic and practical alternative for the treatment of Sarcoptic mange infestation in rabbits.

Author contributions KS: Conceived and designed the analysis, collected the data, performed the analysis, and written the manuscript. SA: Collected the data, performed the analysis. SAS: Conceived and designed the analysis, collected the data. SP: Conceived and designed the analysis.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The study was conducted in clinical cases of *Sarcoptes scabiei* infestation in rabbits presented to Veterinary Polyclinic, Mannarkkad, Palakkad and does not require any permission from animal ethics committee. All protocols followed were as per the guidelines from the standard textbooks in Veterinary Medicine and were ethical.

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