



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.23

TPI 2022; SP-11(3): 83-87

© 2022 TPI

[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 10-01-2022

Accepted: 13-02-2022

**MJ Anikar**

M.V.Sc. Scholar, Postgraduate  
Institute of Veterinary  
Education & Research  
(PGIVER), KU, Rajpur,  
Himmatnagar, Gujarat, India

**CM Bhadesiya**

Assistant Professor, PGIVER,  
KU, Rajpur, Himmatnagar,  
Gujarat, India

**PJ Gajjar**

M.V.Sc. Scholar, PGIVER, KU,  
Rajpur, Himmatnagar, Gujarat,  
India

**VA Patel**

M.V.Sc. Scholar, PGIVER, KU,  
Rajpur, Himmatnagar, Gujarat,  
India

**AI Dadawala**

Assistant Professor, PAH, KU,  
Rajpur, Himmatnagar, Gujarat,  
India

**PP Makwana**

Assistant Professor, PAH, KU,  
Rajpur, Himmatnagar, Gujarat,  
India

**DB Patil**

Director of Research & Dean PG  
Studies, KU, Gandhinagar,  
Gujarat, India

**Corresponding Author****MJ Anikar**

M.V.Sc. Scholar, Postgraduate  
Institute of Veterinary  
Education & Research  
(PGIVER), KU, Rajpur,  
Himmatnagar, Gujarat, India

## Evaluation of therapeutic protocols containing different antifungal agents to treat dermatophytosis in dogs

**MJ Anikar, CM Bhadesiya, PJ Gajjar, VA Patel, AI Dadawala, PP Makwana and DB Patil**

**Abstract**

Veterinary practitioners deal with different types of diseases and disorders of dogs on regular basis out of which, dermatological afflictions are more commonly observed. Out of all types of dermatological afflictions, dermatophytosis is one of the fairly common condition affecting dogs which has zoonotic potential. Most of the veterinary practitioners use different types of treatment protocols for this disease; however, the lack of different diagnostic modalities and therapeutic options make it difficult to get timely clinical recovery in cases of dermatophytosis. The present investigation aimed to evaluate different treatment protocols using different antifungal drugs (*viz.*, ketoconazole, itraconazole, griseofulvin and terbinafine orally and miconazole topically) for their effectiveness against dermatophytosis in 30 confirmed cases. The pre- and post-treatment observations were based on clinical status as well as hematological and serum biochemical parameters of dogs under all treatment groups. Complete clinical recovery without any side effects was observed in all dogs after 30 days of treatment and observation.

**Keywords:** dogs, dermatophytosis, treatment protocols, antifungal

**Introduction**

Dogs suffer from different types of infectious diseases (e.g., pyoderma, dermatophytosis, scabies etc.) and non-infectious conditions (e.g., burns) which affect their skin. A pet dog's healthy skin is entirely dependent on knowledge and adoption of different husbandry and management practices among dog-owners or dog-keepers. Out of all dermatological afflictions recorded in dogs, canine scabies (caused by *Sarcoptes scabiei* var. *canis*) and dermatophytosis (caused by dermatophytes mostly *Microsporum canis*) are known to have zoonotic potential. Hence, it is important to perform accurate diagnostic procedures and to plan suitable treatment strategies which should result in complete cure of such conditions [1, 2, 3].

Here, dermatophytosis is fairly common clinical entity at a veterinary hospital dealing with small animal practice. Detailed clinical examination for presence of characteristic skin lesions and direct microscopy are two most common methods being used by field veterinarians for diagnosis of dermatophytosis in dogs; however, various scientists have suggested that isolation of pathogenic dermatophytes should be considered for confirmatory diagnosis and to achieve desired results whenever possible [4]. Other common but less frequently used diagnostic techniques for dermatophytosis are Dermoscopy/Epiluminoscopy, Wood's Lamp Examination and Sticky Tape Technique [5, 6]. It has been perceived that all the diagnostic procedures cannot be performed in a single case during day-to-day practice because of lack of proper instrumentation or facilities. Moreover, some of these diagnostic modalities are comparatively easy but, they are required to be evaluated for their applicability and feasibility in the field.

In general, the treatment schedule for different dermatological disorders in dogs takes weeks to months. Furthermore, specific treatment, topical treatment (e.g., shampoo, lotion, cream, ointment, solutions etc.) and supportive medications (e.g., coat conditioners/ oral supplements for coat quality etc.) are generally prescribed to the dog-owners which are also affecting them economically. Systemic antifungal therapy, therapeutic shampoo and topical antifungal agents are commonly used for treatment of dermatophytosis; however, ketoconazole remains the only systemic antifungal drug which is widely used in field. Other systemic antifungal drugs such as fluconazole, itraconazole, griseofulvin and terbinafine are also useful for treatment of dermatophytosis [7] but, they have not been subjected to evaluation in clinical patients in Gujarat.

Considering above mentioned facts, the present research work was planned to observe effectiveness of different treatment protocols for clinical cases of dermatophytosis in dogs.

Detailed results are elaborated in the present paper.

## Materials & Methods

The present study was carried out at the Postgraduate Institute of Veterinary Education & Research (PGIVER), Kamdhenu University, Rajpur (Nava), Himmatnagar in collaboration with Polytechnic in Animal Husbandry (PAH), Kamdhenu University, Rajpur (Nava), Himmatnagar and Leo Animal & Bird Clinic, Ahmedabad. The prevalence of dermatophytosis was recorded at Veterinary Hospital functional under PGIVER (Period: April-2018 to March-2020) and incidence was recorded at Leo Animal & Bird Clinic, Ahmedabad (Period: February to August-2020).

Diagnostic confirmation of dermatophytosis was performed by standard diagnostic methods including (1) Clinical examination/Gross skin lesions, (2) Epiluminescence, (3) Wood's lamp examination, (4) Ultraviolet torchlight examination, (5) Trichography, (6) Sticky tape technique, (7) Cultural isolation of fungus on Sabouraud's Dextrose Agar, (8) Specific cultural isolation of fungus on Dermatophyte Test Media and (9) Staining of fungal growth by Lactophenol Cotton Blue stain [5, 6, 8].

Six clinically healthy dogs were included in Group-I (as healthy control) while dogs diagnosed with dermatophytosis

(N=30 positive cases) were included in 05 different treatment groups (*viz.*, Group-II to Group-VI; 06 dogs in each group) as shown in Table-1. All the cases (irrespective of age, breed and gender) were included in the study after obtaining owner's consent.

Healthy dogs under Group-I were applied with topical barrier repairing agent and bathed (once a week) with normal bathing shampoo to prevent any skin disease during the period of observation. All positive cases received different treatments such as use of only topical lotions containing miconazole as antifungal in Group-II; oral ketoconazole @ 10 mg/kg b.wt. q24h or divided dose q12h in Group-III; oral itraconazole @ 5-10 mg/kg b.wt. q24h or divided dose q12h in Group-IV; oral griseofulvin @ 20-50 mg/kg b.wt. q24h or divided dose q12h in Group-V and oral terbinafine @ 30-40 mg/kg b.wt. q24h or divided dose q12h in Group-VI. Additionally, use of topical lotion containing miconazole and bathing (once a week) with a shampoo containing antifungal agent (ketoconazole) were commonly performed as part of treatment protocols for all dogs under Group-II to Group-VI. Oral Omega-3 and Omega-6 fatty acids containing supplements and hepatoprotective and/or renoprotective syrups were given to dogs under all groups.

**Table 1:** Distribution of cases in different groups for evaluation of therapeutic response in dogs diagnosed with dermatophytosis

Particulars	Groups					
	Healthy Dogs	Dogs diagnosed with Dermatophytosis*				
Group	I	II	III	IV	V	VI
No. of Dogs	06	06	06	06	06	06
Specific Drug (Dose Rate)	-	-	Ketoconazole (10 mg/kg b.wt. PO q24h or divided dose q12h) <sup>(d)</sup>	Itraconazole (5-10 mg/kg b.wt. PO q24h or divided dose q12h) <sup>(e)</sup>	Griseofulvin (20-50 mg/kg b.wt. PO q24h or divided dose q12h) <sup>(f)</sup>	Terbinafine (30-40 mg/kg b.wt. PO q24h or divided dose q12h) <sup>(g)</sup>
Topical Application	Topical barrier repair agent for prevention <sup>(a)</sup>	Miconazole containing topical lotion <sup>(b)</sup> (Single or in Combination)				
Shampoo	Normal bathing shampoo	Shampoo containing antifungal agent <sup>(c)</sup>				
Bathing Frequency	Once a Week					
Supportive for Coat	Oral supplements containing Omega-3 & Omega-6 Fatty acids etc. <sup>(h)</sup>					
Supportive for Liver and Kidneys	Oral supplementation having hepatoprotective <sup>(i)</sup> and/or renoprotective <sup>(j)</sup> effects were provided depending on requirement of the case					
<sup>(a)</sup> DermSpot Spot-on, TTK; <sup>(b)</sup> Flotas, VENKY'S; <sup>(c)</sup> Ketochlor, VIRBAC; <sup>(d)</sup> Petoral-K, TTK; <sup>(e)</sup> Vetconazole, VETINA; <sup>(f)</sup> Zorbax, AJANTA PHARMA; <sup>(g)</sup> Terbopet, VIVALDIS; <sup>(h)</sup> Glossy Coat Plus, VENKY'S; <sup>(i)</sup> Tefroil Forte, TTK; <sup>(j)</sup> RKleen, VENKY'S; *Dogs were provided with other required medications based on clinical representation of the case, if required.						

The pre-treatment (Day-0) and post-treatment (30<sup>th</sup> day) observations were based on clinical status as well as hematological and serum biochemical parameters of dogs under all treatment groups.

The clinical status on Day-0 (Pre-treatment) was recorded by collecting photographs. Post-treatment clinical recovery was also evaluated on 30<sup>th</sup> Day Post-treatment. Photographs were collected to record and compare the pre- & post-treatment clinical status.

Blood samples (approx. 5 ml) were collected from cephalic or sephanous vein in a sterile K<sub>3</sub>EDTA vial for hematological analysis. Hematological parameters such as Hemoglobin (Hb), Total Erythrocyte Count (TEC), Total Leucocyte Count (TLC) and Differential Leucocyte Count (DLC) were evaluated on Day-0 (Pre-treatment) and 30<sup>th</sup> Day Post-treatment.

Blood samples (approx. 5 ml) were also collected from cephalic or sephanous vein in a plain sample collection vial for serum extraction and subsequent serum biochemical analysis. Serum biochemical parameters such as Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), Blood Urea Nitrogen (BUN) and Serum Creatinine (SCr) were evaluated on Day-0 (Pre-treatment) and 30<sup>th</sup> Day Post-treatment.

## Results and Discussion

A total of 152 dogs were brought with different types of dermatological diseases at Veterinary Hospital, PGIVER, KU, Rajpur (Nava), Himmatnagar between April-2018 to March-2020 out of which, 11 cases were diagnosed with dermatophytosis with an overall prevalence of 07.24%. On the other hand, a total of 177 dogs were brought with different

types of dermatological diseases at Leo Animal & Bird Clinic, Ahmedabad between February to August-2020 out of which, 56 cases were diagnosed with dermatophytosis with an overall incidence of 31.64%. Out of all cases of dermatophytosis, 30 cases were randomly selected to evaluate treatment protocols after obtaining consent from the dog-owners.

**Pre-treatment (Day-0) & Post-treatment (30<sup>th</sup> Day) Clinical Status**

All the dogs diagnosed with dermatophytosis and treated under different treatment groups recovered uneventfully after 30<sup>th</sup> day of treatment. The pre- and post-treatment clinical status of representative cases is shown in Figure-1 to Figure-4.



**Fig 2:** Pre-treatment (Day-0) and Post-treatment (30<sup>th</sup> Day) clinical status of a Labrador Retriever diagnosed with dermatophytosis



**Fig 1:** Pre-treatment (Day-0) and Post-treatment (30<sup>th</sup> Day) clinical status of a Non-descript dog diagnosed with dermatophytosis



**Fig 3:** Pre-treatment (Day-0) and Post-treatment (30<sup>th</sup> Day) clinical status of a Non-descript dog diagnosed with dermatophytosis



**Fig 4:** Pre-treatment (Day-0) and Post-treatment (30<sup>th</sup> Day) clinical status of a dog diagnosed with dermatophytosis

### Pre-treatment (Day-0) & Post-treatment (30<sup>th</sup> Day) Hematological Parameters

The pre- and post-treatment hematological parameters are shown in Table-2 and Table-3.

Results indicate that the post-treatment levels of Neutrophils decreased while levels of Lymphocytes increased significantly ( $P<0.01$ ) in dogs under Group-II; however, the values were observed to be within the normal range for dogs. In Group-III, the post-treatment levels of Neutrophils decreased significantly ( $P<0.01$ ); however, the values were observed to be within the normal range. The post-treatment values of TLC increased significantly ( $P<0.05$ ) in dogs treated under Group-IV; however, these values were found within the normal range. In Group-V, the post-treatment

levels of Neutrophils decreased while levels of Lymphocytes increased significantly ( $P<0.01$ ); however, the values were within the normal range. The post-treatment levels of TLC ( $P<0.01$ ) and Neutrophils ( $P<0.01$ ) decreased while levels of TEC ( $P<0.05$ ) and Lymphocytes ( $P<0.01$ ) increased significantly in dogs under Group-VI; however, the values were observed to be within the normal range for dogs. The minor initial (pre-treatment) increase in Neutrophils could be due to underlying bacterial infections which does not respond to antifungals and may need separate treatment using antibiotics. The pre- and post-treatment hematological interpretations indicate that hematological parameters such as Hb, TEC, TLC and DLC are not much affected in dogs diagnosed for dermatophytosis.

**Table 2:** Pre-treatment (Day 0) and Post-treatment (30<sup>th</sup> Day) values of haematological parameters Hb (g/dl), TEC ( $\times 10^6/\mu\text{l}$ ) & TLC ( $\times 10^3/\mu\text{l}$ )

	Hb (g/dl)	TEC ( $\times 10^6/\mu\text{l}$ )	TLC ( $\times 10^3/\mu\text{l}$ )
<b>Group-II</b>			
Day-0	11.43 $\pm$ 00.89	05.10 $\pm$ 00.23	10425.50 $\pm$ 593.19
Day-30	12.14 $\pm$ 00.70	05.34 $\pm$ 00.35	9973.17 $\pm$ 99.07
<b>Group-III</b>			
Day-0	12.24 $\pm$ 01.08	05.05 $\pm$ 00.19	11319.17 $\pm$ 392.85
Day-30	12.29 $\pm$ 00.99	05.16 $\pm$ 00.18	10249.50 $\pm$ 134.05
<b>Group-IV</b>			
Day-0	11.52 $\pm$ 03.61	05.87 $\pm$ 00.51	9847.67 $\pm$ 555.65
Day-30	13.01 $\pm$ 00.77	05.70 $\pm$ 00.58	10523.33 $\pm$ 453.51*
<b>Group-V</b>			
Day-0	11.66 $\pm$ 00.53	05.87 $\pm$ 00.59	10932.00 $\pm$ 1073.42
Day-30	11.77 $\pm$ 00.74	06.03 $\pm$ 00.56	9875.00 $\pm$ 362.64
<b>Group-VI</b>			
Day-0	11.05 $\pm$ 00.91	05.01 $\pm$ 00.12	11244.83 $\pm$ 554.83
Day-30	11.27 $\pm$ 01.11	05.19 $\pm$ 00.10*	10304.00 $\pm$ 420.11**
* $P<0.05$ ; ** $P<0.01$			

**Table 3:** Pre-treatment (Day 0) and Post-treatment (30<sup>th</sup> Day) values of haematological parameters DLC (%)

	Neutrophils (%)	Lymphocytes (%)	Monocytes (%)	Eosinophils (%)	Basophils (%)
<b>Group-II</b>					
Day-0	78.17 $\pm$ 01.72	19.50 $\pm$ 03.78	00.67 $\pm$ 01.63	00.67 $\pm$ 00.52	00.00 $\pm$ 00.00
Day-30	73.67 $\pm$ 00.82**	23.50 $\pm$ 04.72**	00.50 $\pm$ 01.22	00.67 $\pm$ 00.52	00.00 $\pm$ 00.00
<b>Group-III</b>					
Day-0	78.00 $\pm$ 04.15	21.83 $\pm$ 03.37	00.67 $\pm$ 00.52	01.00 $\pm$ 01.26	00.17 $\pm$ 00.41
Day-30	71.83 $\pm$ 01.33**	24.50 $\pm$ 00.84	01.17 $\pm$ 00.98	02.33 $\pm$ 01.51	00.17 $\pm$ 00.41
<b>Group-IV</b>					
Day-0	70.00 $\pm$ 02.68	21.50 $\pm$ 04.04	04.33 $\pm$ 01.63	04.00 $\pm$ 00.89	00.17 $\pm$ 00.41
Day-30	72.50 $\pm$ 05.75	19.67 $\pm$ 05.50	03.00 $\pm$ 01.67	04.67 $\pm$ 01.86	00.17 $\pm$ 00.41
<b>Group-V</b>					
Day-0	76.67 $\pm$ 01.63	14.83 $\pm$ 02.40	03.33 $\pm$ 01.37	05.00 $\pm$ 01.26	00.17 $\pm$ 00.41
Day-30	68.83 $\pm$ 02.79**	24.67 $\pm$ 02.80**	01.83 $\pm$ 01.17	04.67 $\pm$ 00.82	00.00 $\pm$ 00.00
<b>Group-VI</b>					
Day-0	78.17 $\pm$ 00.75	17.83 $\pm$ 02.93	01.00 $\pm$ 00.89	02.33 $\pm$ 01.51	00.67 $\pm$ 00.52
Day-30	71.33 $\pm$ 01.03**	25.00 $\pm$ 00.63**	00.67 $\pm$ 00.52	02.50 $\pm$ 01.22	00.33 $\pm$ 00.52
* $P<0.05$ ; ** $P<0.01$					

### Pre-treatment (Day-0) & Post-treatment (30<sup>th</sup> Day) Serum Biochemical Parameters

The pre- and post-treatment serum biochemical parameters are shown in Table-4. The difference between pre-treatment and post-treatment values of serum biochemical parameters (*viz.*, ALT, AST, BUN and SCr) in dogs under different

treatment groups was statistically non-significant ( $P>0.05$ ) which could be due to incorporation of hepatoprotective and/or renoprotective supplements in the treatment regimen. Use of such supplements could have prevented deleterious effects on antifungal drugs on liver and kidneys of dogs.

**Table 4:** Pre-treatment (Day 0) and Post-treatment (30<sup>th</sup> Day) values of serum biochemical parameters

	ALT (IU/L)	AST (IU/L)	BUN (mg/dl)	SCr (mg/dl)
<b>Group-II</b>				
Day-0	22.46±06.56	18.06±04.70	14.86±07.31	00.91±00.33
Day-30	27.94±06.00	22.39±03.27	09.62±02.48	00.69±00.16
<b>Group-III</b>				
Day-0	29.65±12.55	23.76±09.61	13.55±07.65	00.90±00.36
Day-30	30.04±06.94	25.44±06.28	11.20±05.58	00.75±00.25
<b>Group-IV</b>				
Day-0	29.36±08.20	25.30±07.51	11.02±04.21	00.74±00.31
Day-30	29.11±03.34	23.61±03.25	10.24±01.94	00.62±00.13
<b>Group-V</b>				
Day-0	30.15±08.29	26.24±08.08	11.47±02.79	00.79±00.19
Day-30	29.71±01.89	23.84±02.49	09.59±01.27	00.64±00.09
<b>Group-VI</b>				
Day-0	34.01±07.11	29.24±06.55	12.31±04.80	00.80±00.30
Day-30	29.86±05.27	23.83±04.09	09.49±02.04	00.73±00.11

\* $P < 0.05$ ; \*\* $P < 0.01$ 

The clinical recovery observed in the present study could have been achieved due to owners' compliance which is a crucial aspect in all other dermatological disorders in dogs. It has been perceived that estimation of hematological and serum biochemical parameter is not carried out in dogs diagnosed with dermatological disorders at a local veterinary healthcare center. This could be due to lesser-known impact of dermatological conditions on different blood and serum parameters or due to lack of instrumental facilities. Therefore, there is paucity on available published literature on changes in hematological and serum biochemical parameters associated with dermatophytosis in dogs. Monitoring of serum biochemical parameters should be considered while using systemic antifungal agents for treatment of dermatophytosis in dogs as per suggestions given by Mayer *et al.* [9] and Ramsey [10].

### Conclusion

Therapeutic protocol having systemic antifungal (especially oral; ketoconazole or itraconazole or griseofulvin or terbinafine), topical antifungal (miconazole), topical antifungal-containing bathing shampoo along with oral supplementation of coat-quality supplements and hepatoprotective/ renoprotective drugs are effective to bring complete clinical recovery in case of dermatophytosis in dogs. Hematological and serum biochemical parameters may not show drastic alterations in dermatophytosis; however, they should be evaluated to assess effects of antifungal agents being used for treatment.

### Conflict of Interest

Authors declare no conflict of interest with regards to funding. All the dogs were included in the study after obtaining owners' consent. Therapeutic agents used in the study are commercially available in market. The project was approved and recommended by the advisory committee and Director of Research & Dean PG Studies.

### Acknowledgements

Authors acknowledge support from staff of PGIVER & PAH, Kamdhenu University; authorities of Kamdhenu University; staff of Leo Animal & Bird Clinic, Ahmedabad and dog-owners.

### References

1. Anikar MJ, Bhadesiya CM, Chaudhary GR, Patel TP,

Patil DB, Dadawala AI *et al.* Incidence of dermatological disorders in dogs at Leo Animal & Bird Clinic, Vastral, Ahmedabad. International Journal of Advanced Research in Biological Sciences. 2021;8(3):1-7.

- Bhadesiya CM, Raval SK. Percentage analysis of knowledge level for dog-ownership in rural areas of Gujarat. International Journal of Social Science and Humanities Research. 2014;2(4)300-302.
- Raval HS, Nayak JB, Patel BM, Bhadesiya CM. Zoonotic importance of canine scabies and dermatophytosis in relation to knowledge level of dog owners. Veterinary World. 2015;8(6):763-767.
- Copetti MV, Santurio JM, Cavalheiro AS, Boeck AA, Argenta JS, Aguiar LC *et al.* Dermatophytes isolated from dogs and cats suspected for dermatophytosis in Southern Brazil. Acta Scientiae Veterinariae. 2006;34(2):119-124.
- Moriello KA, Coyner K, Paterson S, Mignon B. Diagnosis and treatment of dermatophytosis in dogs. Veterinary Dermatology. 2017;28:266-303/e68 [DOI: 10.1111/vde.12440].
- Abdalla WG. An overview of canine dermatophytosis. South Asian Journal of Research in Microbiology. 2018;2(2):1-16.
- Moriello KA. Treatment of dermatophytosis in dogs and cats: review of published studies. Veterinary Dermatology. 2004;15:99-107.
- Scott DW, Miller WH, Griffin CE. In: Muller and Kirk's Small Animal Dermatology, 6<sup>th</sup> Edition, W. B. Saunders, Philadelphia, 2000.
- Mayer UK, Glos K, Schmid M, Power HT, Bettenay SV, Mueller RS. Adverse effects of ketoconazole in dogs – a retrospective study. Vet. Dermatol. 2008;19(4):199-208.
- Ramsey I. In: BSAVA Small Animal Formulary. 6<sup>th</sup> Ed., British Small Animal Veterinary Association, England, 2008.