

1 **DIAGNOSIS OF FUNGAL AND PARASITIC DERMATOPATHIES IN DOGS AND**
2 **CATS OF PARAÍBA STATE, BRAZIL**

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4 **DIAGNÓSTICO DE DERMATOPATIAS FÚNGICAS E PARASITÁRIAS EM CÃES**
5 **E GATOS NA PARAÍBA, BRASIL**

6
7 **Abstract**

8 This study aimed to diagnose fungal and parasitic dermatopathies, describing its casuistry in
9 dogs and cats at the Veterinary Hospital of the Instituto Federal da Paraíba - IFPB, Sousa-PB.

10 The experiment was carried out at the Laboratory of Immunology and Infectious Diseases
11 (LIID) and at the Small Animal Medical Clinic (SAMC), VH/ IFPB, Sousa, Paraíba, Brazil.

12 Fifty-eight animals with skin lesions, including 41 dogs and 17 cats, were evaluated. Samples

13 were processed, resulting in 12,2% (5/ 41) of dogs testing positive for dermatophytes; 60% (3/

14 5) of those cases were confirmed to have *Microsporum canis* infections. For scabies, 24,4%

15 (10/ 41) of dogs tested positive; of these 80% (8/10, $p \leq 0,05$) had *Demodex canis* infections. In

16 cats, 17,6% (3/ 17) were positive for dermatophytes; of these 67% (2/ 3) were confirmed to

17 have *Microsporum gypseum* infections. The positive testing rate for scabies in cats was 17,6%

18 (3/ 1) ; of these 67% (2/ 3) were *Notoedres cati* infections. In one feline, a concomitant

19 infection was found between a dermatophyte (*M. gypseum*) and a scab (*N. cati*). It was

20 concluded that the incidence of dermatopathies is high in the SAMC/ VH/ IFPB. The main

21 dermatophytes found were *M. canis* in dogs and *M. gypseum* in cats, and the most prevalent

22 scabies in dogs was *D. canis* and *N. cati* for cats.

23 **Keywords:** *Demodex* spp. Dermatomycoses. *Microsporium* spp. *Notoedres* sp. Scabies.

24
25 **Resumo**

26 O objetivo desse trabalho foi diagnosticar as dermatopatias fúngicas e parasitárias,
27 descrevendo a casuística dessas enfermidades em cães e gatos no Hospital Veterinário do

28 Instituto Federal da Paraíba – IFPB, campus Sousa-PB. O experimento foi realizado no
29 Laboratório de Imunologia e Doenças Infectocontagiosas – LIDIC e na Clínica Médica de
30 Pequenos Animais - CMPA, HV/ IFPB. Foram avaliados 58 animais, sendo 41 cães e 17
31 gatos. O material coletado para as análises laboratoriais foram pelos e crostas das lesões.
32 Obtiveram-se 12,2% (5/ 41) dos cães positivos para dermatófitos, destes, 60% (3/ 5) para
33 *Microsporium canis*. Para sarnas, 24,4% (10/ 41) dos cães foram positivos, em 80% (8/10;
34 $p \leq 0,05$) a infestação era por *Demodex canis*. Nos gatos, 17,6% (3/ 17) foram positivos para
35 dermatófitos, destes 67% (2/ 3) *Microsporium gypseum*. A positividade para sarnas em gatos
36 foi 17,6% (3/ 17), destes, 67% (2/ 3) para *Notoedres cati*. Em apenas um felino foi encontrada
37 infecção concomitante entre dermatófito (*M. gypseum*) e sarna (*N. cati*). Concluiu-se que é
38 alta a casuística de dermatopatias na CMPA/ HV/ IFPB. O principal dermatófito encontrado
39 em cães foi *M. canis* e em gatos *M. gypseum*. Dentre as sarnas *Demodex* spp. foi a mais
40 prevalente para cães e *Notoedres* sp. para gatos.

41 **Palavras-chave:** *Demodex* spp. Dermatomicoses. *Microsporium* spp. *Notoedres* sp Sarnas.

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INTRODUCTION

44 Studies have reported that diseases of the integumentary system are the most frequent in
45 small animal outpatient clinics, either as primary complaints or as secondary diseases
46 (MEGID et al., 2016). Among the main dermatopathic diseases are scabies, dermatophytosis
47 and pyoderma (MORIELLO; DEBOER, 2012).

48 Dermatophytosis presents symptoms similar to other dermatopathies such as alopecia,
49 especially on the face, ears, limbs, and tail. Pruritus and desquamation are also characteristic.
50 Most of the diagnosis is made only through the animal's history and epidemiological data,
51 increasing chances of erroneous results and not identifying the pathogen to direct treatment
52 decisions (BOND, 2010). Since they are considered zoonoses, the dermatophytoses of pet

53 animals deserve special attention, since these animals maintain contact with humans,
54 particularly children. According to Moriello; Deboer (2012), the most common
55 dermatophytoses and are most frequently caused by pathogenic fungi of the genera
56 *Microsporum*, *Trichophyton*, or *Epidermophyton*. These dermatophytes infect dogs and cats
57 of all ages; however, old and immunosuppressed animals are more susceptible

58 Scabies are dermatosis causing inflammation with intense itching which causes the
59 appearance of wounds through bites, hemorrhagic crusts and loss of hair (PICCININ et al.,
60 2008). Among the scabies that cause this disease are *Sarcoptes scabiei*, *Notoedres cati*,
61 *Otodectes cynotis* and *Demodex canis*, which occur frequently in dogs and cats (NEUWALD
62 et al., 2004).

63 The most commonly used diagnostic method for scabies is the Direct Microscope Exam
64 (DME), since through the optical microscope, adult mites or their eggs can be observed in
65 samples resulting from skin scaling of the lesions, besides being easy to perform, low cost and
66 high sensitivity (BENSIGNOR, 2003). However, this technique is costly and not feasible in
67 most veterinary clinics since it requires equipment, sterile laboratory space, and qualified
68 professionals to prepare the culture media and perform the techniques.

69 Traditional fungal culture is the confirmatory method for the diagnosis of
70 dermatophytosis. Can be performed in test tubes, microscopic slides and Petri dishes
71 containing culture media for dermatophytes (SIDRIM and ROCHA, 2004). The fungal culture
72 Dermatobac® is a culture slide presenting three culture media, D.T.M., Sabouraud Selective
73 Glucose, and BIGGY, for isolating dermatophytosis-producing fungi. It is a fairly easy test to
74 perform, is selective for fungi, and selectively promotes the multiplication of the
75 dermatophytes while inhibiting the growth of saprophytic fungi. In 72 hours of incubation, it
76 can be determined that the animal has the disease through observed alteration in the coloration
77 of the culture medium. After 21 days of incubation, observing the fungal structures can

78 determine the pathogenic species of fungus causing dermatophytosis, making it a reliable
79 method for diagnosis and directing the correct treatment.

80 Therefore, the objective of this study was to evaluate the casuistry of the scabies and
81 dermatophytosis in dogs and cats at the Veterinary Hospital of IFPB, Sousa-PB campus, using
82 as a diagnostic method EMD for scabies and Dermatobac® for Dermatophytosis.

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MATERIAL AND METHODS

85 The experiment was carried out at the Laboratory of Immunology and Infectious
86 Diseases (LIID) and at the Small Animal Medical Clinic (SAMC), Veterinary Hospital (VH),
87 Instituto Federal da Paraíba (IFPB), Sousa-PB.

88 Fifty-eight animals were evaluated, including 41 dogs and 17 cats that had consultations
89 at the CMPA and presenting symptoms suggestive of dermatophytosis. Lesions and crusts of
90 lesions were collected for the laboratory analyses by scraping the borders of lesions with a
91 sterile blade (BRILHANTE et al., 2003).

92 After the collection, the samples were conditioned in threaded and sterilized collecting
93 tubes, properly identified and sent to LIID, for processing. All samples were first submitted to
94 EMD, according to Silva et al. (2008), and then seeded in the Dermatobac® laminocultures.
95 After 72 h of incubation in B.O.D. at 28°C in the dark, the color change in the D.T.M medium
96 in the positive samples. After 21 days of incubation, the fungal structures were identified in
97 Sabouraud Selective Glucose Medium for the diagnosis of the pathogenic species
98 (MORIELLO, 2014).

99 Data were collected from the clinical files of the animals, which comprise the case
100 series of this disease together with the results of the analyses in the SAMC/ VH/ IFPB. The
101 data collected were the location of the lesions, any differences in susceptibility between

102 species (dogs and cats), sexes, ages, or breed, any other diseases, and the main causative
103 agents of the disease.

104 The study of prevalence distribution was performed using the chi-square test with
105 $p < 0.05$ indicating statistical significance (STREINER; NORMAN, 1994).

106

107 **RESULTS AND DISCUSSION**

108 During the period from April to December 2016, 359 animals were attended to at
109 CMPA/HV, including 245 dogs and 105 cats. Of these animals, 16% (41/254) of dogs and
110 16,2% (17/105) of cats had a clinical presentation suggestive of dermatopathies. This
111 percentage is in agreement with reports in the literature that animals with dermatological
112 afflictions represent between 15–25% of the visitors to veterinary clinics (HIIL et al., 2006).

113 Of the dogs with dermatopathies, only 12,2% (5/41) were positive for dermatophytes.
114 Of these, 60% (3/5) tested positive for *Microsporum canis*, 20% (1/5) *Microsporum gypseum*,
115 and 20% (1/5) for *Trichophyton mentagrophytes*. Similar results were observed by (NEVES
116 et al., 2011) who evaluated the occurrence of dermatophytoses in dogs and cats treated at the
117 Veterinary Hospital at the Universidade Federal de Mato Grosso where 96,78% (270/279) of
118 the 270 dogs with a diagnosis of dermatophytosis presented *M. canis*. They also observed that
119 *M. gypseum* was the second most found dermatophyte with 13% (24/185) of the positive
120 cases.

121 Among the cats with dermatopathies, 17,6% (3/17) were positive for dermatophytes,
122 67% (2/3) for *M. gypseum*, and 33% (1/3) *Epidermophyton* spp. These data do not agree with
123 those presented by (NWEZE, 2011) who evaluated 47 cats attended and 53,2% of these were
124 positive for *M. canis*.

125 Among male dogs, 24,4% (10/41) of the dogs were positive, 80% (8/10; $p \leq 0,05$) for *D.*
126 *canis* and 20% (2/10) for *S. scabiei*. Demodicosis was more prevalent than scabies in a study

127 conducted by (ROCHA et al., 2008) who evaluated 412 dogs from the clinical routine of the
128 Veterinary Hospital of the Federal Rural Semi-Arid University (UFERSA), Mossoró-RN,
129 where they observed 18,6% (77/412) positivity for snails, 90,9% (70/77) for *D. canis*, and 9%
130 (7/77) for *S. scabiei*.

131 The positivity for scabies in cats was 17,6% (3/17), 67% (2/3) for *Notoedres cati* and
132 33% for *Demodex cati* (1/3). These values are in agreement with (ROCHA et al., 2008) who
133 evaluated 26 cats positive for HV/UFERSA and 69,2% (18/26) were positive for *N. cati*.

134 Of the 58 dogs and cats whose samples were evaluated, only one 2-year-old female
135 feline of an unspecified breed, who had crusts in the head region, had a concomitant infection
136 with both scabies (*N. cati*) and dermatophytes (*M. gypseum*). To our knowledge, this is the
137 first report of such a co-infection as we were unable to find other cases in the consulted
138 literature. The scarce reports of associated infection between hernias and fungi describe co-
139 infections with malasseziosis and demodicosis in dogs (NOBRE et al., 1998; MACHADO et
140 al., 2004); sporotrichosis and demodicosis in dogs (MATOS et al., 2012); and sporotrichosis,
141 demodicosis and pediculosis in cats (PEREIRA et al., 2005).

142 Table 1 shows the relationships between the age groups and the incidence of fungal and
143 parasitic infections.

144 Of the dogs that tested positive for Dermatophytes, 20% (3/15) were ≥ 5 years old.
145 Among cats, 33,3% (1/3) were $3 < 5$ years old. These data do not agree with other studies
146 showing that young dogs and cats, especially animals up to 12 months old, are more
147 susceptible to developing dermatophytosis (CAFARCHIA et al., 2004). Among dogs that
148 were positive for scabies, 44,4% (4/9) had an age range of $1 < 3$ years. Among cats positive
149 for scabies, 50% (1/2) were ≥ 5 years old.

150 Among all dogs, 53,5% (22/41) were male and 46,3% (19/41) were female. Of the dogs
151 positive for dermatophytosis, 80% (4/5; $p \leq 0,05$) were male and 20% (1/5) were female. These

152 data do not corroborate with those of (NEVES et al., 2011), who did not find any sex-related
153 predisposition in a study carried out in Veterinary Hospital at the Universidade Federal de
154 Mato Grosso

155 Among the cats treated, 53% (9/17) were male and 43% (8/17) were female. Among
156 those positive for dermatophytosis, 67% (2/3) were male and 33% (1/3) were female. No
157 sexual predisposition was found, which supports a finding already described in the literature
158 by (LIMA., 2016).

159 Table 2 describes the relationship between breed pattern and incidence of fungal and
160 parasitic infections.

161 The most prevalent agent in the dermatophytosis of dogs was *M. canis*, with 7,3%
162 (3/41). This finding corroborates with (PALUMBO et al., 2010), who observed 79,7%
163 (102/128) of *M. canis* positive cases among the animals treated at the Department of
164 Dermatology of the College of Veterinary Medicine and Animal Science of UNESP –
165 Botucatu.

166 Pinscher, with 50% (2/4), and Pit Bull, with 40% (2/5), breed data corroborate with (ROCHA
167 et al., 2008), who observed the prevalence of demodicosis in the Pinscher and Pit Bull breeds
168 of 17,6% and 40,5%, respectively. All of the felines used in the research were unspecified
169 breeds, so there was no way to relate the incidence of fungal and parasitic infections to breed
170 traits.

171 Table 3 shows the clinical signs presented by the treated animals and their relation with
172 the incidence of fungal and parasitic infections.

173 Among the dogs that tested positive for dermatophytes, 20% (2/10) had alopecia +
174 desquamation. Regarding the three felines positive for dermatophytosis, 20% (1/5) had
175 alopecia + pruritus. Alopecia was the most common clinical sign in dermatophytosis. It is also
176 described by (NEVES et al., 2011), who reported alopecia in all dermatophyte positive

177 animals that were attended to at the Veterinary Hospital of the State University of Londrina,
178 Paraná.

179 For dogs that were positive for scabies, 37,5% (3/8) had alopecia + pruritus +
180 desquamation, and 33.3% (1/3) had crusts. Of the total scabies lesions, 30% (3/10) presented
181 in the trunk region in dogs. For cats, lesion locations for both dermatophytosis and scabies
182 were the same table 4.

183 No significant difference ($p \geq 0,05$) was observed regarding the location of lesions for
184 dermatophytosis in dogs and cats. For male dogs, however, the most affected sites ($p \leq 0,05$)
185 were the trunk or generalized presentation. Similar data were found by (PALUMBO et al.,
186 2010) who observed 43% of the dogs presenting generalized lesions.

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CONCLUSION

189 Based on these data, we conclude that the incidence of fungal and parasitic
190 dermatopathies is high in the Small Animal Medical Clinic, Veterinary Hospital of the
191 Instituto Federal da Paraíba – IFPB. The main dermatophytes found were *M. Microsporum*.
192 *canis* in dogs and *Microsporum gypseum* in cats. Among these, *Demodex canis* was the most
193 prevalent pathogen for dogs and *Notoedres cati* was most prevalent for cats.

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Table 1. Relation between age groups and incidence of fungal and parasitic dermatological infection in animals treated at SAMC/ VH/ IFPB, Sousa, State of Paraíba, Brazil.

	Dogs			Cats		
	Attended	Dermatophytes Positives (%)	Scabies Positives (%)	Attended	Dermatophytes Positives (%)	Scabies Positives (%)
0 < 6 months	4	-	1 (25)	4	1 (25)	-
6 months < 1 years	7	1 (14,3)	2 (28,6)	2	-	-
1 a years < 3 years	9	-	4 (44,4)	6	1 (16,7)	1 (16,7)
3 years < 5 years	6	1 (16,7)	2 (33,3)	3	1 (33,3)	1 (33,3)
≥ 5 years	15	3 (20)	1 (6,7)	2	-	1 (50)
Total	41	5 (12,2)	10 (24,4)	17	3 (16,7)	3 (16,7)

Table 2. Breed pattern of dogs treated at SAMC/ VH/ IFPB with positive diagnoses for fungal or parasitic dermatological infections, Sousa, State of Paraíba, Brazil.

Breed pattern	Attended	Fungi Dermatophytes			Scabies	
		<i>M. canis</i> Positives (%)	<i>M. gypseum</i> Positives (%)	<i>T. mentagrophytes</i> Positives (%)	<i>S. scabiei</i> Positives (%)	<i>D. canis</i> Positives (%)
Pit Bull	5	-	-	-	-	2 (40)
Unspecified	17	-	-	-	1 (5,9)	3 (17,6)
Pinscher	4	-	-	-	-	2 (50)
Poodle	5	1(20)	-	-	1(20)	
Labrador	3	-	-	1 (33,3)	-	-
Yorkshire	3	2 (66,7)	-	-	-	-
Bulldog	4	-	1 (25)	-	-	1 (25)
Total	41	3 (7,3)	1 (2,4)	1 (2,4)	2 (4,8) ^a	8 (19,5) ^b

Values followed by different letters differ statistically from each other (*p≤0,05).

Table 3. Clinical signs observed in animals treated at SAMC/ VH/ IFPB with positive diagnoses of fungal and parasitic dermatological infections, Sousa, State of Paraíba, Brazil.

Clinical signs	Dogs			Cats		
	Attended	Dermatophytes Positives (%)	Scabies Positives (%)	Attended	Dermatophytes Positives (%)	Scabies Positives (%)
Alopecia/hypotrichosis	3	-	2 (66,7)	3	-	1 (33,3)
Alopecia + desquamation	10	2 (20)	1 (10)	4	1 (25)	-
Alopecia + pruritus	12	1 (8,3)	2 (16,7)	5	1 (20)	1 (20)
Alopecia + desquamation + itching	8	2 (25)	3 (37,5)	2	-	-
Alopecia + pruritus + ectoparasites	2	-	1 (50)	-	-	-
Hyperkeratosis	6	-	1 (16,7)	-	-	-
Crusts	-	-	-	3	1 (33,3)	1 (33,3)
Total	41	5 (12,2)	10 (24,4)	17	3 (17,6)	3 (17,6)

Table 4. Localization of lesions found in dogs and cats diagnosed with fungal and parasitic dermatological infections at the SAMC/ VH/ IFPB, Sousa, State of Paraíba, Brazil.

Location of the lesion	Dogs			Cats		
	Attended	Dermatophytes Positives (%)	Scabies Positives (%)	Attended	Dermatophytes Positives (%)	Scabies Positives (%)
Head	5	-	2 (40) ^a	3	1 (33,3)	1 (33,3)
Snout	5	1 (20)	-	3	-	-
Trunk	6	1 (16,7)	3 (50) ^b	4	1 (25)	1 (25)
View Profile	6	1 (16,7)	-	-	-	-
Head + muzzle	4	-	1 (25) ^a	-	-	-
Trunk + muzzle	9	-	1 (11,1) ^a	4	-	-
Generalized	6	2 (33,3)	3 (50) ^b	3	1 (33,3)	1 (33,3)
Total	41	5 (12,2)	10 (24,4)	17	3 (17,6)	3 (17,6)

Values followed by different letters differ statistically from each other (* $p \leq 0,05$).