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Aspects of *Stomoxys calcitrans* parasitism in dogs from the Amazonic region of Mato Grosso state, Brazil

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Abstract: This study aimed to evaluate conditions of risk, as well as *Stomoxys calcitrans'* parasitism preference aspects in dogs residing in counties from the Amazonic Region of Mato Grosso State. 78 dogs presenting cutaneous lesions on the ear, including males and females, from different age groups, dog breeds and with distinct morphological characteristics were evaluated. The animals were analyzed based on an epidemiological survey of animals' pelage and external ear containing aspects related to otology sanity and its association with behavioral characteristics. It was verified that the lesions varied from small alopecic areas to extensive ulcerated and erythematous areas with granulomatous aspect. Most part of the animals presented frequent characteristics such as large size, short and light fur, docile behavior, pendent or semi-erect ears, and bilateral auricular lesions. In relation to otological sanity, most dogs presented otitis in light level with clinical, microbiological and cytological aspects, which characterize external otitis.
Keywords: Stable flies, skin lesions, otitis, dogs, parasitology.

Introduction

Stable flies, *Stomoxys calcitrans* (Diptera: Muscidae), are well distributed worldwide and is related to parasitism in farm animals, such as in bovine and equine. Its infestation brings on economical losses, whereas animals have its feed conversion and milk production decreased (BITTENCOURT, 2002; CASTRO et al., 2013). Accoding to some authors, reduction in feed conversion associated to weight gain varying from 10 to 30% although milk production decline can reach 50% are reported in bovine studies, depending on the level of parasitism (KOOLER et al., 2009). In Brazil, the annual economical loss is estimated on 100 million dollars (GRISI et al., 2002)
In addition with the spoliatory action, painful sting and blood-feeding, stable flies receive great highlight in the transmission of many pathogenic agents such as viruses, fungi, bacteria, helminthes' eggs and larva to its hosts. (FÖRSTER et al., 2007; CASTRO et al., 2010; CASTRO et al., 2013).

Despite the fact that bovine and equine are the principal hosts, stable flies also feed from wild animals as well as in other domestic species, (BITTENCOURT, MOYA-BROJA, 2000; BITTENCOURT, MOYA-BORJA, 2002). Actually in Brazil, *S. calcitrans* is widely distributed, mainly in sugar cane planter production areas, as Bittencourt (2012) and Cançado et al. (2013) reported. Therefore, nearby areas of plantation usually exhibit problems due to stable fly parasitism in bovine and equine and body lesions in dogs.

In dogs, stable flies bites cause continuing irritability and agitation in the referred species, which are parasitized during the day. Due to this discomfort, flies are frequently repelled at the moment of its blood repast. According to what was observed by Yeruham, Braverman (1995) in Israel, the nose and ears are preferred areas to be infested by *S. calcitrans*. Lesions can vary from dot hemorrhages to extended areas of necrotic dermatitis in the external auditive conduct reaching the top of erect ears and the ventral border of pendent ears (FOURIE et al., 2006). In accordance with White, Bourdeau (1995), stable flies' parasitism causes allergic processes in the local of sting, which can develop to ulcerative inflammatory processes caused by secondary bacterial infection.

Observation of parasitized dogs sharing the same space with noninfested dogs is common. There is no description of any possible cause for stable fly determined type of dog breed preference. However, some authors report that stable flies are attracted to dogs' ears due to odor exhaled by animals with otitis (SILVA, 2011; GREGÓRIO, 2013).

Considering that in the latest years many dogs presented auricular lesions caused by *S. calcitrans'* stings in the medium-north of Mato Grosso State, as it was described similarly by other authors, this study aimed to survey dermatological

characteristics, as well as a evaluation of risk conditions associated with stable flies parasitism in dogs of Sinop City, with emphasis on possible correlation between parasitism and otitis occurrence in animals.

Methods

Conceded by owners from Sinop and Guarantã do Norte, Mato Grosso State, Brazil from urban and rural region, 78 dogs were evaluated. The animals presented lesions characteristic of auricular dermatitis with presence of stable flies, as described by Yeruhan, Braverman, (1995); Bittencourt, (2012).

As Souza et al. (2008) recommended, individual application were fulfilled containing animal gender and age. Besides, dogs were classified in three groups: young, until five years old; adult, between five and ten; and elderly, older than 10 years old.

Referring to dog breed and size, they were classified in small, medium and large size; for ear anatomical morphology, they were divided into erect, semi-erect and pendent ears; for hair type and length: straight, hard or curly; short, medium or long (SOUZA et al., 2008).

For occurrence evaluation of otological problems, bilateral otoscopy in the evaluated dogs was performed using veterinary otoscope. For mite (*Otodectes cynotis)* research in auditive conducts, 16 cm dissecting tweezers protected with hydrophilic swab on top were also used, wherein a swab was introduced per auditive conduct for collection of ontological secretion samples. Posteriorly, this secretion was examined in stereoscopic microscope for the detection of mites, thereby constituting a parasitological diagnosis (FOLEY, 1991). The encountered mites were fixed between a glass plate and a glass slide, adding Hoyer solution to the sample, then identified according to MARCONDES (2001).

From the exanimated secretions, glass slides were prepared for cytological exam in the following way: rolling the swab over an optical microscopic glass slide to spread the otological secretion. then the glass slide was fixed with the use of fire, and colored using the panoptic rapid staining method.

These slides were observed later in optical microscope for determination of scaling, inflammatory, bacterial and yeast cells that could be present in the auditive conduct. This exam was evaluated in accordance with Nobre et al. (1998), counting morphologically similar cells per field of view, considering the following score: (negative) absence of cells, (+) until 5, (++) from 5 to 10 and (+++) more than 10 cells per field of view.

After achievement of collections, the obtained data was evaluated the program Excel (Microsoft) for frequency of animals with otological alterations through verification of clinical and microbiological diagnoses. The probability of random occurrence (p) using 95% confidence interval was calculated to facilitate the development of projects focused on control of the disease.

Results and discussion

A total of 78 dogs, males and females, presenting different breed and age aspects, residing in the Amazonian Region of Mato-Grosso State, specifically in rural and urban areas of Sinop and Guaranty do Norte Cities were evaluated. All evaluated animals presented alterations caused by stable flies stings at the moment of the questionnaire and sample collection, which are for laboratorial analysis. These lesions varied from small alopecic areas to extensive ulcerated and erythematous areas with granulomatous aspects (Image 1).

Image. 1. Different clinical aspects of auricular lesions in dogs parasitized naturally by *Stomoxys calcitrans* from the Amazonian Region of Mato Grosso State, Brazil.

With regard to the principal aspect reported in the literature as attractant to stable fly parasitism in dogs, 70,51% (n=55) of the animals presented some type of otological alteration characteristic of external otitis. Only 23, from 78 animals, did not present any type of alteration, as such as increase in production of earwax, alteration in external auricular odor, presence of secretion and edema, among others (Table 1).

In relation to the level of otitis, most of the parasitized dogs presented light brown earwax, but no typical clinical signs with chronic and serious otitis, as such as absence of pain during examination (83,33%), absence of edema (67,94%), normal skin color (58,97%) and with normal quantity of secretion (71,79%). These results confirm the outcome from Souza et al. (2008) and Rodriguez-Visas (2003) studies, when lesion distribution in dogs with otological alterations was evaluated.

Table 1. Distributions of otological and sanitary characteristics from dogs parasitized naturally by *Stomoxys calcitrans* from the Amazonian Region of Mato Grosso State, Brazil

Characteristics	**N**	**%**
Clear signs of otitis		
yes	24	30,77
no	54	69,23
Pain during examination		
yes	13	16,66
no	65	83,33
Lesion on board of the ear		
right	7	8,97
left	5	6,41
both	66	84,62
Edema		
yes	25	32,06
no	53	67,94
Redness		
yes	32	41,03
No	46	58,97
Otological Secretion		
Increased	17	21,79
Normal	56	71,79
Decreased	5	6,42
Presence of otoacariasis		
Yes	4	5,13
No	74	94,87
Earwax Color		
Normal	6	7,69
Alternate	72	92,31
Otitis		
Yes	55	70,51
No	23	29,49
Graduation of *Malassezia* Infection		
0	14	17,94
+	25	32,06
++	28	35,89
+++	11	14,11

Referring to stable flies preference in parasitizing one or more external ears, it was verified that 84, 62% (n=66) of the animals presented lesions on both ears, while only seven animals presented cutaneous lesions on just one ear and five exclusively on the left ear. Possibly, this observation is due to the fact that most of the animals presented otological alteration in both ears, as Souza et al. (2008) verified.

Although most animals present low level of otitis, but still presenting it, this result corroborates with Silva (2011) and Gregório (2013), in which both stated that animals with external otitis are preferably parasitized by *Stomoxys calcitrans.*

In regards to physical characteristics from parasitized animals, in relation to its size, it was verified that large size dogs were preferably parasitized (65,37%) when compared to medium (21,79%) and small (12,83%) sizes. In relation to age of the animals, it was verified that 80,77% of the parasitized animals were until five years old when compared to dogs between 5 and 10 years old (19,93%). Dogs over 10 years old presenting parasitism were not observed (Table 2).

Table 2. Age, morphological and behavioral characteristics in dogs parasitized naturally by *Stomoxys calcitrans* in the Amazonian Region of Mato Grosso State, Brazil.

Characteristics	**N**	**%**
Gender		
Males	50	64,10
Females	28	35,90
Age		
until 5 years	63	80,77
between 5 and 10 years	15	19,23
Size		
Large	51	65,38
Medium	17	21,79
Small	10	12,83
Type of Fur		
Short	64	82,05
Medium	14	17,95
Fur color		
Clear	49	62,82
Dark	29	37,17
Type of Auditive Conduct		
Semi-erect	38	48,72
Pendent	31	39,75
Erect	9	11,53
Behavior		
Docile	57	73,07
Agitated	21	26,92

Another important characteristic for evaluation was the type of the auditive conduct. In accordance with the results obtained in this study, 88,47% of the animals presented the semi-erect or pendent ear type and only nine (11,53%) animals had erect ears. Although this condition had never been evaluated in the literature, dogs with semi-erect and pendent ears present more parasitism possibly by the facility of *S. calcitrans* in landing more comfortably to accomplish hematophagism.

In studies performed in bovine and equine, Bittencourt, Moya-Borja (2000 and 2002) observed that, in these species, the principal place for stables flies to feed were inferior portion of their thoracic members, although many blood repasts in diverse parts of the body has been reported. However, the external part of the ear was not mentioned in both studies. According to these authors, these places are preferably parasitized by the absence of cutaneous reflex that expels the flies in areas as such as in the back and proximal parts of members, as well as by higher superficial blood irrigation in the referred region.

In relation to hair characteristics, it was verified that animals presenting short fur (82,05%) and with light color (62,82%) present more

parasitism frequency than when compared with animals with medium size hair with dark tones**.** This aspect in dogs has also not been cited by any other author in the literature. According to Lara et al. (1975), stable flies have preferences for light colors in environments with higher solar incidence.

In spite of this, other studies reported the preference by stable flies for parasitism in equine and bovine with dark fur (BITTENCOURT, 1998; PIRES et al., 2001; ALMEIDA et al., 2001). In accordance with Parr (1962), cows with dark fur presented higher rate of parasitism by stable flies. Similarly, Badini et al (2003) verified that cows with black and white fur were the most parasitized animals, followed by animals with black, black roan, dun and brown fur.

Another important aspect observed in the present study refers to the behavior of the parasitized dogs. According to the results obtained through observation, most animals were calm (73,07%), when compared with agitated animals (26,92%). This observation can possibly be explained by the fact that stable flies can easily feed from animals that stay still, facilitating its stability on the body of the animal to accomplish hematophagism.

In this manner, it was possible to verify that the presence of otological alterations was an important risk condition in reference to stable flies parasitism in dogs. Besides it was also possible to state that some morphological characteristics, as such as calm behavior, large size, short and light hair, and semi-erect or pendent ears, among others, are more attractive for stable flies.

Conclusion

Therefore, maintain the otological sanity**,** as well as the preventive treatment in dogs in areas and season of higher parasitism frequency, will reduce traumatism caused by *S. calcitrans* stings, as well as reduce the possibility agents' transmission by the referred fly.

New studies should be conducted to evaluate the participation of determined microbiotic agents present in external otitis in dogs; to verify it's importance in the attraction of stable flies in case of parasitism in dogs.

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