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# Prevalence of *Oestrus ovis* (Diptera: Oestridae) in sheep from the São Paulo Central region, Brazil

Prevalência de *Oestrus ovis* (Diptera: Oestridae) em ovinos da região Central de São Paulo, Brasil

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## Abstract

The heads of 139 slaughtered sheep were examined with the aim of determining *Oestrus ovis* prevalence and infestation intensity in the central region of the State of São Paulo, Brazil. Heads from slaughtered sheep were examined and the first (L1), second (L2) and third (L3) *O. ovis* larval instars were recovered from the nasal and sinus cavities. *O. ovis* larvae were detected in 13.7% of the sheep analyzed. The monthly mean intensity of infestation ranged from 1 to 10.2 larvae per infested head, with general mean intensity of 4.5 larvae/infested head. Of the total of 85 larvae, 21.2% were L1, 37.6% L2 and 41.2% L3. In conclusion, all different *O. ovis* larvae instars were recovered from slaughtered animals, which demonstrates the existence of favorable climatic conditions for the fly activity and larval development of *O. ovis* in sheep raised in the Central region of the State of São Paulo.

**Keywords:** *Oestrus ovis*, sheep, prevalence.

## Resumo

Com o objetivo de determinar a prevalência e intensidade de infestação por larvas de *Oestrus ovis* na região Central do Estado de São Paulo, 139 cabeças de ovinos obtidas de um abatedouro foram examinadas. As larvas *O. ovis* foram recuperadas da cavidade nasal e seios frontais, identificadas de acordo com o estágio larval e quantificadas. As larvas de *O. ovis* foram detectadas em 13,7% das cabeças examinadas e a intensidade média mensal de infestação variou entre 1 a 10,2 larvas/cabeça infestada, com média geral de 4,5 larvas/cabeça infestada. Do total de 85 larvas recuperadas, 21,2% eram larvas de primeiro estágio (L1), 37,6% de segundo (L2) e 41,2% de terceiro (L3). Em conclusão, todos os diferentes instares larvais de *O. ovis* foram recuperados de animais abatidos, o que demonstra a existência de condições climáticas favoráveis para a atividade da mosca bem como o desenvolvimento larval em ovinos criados na região Central do Estado de São Paulo.

**Palavras-chave:** *Oestrus ovis*, ovino, prevalência.

## Introduction

*Oestrus ovis* (Diptera: Oestridae), the sheep nasal bot fly, is a cosmopolitan parasite whose larvae develop in the head sinuses and nasal passages of sheep and goats in all sheep-farming areas worldwide. The female fly is viviparous and deposits larvae in or around the nostrils of its host; these early first instars attach to the mucous membrane inside the nasal cavities, change to second instars, and move up to the sinuses where they develop into mature third instars, which are expelled by pupation in the soil (ZUMPT, 1965). The duration of this parasitic portion of the

life cycle varies considerably: from a few weeks to several months, depending on the season and climatic conditions (COBBETT; MITCHELL, 1941). Clinical respiratory signs such as seromucous or purulent nasal discharge, frequent sneezing, and dyspnea may severely impair the health of affected animals (DORCHIES et al., 1998).

*O. ovis* can thrive in different environments and has adapted to the climate prevailing wherever sheep are kept (HORAK, 1977), and this ability to adapt to different environments allows for the natural persistence of infestation and makes it difficult to control it (ALCAIDE et al., 2005). Several researches have demonstrated the high prevalence of ovine oestrosis in numerous areas all over the world, e.g. Zimbabwe (PANDEY, 1989), France (YILMA;

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DORCHIES, 1991), Italy (CARACAPPA et al., 2000), Spain (ALCAIDE et al., 2003) and Greece (PAPADOPOULOS et al., 2010). Oestrosis is commonly found in sheep in Brazil, but there are few studies on the epidemiology of this parasite and most of them are restricted to the south region of the country, where favorable climatic conditions are observed throughout the year. The prevalence of oestrosis in sheep was of 85.4% in Bagé (RIBEIRO et al., 1990) and in Encruzilhada do Sul, both in the State of Rio Grande do Sul; the mean intensity of infestation was 23.8 larvae (OLIVEIRA et al., 1999). In the State of Santa Catarina, *O. ovis* infestation intensity was greater during the spring and summer months and no larvae were recovered from tracer sheep when the temperature was lower than 9 °C (RAMOS et al., 2006).

The first study on *O. ovis* epidemiology in the State of São Paulo was carried out recently in Botucatu, where prevalence was 50% with mean intensity of 16.8 larvae per animal, with higher infestation rates during spring and summer (SILVA et al., 2012). The State of São Paulo presents different climatic conditions in each of its regions and small sheep farms are found in most areas of this State. Therefore, detailed research on the epidemiology of parasitic infestation is required to recommend the best strategies of oestrosis prophylaxis in small ruminants. This study aimed to determine *O. ovis* prevalence in slaughtered sheep from five counties of Central region of the State of São Paulo, Brazil.

## Materials and Methods

The heads of 139 slaughtered sheep were examined from July 2009 to February 2010. The animals were originated from Itápolis, Ibitinga, Borborema, Guarantã and Tapinas, municipalities in the Central region of the State of São Paulo. The monthly amount of sheep slaughtered in an abattoir in the municipality of Itápolis was variable and the heads of all slaughtered animals were examined. Most of the sheep were ≤ 1 year old (89.2%), with predominance of Santa Ines breed (80.6%) and its crosses with Dorper breed. Information on prior antiparasitic treatment and sheep management were not available.

Climate data from Itápolis were obtained from a study performed by the Center of Meteorological and Climate Research Applied to Agriculture (CEPAGRI, 2012).

The heads of the slaughtered sheep were separated from the carcasses, put into individual plastic bags to avoid transfer of larvae from one head to another and to collect those that came out of the nasal cavities. They were transported to the laboratory inside a cool box with ice. The heads were cut open along their longitudinal and sagittal axes. All larvae present in the nasal cavity (nasal passage, septum, middle meatus and conchae) and paranasal sinus (frontal and maxillary) were carefully examined; all larvae found were collected and counted. The larvae were preserved in 70% alcohol and identified according to their stage of development based on the descriptions by Zumpt (1965) and Capelle (1966).

### 1. Statistical analyses

Spearman's rank correlation coefficient was estimated between larval burden and climatic conditions (mean temperature and rainfall) using Minitab release 11.

Descriptive statistical analyses were performed in agreement with Bush et al. (1997). The following terms were used:

Prevalence: the number of hosts infested with *O. ovis* larvae divided by the number of hosts examined;

Intensity of infestation: the number of *O. ovis* larvae in a single infested host;

Mean intensity of infestation: the total number of *O. ovis* larvae found divided by the number of hosts infected with that parasite.

## Results

The maximum and minimum amount of heads examined per month was 26 in July and August 2009 and 9 in October 2009, respectively. Of the 139 heads examined, 19 (13.7 %) were infested with *O. ovis* larvae with minimum and maximum prevalence of the 7.7% in August 2009 and 20.0 % in February 2010, respectively (Table 1). No *O. ovis* larva was recovered in October 2009, coinciding with the lowest number of heads examined. The monthly mean intensity of infestation ranged from 1 to 10.2 larvae per infested head, with general mean intensity of 4.5 larvae per infested head. Means of temperature and rainfall in Itápolis are presented in Table 2. The average annual rainfall

**Table 1.** Number of heads infested with *Oestrus ovis* per month, mean larval burden per head, number of first, second and third larval stages (L1-L3) and total number of larvae found per month in sheep from the Central region of the State of São Paulo, Brazil.

Month	Number of heads examined	Number of heads infested	Prevalence (%)	Mean larval burden	L1	L2	L3
July /2009	26	5	19.2	10.2	17	19	15
Aug. /2009	26	2	7.7	2.0	0	0	4
Sept. /2009	13	2	15.4	1.0	0	0	2
Oct. /2009	9	0	0	0	0	0	0
Nov. /2009	12	1	8.4	4	0	0	4
Dec. /2009	16	3	18.8	4.7	1	9	4
Jan. /2010	17	2	11.8	1.0	0	0	2
Feb. /2010	20	4	20.0	2.0	0	4	4
Total	139	19			18	32	35
Mean			13.7	4.5			

**Table 2.** Average of maximum, minimum and mean monthly temperatures and rainfall in the municipality of Itápolis, State of São Paulo.

Month	Temperature (°C)			Rainfall (mm)
	Minimum	Maximum	Mean	
Jan.	19.5	30.9	25.2	235.9
Feb.	19.7	31.1	25.4	204.5
Mar.	19.0	30.8	24.9	158.2
Apr.	16.4	29.5	22.9	78.9
May	13.8	27.6	20.7	65.0
June	12.4	26.6	19.5	43.5
July	11.9	26.9	19.4	22.9
Aug.	13.4	29.3	21.4	25.7
Sept.	15.5	30.3	22.9	70.6
Oct.	17.1	30.6	23.9	121.2
Nov.	17.9	30.8	24.3	147.7
Dec.	19.0	30.5	24.7	242.4
Annual	16.3	29.6	22.9	1416.5
Minimum	11.9	26.6	19.4	22.9
Maximum	19.7	31.1	25.4	242.4

Source: CEPAGRI (2012).

**Table 3.** Prevalence of infestation by *Oestrus ovis* according to sheep age in the Central region of the State of São Paulo from July 2009 to February 2010.

Age in years	Heads examined/heads infested	Prevalence (%)
1 ≤	124/16	12.9
2	8/2	25.0
≥ 3	7/1	14.3
Total	139/19	13.7

% percentage.

was 1416.5 mm and the average annual temperature for this period was 22.9 °C. No significant correlations were observed between monthly larval numbers and climatic variables, i.e., mean temperature and rainfall ( $P > 0.05$ ).

Of the total of 85 larvae, 21.2% was L1, while L2 and L3 represented 37.6% and 41.2%, respectively. The sheep heads collected were derived mainly from young animals ( $\leq 1$  year old), but the prevalence of *O. ovis* larvae was similar between the age groups (Table 3).

Discussion

The prevalence of *O. ovis* infestation (13.7%) in this study was lower than those reported in similar studies carried out in other countries such as France, where 65% of sheep was infested with *O. ovis* larvae (YILMA; DORCHIES, 1991); or in Sicily, with 55.8% of prevalence (CARACAPPA et al., 2000); and Turkey, with 40.6% (ARSLAN et al., 2009). Higher prevalence was also observed in other Brazilian studies: 85.4% in the south region of the country in sheep exposed to natural infestation for one year (RIBEIRO et al., 1990) and 50% prevalence in tracer sheep in Botucatu, State of São Paulo, Brazil (SILVA et al., 2012).

Despite the lower prevalence observed in the present study, *O. ovis* larvae were present in all experimental months, except in

October 2009, coinciding with the lowest number of sheep heads examined. Probably, if more heads had been monthly examined, there would have been greater chances to find infested sheep, as observed in studies carried out in other countries, where sheep are slaughtered in greater amounts and more often. In Sicily, for instance, 70 heads were examined per month (CARACAPPA et al., 2000), whereas in the present study the maximum number of sheep heads examined per month was 26. In the State of São Paulo, Brazil, large slaughterhouses specialized in cattle, poultry and pigs are common; however, the slaughtering of sheep, in general, is restricted to small abattoirs with less often routine, making it difficult to collect a large number of heads to be examined.

Several factors can influence *O. ovis* epidemiology, such as sheep management practices and particular climatic conditions. The low prevalence of oestrosis in these animals may have been influenced by previous treatment with drugs, such as macrocyclic lactones, which are usually used for the prophylaxis of infections by gastrointestinal nematodes and act against *O. ovis* larvae instars (DORCHIES et al., 1996, 1997; LUCIENTES et al., 1998). The influence of anthelmintic treatment in *O. ovis* epidemiology was also observed in Botucatu, where reduction in the infestation of tracer sheep coincided with the treatment of flocks with macrocyclic lactones (SILVA et al., 2012).

Among the climatic factors that influence oestrid fly activity, temperature, light intensity and wind are considered the most important, but in the case of *O. ovis*, temperature is the main factor affecting the larvipositional activity of gravid females (CEPEDA-PALACIOS; SCHOLL, 2000). Although the heads of the slaughtered sheep were examined during each of the eight months, the climatic conditions are likely to be favorable to *O. ovis* activity throughout the year in the sheep origin region, where the mean of temperature is around 22 °C and maximum and minimum averages are around 16.3 and 29.6 °C, respectively.

It is noteworthy that mostly L2 and L3 *O. ovis* larval instars were recovered in this study. Probably because the climatic conditions were suitable to endogenous larval development and L1 were able to change into L2 in a short period of time. Larvae in sheep head can have a rapid development, reaching maturity in three weeks (COBBETT; MITCHELL, 1941). In the State of Santa Catarina, Brazil, larger L3 numbers were also recovered from tracer sheep (RAMOS et al., 2006), but probably because those animals were exposed to infestation for 28 days and were then housed for 20 more days before slaughter, giving larvae enough time to complete their development.

In conclusion, all different *O. ovis* larvae instars were recovered from the animals slaughtered in this study, which demonstrates the existence of favorable climatic conditions for the fly activity and larval development of *O. ovis* in sheep raised in the Central region of the State of São Paulo.

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