








Dermatitis in humans caused by *Ornithonyssus bursa* (Berlese 1888) (Mesostigmata: Macronyssidae) and new records from Brazil

Dermatite em humanos causada por *Ornithonyssus bursa* (Berlese 1888) (Mesostigmata: Macronyssidae) e novos registros para o Brasil

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Abstract

Ornithonyssus bursa, known as the “tropical fowl mite”, is a hematophagous mite of domestic and wild birds, occasionally biting humans. Infestation on humans occurs mainly when the abandoned nests are close to homes, or by manipulation of infested birds by humans. In Brazil, this species occurs in the south and southeast of the country. In the present study we are reporting bites on humans, new localities records, host associations, and molecular information of *O. bursa*.

Keywords: “Tropical fowl mite”, human parasitism, dermatitis, Brazil.

Resumo

Ornithonyssus bursa, conhecido como “ácaro tropical de galinha”, é um ácaro hematófago de aves domésticas e silvestres, ocasionalmente picando humanos. A infestação em humanos ocorre principalmente quando os ninhos abandonados de aves estão próximos de casas, ou pela manipulação de humanos de aves infestadas. No Brasil, esta espécie ocorre na região sul e sudeste do país. No presente estudo, estamos relatando picadas em humanos, registros de novas localidades de ocorrência, novo hospedeiro e informações moleculares de *O. bursa*.

Palavras-chave: “Ácaro tropical de galinha”, parasitismo em humanos, dermatite, Brasil.

Introduction

The mite *Ornithonyssus bursa* (Berlese, 1888) (Mesostigmata: Macronyssidae) is known as the “tropical fowl mite”, a hematophagous mite, mainly parasitizing wild and domestic birds, but occasionally biting humans (DENMARK & CROMROY, 2003).

This mite can cause lesions with intense pruritus, even killing the host (COIMBRA et al., 2012; MASCARENHAS et al., 2009).

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In addition to the records on domestic birds, this species has been reported in the nests of *Agelaius xanthomus* (Passeriformes: Icteridae) in Puerto Rico (POST, 1981) and in nests of *Myiopsitta monachus* (Psittaciformes: Psittacidae) in Argentina (ARAMBURÚ et al., 2002).

In Brazil, there are records of this mite associated with young birds of the species *Megascops choliba* (Strigiformes: Strigidae), *Pitangus sulphuratus* (Passeriformes: Tyrannidae) (MASCARENHAS et al., 2009), and *Columbina talpacoti* (MORAES et al., 2011). A study in the state of São Paulo by Goulart et al. (2011) recorded *O. bursa* parasitizing *Zenaida auriculata* (Columbiformes: Columbidae)



and Silva et al. (2018) recorded this species in the state of Rio Grande do Sul on nests of *Vanellus chilensis* (Charadriiformes: Charadriidae), *Gallinago paraguayiae* (Charadriiformes: Scolopacidae), *Columbina picui*, *C. talpacoti*, *Leptotila verreauxi* and *Zenaida auriculata* (Columbiformes: Columbidae), *Anumbius annumbi* and *Certhiaxis cinnamomeus* (Passeriformes: Furnariidae), *Progne tapera* (Passeriformes: Hirundinidae), *Cacicus chrysopterus* (Passeriformes: Icteridae), *Mimus saturninus* (Passeriformes: Mimidae), *Zonotrichia capensis* (Passeriformes: Passerellidae), *Basileuterus culicivorus* (Passeriformes: Parulidae), *Turdus albicollis* and *T. leucomelas* (Passeriformes: Turdidae), *Paroaria coronata* and *Sicalis flaveola* (Passeriformes: Thraupidae), *Pitangus sulphuratus* and *Xolmis irupero* (Passeriformes: Tyrannidae) and *Nothura maculosa* (Tinamiformes: Tinamidae). Besides that, this species is commonly found parasitizing backyarding chickens in Brazil (GUIMARÃES et al., 2001).

Infestation on humans occurs mainly when abandoned nests are close to homes, or by manipulation of infested birds by humans (RIBEIRO & GIORA, 1994; SEMENAS & ROCHA, 1998). The parasitism causes itch, temporary lesions and even painful dermatitis (RIBEIRO et al., 1992; DENMARK & CROMROY, 2003).

The first report of human dermatitis caused by *O. bursa* in Brazil was in the Viamão municipality of Rio Grande do Sul (RIBEIRO et al., 1992). In the city of Santa Maria, also in Rio Grande do Sul, *O. bursa* was found in a nest of *Myiodynastes maculatus* (Passeriformes: Tyrannidae) located in the air-conditioning exhaust vent of a residence in which the people living there were bitten by these mites (OLIVEIRA et al., 2012).

Mentz et al. (2015) reported bites on humans from an abandoned nest of *Furnarius rufus* (Passeriformes: Furnariidae) in the city of Porto Alegre (Rio Grande do Sul). *Ornithonyssus bursa* was also collected on *Columbina picui* (Columbiformes: Columbidae) in the cities of Pelotas and Capão do Leão (Rio Grande do Sul), although in this case, there were no reports of human bites (COIMBRA et al., 2012).

In the present study, we report bites on humans and new occurrence of *O. bursa* based on material deposited in the Acari Collection of the Instituto Butantan (IBSP).

Materials and Methods

Material identification

Voucher species of the family Macronyssidae deposited in Acari Collection of the Instituto Butantan, São Paulo, Brazil (IBSP) were examined. Specimens in alcohol were slide-mounted with Hoyer's medium according to Walter & Krantz (2009). All specimens were identified in accordance with Guimarães et al. (2001), Radovsky (2007) and Denmark & Cromroy (2003). Micrographs of four specimens (IBSP 12804) were made by the Low Temperature Scanning Electron Microscopy (LT-SEM) at the US Department of Agriculture, Electron and Confocal Microscopy Unit, Beltsville, Maryland following Dowling et al. (2010) and Bolton et al. (2014).

Receiving material

Some of the samples were sent to the IBSP by people that were bitten by these mites. All the mites had been collected by people in their homes, mainly in their beds and couches; these people warned that they had been bitten. Including, one of these cases was reported by the last author, DMB-B that was housed in a house in Parana state, and was bitten by these mites.

Molecular analysis

DNA extraction using the Guanidine Isothiocyanate Lysis Protocol (CHOMCZYNSKI, 1993), was individually performed on three specimens (access number IBSP 12804), placed in an Eppendorf microtube and punctured in the idiosomal region with a sterile needle (1.20 * 40 – 18G). After the DNA extraction, the specimens were recovered, mounted on slides and kept as vouchers.

A conventional PCR targeting a 500-pb fragment of the 18S ribosomal RNA gene was performed using primers Mite18S-1F (3'-ATATTGGAGGGCAAGTCTGG-5') and Mite18S-1R (3'-TGGCATCGTTTATGGTTAG-5') as described by Otto & Wilson (2001). For each reaction, negative (Milli-Q water free of DNA) and positive controls were used. All PCRs were performed in a Mastercycler Gradient (Eppendorf® California, USA). PCR products with concentrations higher than 20 ng/μl were selected and purified with ExoSap-IT (GE Healthcare Pittsburgh, PA). Sanger sequencing of the samples was performed in the "Centro de Pesquisa sobre Genoma Humano e Células Tronco do Instituto de Biociências da USP". Obtained sequences were assembled with Sequencing Analysis 5.3.1 software and submitted to BLAST analyses (ALTSCHUL et al., 1990) in order to infer similarities with other mites available in GenBank. Different haplotypes were visually discriminated after an alignment using CLUSTAL W algorithm (THOMPSON et al., 1994) implemented in Geneious R9 (KEARSE et al., 2012).

Results

Specimens deposited in the IBSP collection under the accession numbers IBSP 157, IBSP 884, IBSP 903, IBSP 1868, IBSP 3579, IBSP 5639, IBSP 5661, IBSP 11984, IBSP 12650, IBSP 12734, IBSP 12804, IBSP 13663, IBSP 14355 were identified as *O. bursa* and were collected parasitizing birds or in bird nests. The differential diagnosis for this species is represented by the setae at the posterior corners of the sternal shield, common posterior margin of the dorsal shield with 4 pairs of setae (Figures 1 and 2).

The samples under the accession numbers IBSP 11984, IBSP 12650, IBSP 12734, IBSP 12804, IBSP 13663 and IBSP 14355 were also associated with humans who were bitten. In these cases, the people reported that the clinical signs consisted of papular dermatitis, and the scratching of these papules resulted in large inflamed areas, as shown in Figure 3. According to people who were bitten, the itching persisted for at least 5 days, even after treatment with antihistamines. The dermatitis shown in Figure 3 was taken by Dr. Darci Moraes Barros-Battesti shortly after being

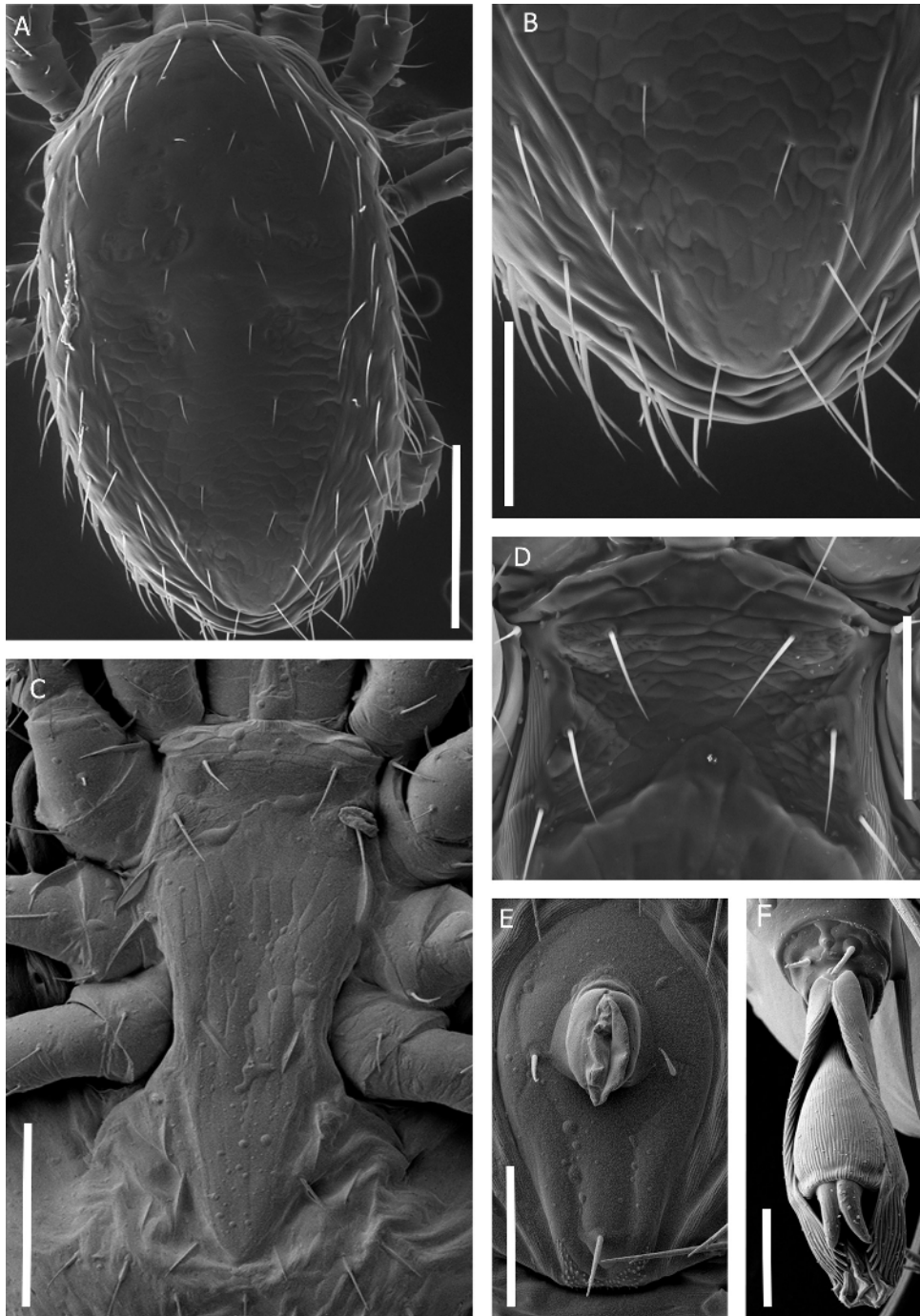


Figure 1. Morphological details of *Ornithonyssus bursa*. A - entire dorsal shield; B - posterior margin of the dorsal shield; C - genital shield; D - three pairs of setae inside the sternal shield; E - anal shield; F - claw of the tarsus of the leg II. Scale bars: A and C 300 μ m, B and D 100 μ m, E 50 μ m; F 10 μ m.

bitten. In conversation with these people that were bitten, they said that they were only bitten during the night.

Material Examined

5 ♀ (IBSP 157), Butantan, São Paulo, São Paulo state, Brazil (46° 38' 09" W, 23° 32' 52" S, elevation: 760m), 18-XI-1935, *Gallus gallus domesticus* (Galliformes: Phasianidae); 10 ♀ (IBSP 884), same

locality and host, 22-IX-1936; 10 ♀ (IBSP 903), same locality and host, 6-X-1936; 1 ♀ (IBSP 1868), Sabaúna, Mogi das Cruzes, São Paulo state, Brazil (46° 05' 09" W, 23° 28' 48" S, elevation: 742m), 01-VIII-1948, *Pygochelidon cyanoleuca* (Passeriformes: Hirundinidae), N. Bolognani coll.; 2 ♀ (IBSP 3579), Maracanã, Rio de Janeiro, Rio de Janeiro state, Brazil (43° 13' 43.67" W, 22° 54' 48.3" S, elevation: 2m), same data, *G. g. domesticus*; 1 ♀ (IBSP 5639), São José dos Campos, São Paulo state, Brazil (45° 53' 12" W,

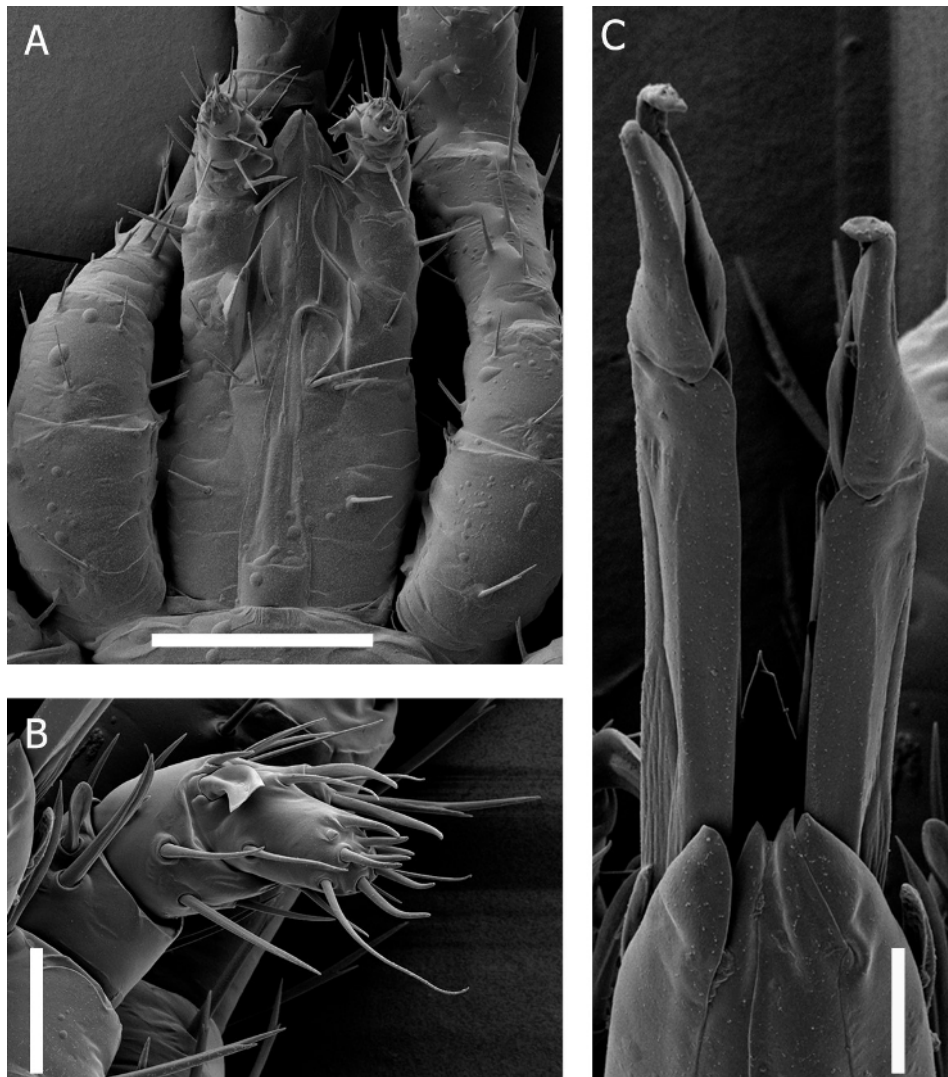


Figure 2. Morphological details of *Ornithonyssus bursa*. A - ventral view of the gnathosoma; B - palpal tarsus; C - cheliceral blades; Scale bars: A 50µm, B and C. 20µm.

23° 10' 46" S, elevation: 600m), 09-IV-1941, same host, O. N. Fagundes coll.; 6 ♀ (IBSP 5661), Butantan, São Paulo, São Paulo state, Brazil, 12-IX-1958, *G. g. domesticus*, M. Nogueira coll.; 1 ♀ (IBSP 11984), Jardim São Jorge, São Paulo, São Paulo state, Brazil (46° 38' 10" W, 23° 32' 52" S, elevation: 760m), no data, unidentified bird nests and *Homo sapiens* (Primates: Hominidae); 3 ♀ (IBSP 14355), Vila Prudente, São Paulo, São Paulo state, Brazil (46° 34' 48.2" W, 23° 34' 51.6" S), IX-2018, unidentified bird nests and *Homo sapiens*; 1 ♀ (IBSP 12650), Jardim Maristela, Itapevi, São Paulo state, Brazil (46° 56' 02" W, 23° 32' 57" S; elevation: 770m), 21-X-2016, unidentified bird nests and *Homo sapiens*; 4 ♀ (IBSP 12734), Dois Vizinhos, Paraná state, Brazil (53° 03' 25" W, 25° 44' 01" S, elevation: 509m), 12-XI-2016, *Columbina talpacoti* (Columbiformes: Columbidae) and *Homo sapiens*; 1 ♀ (IBSP 12804), Botucatu, São Paulo state, Brazil (48° 26' 41" W, 22° 53' 10" S, elevation: 804m), I-2016, same hosts; 1 ♀ (IBSP 13663), Jaboticabal, São Paulo state, Brazil

(48° 19' 20" W, 21° 15' 18" S, elevation: 605m), X-2017, *Zenaida auriculata* (Columbiformes: Columbidae) and *Homo sapiens*.

Molecular analysis

Three specimens (IBSP 12734) of *O. bursa* were submitted to PCR. One of the three samples submitted to PCR amplified a fragment of 443-bp (GenBank accession number: MG966210). BLAST comparisons of these sequences showed 98.1% (407/415-bp) of identity with homologous sequences from *O. bursa* (FJ911854).

Discussion

Over the years many studies recorded the presence of *Ornithonyssus sylviarum* (Canestrini & Fanzago, 1877), a species similar to *O. bursa*, parasitizing several birds in Brazil (FACCINI & MASSARD, 1974; PEREIRA et al., 1977; FACCINI, 1987;

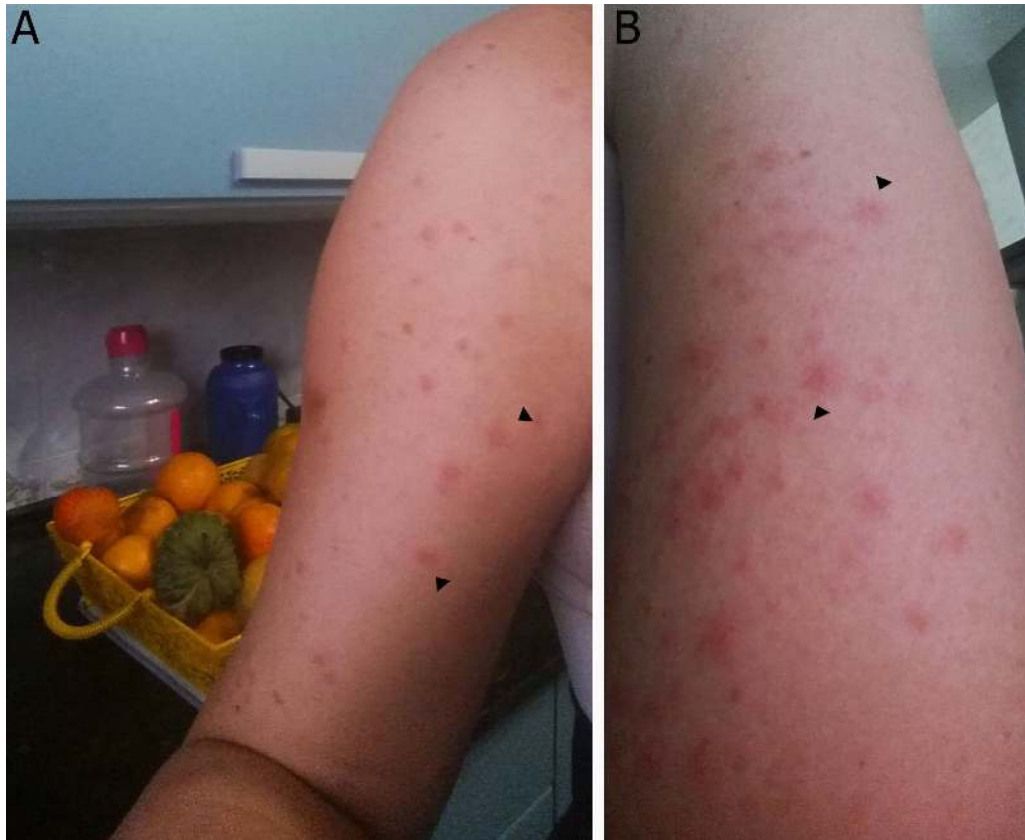


Figure 3. Papular dermatitis. A. Person's arm bitten by *Ornithonyssus bursa*; B. Details of the papular dermatitis on the person's arm. The Black arrows show the areas of papular dermatitis.

FACCINI et al., 1991; SERAFINI et al., 2003; SOARES et al., 2008). To have a clear separation between these two species, the main differences are: posterior margin of the dorsal shield of *O. sylviarum* much narrower than in *O. bursa*. In addition, *O. bursa* has three pairs of setae on the sternal shield, while *O. sylviarum* usually has two pairs of setae (DENMARK & CROMROY, 2003; DI PALMA et al., 2012).

The specimens from Dois Vizinhos (IBSP 12734) were collected on the humans living in the house, near the air conditioning exhaust vents. This situation was also observed by Oliveira et al. (2012). Currently only dermatitis has been observed on humans, there are no records about transmission of pathogens through the bite of *O. bursa*.

The examined materials in the present study are new locality records in State of São Paulo (Botucatu, Jaboticabal, Mogi das Cruzes and São José dos Campos), Rio de Janeiro (Maracanã) and Paraná (Dois Vizinhos). The passerine *Pygochelidon cyanoleuca* (Passeriformes: Hirundinidae) is a new association with *O. bursa*.

In addition, we also obtained a partial 18S sequences from one specimen. This sequence is quite similar (~98%) to the sequence cited by Dowling & O'Connor (2010). This is greater 18S divergence than typically expected for conspecifics; however, the sequence from this study is only a partial 18S and all of the differences between the two sequences fall within the most variable region of the gene. Additionally, the mites were from geographically disparate areas. Both of these factors could lead to increased levels of divergence

and it would be interesting to see what genetic divergence looks like from *O. bursa* around the world.

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