

Tropical medicine rounds

Avian mite dermatitis: an Italian case indicating the establishment and spread of *Ornithonyssus bursa* (Acari: Gamasida: Macronyssidae) (Berlese, 1888) in Europe

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Abstract

Background Avian mite dermatitis is a skin disease caused in mammals by the incidental bites of blood-sucking mites which customarily parasitize wild and domestic birds. It manifests in the form of pruritic, erythematous, or urticarial papules, with a central sting mark, in skin regions normally covered by clothing. The species mainly implicated in human bite cases are *Dermanyssus gallinae*, *Ornithonyssus sylviarum* and, less frequently, *Ornithonyssus bursa*. The latter is mainly a tropical and subtropical mite and its – presumably transitory – presence has been recorded only once in Europe, in migratory birds.

Case report We report a case of avian mite dermatitis in a 70-year-old man, an owner of chickens, who lived in Sicily, an island in southern Italy. He presented with an itching, erythematous, papular eruption. Numerous mites were seen racing across his skin. The precise identification of *O. bursa* was based on the morphology of its plates and chelicerae and on the arrangement of its setae.

Conclusions Not only does this paper report the first European case of human infestation with *O. bursa*, it provides evidence that this alien species has settled and spread in the Old Continent. It may have been flown in from a small focus reported in Danish migratory birds in the 1980s or may have been accidentally introduced into Italy through the importation of infested poultry from South America. Such occurrences may have unpredictable epidemiological and ecological consequences. More comprehensive veterinary inspection of imported birds is desirable.

Introduction

Avian mite dermatitis is a pruritic skin disease caused by the bites of blood-sucking mites, which live as ectoparasites of wild and domestic birds, when they temporarily leave their usual hosts to feed on humans or other mammals.¹ Its clinical manifestations consist of pruritic, erythematous, and/or urticarial papules, which often bear a red puncture mark and are mainly located on areas of the body that are normally covered.^{1,2}

Three species are generally responsible for the disease in humans: *Dermanyssus gallinae* (De Geer, 1778) (poultry red mite), a parasite of wild and domestic birds with worldwide distribution,^{1–4} *Ornithonyssus sylviarum* (Canestrini and Fanzago, 1877) (northern fowl mite), a pest of chickens in temperate regions,^{1–3,5} and *Ornithonyssus bursa* (Berlese, 1888) (tropical fowl mite), a tropical and subtropical mite of wild and household birds,

which is far less commonly reported to feed on people.^{2,6–8} A fourth possibly responsible species, although not specifically considered an avian mite, is *Ornithonyssus bacoti* (Hirst, 1913) (tropical rat mite), a parasite of rodents which may occasionally infest birds.²

To date, there has been only one record of *O. bursa* in Europe,⁹ in migratory birds in Denmark. In this paper we report, for the first time, an autochthonous case of human dermatitis caused by this species, occurring in Sicily, a southern and temperate region of Italy.

Case report

A 70-year-old Sicilian man from Palermo, who had never travelled abroad, presented with an itching papular eruption that had started one week earlier. He was affected by hepatic cirrhosis and hepatocellular carcinoma, for which he was receiving proper hospital-based treatment.



Figure 1 Clinical examination shows erythematous and urticarial papules, some of which are excoriated, on the left flank and lateral chest of a 70-year-old man. Inset: detail of the lesions, which show a central red puncture mark, an excoriation, or a small bloody crust on the top

Physical examination revealed several erythematous and urticarial papules measuring 4–5 mm in diameter, with a red puncture mark or a small bloody crust on top. The manifestations were mainly located over the trunk and proximal limbs, clustered at the sacral and scapular regions, and on the flanks and lateral chest (Fig. 1). Itching was severe and equally intense during the day and night, and some of the lesions were excoriated by scratching. On closer inspection, we noticed several minuscule black organisms moving rapidly across the skin of the patient, who admitted having already observed them on himself, on his wife's skin, and in his bed.

A diagnosis of arthropod infestation was made, and the source of the parasites was traced to a household coop located in the backyard of the patient's home, where he kept two hens. These had been purchased a few weeks earlier from a local private breeder, who allegedly bought his stock from Italian farms.

A few arthropods were collected from the patient's skin and mounted on slides in immersion oil. The resulting specimens were observed by transmitted light microscopy, which revealed the morphology typical of adult mites, which is characterized by an anterior gnathosoma, bearing the palps and chelicerae, and a posterior idiosoma, with four pairs of legs (Fig. 2). In two specimens, recognizable as adult females, the shape of the shields and chelicerae and the arrangement of the



Figure 2 Overview of the body of adult female *Ornithonyssus bursa*, showing the long chelicerae, elongated genital plate, and anal opening in the anterior half of the plate. Two pairs of well-developed setae at the posterior contour of the dorsal plate can be seen. Inset: sternal plate with three pairs of setae on the lateral edges. A 45° axial turn reveals the dorsal and ventral features. (Transmitted light microscopy whole-mount photomicrographic map; original magnification: $\times 100$ [inset: $\times 250$]; scale bars: 100 μm)

setae could be compared with the keys indicated in the literature as characteristic of the four species consistent with our case: *D. gallinae*, *O. sylvarum*, *O. bursa*, and *O. bacoti*.^{10–16} Krantz and Walter's treatise was utilized for identification of categories from superorder to family level.¹⁷

Our specimens matched the keys for the identification of *O. bursa*^{10–14} (Table 1), and the other three candidate species were excluded.^{14–16} Thus, mite infestation caused by *O. bursa* was diagnosed.

The patient was treated with two applications of permethrin cream 0.5%, applied one week apart, and was advised to destroy the chickens, disinfest his house, backyard, and mattress with pyrethroids, and thoroughly wash his bedding and clothes. The infestation ceased, and the dermatitis healed spontaneously.

Discussion

Avian mite dermatitis is a skin disease caused by the bites of mesostigmatid mites that primarily parasitize wild and domestic birds but occasionally leave their natural hosts

Table 1 Features observed in the present specimens of *Ornithonyssus bursa*

Feature	Key(s) to	Exclude
Chelicerae: long and stout with well-developed two-digit chelae ¹⁷	Family Macronyssidae ¹⁷	<i>D. gallinae</i> (stiletiform chelicerae) ^{11,15}
Anal plate small and pear-shaped with anal opening in the anterior half of the plate ^{11,13}	Genus <i>Ornithonyssus</i> ^{11,13}	<i>D. gallinae</i> (broad anal plate, anal opening in the posterior half of the plate) ¹⁰
Anal plate with a rounded posterior margin ¹² Elongated genital plate ¹³	Genus <i>Ornithonyssus</i> ¹³	<i>O. bacoti</i> (anal plate with a straight posterior margin) ^{16,17} <i>D. gallinae</i> (truncated and posteriorly broadly rounded genital plate) ^{10,15} <i>O. bacoti</i> (elongated genital plate with an anterior, medial projection fitting into the posterior concavity of the sternal shield) ¹⁶
Sternal plate with three pairs of setae on the two lateral edges ^{10,12}	Species <i>O. bursa</i> ^{10–12} and <i>O. bacoti</i> ¹¹	<i>O. sylviarum</i> ^{10–12} and <i>D. gallinae</i> (two pairs of setae on the sternal shield) ^{10,15}
Dorsal plate evenly tapering towards its posterior end ^{12,17}	Species <i>O. bursa</i> ^{12,17}	<i>O. sylviarum</i> (dorsal plate narrowing abruptly near its posterior end) (drop-shaped posterior end) ^{12,15,17} <i>O. bacoti</i> (dorsal plate narrowed posteriorly to a blunted point) ^{11,16} <i>D. gallinae</i> (dorsal plate smoothly narrowing posteriorly with a truncated posterior margin) ¹⁵
Setae on the dorsal plate: short in the middle dorsal row ¹¹	Species <i>O. bursa</i> ^{10,11,14}	<i>O. sylviarum</i> (only one pair of well-developed setae, i.e. Z5, at the posterior margin of the dorsal plate) ^{10,14}
Only two pairs of well-developed setae (S5 and Z5) at the posterior contour of the plate ^{10,14}		<i>O. bacoti</i> (setae on the dorsal plate as long as other dorsal setae) ^{11,16}

D. gallinae, *Dermanyssus gallinae*; *O. bacoti*, *Ornithonyssus bacoti*; *O. bursa*, *Ornithonyssus bursa*; *O. sylviarum*, *Ornithonyssus sylviarum*.

and attempt to feed on humans or other mammals. Two families are involved in such cases: the *Dermanyssidae*, represented by the species *D. gallinae*, and the *Macronyssidae*, represented by the species *O. sylviarum* and *O. bursa*.^{1–8}

Dermanyssus gallinae has a worldwide distribution, although it is mainly found in the Palaearctic ecozone and in North America.^{2,18} *Ornithonyssus sylviarum* resides in the temperate regions of the five continents.^{2,18,19} *Ornithonyssus bursa* is primarily observed in tropical and subtropical regions, although it has been sometimes detected in temperate climates.^{2,19–23} It is well represented in Africa, Asia, Australia, and America,^{6–8,19–23} but the only record of this species in Europe concerns an infestation of swallows in 1986, in Denmark, into which the mites had evidently been flown from their native climates by these migratory birds, and where they were not likely to survive the winter.⁹

These mites infest poultry, as well as wild, ornamental, and peridomestic birds, including pigeons, sparrows, and swallows. The skin disease in the infested birds has different features, depending in part on the biological behavior of the parasites. In fact, *D. gallinae* makes contact with its host only at night for quick and sporadic bloodmeals,

and the lesions, which merely result from the bites, consist of erythematous papules located on any region of the skin.²

By contrast, *O. sylviarum* dwells full-time on its hosts skin and in its coops.² *Ornithonyssus bursa* infests both its host, on which it feeds intermittently, and its host's environment in great numbers. The dermatitis caused in birds by the latter two species is characterized by a combination of acute and chronic eczematous manifestations, mixed with exuviae and feces from the parasites, without obvious bites.²

Mammals are unnatural and temporary hosts for avian mites, which quickly leave their skin after feeding. They are virtually never detected on mammal skin, although exceptional cases of primary infestation in rodents have been reported.⁴ Man is also an aberrant host for these parasites, which only in exceptional cases have been reported to crawl on to human skin or colonize human bedding.^{6,8,24} Most cases occur in people who work in infested poultry operations; in other instances, attacks can be attributed to food-seeking mites from abandoned nests and roosts of peridomestic birds. The mites intrude into buildings through any openings and crevices in walls and ceilings,² biting individuals and whole communities

and sometimes causing epidemics in schools and hospitals.²⁴

Unlike the various forms of the disease in birds, the clinical manifestations in humans do not vary, regardless of the species responsible, and are typically those represented in the present subject. They consist of pruritic erythematous and/or urticarial papules, often marked by a pinpoint red spot on the top. The lesions are usually located on the cutaneous regions protected by garments without the preferential involvement of apocrine areas and finger webs observable in scabies.^{1,2} Itching is intense, but, by contrast with that of scabies, it is not intolerable and does not worsen at night. Papular-vesicular lesions are also observable, with which wheals may be associated. In addition, the involved skin will show a number of patient-inflicted scratches induced by the itch.^{2,8} An interesting, and rare, feature in the present subject refers to the finding of a great number of mites on the patient's skin; this does not necessarily entail reproduction and molting but is evident of disequilibrium in the host-parasite relationship.

The species most frequently implicated in human bite cases are *D. gallinae* and *O. sylviarum*, whereas *O. bursa* is far less commonly reported to bite humans.¹⁻⁸ A fourth species, *O. bacoti*, is a parasite of rodents and can occasionally infest birds. In the present patient, the responsible species was *O. bursa*, which was identified according to the morphology of its plates and chelicerae, and the arrangement of the setae on the sternal shield and the posterior end of the dorsal shield¹⁰⁻¹² according to Lindquist and Evans' chaetotactic system (1965).¹⁷ Thus, the present paper not only reports the first European case of human infestation with *O. bursa*, it also provides evidence of the establishment and spread of this species in the Old Continent. The mite may have been flown from the aforementioned Danish focus or from similar, unnoticed foci in other countries. Alternatively, as the importing of fowls from South America has become common practice in Italy, we hypothesize that *O. bursa* may have been accidentally introduced into Italy by its carriage on infested animals and that its development may have been boosted by climate tropicalization, which carries unpredictable epidemiological and ecological implications. In the present case, however, there was no evidence of direct transmission of the mite from imported fowl, and neither did the patient report having made any trips abroad, which excludes the possibility of overseas infection, as reported by Diaz.²⁵ Finally, this mite may always have been present in southern Italy and may simply have been overlooked or its presence misdiagnosed until now. We suggest that more accurate veterinary inspection of imported birds is required.

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