

## Outbreaks of *Dermanyssus gallinae* (Acari, Mesostigmata) Related Dermatitis in Humans in Public and Private Residences, in Italy (2001-2017): An Expanding Skin Affliction

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### Abstract

Avian mite dermatitis is a skin affliction of mammals, including humans caused by bites of nidicolous, haematophagous mites in the suborder Mesostigmata, which naturally parasitize birds. The red-mite, *Dermanyssus gallinae* is the most common species implicated in episodes of dermatitis in city-dwellers, worldwide. Symptoms manifest in the form of pruritic, erythematous papules on exposed/covered body areas. We report 20 urban outbreaks of red-mite dermatitis occurring in Southern Italy from 2001 to 2017 (June) and diagnosed through parasitological identification by veterinarian entomologists. The patients, a total of 54 subjects, were infested in their homes/workplaces by both mites emigrating indoors from deserted nests of sinantropic birds close to the infested edifices and from pet canaries. Red-mites may be the explanation of cases of pruriginous dermatitis of obscure origin in city-dwellers. The applying of the One Health approach is crucial for diagnosis, treatment and prevention of dermatitis by epizootic ectoparasites.

**Keywords:** *Dermanyssus gallinae*; Red mite; Dermatitis; Itching; Acariasis; Emerging diseases; Entodermatitis

### Introduction

The zoonotic avian mites are non-burrowing, haematophagous ectoparasites in the suborder Mesostigmata. Among them, the most dermatologically relevant belong to two closely related genera in two families; *Dermanyssus* species in *Dermanyssidae* and *Ornithonyssus* species in *Macronyssidae*. They are of very similar size and shape. The genus *Dermanyssus* (D.) Duges, recognizes at least 25 species, [1] including the poultry red-mite (PRM) *D. gallinae*, the most important species for the human health. PRM-attacks associated to synantropic birds are rarely recorded because their diagnosis is challenging. To confirm this, we report the widest case series of PRM-dermatitis in city-dwellers diagnosed by parasitological identification; we also provide information of practical interest on this subject and suggestions useful to establish a correct diagnosis.

### Case Report

In 2001-2016 years, between March and October and in June 2017, the Medical Entomology Laboratory of the Istituto Zooprofilattico Sperimentale della Puglia e della Basilicata (IZSPB) received from privates/public health services/physicians samples of arthropods to identify. They were suspected to be related to 20 outbreaks of pruritic skin disorders in city-dwellers. Parasites were collected in public edifices (4/20) (Hospital/Law Court/Municipal Hall) and in apartments (16/20) of afflicted patients, located in 11 municipal districts of the Southern Italy. A total of 54 subjects (49 adults and 5 children) were involved. They suffered from itching and punctiform, erythematous papules; the cutaneous reactions were diffuse or almost exclusively on hands, arms and legs and they lasted from a minimum of 1 week to a maximum of 36 weeks. In 14 (14/20) cases, physicians (general practitioners/pediatricians/dermatologists) were consulted by patients because of the pruritus and they attributed the symptoms to different arthropods and/or other causes (atopy/ allergy/ psychogenic pruritus). Antihistamines and steroids were prescribed after the medical examination (14/14 cases), also in combination with parasitic shampoos (2/14), antibiotics (2/14) and tranquilizers (1/14). Symptoms returned after treatment was stopped. In the remaining outbreaks (6/20) no medical advice was sought. The collected arthropods were identified by IZSPB veterinarian

entomologists as *Dermanyssus gallinae* (Figure 1) according to Varma morphological keys [2] and key characters [3]. After environmental investigation, the PRMs source was identified in pigeon (18/20)/sparrow (1/20) nests close to the habitations and pet canaries (1/20). Showering/washing of patients/their clothes, removal of the mite source coupled with intensive vacuum cleaning and disinfection (pyrethroids) of the



**Figure 1:** Red-mite, *Dermanyssus gallinae*, ventral view of female; buccal apparatus: pedipalps with two long thin chelicerae (particular).

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infested quarters, led to complete regression of the symptoms. At the suggestion of the IZSPB veterinarian entomologists no therapy was prescribed. There was no evidence of mites or dermatitis in the follow-up period.

## Discussion

The poultry red-mite, *Dermanyssus gallinae*, De Geer is a cosmopolitan nidicolous blood-sucking ectoparasite able to infest naturally several species of domestic and wild birds and, occasionally mammals, including humans [2], thus representing a significant medical and veterinary issue [4]. It visits the host temporarily for short blood meals (1-2 hours), typically at night; in daytime, the mite hides away in its close proximity [2]. The life cycle includes five developmental stages (egg-larva-2 nymphal stages, male and female) of which adult and nymphs consume blood; under favorable temperature conditions and in presence of the avian host, it is completed within 7-10 days [2]. *D. gallinae* can be seen to naked eye; unfed red-mites are approximately 0.70 mm long  $\times$  0.40 mm wide, greyish-white in colour



Figure 2: 55-year-old man: erythematous papules on abdomen, particularly intense where clothes constrict the body.



Figure 3: 2-year-old, female: clustered papules where a central puncture mark is visible.



Figure 4: Red mites (ungorged) attracted by warm hiding places, such as TV in stand-by mode.

and rather motile in movement; when engorged they increase to more than 1 mm long becoming reddish-brown and sluggish [2]. In urban environments, PRMs are associated mainly with feral pigeon breeding sites [5,6], where they can fast for more than 5 months [7]. These birds are among the most successful avian settlers due to the abundance of food and the absence of predators and they built their nests in crevices and holes on the facades of houses, behind air-conditioners, in the eaves, attics, etc. [5] When the avian host is absent, as commonly occurs in late spring/early summer, when fledglings leave, food-searching mites will parasitize alternative hosts, such as humans in their close proximity. Due to exposure to mite's bite and inoculation of saliva's components, subjects develop itching, erythematous, papular eruptions, sometimes bearing a puncture mark mostly visible in recent bites. However, the changes arising in the skin as a consequence of the feeding process of these blood-sucking arthropods are usually very difficult to relate to problems of parasitization without a degree of clinical suspicion; searching and identifying these arthropods also require understanding of mite biology/taxonomy. Consequently, the effective prevalence of such skin affliction may remain underestimated. However, epidemiological conditions in nowadays cities promote the expansion of the mite source (i.e. Pigeons) and the human-PRM contact, raising the risk of developing this dermatitis. Based on our experience, severe pictures manifest when favorable conditions for mites occur (darkness, long-term availability of inactive hosts, high humidity, hideouts close to victims, etc.), as observed in subjects parasitized in bedding, on whom PRMs can feed for a suitable time, even crawling under clothes, then returning to hideouts and repeating such feeding every few days. In these cases, bite-induced dermatitis is generalized, with hundreds of pruritic skin eruptions in disseminate distribution also on covered body areas, particularly intense where clothes constrict the body (Figures 2 and 3). By contrast, when infestations occur in workplaces, subjects manifest few cutaneous reactions almost always on exposed body areas, mainly arms and legs, after coming into contact accidentally with PRMs. They usually see the mites racing across their clothes and/or office furnitures and refer biting/stinging sensation during the working activities, as well as documented in other cases [9]. We retain that under these conditions, PRMs are able to only perform quick exploratory bites, due to disturbance factors (active host, daytime, etc.); in fact, they rapidly strike and are able to bite in less than 1 second

[8], time sufficient to inject saliva's components and to induce rash and itching. When unexplained annoying bite like eruptions occur in humans in residential settings, *D. gallinae* involvement should always be suspected. Because diagnosing infestation based on presenting symptoms is inadequate and cause of misdiagnosis, diagnostic elements can be acquired by the environmental investigation. A good knowledge of the PRM biology/ecology (variations in size and colour, nocturnal feeding habits, typical hiding places, etc.) is crucial to find the mite. PRMs are sensitive to temperature changes as a cue to detect a potential host [10]; particularly, they are attracted by good and warm hiding places capable to simulate the bird body temperature (e.g. pigeons 42°C), such as the electrical devices running in stand-by mode (e.g. laptop computers, television, radio clocks etc), thus generating heat. Therefore, it is strongly recommended to check these electrical appliances for the mite detection (Figure 4). The seasonal occurrence of this infestation, clearly demonstrated [11], may be a further diagnostic factor; it reflects the peak of the PRM- population linked to the peak of the reproductive activity of synanthropic birds, mainly pigeons occurring in spring/summer with more nests built and abandoned.

Pets can be also infested with *D. gallinae*, including canaries [12] which for the first time we report here as source of human infestations, such as previously recorded for pet gerbils [13]. The meaning of these mites in public health also stems from their role as potential allergens and reservoirs/vectors of zoonotic pathogens [14]; recently, Bartonella quintana and both Lyme Disease and Q Fever agents have been detected in Dermanyssus mite species collected from urban outbreaks of human dermatitis [15,16]. For this reason, the potential of PRM in transmitting diseases need to be indagated seriously. Furthermore, zoonotic mesostigmatic mites morphologically close to *D. gallinae* but with different relationship to their host, such as *Ornithonyssus* (*O.*) *bacoti*, *O. sylviarum* and *O. bursa* [17-19] can be associated with urban dermatitis worldwide. For this reason, it is important correctly to identify the collected parasites.

## Conclusion

Because reports of mesostigmatic mite attacks in city-dwellers have increased in frequency in recent years, we retain that these infestations may become an emerging public health problem in urban environment. For this, our experience suggests greater attention to this topic and based on the One-Health approach, activation and incentivization of more close collaboration between physicians/dermatologists/entomologists/veterinarians to diagnose, solve and prevent dermatitis by zoonotic ectoparasites, including the PRM dermatitis.

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