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CASE REPORT OPEN ACCESS

Pigeon mite: An underdiagnosed cause of papular urticaria

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Abstract
Background: *Dermanyssus gallinae*, known as bird mite, generally lives on nestlings' featherless skin. Humans are accidentally infected, and itchy dermatitis is induced when the mites are unable to use birds' blood. The diagnosis is difficult due to the very small size and rapid movement of the mites, which make them hard to spot.
Case presentation: A 14-year-old male and his mother were referred to the allergy clinic complaining of a 2-week generalized itchy cutaneous papular lesion, unresponsive to antihistamines, with the feeling of an insect moving on the surface of the skin. Due to the history of recently hatched pigeons nesting on their balcony and finding very small bugs, diagnosed as *D. gallinae*, they were instructed to clean the pigeon's nest as the source of these parasites, which successfully solved the problem.
Conclusion: Bird mite infestation should be considered in the differential diagnosis of recurrent pruritus and urticaria, refractory to conventional treatments. Physicians should be aware of this mite infestation in approach to any patient with papular urticaria.

Introduction

There is a wide spectrum of shared human-animal disorders among which there is a disease related to an arthropod parasite called *Dermanyssus gallinae*. This parasite's primary hosts and reservoirs are pigeons *(Columba livia)*, poultry, canaries *(Serinus canaria domestica)*, and parrots *(Psittaciformes)*. *D. gallinae* and *Ornithonyssus sylviarum* are known as bird mites. These mites will seek alternative hosts when they are unable to use their main hosts' (birds) blood. Itching and urticaria (pruritic dermatitis) might be induced if humans are accidentally infected.[1] The most challenging issue regarding the diagnosis is the very small size of the mites and their rapid movement, which make them hard to be spotted by naked eyes. Pigeon nests, which are generally located near the humans' houses, are huge resources, sometimes counting about 50,000 of mites. Very young featherless birds are the main targets for the mites, even though it has not been reported to be hazardous for the nestlings. These parasites seek for new hosts

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when the birds leave their nests, and the nearest new host would be the habitats of the adjacent house.[2]

Papular urticaria is a manifestation of papules with repeated swelling vesicles of various sizes. This seems to be an allergic reaction to insect bites. The severity of lesions and itching is proportional to the host's response to saliva proteins or insect bites. It seems that children are more prone to papular urticaria, which may be caused by immunological mechanisms or their physiological behaviors. Typically, papules in sizes of 3–10 mm are seen in groups in exposed areas, especially the face, limbs, and abdominal and lumbar bands. The lesions are usually excoriated and show the characteristic severe pruritus.[3]

Although granular deposits of C1q, C3 an IgM in the superficial dermal vessels, and perivascular aggregation of mononuclear cells are suggested in the pathogenesis of popular urticaria, but the exact immune mechanisms remain unclear.[3,4]

Other differential diagnoses for papular urticaria include atopic dermatitis, contact dermatitis, adverse drug reactions, "id" reaction, varicella, miliaria rubra, polymorphic light eruption, linear IgA bullous dermatosis, pityriasis lichenoides, and Gianotti–Crosti syndrome. The features of distinguishing papular urticaria from these differential diagnoses include the pattern of distribution, recurrence, and histopathology.[5]

Herein we report a 14-year-old boy and his mother who presented with the symptoms of itching and bite-like lesions.

Case Report

A 14-year-old male and his mother were referred to our allergy clinic. Both had generalized itchy lesions since 2 weeks. Itching was more serious at night and was associated with the feeling of an insect moving on the surface of the skin. There was no complaint of any other concomitant symptoms such as fever or history of taking medicines.

Both patients had received oral antihistamine treatment, which was not successful in relieving the cutaneous lesions and itching. On clinical examination, small red papules were found throughout their skin, especially the neck, trunk, as well as both upper and lower limbs (Figure 1).

Figure 1 The multiple bite sites by *Dermanyssus gallinae*.

This family had no pets, but the mother reported that during the last weeks before starting their skin problems a pair of pigeons had been nesting on their home balcony and had recently hatched. A few days before their visit, the family noticed very small bugs (less than 1 mm) moving on bed covers and some household items. A specimen of these bugs, which was brought by the patients, was sent to the entomological laboratory for a more accurate diagnosis. The result of laboratory diagnosis was *D. gallinae* (Figure 2).

The family was instructed to clean and throw away the pigeon's nest and all its attachments, the source of these parasites. After doing this, the lesions disappeared within a few weeks without any special treatment, and no complications occurred.

Discussion

This was a report of a mother and his son, who were referred to the allergy clinic complaining of pruritus and urticaria, nonresponsive to antihistamine, finally diagnosed as *D. gallinae* infestation. Considering the fact that this family resided in a city, not keeping any pets or poultry, finding the mite source was challenging. However, there was a bird nest on the balcony of their house. The diagnosis in this case was problematic due to the small size of the mites and lack of any external stimuli in addition to not owning pets. In other words, the most important factor in such cases would be the high suspicion index.

Similar cases have been reported in the form of simultaneous involvement of family members with papular urticaria manifestations, which can help in the diagnosis of this disease.[6]

The word "Gamasoidosis" is a term used to describe non-burrowing skin diseases of mites that feed on blood, and for this purpose parasitize birds and other animals.[1] *D. gallinae* often feeds at night and may be found in a variety of birds.[7] The avian or bird mite, *D. gallinae*, is significantly different from *Sarcoptes scabiei*, the mite that causes scabies. Compared to *S. scabiei* , *D. gallinae* is a blood-sucking mite, which is not able to burrow or lay eggs in the human skin.[7] The *D. gallinae* may be yellow, brown, or black, and its color may change to red when it has just fed from the host. It has four pairs of legs and is about 1 mm in size.[7] Growth and development of

Figure 2 *Dermanyssus gallinae* found by the patient, observed under light microscopy.

D. gallinae from egg stage to full maturity obviously occur within 2 weeks or even fewer than a week.[8,9] The conditions inside the poultry nests are suitable for *D. gallinae* population growth. So, the temperature between 10 and 35°C and the relatively high humidity (more than 70%) of these nests facilitate the reproduction and development of *D. gallinae*.[9,10] In other words, the mite population will be doubled during a week in a properly warm and humid bird nest.[9,11] The ability of *D. gallinae* to tolerate starvation up to about 8 months helps them to migrate long distances and extended time after losing the host, when they exit the original pigeon nest.[12,13] The mites move at a speed of up to about 120 m per hour, which helps them to roam the habitat and find new hosts.[14]

Bird mites usually spend their entire life on birds. However, they can also infect humans as an accidental host. There are also reports of human-infecting mites that infect chickens (*Gallus gallus domesticus*), ducks (Anatidae), pigeons (*C. livia*), canaries (*S. canaria domestica*), parrots (Psittaciformes), sparrows (Passeridae), starlings (Sturnidae) and tiger finches (*Taeniopygia guttata*). Because many of these birds are kept as pets, it is important to pay attention to their role as zoonosis carriers.

The mites who fed on fledglings need to find an alternative source of nutrition when the birds leave the nest. Therefore, these birds' nest can act as a mite reservoir and infect humans as an alternative host, particularly if they are close to human habitats. Mites may attack humans, which may cause itching and inflammation of the skin.[15] During the day, mites enter buildings through seams and cracks in the doors, windows, walls, floors, and ceilings. They can also be entered through air ducts or air conditioning units.[16,17]

There are reports of association of *D. gallinae* with some viral and bacterial species. Among these are the avian influenza viruses *Chlamydia psittaci*, *Coxiella burnetii,* and *Borrelia burgdorferi*. Also, studies have shown that this mite can be a carrier of *Salmonella enterica enterica*, which causes typhoid fever in chickens.[18]

Among the birds mentioned above, migratory species such as parrots are considered a health concern because they can act as a reservoir for a significant amount of pathogenic agents such as Salmonella sp. and *C. psittaci* through the *D. gallinae* vector in the human population.[19]

Although infestation with these mites is a common and well-known parasitic problem in rural areas, especially in poultry and pigeon breeders, it often remains undiagnosed in urban areas for a long time. The patients' problems might not be fundamentally resolved due to the fact that identification of the clinical manifestations, induced by *D. gallinae* bite, can be difficult for clinicians who are not familiar enough with these mites. However, the appearance of red papules, especially in the exposed areas of the body, with nocturnally exacerbated itching, in the absence of any history of other diseases or previous infections before the period of being exposed to the mites, along with the discovery of these parasites in the living space, can lead to the diagnosis.[20]

Considering the increase in the presence of feral pigeons in cities and near residential houses, especially their nesting on the terraces and balconies of houses, this type of infestation and its clinical manifestations should always be taken into account by physicians. Also, this disease is seen as an occupational hazard in poultry breeders, which is caused by the high prevalence of infestation in their work and living environment. Particularly, in areas where there is a high rate of exposure, physicians should bear this infestation in mind as a reason of chronic problematic itchy skin rashes, which is hardly ever distinguished correctly.[2,21,22]

The first step to approach the bird mites' bite and the resultant urticaria is taking proper preventive measures. The most effective methods to block the spread of bird mites in residential areas include not feeding the birds and netting the terraces of buildings, to avoid nesting birds near humans' residences. During the nesting season, the nests must be removed and cleaned before the birds can settle in them and lay their eggs. Using acaricides, and washing clothes and sheets at 60°C will also be helpful. Antiseptic compounds (Hexidine, twice a day) as well as antihistamines such as cetirizine, 10 mg/day, can be used to reduce itching.[20]

People should also be instructed to contact medical healthcare services if they have symptoms of itching or feeling of insect movement on the skin.[17]

All in all, *D. gallinae* as one of the well-known bird mites could infest humans, either in rural or urban areas, inducing pruritic dermatitis, resistant to common medicines. Hence, bird mite infestation should be considered in the differential diagnosis of recurrent pruritus and urticaria, refractory to conventional treatments. The diagnosis is challenging due to the disorder being uncommon in cities. However, physicians should be aware of this mite infestation while approaching any patients with papular urticaria.

Competing Interests

The authors declare no competing interests.

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Authors' Contributions

Saber Gharagozlou contributed to the collection of data and writing the first draft, and approved the final manuscript before submission. Marzieh Tavakol helped in the process of writing manuscript and edited the final version of the article. Mohammad Gharagozlou contributed to the history taking, following and treating the patient, as well as writing and editing the manuscript.

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