

When there is no communication between urban planners and public health operators: urban *Dermanyssus gallinae* infestations in humans.

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Abstract

At the international level, it is necessary to apply *urban health* strategies that can integrate concrete actions to protect and promote health in urban and architectural planning. In cities, the "urban fauna" mostly consists of synanthropic birds (sparrows, starlings, swallows, martins, jackdaws, crows, hawks, gulls, pigeons) that have adapted to a continuous relationship with humans. These animals enrich the ecological network of biodiversity but also pose health problems. The most successful avian colonizers are pigeons (*Columba livia*), which proliferate due to the abundance of food available to them and the absence of predators. Pigeons may harbor several organisms that are pathogenic for humans, and among these the role of *Dermanyssus gallinae* should not be underestimated. In the absence of their preferred pigeon host, these mites will move from the nest to windowsills and window frames from which they attack humans. The Authors show that modern architectural design features in towns can favor the establishment and proliferation of pigeons, contributing to the public health risk for dermanyssosis or other diseases related to these birds. They describe an outbreak of dermanyssosis due to incorrect or unsuitable structural interventions, and highlight the need of re-thinking urban architectural choices in order to safeguard public health.

Riassunto

Nel campo dell'urbanistica e della pianificazione territoriale, anche a livello internazionale, soprattutto alla luce della situazione pandemica, è necessario applicare strategie di *urban health* che sappiano integrare azioni concrete di tutela e di promozione della salute nella progettazione urbana e architettonica.

Nelle città, la "fauna urbana" è rappresentata principalmente da uccelli sinantropici (passeri, storni, rondini, piccioni, ecc.), i quali si sono perfettamente adattati alla relazione con l'uomo. Questi animali arricchiscono la rete ecologica della biodiversità, ma pongono anche problemi di sanità pubblica. I colonizzatori aviari di maggior successo nelle nostre città sono i piccioni (*Columba livia*), i quali proliferano grazie all'abbondanza di cibo disponibile - procurato spesso direttamente (ed erroneamente) dagli stessi cittadini - e all'assenza di predatori. I piccioni, tuttavia, possono ospitare organismi patogeni per l'uomo e tra questi non va sottovalutato il ruolo di *Dermanyssus gallinae*. In assenza dell'ospite preferenziale, questi acari si spostano dal nido e, attraverso il davanzale delle finestre e gli infissi, raggiungono gli esseri umani. Questo contributo intende dimostrare che alcune soluzioni architettoniche adottate nelle città possono favorire l'insediamento e la proliferazione dei piccioni, contribuendo al rischio di dermanissosi o di altre patologie legate a questi uccelli. Gli autori descrivono un focolaio di dermanissosi dovuto a interventi strutturali errati o inadeguati e sottolineano la necessità di ripensare le scelte architettoniche urbane per la salvaguardia della salute pubblica.

Urban health

The term *urban health* means a "strategic orientation that integrates the actions of protection and promotion of health in territorial planning, favoring conscious and sustainable processes of urban regeneration" (1).

At the international level, and especially in the light of the pandemic situation, it is necessary to apply strategies of urban health that can integrate concrete actions of protection and promotion of health in urban and territorial architectural planning.

In this perspective, the contemporary dimension of our cities requires urban planning and structural choices that must necessarily adhere to a clear and conscious planning model (2).

A city planning that is oriented according to the concepts of *urban health* should be intended as the adoption of methodologies aimed not just at improving the behavior and daily habits of one or more communities, but also at guaranteeing a healthy environment in terms of contamination, transmissibility, disease spread and sanitary risk, through architectural actions addressed to new buildings, buildings to restore, to requalify, to stabilize, etc. (3).

The main tendencies of the 21st century lead urban planning and structural decisions (including the choice of the materials to be used) towards project scenarios that can create shapes, spaces, and architectural elements able to guarantee collective well-being and outside spaces (4).

Cities, towns and synanthropic animals

Many "synanthropic" animals live in cities and towns, constituting "urban fauna". This mostly consists of animals (once prevalently wild) that have chosen urban areas as their habitat, thus accepting and adapting to a continuous relationship with humans.

Most urban fauna consists of birds (sparrows, starlings, swallows, martins, jackdaws, crows, hawks, gulls, pigeons). While these animals enrich the ecological network of biodiversity and natural biogeochemical cycles, they also pose health problems that require human interventions to ensure a level of environmental sustainability by limiting the expansion and proliferation of these animal populations.

Cities have the perfect characteristics of a preferential habitat for synanthropic animals because the availability of food, the presence of crevices, roofs, attics, sewers, and so on, create the ideal conditions for them to live and proliferate.

In our cities, the most successful avian colonizers are pigeons (*Columba livia*), whose proliferation is favored by the abundance of available food, often provided directly (and mistakenly) by city residents themselves, and by the absence of predators (5). Pigeons build their nests in and near urban centers and are particularly plentiful in old villages, given the presence of badly restored old buildings, where they nest in crevices and holes on the façades, in skylights, under eaves, in attics, and so on. Their proliferation causes several problems: increased environmental fecalization, soiling of buildings and monuments, damage to lawns, and the inevitable spread of pathogens, including those of zoonotic interest. In this context it is worth mentioning that pigeons are protected by the law, in fact, the Regional Act No. 157 of 11 February 1992, laying down provisions on the protection of wildlife and restrictions on hunting, states that killing, capturing, moving or destroying nests or eggs of these birds is prohibited by articles 3 and 18. Usually the restoration of the hygienic conditions for the rehabilitation of a certain area falls within the responsibilities of the properties' owners; however, in case of particular conditions of degradation, the Municipality activates a procedure, requiring the owners of the buildings to carry out the necessary interventions for the rehabilitation of the area and the installation of appropriate physical or acoustic bollards for the birds.

Pathogens transmitted by pigeons and *Dermanyssus gallinae*

Pigeons harbor at least 60 different organisms that are pathogenic for humans (5), among which the role of *Dermanyssus gallinae* - an ectoparasitic mite approximately 1.5 mm in length and gray to brown/red, depending on feeding status - should not be underestimated. This mite is mainly known as a parasite of domestic birds (broilers, turkeys and ducks, canaries, budgerigars) and of several synanthropic birds found in towns (swallows, sparrows, pigeons) (6).

The mite's life cycle consists of egg, larva, two nymphal stages, male and female, and is completed on average in two weeks; under ideal conditions (35 °C and relative humidity above 70 %) this period can be halved (7).

During daylight hours, *D. gallinae* mites live concealed in nests, but from dusk till dawn they move onto the hosts in order to take a blood meal.

When birds abandon their nests (usually once chicks have fledged), in the absence of their preferred host, the mites move from the nest to search for a new host on which to

feed. It is often the case that nests are situated near city homes, and the mites can reach humans via windowsills and window frames at any time of day, and most frequently in the period between late spring-early summer and autumn.

In Europe, urban infestations of *D. gallinae* have been recorded in 12 countries; they are most frequent in private homes/apartments (over 150 outbreaks have been recorded), but also in hospitals (6 cases) and public offices/buildings (12 cases) (8). Most of these cases have been recorded in Italy and more often in Southern Italy. Those attacked by *D. gallinae* mites display erythema and urticarioid manifestations. Skin lesions can occur in any area of the body, including the genitals, and itching is generally so intense that subjects often have skin abrasions caused by scratching. Infestation is also of concern due to the possible role of *D. gallinae* as a vector/reservoir of several zoonotic pathogens (9).

Incorrect/unsuitable structural interventions and the risk of infestation

The most modern design choices involve architecture that uses new materials that allow conformity to anti-seismic regulations, and at best they focus on the perceptual and fruitive functionality of urban areas. However, the tendency is to underestimate the question of public health and the limitation of microbiological risk. This is, for example, the case of very recent architectural realizations, such as those shown in **Figure 1**. These are structural consolidation works involving the use of steel girders, which are not aesthetically displeasing but have inevitable consequences for health. These structures provide an excellent place for pigeons to perch, while the iron tarpaulins positioned along the walls (**Figure 1a**) provide a perfect nesting environment, protecting birds from adverse weather and possible predators.

When these types of architectural choices are made in urban settings (e.g. near the windows of private homes, offices, or hospital wards (**Figure 1b**)), the health risks are amplified. When pigeons abandon their nests, *D. gallinae* mites are deprived of their usual blood meal, and this "forces" them to seek out alternative hosts: humans.

Architecture that favors the creation of crevices, holes, and niches, which are sometimes seen as aesthetic improvements, is even more widespread, while the pervasive presence of air conditioners on building facades, often typical of spontaneous construction, constitutes a worse problem (**Figure 1c**; **Figure 2**). These conditions multiply the nesting sites and foci which can lead to infestation of humans.

Very recently, we observed a case of infestation involving two people working in a hospital office. Both had lesions on the arms, neck, chest, thighs, and signs of dermatitis with the presence of erythematous and urticarial papules (**Figure 3**). The patients associated the itching with their workplace, and a subsequent inspection of the office revealed the presence of numerous mites around the window frames and on the windowsill, and an abandoned pigeon nest was observed just outside the window, between the air conditioning machine and the outer wall of the building (**Figure 4**). The mites were collected and identified as *Dermanyssus gallinae* (**Figure 5**).

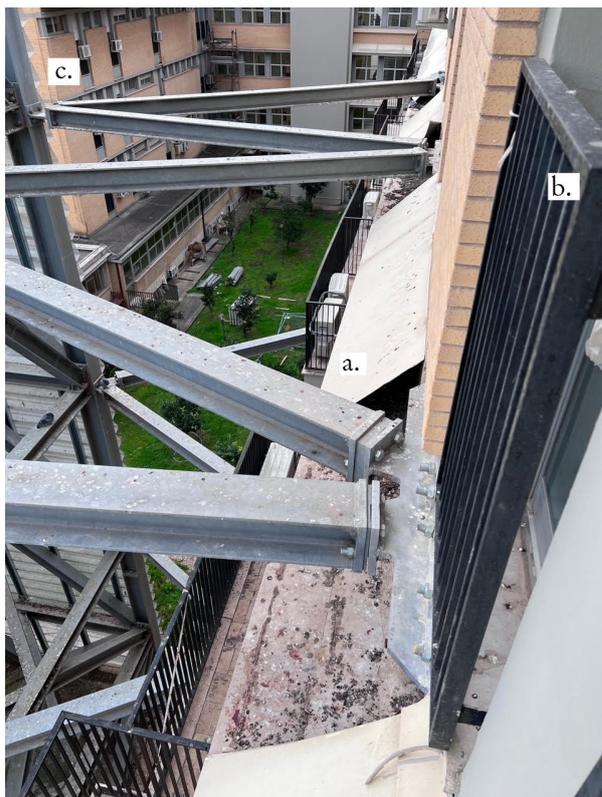


Figure 1 - Steel structures were positioned around the hospital structure for stability and protection from earthquakes. a: series of canopies to promote rainwater drainage, inside which pigeons find space and protection for their nests; b: balcony outside the French window of the inpatient room; c: air conditioners under the windows of the inpatient rooms.



Figure 2 -Air conditioners under the windows of public offices or health care facilities.



Figure 3 - (Patient 1) Erythematous papules on the upper legs.



Figure 4 -An abandoned pigeon's nest between an air conditioner and the wall under the office windowsill.



Figure 5 - *Dermanyssus gallinae* collected on the office window frame

A possible solution

On the base of these observations, it appears necessary and urgent to adopt a new multi-actor approach to the process of territorial planning and governance. There is a great need for multidisciplinary communication between the scientific community (i.e., urban planners, designers, doctors, environmentalists, jurists), the political-administrative decision-makers, and the local communities so that adequate instruments of territorial governance can be implemented in the Building Regulations. The regulations should include appropriate measures to protect human health and ensure that buildings are in hygienic conditions by reducing the possible nesting places they provide and guaranteeing correct and constant structural maintenance. This will prevent birds from gathering and nesting on buildings, thus reducing the chances of disease transmission and also protecting the buildings themselves from the damage that birds cause.

The increasingly important concept of biosafety (10) in territorial planning allows urban planners and experts to adopt measures, policies, and procedures that are necessary to minimize potential risks to the environment and human health. The application of environmental health criteria and sustainability guidelines to architectural projects and planning can improve the quality of life in cities.

The Italian Government's most recent report on *urban health* (June 2021) outlines a model of proximity network that is flexible and ensures communication dialogue between the different scientific levels and approaches.

The report suggests the introduction of a new professional figure, the *city health manager*, a specialist who can successfully manage the problems related to cities, the territory, and the economy (10).

While agreeing with the proposals of Central Government, it would also appear necessary to implement new and more impactful initiatives in order to focus constant attention on issues such as the preservation of the balance between human health and the quality of

life in the cities by applying the One Health approach, which is so often cited but rarely translated into practice.

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