

Respiratory diseases in pigeons: viral, bacterial, and fungal etiologies with emphasis on *Chlamydia psittaci* and *Aspergillus*

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Abstract. Respiratory diseases in pigeons (*Columba livia*) represent a multifactorial pathological entity involving viral, bacterial, and fungal agents, often exacerbated by environmental stressors and management conditions. This mini-review synthesizes current knowledge on the major etiologies of respiratory disease in pigeons, with particular emphasis on zoonotically significant pathogens such as *Chlamydia psittaci* and opportunistic fungi of the genus *Aspergillus*. Viral agents, including pigeon paramyxovirus type 1 (PPMV-1) and pigeon herpesvirus 1 (PHV-1), contribute variably to respiratory and systemic disease, with documented zoonotic implications in immunocompromised humans. Bacterial infections are dominated by *C. psittaci*, a well-recognized cause of avian chlamydiosis and human psittacosis, alongside *Mycoplasma* spp., which frequently occur as commensals or co-infecting agents. Fungal respiratory disease, particularly aspergillosis caused by *Aspergillus fumigatus*, is associated with immunosuppression, environmental contamination, and intensive breeding conditions, leading to acute or chronic pulmonary pathology. The review highlights the complex interplay between pathogens, host factors, and environmental conditions, as well as the public health implications of pigeon-associated respiratory diseases. Improved diagnostic, preventive, and management strategies are essential to mitigate both avian morbidity and zoonotic risk.

Key Words: aspergillosis, *Aspergillus fumigatus*, avian pathology, *Chlamydia psittaci*, *Mycoplasma*, pigeons, pigeon paramyxovirus-1, psittacosis, respiratory diseases, zoonosis.

Introduction. As a model organism, pigeons (*Columba livia*) play a key role in biological research because of their exceptional orientation abilities, diverse phenotypes, and well-characterized physiology, enabling comprehensive studies that integrate behavior, morphology, and metabolism (Ionescu et al 2015; Ionescu & Oroian 2015; Ionescu & Oroian 2019; Popescu et al 2026; Popescu & Cimpean 2026).

Respiratory disease in pigeons arises from a complex interplay of viral, bacterial, and fungal agents, often under conditions of stress, poor management, or concurrent infection. Many of these pathogens also have zoonotic potential, especially *Chlamydia psittaci* and pigeon paramyxovirus-1 (PPMV 1), which can cause severe pneumonia in humans exposed to infected pigeons (Marlier & Vindevogel 2006; Kuiken et al 2018; Zou et al 2022; Sultani et al 2025). Fungal agents such as *Aspergillus* spp. further complicate the respiratory picture, particularly in captive or intensively used racing pigeons (Bernart et al 2010; Girma et al 2016; Shoukat et al 2018; Ipek et al 2023).

The aim of this mini-review is to provide a comprehensive and integrative overview of respiratory diseases in pigeons, focusing on the major viral, bacterial, and fungal etiologies involved. Particular attention is given to *Chlamydia psittaci* due to its high prevalence in pigeon populations and significant zoonotic potential, as well as to fungal infections caused by *Aspergillus* spp., which are strongly influenced by environmental and management factors. The study seeks to elucidate the epidemiological, pathogenic, and

clinical aspects of these infections, while also emphasizing their implications for animal health, avian management practices, and public health.

Viral Respiratory Etiologies in Pigeons. Domestic pigeons are affected by several major viruses, notably pigeon paramyxovirus 1 (PPMV 1), herpesvirus 1, adenovirus, poxvirus, rotavirus and circovirus (Marlier & Vindevogel 2006). These infections target respiratory and other tissues and may present with respiratory signs, systemic disease, or neurologic involvement (Marlier & Vindevogel 2006). PPMV 1 genotype VI is dominant in pigeons in China and has caused zoonotic infections with fatal pneumonia in severely immunocompromised or post COVID patients (Kuiken et al 2018; Zou et al 2022; Cui et al 2023). In such human cases, clinical manifestations include severe pneumonia, acute respiratory distress syndrome, and multiorgan failure, with epidemiologic links to close pigeon contact and detection of PPMV 1 in respiratory samples and pigeon material (Kuiken et al 2018; Zou et al 2022; Cui et al 2023).

Pigeon herpesvirus 1 (PHV 1) is widespread in racing pigeons; molecular surveys show PHV 1 DNA in about one third of tested birds, frequently co-occurring with *Mycoplasma* spp. (Hellebuyck et al 2017). However, in that population, neither PHV 1 alone nor coinfection correlated statistically with overt respiratory disease, underlining the importance of host and environmental factors (Hellebuyck et al 2017) (Table 1).

Table 1

Viral pathogens and zoonotic risk

<i>Pathogen (pigeons)</i>	<i>Main issues in pigeons</i>	<i>Zoonotic concern</i>	<i>References</i>
PPMV 1 (APMV 1 VI)	Respiratory/systemic, high virulence motifs	Fatal pneumonia in immunocompromised humans	Marlier & Vindevogel 2006; Kuiken et al 2018; Zou et al 2022; Cui et al 2023
PHV 1	Common in racing pigeons, often subclinical	No clear human cases in these papers	Marlier & Vindevogel 2006; Hellebuyck et al 2017
PPMV 1 (APMV 1 VI)	Respiratory/systemic, high virulence motifs	Fatal pneumonia in immunocompromised humans	Marlier & Vindevogel 2006; Kuiken et al 2018; Zou et al 2022; Cui et al 2023

Bacterial Respiratory Etiologies with Focus on *Chlamydia psittaci* and *Mycoplasma*. General avian reviews identify *Chlamydia psittaci* among the most important bacterial respiratory pathogens, along with *Mycoplasma gallisepticum*, *Pasteurella multocida*, and *Escherichia coli* (Yehia et al 2023). In pet and ornamental birds (including columbids), respiratory disease frequently involves *E. coli*, *Salmonella typhimurium*, *Pasteurella* spp., *Mycoplasma* spp., and *Chlamydia* spp., with notable occurrence of *Chlamydia* in columbids (Udhayakumar et al 2025).

***Chlamydia psittaci* in Pigeons and Humans.** *Chlamydia psittaci* infection in birds (avian chlamydiosis) is shed via feces and nasal discharges and can infect humans as psittacosis/ornithosis, typically presenting as atypical pneumonia (Smith et al 2005; Balsamo et al 2017). Pigeons are important reservoirs with high prevalence and recognized zoonotic potential; oropharyngeal testing in domestic pigeons in Baghdad revealed 27–40% positivity for *C. psittaci* antigen by ELISA/rapid tests, highlighting frequent subclinical carriage and public health implications (Sultani et al 2025).

Comprehensive compendia standardize control measures for avian chlamydiosis, emphasizing identification and management of infected birds to prevent human psittacosis (Smith et al 2005; Balsamo et al 2017). In humans, psittacosis often presents with high fever, dyspnea, and radiographic consolidations. Diagnosis relies on PCR of respiratory samples or serology, and targeted treatment with tetracyclines (e.g., doxycycline) is effective (Marchese et al 2023; Matre et al 2025). Case reports describe severe acute

respiratory distress syndrome in children and adults with intense exposure to infected parrots, underscoring that inhalation of contaminated aerosols from birds is the key transmission route and that early suspicion is essential when bird contact is present (Marchese et al 2023; Matre et al 2025).

***Mycoplasma* and Other Bacteria in Pigeon Respiratory Disease.** Mycoplasmas are frequently isolated from pigeons with and without respiratory signs. In racing pigeons, *Mycoplasma columbinum*, *M. columborale*, and *M. columbinasale* were cultured from oropharynx, nasal sinuses, lungs, air sacs, and even brain; yet many birds were co-infected with other agents, and the study could not conclusively prove *Mycoplasma* as the primary cause of natural respiratory disease (Keymer et al 1984). More recent work in domestic flying pigeons with open beak breathing and tracheal hyperemia demonstrated *M. columbinasale* in tracheal lesions via PCR and immunohistochemistry. Clinical resolution after tylosin suggested a pathogenic role in tracheitis and low grade respiratory mortality (Giglia et al 2022).

Large scale PCR screening in racing pigeons showed *Mycoplasma* spp. in about 40% of birds and over half of lofts, with 15–16% coinfecting with *Mycoplasma* and PHV 1. Nonetheless, infection status did not correlate significantly with clinical respiratory signs, indicating frequent subclinical colonization and the likely contribution of stress or additional pathogens for overt disease (Hellebuyck et al 2017). In broader pet bird surveys including columbids, *E. coli*, *Salmonella typhimurium*, *Pasteurella* spp., *Mycoplasma* spp., and *Chlamydia* spp. are commonly detected in respiratory disease, with some age and order specific patterns (e.g., higher *Chlamydia* rates in columbids) (Udhayakumar et al 2025).

Fungal Respiratory Etiologies with Emphasis on *Aspergillus* spp. Aspergillosis is a non-contagious mycotic disease that primarily affects the lower respiratory system of birds, including pigeons, especially when immunity is compromised or when birds are exposed to large numbers of spores under stress, poor ventilation, or contaminated feed and litter (Beernaert et al 2010; Girma et al 2016; Shoukat et al 2018). *Aspergillus fumigatus* is the most frequently implicated species, although other species such as *A. flavus* and *A. parasiticus* are also of concern due to their mycotoxin production (Beernaert et al 2010; Girma et al 2016; Shoukat et al 2018). Infection occurs mainly by inhalation of airborne conidia, and disease may appear as acute, high mortality outbreaks in young birds or as chronic, sporadic disease in older, immunocompromised individuals (Beernaert et al 2010; Girma et al 2016; Shoukat et al 2018).

Pathogenesis and Lesions in Pigeons. Invasive pulmonary aspergillosis (IPA) in pigeons can range from simple lung congestion to extensive necrotizing granulomas in lungs, air sacs, and serosal surfaces, corresponding to acute invasive forms (Mariappan et al 2022). Systemic *A. fumigatus* infection in racing pigeons has been documented during periods of intense exercise and high environmental temperatures, suggesting that heat stress and strenuous activity enhance susceptibility and fungal colonization of the respiratory tract (Ipek et al 2023). In such outbreaks, gross lesions include nodular or plaque like lesions on lungs, air sacs, and visceral peritoneum, while histopathology reveals necrotic fungal granulomas and, in some birds, malacic lesions in the central nervous system associated with fungal elements (Mariappan et al 2022; Ipek et al 2023).

More generally in birds, impaired immunity and high spore loads are considered key factors in aspergillosis pathogenesis. Research suggests *A. fumigatus* conidia may resist killing by avian respiratory macrophages, promoting establishment of infection (Beernaert et al 2010). Treatment is often difficult and prevention through good sanitation, dry and well ventilated housing, and avoidance of moldy or dusty feeds is considered the primary control strategy in poultry and other avian species (Beernaert et al 2010; Girma et al 2016).

Environmental Fungal Flora and Pigeon Respiratory Tract. Mycological surveys of pigeons captured in a grain mill demonstrate that their trachea and lungs harbor abundant molds and yeasts, with 199 of 207 isolates being filamentous fungi and *Aspergillus* spp.

predominant, particularly in the lungs (De Melo-Neto et al 2022). All isolated fungi were saprophytic environmental organisms, but many are regarded as potentially pathogenic and capable of causing acute respiratory symptoms in birds and humans exposed to high airborne inocula (De Melo-Neto et al 2022). Grain mill environments can contain high concentrations of airborne fungi (e.g., *Aspergillus*, *Penicillium*, *Cladosporium*), and pigeons in such environments both indicate and potentially amplify the occupational risk to workers via shared exposure to fungal propagules (De Melo-Neto et al 2022).

Aspergillosis Across Avian Hosts. Reviews focusing on aspergillosis in poultry and other birds emphasize its ubiquity wherever environmental conditions favor fungal growth, its predominance as a respiratory disease, and its occurrence in both acute and chronic forms (Beernaert et al 2010; Girma et al 2016). In chickens and turkeys, the disease may be endemic, whereas in wild birds and some captive species it appears more sporadic but remains a major cause of mortality (Beernaert et al 2010; Girma et al 2016). In wild and captive birds including pigeons, peafowl, and vultures, IPA can present with species specific variation in gross and histologic lesions, ranging from acute necrotizing pulmonary infection to chronic granulomatous disease with angio invasion, supporting the concept of host dependent pathologic patterns (Mariappan et al 2022).

Conclusions. Respiratory diseases in pigeons are complex and multifactorial conditions resulting from interactions between diverse infectious agents and environmental stressors. Viral pathogens such as PPMV-1 and PHV-1, bacterial agents including *Chlamydia psittaci* and *Mycoplasma* spp., and fungal organisms such as *Aspergillus fumigatus* contribute variably to disease expression, often in the context of coinfections and subclinical carriage. Among these, *C. psittaci* remains of paramount importance due to its zoonotic potential and role in human psittacosis, while aspergillosis represents a major opportunistic disease linked to environmental exposure and host susceptibility. The evidence underscores the necessity of a holistic approach to disease control, integrating improved hygiene, environmental management, early diagnosis, and targeted therapy. Furthermore, increased awareness of zoonotic risks is essential for individuals in close contact with pigeons, reinforcing the need for preventive measures at the human–animal interface.

Acknowledgments. Consensus (<https://consensus.app>. Consensus NLP, Inc) was used when rendering Table 1.

Conflict of Interest. The authors declare that there is no conflict of interest.

References

- Balsamo G., Maxted A., Midla J., Murphy J., Wohrle R., Edling T., Fish P., Flammer K., Hyde D., Kutty P., Kobayashi M., Helm B., Ojulfstad B., Ritchie B., Stobierski M., Ehnert K., Tully T., 2017 Compendium of measures to control *Chlamydia psittaci* infection among humans (psittacosis) and pet birds (avian chlamydiosis), 2017. *Journal of Avian Medicine and Surgery* 31:262-282.
- Beernaert L., Pasmans F., Waeyenberghe L., Haesebrouck F., Martel A., 2010 *Aspergillus* infections in birds: a review. *Avian Pathology* 39:325-331.
- Cui S., Xiong H., Feng Z., Chu Y., Que C., Qin J., Pan Y., Yu K., Jia L., Yao X., Liao J., Huo D., Guo C., Zhao H., Xu M., Tian Y., Peng Q., Li F., Xu H., Hong R., Zhang D., Wang G., Yang P., Gao G., Wang Q., 2023 Severe pigeon paramyxovirus 1 infection in a human case with probable post-COVID-19 condition. *Emerging Microbes & Infections* 12:2251600.
- De Melo-Neto M., Maranhão F., Da Silva Guimarães P., Silva D., 2022 Mycobiota recovered from the trachea and lungs of pigeons (*Columba livia*) captured in a grain mill. *Research, Society and Development* 11(3):e57211326802.
- Giglia G., Porcellato I., Marenzoni M., Rampacci E., Bottinelli M., Matucci A., Passamonti F., Lepri E., 2022 Detection of *Mycoplasma columbinasale* in cases of respiratory disease in domestic pigeons (*Columba livia* var. *domestica*). *Case Reports in*

- Veterinary Medicine 2022:3950684.
- Girma G., Abebaw M., Zemene M., Mamuye Y., Getaneh G., 2016 A review on aspergillosis in poultry. *Journal of Veterinary Science and Technology* 7:1-5.
- Hellebuyck T., Göbel S., Pasmans F., Adriaensen C., Martel A., 2017 Co-occurrence of *Mycoplasma* species and pigeon herpesvirus-1 infection in racing pigeons (*Columba livia*). *Journal of Avian Medicine and Surgery* 31:351-355.
- Ionescu H., Oroian T. E., 2015 Phenotypic characterization of a population of pigeons, Galati players breed, black flecked white and red flecked white variety. *ABAH Bioflux* 7(2):177-182.
- Ionescu H., Oroian T. E., 2019 Metabolic investigations on pigeons. *ABAH Bioflux* 11(1):36-39.
- Ionescu H., Oroian T. E., Botha M., 2015 Phenotypic characterization of a population of Galati players pigeon breed blue flecked white and white unicolor variety. *ABAH Bioflux* 7(2):183-187.
- Ipek E., Epikmen E., Tunca R., 2023 Investigating an outbreak of *Aspergillus fumigatus* infection in a racing pigeon (*Columba livia domestica*) flock. *Erciyes Üniversitesi Veteriner Fakültesi Dergisi* 20(2):134-140.
- Keymer I., Leach R., Clarke R., Bardsley M., McIntyre R., 1984 Isolation of *Mycoplasma* spp. from racing pigeons (*Columba livia*). *Avian Pathology* 13(1):65-74.
- Kuiken T., Breitbart M., Beer M., Grund C., Höper D., Van Den Hoogen B., Kerkhoffs J., Kroes A., Rosario K., Van Run P., Schwarz M., Svraka S., Teifke J., Koopmans M., 2018 Zoonotic infection with pigeon paramyxovirus type 1 linked to fatal pneumonia. *The Journal of Infectious Diseases* 218:1037-1044.
- Marchese S., Marchese G., Paviglianiti G., Lapi M., Ottovoggio G., Pipitone G., Corsello G., 2023 A pediatric case of *Chlamydia psittaci* caused severe Acute Respiratory Distress Syndrome (ARDS) in Italy. *Italian Journal of Pediatrics* 49:107.
- Mariappan A., Munusamy P., Latheef S., Kohale S., Verma A., Puvvala B., Mathesh K., Dhama K., 2022 Grading of anatomopathological disparity in the cases of invasive pulmonary aspergillosis in wild avian species as recorded in pigeons (*Columba livia*), peafowls (*Pavo cristatus*), and griffon vultures (*Gyps fulvus*). *Archives of Razi Institute* 77(1):301-313.
- Marlier D., Vindevogel H., 2006 Viral infections in pigeons. *Veterinary Journal* 172(1):40-51.
- Matre T., Hareide S., Bergane L., Mousavi M., 2025 [Ornithosis]. *Journal of the Norwegian Medical Association: Journal for Practical Medicine, New Series* 145:9. [In Norwegian].
- Popescu A., Burduhos P., Kovacs E., 2026 Navigation mechanisms in homing pigeons: integrating magnetoreception, olfaction, solar and visual cues. *ABAH Bioflux* 18(1):56-61.
- Popescu A., Cimpean A., 2026 Aerodynamic efficiency and wing morphology in high-performance racing pigeons (*Columba livia*). *ABAH Bioflux* 18(1):62-68.
- Shoukat S., Wani H., Jeelani R., Ali U., Ali M., 2018 An overview of avian aspergillosis. *International Journal of Avian & Wildlife Biology* 3(3):215-216.
- Smith K., Bradley K., Stobierski M., Tengelsen L., 2005 Compendium of measures to control *Chlamydophila psittaci* (formerly *Chlamydia psittaci*) infection among humans (psittacosis) and pet birds, 2005. *Journal of the American Veterinary Medical Association* 226(4):532-539.
- Sultani S., Al-Doori A., Samawi F., 2025 Prevalence and zoonotic potential of *Chlamydia psittaci* in domestic pigeons from Baghdad: ELISA and rapid test insights. *Dijlah Journal of Medical Sciences* 1(3). DOI: <https://doi.org/10.65204/DJMS-PZPCP>
- Udhayakumar C., Prasanna K., Krithiga K., Priya P., Rajagopal A., Sruthi S., Sajitha I., 2025 Occurrence and molecular characterisation of respiratory bacterial infections in pet birds: A gender and age-specific analysis. *Journal of Veterinary and Animal Sciences* 56(3):400-405.
- Yehia N., Salem H., Mahmmod Y., Said D., Samir M., Mawgod S., Sorour H., AbdelRahman M., Selim S., Saad A., El-Saadony M., El-Meihy R., El-Hack M., El-Tarabily K., Zanaty A., 2023 Common viral and bacterial avian respiratory infections: an updated review.

Poultry Science 102(5):102553.
Zou X., Suo L., Wang Y., Cao H., Mu S., Wu C., Yan L., Qi X., Lu J., Lu B., Fan Y., Li H., Huang L., Ren L., Liu B., Cao B., 2022 Concurrent pigeon paramyxovirus-1 and *Acinetobacter baumannii* infection in a fatal case of pneumonia. *Emerging Microbes & Infections* 11:968-977.

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