Biological Times

Volume No. 2 | Issue No. 12 | Pages 62-63

Chlamydial infection in avian and wild birds

Muhammad Haidar Farooq Qureshi[1], Jahanzaib Hassan[2], Ayan Attique Dar[2], Adnan Arshad[3], Asher Waheed[1], Saleha Tahir[1*]

1. Department of Microbiology, Faculty of Veterinary science, University of Agriculture, Faisalabad, Pakistan.
2. Department of Veterinary Medicine, Faculty of Veterinary science, University of Agriculture, Faisalabad, Pakistan.
3. Faculty of Science, medicine and Health, University of Wollongong, Australia.

*Corresponding author: **salehatahir999@gmail.com**

ABSTRACT

Avian chlamydiosis is an immensely neglected disease with significant zoonotic potential. The causal agent, *Chlamydia psittaci*, infects most types of companion animals, birds, livestock, and humans. It has several hidden characteristics and epidemiological features that set it apart from other microbial agents. Recent reports of equine-to-human transfer have frightened public health officials, emphasizing the significance of routine screening for this deadly disease. The presence of the illness in wild birds, poultry and pet birds causes financial damage to the pet bird and poultry industries.

Keywords: Chlamydiosis, Chlamydia, Zoonosis, Prevalence, Avian birds

Introduction:

Due to their intricate biology, diverse modes of transmission, and capacity to infect a variety of host species, ignored zoonotic diseases present a difficult challenge to the systematic community. Pet bird owners should be informed that one of the zoonotic diseases that is often overlooked is avian chlamydiosis that can cause deadly unusual pneumonia in humans. The pathogen has the potential to infect humans after infecting birds. Avian chlamydiosis expanded quickly as a result of the importing of exotic pet birds. *Chlamydia psittaci* is the organism responsible for causing avian chlamydiosis, and ornithosis, psittacosis, parrot sickness, and chlamydiosis are the names of the infections in humans [1]. *C. psittaci* genotypes are determined by genotyping the ompA gene. There are nine distinct genotypes recognized, seven of which are found in birds [2].

By regurgitating, birds can spread the infection to their young, which may result in a chronic form of chlamydiosis. Large-scale chicken production may represent a public health risk as a result of the disease's isolation from companion birds like parrots and domesticated birds like ducks. These species are now being treated as neglected reservoirs for the pathogen. Other bird species, such as the ducks, poultry, and turkeys, had stronger evidence than Psittaciformes to be the source of human psittacosis, according to a review of the transmission by zoonotic agents of avian chlamydiosis [3].

Birds can get sick from infection, and the extent of the disease depends upon the host species, the strain's virulence, and the exposure route. Clinical symptoms in birds can include lethargy, anorexia, mucopurulent nasal discharge, diarrhea, and polyuria, however they are typically nonspecific symptoms like lethargy and anorexia. Three days to several weeks can pass during incubation. Chlamydiosis cannot be distinguished from other systemic disorders by gross pathological features alone. Respiratory, gastrointestinal, and ophthalmic sickness are among the most frequent pathologic diseases linked to chlamydiosis [4]. The bacterium can be intermittently excreted by infected birds through their faeces and respiratory tract secretions. Stress and concurrent illnesses can cause the bacteria to shed its skin cells [5].

Pathogenesis and Transmission

C. psittaci can infect every kind of birds. However the variety of sensitivity varies. While C. ibidis and C. buteonis are host-restricted, other Chlamydial species, like C. avium and C. gallinacea, have a wide host range. Infections in the respiratory, digestive systems characterize the disease in birds. It can cause acute, sub-acute, or chronic disease in both wild and domesticated birds worldwide. Turkeys and ducks are more prone to the disease than chickens [6]. The diseased birds do not usually show symptoms of sickness, and persistent infection is prevalent in birds with occasional or long-lasting disease and recurrent flaking. Some strains are dormant in birds, and contamination develops when conditions are favorable. Birds are the principal host of *C. psittaci*, which transmits the disease to horses, domestic animals, and humans directly. Bacteria can also transfer from birds to horses and humans, as shown in Fig. 2. Animals are occasional hosts, while humans are accidental hosts.

The attachment of the contagious basic body to the host cells' surface starts the chlamydial development cycle. Once within the cell, they transform into not transmissible reticulate bodies (RBs) inside the phagosome of the host cell. The RBs divide through binary fission. The size of the cytoplasmic inclusion bodies then increases. The RBs change into EBs during this growth cycle by way of intermediary forms. The enclosure body may have grown to nearly three-quarters of the cell volume at the conclusion of productive chlamydial development. The inclusion and cytoplasmic membranes rupturing and lysing cause the release of EBs. The infection is primarily spread through sick birds' faeces and respiratory secretions. There are no records of C. psittaci being vertically transmitted through bird eggs [13]. Commonly asymptomatic carriers of C. psittaci, the infected birds might nevertheless spread the pathogen in their faeces and nasal secretions. Constipation, conjunctivitis, and serous ocular and nasal discharge are common symptoms infected birds. The condition is challenging to diagnose, particularly in asymptomatic birds. Birds can be diagnosed with infection using tissue smears, faeces, conjunctival, choanal, and cloacal swab samples, as well as liver biopsy. For signs of chlamydiosis in birds, a number of diagnostic techniques are advised, such as polymerase chain reaction (PCR), bacteriologic culture, antibody detection, and antigen detection.

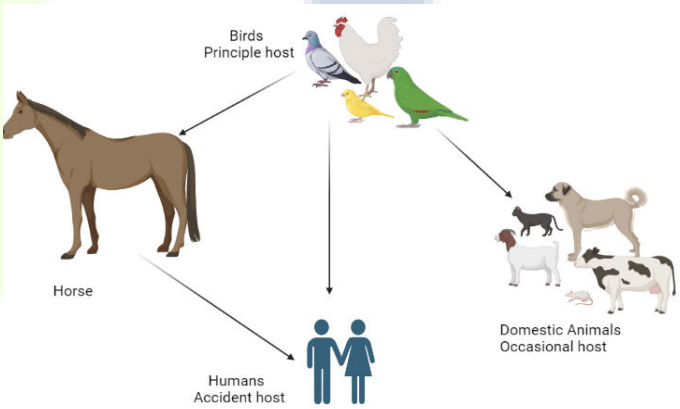

Fig 1: Possible route of transmission for *Chlamydia psittaci*

Pet birds may exhibit symptoms such as fatigue, a lack of appetite, wrinkled bird feathers, eye or nasal fluid diarrhea, and greenish to yellow green droppings. A common lesion in psittacine birds is splenomegaly with subscapular haemorrhages. Depending on the strain and the host species, the symptoms might vary and occasionally result in death from pericarditis, pneumonia, hepatitis, splenitis, and air sacculitis. [7]. A sick, unthrifty bird having a poor feather coat will be observed in chronic disorders, whereas upper respiratory symptoms, lethargy, and green faeces will be observed in acute diseases.

The majority of human psittacosis cases are caused by close interaction with birds or bird materials, such as management diseased birds or inhaling respiratory secretions. A thorough analysis of human psittacosis case-control studies revealed that 16% of the articles included the theory that direct or indirect contact with wild birds could be a potential source of infection. The vast majority of human psittacosis instances are thought to have been acquired through interaction with hostage birds, but there are also suspected cases from either initial or indirect contact with wild birds [9]. There have been few occasions where human illness has been suspected as a result of

To cite this article: Qureshi MHF, J Hassan, AA Dar, A Arshad, A Waheed & S Tahir. 2023. Chlamydial infection in avian and wild birds. Biological times, 2(12): 62-63

environmental exposure to or handling of feral pigeons, though observation of wild pigeon groups within the same location is rarely done to test this idea.

The majority of human psittacosis cases are caused by close contact with birds or bird materials, such as handling diseased birds or inhaling respiratory secretions. Although direct or indirect contact with exotic birds is suspected in some cases of human psittacosis, contact with captive birds is thought to be the primary source of infection in most cases. A thorough review of case-control studies on human psittacosis revealed that 16% of the articles mentioned contact with wild birds as a possible source of infection [8]. There have been few occasions where human illness has been suspected as a result of handling or exposure to feral pigeons in the environment, though observation of wild pigeon groups within the same location is rarely done to test this idea.

Diagnosis

For the diagnosis of any disease, two procedures are used: the first is antigen detection, and the second is antibody detection. The combination of a larger infective organism load and the acute character of the sickness increases the likelihood of disease diagnosis. Because chlamydial species impact numerous organs and have complicated disease consequences, standard diagnostic techniques for them are uncommon. Furthermore, because Chlamydiae cannot be grown on agar plates and requires cell culture for isolation, its intracellular lifestyle has significant significance in diagnosis. The infected bodies can be identified in exudate smears, tissue impressions, and histological preparations using the Giemsa, Gimenez, modified Gimenez, Ziehl-Neelsen, and Macchiavello stains; however, none of the stains can specifically detect chlamydia which is why they are losing favor [12]. Typically, commercially available kits are used for immunofluorescence and immunohistochemistry staining to identify chlamydial organism in smears and slices. African green monkeys and buffalo green monkeys' embryonated eggs, laboratory animals, or cell cultures have been found to contain *C. psittaci*. Diagnosis procedure shown in Fig 2.

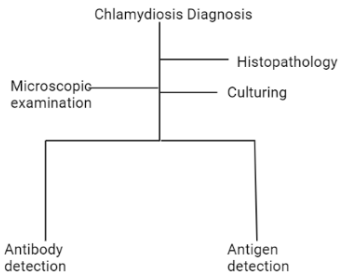

Fig 2: Diagnostic procedures for avian chlamydiosis

Future Recommendations

Evidence has shown that C. psittaci is present in wild bird populations across the globe, and it is likely that other chlamydial germs are also widely spread. But in wild bird populations, the true prevalence of chlamydial infections is often unknown, especially outside of Europe where chlamydial surveillance has been less extensive [10]. Rather than relying on convenient sample via veterinarian or public applications, wildlife rehabilitation clinics, or faeces sampling, a more proactive screening or active observation of wild bird populations is needed worldwide. These techniques might only identify a portion of wild species and are prone to prejudice.

To ascertain the potential effects of C. psittaci and other chlamydial infections on bird survival, reproduction, and fitness, longitudinal studies are required [11]. Even though it can be challenging to investigate the impact of chlamydial infection due to the lack of specificity and shifts of clinical signs, it may be worthwhile to record clinical findings, measure changes to blood biochemistry and enzyme profiles, and assess haematological changes with pertinent erythrocyte measures in order to look for a correlation between strains and clinical signs in hosts that are particularly concerning. In order to investigate pathological changes within the same individuals, persons may be sampled more than once. Mark-recapture data may also be used simultaneously to evaluate survival.

Conclusion

Chlamydial bacteria were identified in at least 70 distinct species of wild birds and have been discovered on every continent. Although chlamydial infections have been linked to the Psittaciformes and Columbiformes, new research reveals that groups such as the Corvidae and Accipitridae may additionally have a high incidence, with certain strains showing host specificity. Increased monitoring in other locations is likely to find more chlamydial pathogens in a broader spectrum of hosts. Most of chlamydial monitoring has been undertaken in Europe, which represents the bigger variety of chlamydial species detected there. However, the presence of epizootics, albeit rare, and the possibility of severe sickness indicate that infections caused by chlamydia may be important for bird conservation. As habitat loss and environmental change continue to have an influence on the world, there is an immediate desire to better comprehend basic disease ecology in animal hosts, particularly viruses that have been shown to be particularly capable of host flipping.

References

[1] Ravichandran, K., S. Anbazhagan, K. Karthik, M. Angappan and B. Dhayananth. 2021. A comprehensive review on avian chlamydiosis: a neglected zoonotic disease. Trop. Anim. Health Prod. 53.

[2] Stokes, H. S., Berg, M. L., & Bennett, A. T. (2021). A review of chlamydial infections in wild birds. Pathogens, 10:8- 948.

[3] Hogerwerf, L., Roof, I., de Jong, M.J., Dijkstra, F. and van der Hoek, W., 2020. Animal sources for zoonotic transmission of psittacosis: a systematic review, BMC infectious diseases, 20: 1-14.

[4] Wellehan, J. F., Lierz, M., Phalen, D., Raidal, S., Styles, D. K., Crosta, L., ... & Lumeij, J. T. (2016). Infectious disease. Current therapy in avian medicine and surgery, 22.

[5] Chereau, F., Rehn, M., Pini, A., Kühlmann‐Berenzon, S., Ydring, E., Ringberg, H., ... & Wallensten, A. (2018). Wild and domestic bird faeces likely source of psittacosis transmission—A case‐control study in Sweden, 2014‐2016. Zoonoses and public health, 65: 790-797.

[6] Lin, W., Chen, T., Liao, L., Wang, Z., Xiao, J., Lu, J., ... & Xie, Q. (2019). A parrot‐type Chlamydia psittaci strain is in association with egg production drop in laying ducks. Transboundary and emerging diseases, 66: 2002-2010.

[7] Rybarczyk, J., Versteele, C., Lernout, T., & Vanrompay, D. (2019). Human psittacosis: a review with emphasis on surveillance in Belgium. Acta Clinica Belgica.

[8] Schell, C. J., Stanton, L. A., Young, J. K., Angeloni, L. M., Lambert, J. E., Breck, S. W., & Murray, M. H. (2021). The evolutionary consequences of human–wildlife conflict in cities. Evolutionary Applications, 14: 178-197.

[9] Hulin, V., Bernard, P., Vorimore, F., Aaziz, R., Cléva, D., Robineau, J., ... & Laroucau, K. (2016). Assessment of Chlamydia psittaci shedding and environmental contamination as potential sources of worker exposure throughout the mule duck breeding process. Applied and Environmental Microbiology, 82:1504-1518.

[10] Szymańska-Czerwińska, M., Mitura, A., Niemczuk, K., Zaręba, K., Jodełko, A., Pluta, A., ... & Schnee, C. (2017). Dissemination and genetic diversity of chlamydial agents in Polish wildfowl: Isolation and molecular characterisation of avian Chlamydia abortus strains. PLoS One, 12:3-0174599.

[11] Branley, J. M., Weston, K. M., England, J., Dwyer, D. E., & Sorrell, T. C. (2014). Clinical features of endemic community-acquired psittacosis. New microbes and new infections, 2: 7-12.

[12] Campbell, T. W. (2015). Normal avian cytology. Exotic Animal Hematology and Cytology. 4th edition. Terry W. Campbell, ed. Wiley‐Blackwell, Oxford, 219-227.

[13] Stokes H. S., Berg M. L. & Bennett A. T. D. A review of chlamydial infections in wild birds. Pathogens, 2021, 10, 948.