

Chlamydiosis (Psittacosis)

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Chlamydiosis (ornithosis in non-psittacine birds) is a common and important disease in pet bird medicine. It is a natural disease of birds that may be transmitted to humans. The zoonotic form is called psittacosis. The causative has been reclassified from *Chlamydia psittaci* to *Chlamydophila psittaci*. It is a gram-negative bacterium and obligate intracellular organism. The new discoveries that led to the reclassification will result in further studies of *Chlamydia sp.* and *Chlamydophila sp.* that will allow a better understanding of these organisms with improved diagnostic tests, treatments, and vaccine development for *Chlamydophila psittaci*.

Prior to importation restrictions, chlamydiosis was most common in recently imported birds. With the decrease in the number of imported birds, there may be a reduction in the frequency of the disease in large psittacines. Unfortunately, the disease still exists in breeder flocks, and domestically bred young birds still present with it. It is quite often diagnosed in budgerigars and cockatiels, among other species. In these breeder flocks, the parent birds are often imported and the flocks are "open"-that is, the breeders continuously add to their collections without necessarily quarantining the new birds or feeding medicated food for 45 or more days.

The chlamydial organisms are transmitted through secretions, droppings, and feather material. During acute illness, they are shed extensively in the droppings. Carrier birds may also shed the organism, though they do so periodically and show no sign of the disease. The time between exposure and onset of illness is variable, generally ranging from 3 days to several weeks. However, latent infections are common in birds, and the active disease may not develop until years after exposure. A bird may remain an asymptomatic carrier until stressed.

The manifestations of the disease in birds are variable, ranging from asymptomatic to acute death. When clinical signs occur in birds, they include abnormal droppings, weight loss (with the appetite appearing either normal or abnormal), depression, heterophilia, splenomegaly, and air sacculitis. Conjunctivitis and upper respiratory tract signs can be seen, especially in budgerigars and cockatiels; frequently, they are the only clinical signs displayed in these birds. Large psittacines usually show a loose stool and polyuria. A characteristic sign in Amazons and macaws is the presence of lime-green urates (biliverdinuria). Very young parrots (hand-fed neonates), cockatiels, and many other bird species may also show abnormal droppings, often with yellowish urates. Because the color changes in the droppings are thought to be produced by liver inflammation, the appearance of the droppings can be considered suggestive only of systemic or liver disease.

Ante mortem diagnosis can be accomplished through a variety of methods, including the following:

Hematology Although hematology can be an aid to diagnosis for chlamydiosis, it cannot actually confirm a case. The blood picture obtained is that of leukocytosis, monocytosis, anemia, and usually icterus.

Stained smears of exudate Variable results have been obtained with currently used stains.

Isolation and identification of the organism in culture The gold standard for the definitive diagnosis of *Chlamydophila psittaci* in the avian patient had been culture and isolation of the organism. For this method, pharyngeal, fecal, or cloacal swabs are generally used. Although this is a good diagnostic method for chlamydiosis, it may not be as reliable as some of the other methods, since the organisms are intermittently shed, have an obligate intracellular nature and are extremely labile. To have the best opportunity for *Chlamydophila psittaci* culture and isolation in a live patient, serial fecal samples or combined choanal/cloacal cultures should be collected for 3 to 5 consecutive days and pooled in transport media supplied by the diagnostic laboratory. Liver and spleen samples are preferred (from necropsied patients) for isolation of the intracellular bacterium. A drawback is that it takes up to 2 weeks for test results to be generated.

Isolation tests (ELISA) These tests detect the presence of the *Chlamydophila psittaci* organism in pharyngeal, fecal, or cloacal swabs or in samples of exudate. As with the previous method, however, isolation tests may be unreliable due to the intermittent shedding of the organisms. Further, treatment with antibiotics will suppress shedding. Thus, birds that are not shedding but are positive for the disease will be misdiagnosed. Isolation tests may be used in the veterinary office as a quick screening method for *Chlamydophila psittaci* infected birds that are shedding.

Serology Serological testing is highly effective for demonstrating the presence of *Chlamydophila psittaci* antibodies. In addition to being used for diagnostic purposes when illness is noted, serological testing is an excellent means of screening new bird purchases, since it will detect not only birds infected with *Chlamydophila psittaci* but also birds that have been exposed to the organism.

Three *Chlamydophila* serologic assays have been commonly used:

Complement fixation (CF) is used to detect anti-*Chlamydophila* IgG; **latex agglutination (LA)** was used to detect both anti-*Chlamydophila* IgG and IgM, but is no longer used because of difficulties producing consistent antigens; and **elementary body agglutination (EBA)** is used to detect anti-*Chlamydophila* IgM. The EBA can detect infected birds within 15 days of infection and is generally positive by the time the bird is showing signs of illness. In a typical immunoglobulin response to an antigen, IgM levels increase quickly and then wane, while IgG levels increase later and persist. Thus, recently infected birds are likely to be EBA positive initially and then, about a week later, CF positive. Birds that are seronegative rarely have clinical disease.

It appears that as long as an infection persists, CF titers remain detectable. However, in chronic infections, EBA titers may fall to undetectable levels. When birds are treated, EBA titers will become negative. In many birds, CF titers will also become negative; however, CF titers have been documented to persist for many months in birds thought to be appropriately treated. Disadvantages to serological testing are that it will not detect carriers and that there is a lag time in antibody production in acutely ill birds. Rarely, a bird with chronic chlamydiosis may be EBA negative. The EBA works very well for psittacine birds, but may have some limitations in other species, particularly doves and pigeons. For these species complement fixation (CF) is recommended.

DNA polymerase chain reaction (PCR) probes This test is designed to detect the specific nucleic acid sequence of the *Chlamydophila psittaci* organism in blood samples or samples from a combination choanal/cloacal swab. It is the most sensitive of the tests available today for detecting chlamydiosis in currently infected birds. It does not rely upon an antibody response and has the potential of detecting infected birds before they are positive by serologic methods. The major disadvantage of PCR is its extreme sensitivity in detecting small quantities of contaminating and irrelevant target nucleic acid. It does not differentiate between nucleic acid from viable or nonviable organisms, so that a positive result might indicate environmental exposure. Another disadvantage is that the PCR assay is inhibited by tetracyclines and other antibiotics (as with other isolation tests).

New diagnostic tests Two new tests have been developed to detect ribosomal RNA (rRNA) and/or ompA gene for the family Chlamydiaceae, the Taq Man and multiplex tests. By detecting rRNA, which will reveal the presence of replicating *Chlamydophila psittaci* organisms, this new technology will determine if viable organisms are found in the patient. These tests will be available to veterinarians in the future and show bright promise for advanced technology in clinical veterinary situations.

Owners need to be cautioned about the limits of specificity and accuracy associated with whatever test is used. Current *Chlamydophila psittaci* diagnostic methods are a source of frustration, since no single test or combination of tests will absolutely determine if a bird is free of *Chlamydophila psittaci*. Serological testing provides an initial opportunity to screen for potentially positive birds, either as part of a new purchase examination or as a means of detecting subclinical chronically infected birds. Isolation techniques are the only currently available techniques for detecting a carrier, if the bird happens to be shedding the organism at the time of sampling. Blood testing by DNA probe appears to be useful for the detection of currently infected birds; however, negative results need to be interpreted appropriately. A combination of serology and DNA probe (oral/cloacal PCR) is likely the most sensitive and specific means of detection in most species. Even with it, the problem exists of determining how to address the seropositive, antigen- and DNA-probe negative bird.

For all of these reasons, combining test results with history and physical findings is always recommended before coming to a diagnostic conclusion. Other differential diagnoses for a thin bird with abnormal droppings and a severe heterophilia include aspergillosis and avian tuberculosis.

The treatment of chlamydiosis involves immediate placement on appropriate antibiotics and, in critical cases, good nursing support. Doxycycline is currently the drug of choice. Quinolones also may be helpful as an adjunct to therapy, but current data on their use in the treatment of chlamydiosis are restricted to a few species. The treatment for *Chlamydoiphila psittaci* should be administered for a minimum of 45 days.

Doxycycline can be injected intramuscularly once every 5-7 days. Vibravenos is not currently available in the United States or Canada, but compounding pharmacy brands may be available. Doxycycline can also be administered as an oral suspension once or twice daily, or added to food at the rate of 1,000 mg/kg food (wet weight). For the latter method of administration, a mixture of corn, beans, cooked rice, and an oatmeal carrier has been suggested. In addition, doxycycline-medicated formulated diets may be available on a limited basis. Chlortetracycline-medicated formulated diets and seed, which are more widely available, can also be used. Unfortunately, birds that are unfamiliar with a pelleted diet may not make the transition and will have to be treated orally or with intramuscular injections. There are recommendations for medicating birds with doxycycline through the drinking water and maintaining therapeutic blood levels. The advantages are low cost, easy preparation, and good acceptance by the birds. The major disadvantage is the possibility of toxicosis if water consumption increases (hence doxycycline consumption). Doxycycline toxicosis can cause acute hepatitis, accompanied by increases in AST, LDH, and bile acids, with affected birds showing non-specific signs of illness, including, inactivity, ruffling, anorexia, weight loss, loose droppings, and development of yellow urates. Budgerigars, in particular, are highly susceptible to doxycycline toxicosis. Clinical signs resolve in 2 to 3 days after the doxycycline treatment is discontinued. The suggested dosage of doxycycline hyclate is 400 mg/liter of drinking water for cockatiels and 400 to 600 mg/liter of drinking water for parrots and macaws. Birds placed on this regimen should be carefully monitored for evidence of toxic side effects. If any signs of toxicosis occur, the treatment in the water should be discontinued and another treatment protocol selected. Breeders keeping open flocks can help to prevent this disease through the use of a quarantine/treatment program and an annual medicated feed regimen. Due to the ease of medicating birds with the use of a formulated diet, as well as because of the diet's nutritional benefits, many breeders maintain their birds on formulated diets year-round.

Psittacosis simply refers to the zoonotic form of the disease. Many states require that practitioners inform veterinary authorities whenever the disease is detected in pet birds. Practitioners should also inform the owner of the zoonotic potential of the disease and note in the medical record that both the owner and appropriate authorities have been informed. It is recommended that other birds in the household be evaluated, since they, too, may require treatment.

In humans, psittacosis causes flu-like symptoms and atypical pneumonia with potential cardiac and/or neurological complications. The severity of the disease depends upon the immune status of the host. Human infection can result from transient exposure to infected birds or exposure to their contaminated droppings and secretions. The incubation period is generally 5-14 days after initial contact; but in rare cases, it may extend up to 30 days.

Ante mortem diagnosis is based upon the presence of atypical pneumonia and a positive complement fixation test. For the latter, both an acute sample and convalescent serum samples should be taken. A fourfold increase in titer provides evidence of the disease. As in birds, tetracycline drugs can be used for treatment.

During 1985-1995, a total of 1,132 cases of psittacosis in humans were reported to the Centers for Disease Control in the United States. Of the cases reported in the 1980s, pet birds were the source of infection for 70% of the cases in which the source was known. Most human cases of *Chlamydia psittaci* (= *Chlamydoiphila psittaci*) are associated with birds.

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