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Compendium of Psittacosis (Chlamydiosis) Control, 1997

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Compendium of Psittacosis (Chlamydiosis) Control, 1997

Summary

Infection with Chlamydia psittaci, *often referred to as avian chlamydiosis (AC), is an important cause of systemic illness in companion birds (i.e., birds kept by humans as pets) and poultry. Infection can be transmitted from infected birds to humans. In humans, infection caused by* C. psittaci *is referred to as psittacosis, which can result in fatal pneumonia. This compendium provides information on AC (also known as psittacosis, ornithosis, and parrot fever) and psittacosis (also known as parrot disease, parrot fever, and chlamydiosis) to public health officials, veterinarians, physicians, the companion-bird industry, and others concerned with control of the disease and protection of public health. These recommendations provide effective, standardized disease control procedures for AC in companion birds and will be reviewed and revised as necessary.*

INTRODUCTION

In this report, psittacosis (also known as parrot disease, parrot fever, and chlamydiosis) refers to any infection or disease in humans caused by *Chlamydia psittaci.* Avian chlamydiosis (AC) refers to any infection with or disease caused by *C. psittaci* in birds. This compendium provides information on AC and psittacosis to public health officials, veterinarians, physicians, the companion-bird industry, and others concerned with control of the disease and protection of public health. These recommendations provide effective, standardized disease control procedures for AC in companion birds and will be reviewed and revised as necessary.

PART I. *C. psittaci* INFECTION AMONG BIRDS (AVIAN CHLAMYDIOSIS)

AC is a zoonotic disease caused by the bacterium *C. psittaci*. This bacterium has been isolated from 129 avian species and is most commonly identified in psittacine birds (e.g., parakeets, parrots, macaws, and cockatiels). Among caged, nonpsittacine birds, infection with *C. psittaci* occurs most frequently in pigeons, doves, and mynah birds. The incidence of infection in canaries and finches is believed to be lower than in other psittacine birds.

The time between exposure to *C. psittaci* and the onset of illness in caged birds ranges from 3 days to several weeks. However, latent infections are common in birds, and active disease may appear years after exposure. Shipping, crowding, chilling, breeding, and other stress factors may activate shedding of the infectious agent among birds with latent infection. Birds may appear healthy but may be carriers of *C. psittaci* and may shed the organism intermittently. When shedding occurs, the organism is excreted in the feces and nasal discharges of infected birds, is resistant to drying, and can remain infective for several months.

Clinical Signs of Chlamydial Infection in Birds

Chlamydial infection in birds may be asymptomatic, or it may become an acute, a subacute, or a chronic clinical disease. Signs depend on the species of bird, virulence of the strain, stresses on the bird, and route of exposure.

Birds with symptomatic AC typically have manifestations (e.g., lethargy, anorexia, and ruffled feathers) consistent with those of other systemic illnesses. Other signs associated with AC include serous or mucopurulent ocular or nasal discharge, diarrhea, and excretion of green to yellow-green urates. Anorectic birds may produce sparse, dark-green droppings. Birds may die soon after onset of illness or, as the disease progresses, may become emaciated and dehydrated before death. Mortality depends on stress factors, virulence of strain, species and age of bird, and extent of treatment or prophylaxis.

Case Classification for Avian Chlamydiosis

A *confirmed case* of AC is defined as infection by *C. psittaci* based on at least one of the following confirmatory laboratory results: a) isolation of *C. psittaci* from a clinical specimen, b) identification of *Chlamydia* antigen by immunofluorescence (fluorescent antibody [FA]) or enzyme-linked immunosorbent assay (ELISA) of the bird's tissues, c) a greater than fourfold change in serologic titer in two specimens from the bird obtained at least 2 weeks apart and assayed in parallel at the same laboratory, or d) identification of *Chlamydia* organisms within macrophages in smears stained with Gimenez or Machiavelo stain or sections of the bird's tissues.

A *probable case* of AC is defined as infection by *C. psittaci* in a bird that has clinical illness compatible with AC and at least one of the following confirmatory laboratory results: a) one high serologic titer in one or more specimens obtained after the onset of signs or b) the presence of *C. psittaci* antigen (identified by ELISA or FA) in feces, a cloacal swab, or respiratory or ocular exudates.

A *suspected case* of avian chlamydiosis is defined as a) clinical illness compatible with AC that is epidemiologically linked to another case in a human or bird but that is not laboratory confirmed; b) an asymptomatic infection in a bird for which laboratory results are equivocal (e.g., a single serologic titer of ≥1:64); c) illness in a bird that has positive results for infection based on a nonstandardized test or a new investigational test; or d) a clinical illness compatible with chlamydiosis that is responsive to appropriate therapy. Several diagnostic methods are available for identifying AC in birds (Appendix A).

General Recommendations for Treatment of Infected Birds

All birds that have confirmed or probable AC should be placed in isolation and treated, preferably under the supervision of a veterinarian. Birds that have suspected cases or birds that have been exposed to AC should be isolated and retested or treated. Because treated birds can be reinfected by *C. psittaci* after treatment, such birds should be isolated from untreated birds or other potential sources of infection. To prevent reinfection from environmental sources, aviaries should be thoroughly cleaned and sanitized. No vaccine against chlamydiosis in birds is currently available.

The following general recommendations should be followed by bird owners and dealers in treating birds that have confirmed, probable, or suspected cases of AC:

- Protect birds from undue stress (e.g., chilling or shipping), poor husbandry, or malnutrition. These problems reduce the effectiveness of treatment and promote the development of secondary infections with other bacteria or yeast.
- Observe the birds daily, and weigh them every 3–7 days to confirm maintenance of body weight.
- Do not administer antibiotics to birds through drinking water, and avoid the use of high dietary concentrations of calcium or other divalent cations.
- Isolate birds that are to be treated in clean, uncrowded cages, segregated by sex.
- Clean up all spilled food promptly; wash water and food containers daily.
- Provide fresh water and appropriate vitamins daily. Treatment options for companion birds that have AC are provided (Appendix B).

Recommended Control Measures

The following control measures are recommended for veterinarians, physicians, and the companion-bird industry to prevent the transmission of *C. psittaci* infection to persons or other birds.

- Maintain accurate records of all bird-related transactions to aid in identifying sources of infected birds and potentially exposed persons. Records should include the date of purchase, species of bird(s) purchased, source of birds, and any identified illnesses or deaths among birds. In addition, when birds are sold by a store, the seller should record the name, address, and telephone number of the customer; the date of purchase; the species of bird(s) purchased; and the band numbers, if applicable.
- Do not purchase or sell birds that have signs compatible with AC (e.g., ocular or nasal discharge, diarrhea, or low body weight).
- Quarantine newly acquired birds for 14–30 days and test or prophylactically treat them before adding them to a group. If birds are boarded or sold on consignment, they should be kept in an area with separate air-handling equipment. Birds should be tested for AC before they are accepted for boarding or consignment.
- Practice preventive husbandry. Cages should be positioned so that fecal matter, feathers, food, and other materials from one cage cannot enter another cage. Cages should not be stacked, and solid-sided cages or barriers should be used if cages are adjoining. All cages and all food and water bowls should be cleaned daily. Soiled bowls should be emptied, cleaned with soap and water, rinsed, placed in a disinfectant solution, and rinsed again before reuse. Between occupancies by different birds, cages should be thoroughly scrubbed with soap and water, disinfected, and rinsed in clean, running water. Exhaust ventilation should be sufficient to prevent accumulation of aerosols.

- Avoid reinfection of birds by using proven prevention measures. If AC is confirmed, probable, or suspected, birds requiring treatment should be held in isolation. Rooms and cages where infected birds were housed should be cleaned immediately and disinfected. The bottom of the cage should be made of wire mesh, and litter that will not produce dust (e.g., newspapers) should be placed underneath the mesh. When the cage is being cleaned, the bird should be transferred into a clean cage, and the soiled cage should be a) thoroughly scrubbed with a detergent to remove all fecal debris, b) rinsed, c) disinfected (allowing at least 5 minutes of contact with the disinfectant), and d) rerinsed to remove the disinfectant. The cages and the room where the bird was housed—as well as the room's air-handling system—should be thoroughly disinfected to eliminate chlamydial organisms from the environment. All items that cannot be adequately disinfected (e.g., wooden perches, nest material, and litter) should be discarded. During treatment, precautions should be taken to minimize circulation of feathers and dust (e.g., by wet-mopping the floor frequently with disinfectants, making liberal use of oil-impregnated sweeping compounds when sweeping between moppings, and preventing air currents and drafts within the area). Contamination from dust can be reduced by spraying the floor with a disinfectant or with water before sweeping it. To prevent aerosolization of particles, the use of vacuum cleaners is strongly discouraged. Waste material should be removed frequently from the cage (after moistening the material). This waste should be burned or double-bagged for disposal. When possible, healthy birds should be cared for before isolated birds are handled.

- Use disinfection measures. Because *C. psittaci* has a high lipid content, it is susceptible to most disinfectants and detergents. In the clinic or laboratory, a 1:1,000 dilution of quarternary ammonium compounds (alkyldimethylbenzylammonium chloride [e.g., Roccal® or Zephiran®]) is effective, as is 70% isopropyl alcohol, 1% Lysol®, 1:100 dilution of household bleach (i.e., 2.5 tablespoons per gallon [10 mL/L]), or chlorophenols. *(C. psittaci* is susceptible to heat but is resistant to acid and alkali.) Many disinfectants are respiratory irritants and should be used in a well-ventilated area. Avoid mixing disinfectants with any other product.

- Take measures to protect persons at high risk from becoming infected. All persons in contact with infected birds should be informed about the nature of the disease. If respiratory illness develops in an exposed person, a physician should initiate early and specific treatment for psittacosis. Persons at risk should be instructed to wear protective clothing, gloves, and a paper surgical cap and respirator with at least an N95 rating (or a dust-mist mask if an N95 or higher-efficiency respirator is not available) when cleaning cages or handling infected birds. Surgical masks may not be effective in preventing transmission. When necropsies are performed on birds that are potentially infected, additional precautions should be taken, including a) wetting the carcass with detergent and water to prevent aerosolization of infectious particles and b) working under an examining hood that has an exhaust fan.

Responsibilities of Veterinarians

Veterinarians should be aware that AC is not a rare disease in pet birds. The disease should be considered in any lethargic bird that has nonspecific signs of illness, especially if the bird was recently purchased. If AC is suspected, appropriate laboratory specimens should be submitted to a veterinary diagnostic laboratory to confirm the diagnosis. Both laboratories and attending veterinarians should follow local and state regulations or guidelines regarding the reporting of cases.

Veterinarians should work closely with authorities who conduct investigations in their jurisdictions. When appropriate, veterinarians should inform their clients that infected birds should be isolated and treated. In addition, clients should be informed of a) the public health hazard posed by AC, b) appropriate precautions that should be taken to avoid the risk for transmission to persons and other companion birds, and c) the need to seek medical attention if persons exposed to the bird develop influenza-like symptoms or other respiratory illness.

Quarantine

The appropriate state animal and/or public health authorities may issue a quarantine for all affected and susceptible birds on a premises where infection has been identified. The purpose of imposing a quarantine is not to discourage disease reporting but to prevent further disease transmission (*1*). Because of the severe economic impact of quarantines, reasonable economic options should be made available to the owners and operators of pet stores. With the approval of state authorities, the owner of quarantined birds may choose one of two options: a) remove the birds from the premises and treat them in a separate quarantine area or b) euthanize the birds. After completion of the treatment or removal of the birds, a quarantine may be lifted when the infected premises are thoroughly cleaned and disinfected. The area can then be restocked with birds.

Importation of Birds and Import Regulations

The Veterinary Services of the Animal and Plant Health Inspection Service, U.S. Department of Agriculture (USDA), regulates the importation of pet birds to ensure that exotic poultry diseases are not introduced into the United States. These regulations are set forth in the Code of Federal Regulations (CFR), Title 9, Chapter 1 (*1*). Because of the possibility of smuggled pet birds, these import measures do not guarantee that avian chlamydiosis cannot enter the United States. In general, current USDA regulations regarding the importation of birds require—

- that the importer obtain, in advance of shipping, an import permit from the USDA and a health certificate issued and/or endorsed by a veterinarian of the national government of the exporting country;
- a USDA veterinary inspection at the first port of entry in the United States and quarantine for a minimum of 30 days at a USDA-approved facility, to determine if the birds are free of evidence of communicable diseases of poultry. In addition, the birds must be tested to ensure they are free of exotic Newcastle disease and pathogenic avian influenza; and

- that, during U.S. quarantine, psittacine birds receive a balanced, medicated feed ration containing ≥1% chlortetracycline (CTC) with ≤0.7% calcium for the entire quarantine period as a precautionary measure against avian chlamydiosis. The USDA recommends that importers continue CTC prophylactic treatment of psittacine birds for an additional 15 days (i.e., for 45 continuous days).

PART II. *C. psittaci* INFECTION AMONG HUMANS (PSITTACOSIS)

Because several diseases affecting humans can be caused by other species of *Chlamydia*, the disease resulting from the infection of humans with *C. psittaci* is frequently referred to as psittacosis. Most *C. psittaci* infections in humans result from exposure to psittacine birds.

During 1985–1995, a total of 1,132 cases of psittacosis in humans was reported to CDC (*2*). Because the diagnosis of psittacosis can be difficult, these 1,132 cases probably represent an underestimation of the actual number of cases. During the 1980s, public health surveillance indicated that exposure to caged pet birds accounted for 70% of the psittacosis cases for which the source of infection was known; of these, owners of companion birds or bird fanciers were the largest group of affected persons (43%). Pet-shop employees accounted for an additional 10% of cases. Other persons at risk include pigeon fanciers and persons whose occupation places them at risk of exposure (e.g., employees in poultry-slaughtering/processing plants, veterinarians, veterinary technicians, laboratory workers, workers in avian quarantine stations, farmers, and zoo workers). Because human infection can result from transient exposure to infected birds or their contaminated droppings, persons with no identified avocational or occupational risk may become infected.

Clinical Signs

Human infection with *C. psittaci* usually occurs through the inhalation of the organism aerosolized from urine, respiratory secretions, or dried feces of infected birds. Other sources of exposure can include bird bites, mouth-to-beak contact, and handling the plumage and tissues of infected birds. Transient exposures may be adequate to induce infection. The incubation period is 5–14 days, and the severity of disease resulting from infection ranges from inapparent to severe systemic disease accompanied by pneumonia.

Cases of symptomatic infection typically are characterized by abrupt onset of fever, chills, headache, malaise, and myalgia. A nonproductive cough usually develops, and a pulse-temperature dissociation sometimes occurs. Auscultatory findings may underestimate the extent of pulmonary involvement. Radiographic findings may include lobar or interstitial infiltrates.

The differential diagnosis of psittacosis-related pneumonia may include infection by *Coxiella burnetii*, *Mycoplasma pneumoniae* spp., *Chlamydia pneumoniae*, *Legionella* spp., and viruses (e.g., influenza). Psittacosis may result in endocarditis, myocarditis, hepatitis, arthritis, keratoconjunctivitis, and encephalitis. Death occurs in <1% of properly treated patients.

Case Definition

A patient is considered to have a *confirmed* case of psittacosis if a) *C. psittaci* is cultured from clinical specimens or b) clinical illness is compatible with chlamydiosis and the antibody titer is increased by greater than fourfold (i.e., to ≥32) as demonstrated by a complement-fixation (CF) or microimmunofluorescence (MIF) test for *C. psittaci* by either paired sera obtained at least 2 weeks apart or detection of IgM antibody (i.e., ≥16) by MIF against *C. psittaci*. A patient is considered to have a *probable* case of psittacosis if there is a) a clinically compatible illness that is epidemiologically linked to a confirmed case or b) a single antibody titer ≥32 by MIF or CF is present in at least one serum specimen obtained after onset of symptoms.

These case definitions were established by CDC and the Council of State and Territorial Epidemiologists for epidemiologic purposes (*3*). They should not be used as sole criteria for establishing clinical diagnoses.

Diagnosis

Diagnosis almost always is established by using serologic methods in which paired sera are tested for *Chlamydia* antibodies by CF test. However, because *Chlamydia* CF antibody is not species specific, high CF titers also may result from *C. pneumoniae* and *Chlamydia trachomatis* infection. Acute- and convalescent-phase serum specimens should be obtained as soon as possible after onset of symptoms and ≥2 weeks after onset of symptoms, respectively. Because treatment with tetracycline may delay or diminish the antibody response, a third serum sample may help confirm the diagnosis. All sera should be tested simultaneously at the same laboratory. If indicated by epidemiologic and clinical history, MIF assays can be used to distinguish *C. psittaci* infection from infection with other chlamydial species. Information about laboratory testing is often available at state laboratories. In humans, the infective agent can be isolated from sputum, pleural fluid, or clotted blood during acute illness before treatment with antibiotic.

Treatment

Tetracyclines are the drugs of choice for treating psittacosis in humans; most persons respond to oral therapy (100 mg of doxycycline administered twice a day or 500 mg of tetracycline hydrochloride administered four times a day). For severely ill patients, tetracycline hydrochloride may be administered intravenously at a dosage of 10–15 mg/kg of body weight/day. Remission of symptoms usually is evident within 48–72 hours. However, relapse may occur, and treatment must continue for at least 10–14 days after fever abates. Although its in-vivo efficacy has not been determined, erythromycin is probably the best alternative agent for persons for whom tetracycline is contraindicated (e.g., children aged <9 years and pregnant women).

Reinfection can occur. Person-to-person transmission occurs only rarely; therefore, patient isolation and prophylaxis of contacts are not indicated.

Responsibilities of Physicians

Most states require physicians to report cases of psittacosis in humans to the appropriate health authorities. Timely diagnosis and reporting may aid in identifying the

source of the infection and in controlling the spread of disease. Because single-serum titers are both insensitive and nonspecific for diagnosis of psittacosis, confirmation with paired acute- and convalescent-phase sera is recommended.

Birds that are suspected sources of human infection should be referred to veterinarians for evaluation and treatment. Local and state authorities may conduct epidemiologic investigations and institute additional disease-control measures.

Epidemiologic Investigations

Epidemiologic investigations may be necessary to assist in controlling the transmission of *C. psittaci* in birds and humans. An epidemiologic investigation should be initiated if: a) a bird that has confirmed AC was procured from a pet store, breeder, or dealer within 60 days of the onset of its signs or b) a bird has come in contact with a human who has confirmed psittacosis.

Humans or birds infected with or suspected of being infected with *C. psittaci* should be investigated at the discretion of the appropriate local or state public or animal health authorities. Investigations involving recently purchased birds should include a visit to the site where the infected bird is located and identification of the location where the bird was originally procured (e.g., pet shops, dealers, breeders, and quarantine stations). In conducting investigations, important considerations may include documenting the number and type(s) of birds involved, the health status of potentially affected persons and birds, locations of facilities where birds were housed, relevant ventilation-related factors, the treatment protocol, and the source of medicated feed, if such treatment is initiated. To facilitate identification of multistate outbreaks of *C. psittaci* infection, local and state authorities should report suspected outbreaks to the Childhood and Respiratory Diseases Branch, Division of Bacterial and Mycotic Diseases, National Center for Infectious Diseases, CDC; telephone (404) 639-2215.

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Appendix A

DIAGNOSTIC METHODS FOR AVIAN CHLAMYDIOSIS

Histopathologic Findings

In birds that have avian chlamydiosis (AC), cloudy air sacs and enlarged liver and spleen are usually observed, but no specific, gross lesion is pathognomonic. Laboratory diagnostic procedures include polymerase chain reaction (PCR), antigen-capture enzyme-linked immunosorbent assay (ELISA), and the chromatic or immunologic staining of tissue-impression smears to identify organisms. Isolation of the etiologic agent, *Chlamydia psittaci,* from spleen, liver, air sacs, pericardium, heart, or intestines is the optimal diagnostic verification.

Culture Technique

Culture technique is a specific diagnostic procedure that allows the recovery of the etiologic agent. *Chlamydia* organisms are obligate intracellular bacteria that must be isolated in tissue culture, mice, or chick embryos. Specialized laboratory facilities and training are necessary both for reliable identification of chlamydial isolates and for protection of the microbiologists. Consequently, few laboratories perform chlamydial cultures.

In live birds, depending on which clinical signs they exhibit, combined cloacal and choanal-swab specimens should be collected, refrigerated, and sent to the laboratory packed in ice, but not frozen. The proper handling of samples is critical for maintaining the viability of organisms for culture, and a special transport medium is required. Veterinarians should contact their specific diagnostic laboratory for procedures required for submission of specimens for isolation.

Live birds being screened for *C. psittaci* may not shed the microorganism daily. Therefore, to reduce laboratory costs, serial specimens should be collected for 3–5 consecutive days and pooled before being cultured. Tissue samples from the liver and spleen are the preferred necropsy specimens for isolation of *C. psittaci*. When legal actions may result from chlamydiosis cases, use of culture is recommended to avoid limitations associated with other tests.

Serologic Tests

A major problem with serologic testing is the interpretation of results. A positive serologic test result is evidence that the bird was infected by *C. psittaci* in the past, but it does not prove that the bird currently has active disease. False-negative results may occur for birds that have acute infection when they are sampled before seroconversion. Antibiotic treatment may diminish the antibody response.

Serologic diagnostic methods used to identify antibodies to *C. psittaci* include complement-fixation (CF) tests, modified-direct CF tests, latex-agglutination tests, elementary-body agglutination (EBA) tests, and microimmunofluorescence tests. A single testing method may not be adequate because of the diversity of reactions with immunoglobulins from the various avian species. Therefore, the use of a combination

of antibody- and antigen-detection methods for the diagnosis of chlamydiosis is recommended, particularly when only one bird is tested. When specimens are obtained from a single bird, serologic testing is most useful when a) signs of disease and the history of the flock or aviary are considered and b) paired samples of sera are examined and the results are compared with the white blood cell counts and liver-enzyme activities of healthy birds. Either a greater than fourfold increase in titer or a combination of a titer and antigen identification is needed to confirm a diagnosis of chlamydiosis.

Some of the advantages/disadvantages of several of the serologic tests for antibodies are as follows:

Direct CF Test

Direct CF is more sensitive to antibody activity than are agglutination methods. No commercial antigen is available. False-negative results are possible in specimens from small psittacine birds (e.g., budgerigars, young African grey parrots, and lovebirds). High titers may persist after treatment and complicate interpretation of subsequent tests. Modified direct CF is more sensitive than direct CF.

Latex Agglutination

Antigen currently is not available. As a result, other methods are recommended for testing for antibody for *C. psittaci*.

Elementary-Body Agglutination

EBA is commercially available and can detect early infection. Titers ≥10 in budgerigars, cockatiels, and lovebirds and titers of ≥20 in larger birds are interpreted by the laboratory as indicating current infection. However, positive titers may persist after treatment is completed, and EBA is performed only by a single laboratory.

Tests for Antigen

Immunofluorescent-Staining Tests

Monoclonal or polyclonal antibodies, fluorescein-staining techniques, and fluorescent microscopy are used to identify elementary bodies (i.e., infectious agents) in impression smears from dead birds. When used with cloacal or fecal smears, the test sensitivity and specificity are questioned by some authorities. The test is most useful if the bird is shedding antigen. Its advantages are that it gives rapid results and does not require live, viable organisms. Laboratory experience is important for accurate interpretation of immunofluorescent stains.

ELISA

Two of the ELISA tests (i.e., IDEIA® and Kodak Surecell®) currently being used to identify *C. psittaci* were originally developed for identification of the lipopolysaccharide antigen on *C. trachomatis*, which is a human pathogen. The sensitivity and specificity of these tests for identifying *C. psittaci* are not precisely known. Because of intermittent shedding, the sensitivity may be low in symptomatic birds. Moreover, some tests may be falsely positive because of cross-reaction with other bacteria. The

test results must be evaluated in conjunction with other clinical findings. If a bird has a positive ELISA result but is clinically healthy, the veterinarian should attempt to verify that the bird is shedding antigen through isolation of the organism. When a clinically ill bird has a negative ELISA result, a diagnosis of AC cannot be excluded without further testing (e.g., isolation, serologic testing, or fluorescent antibody).

Additional Tests

Additional tests are in use or under development, including the elementary-body agglutination test, microagglutination test, microimmunofluorescence, and PCR. However, peer-reviewed reports on such tests currently are not available.

Laboratories that Provide AC Testing

The National Association of State Public Health Veterinarians can provide a list of laboratories that offer avian chlamydia testing. Address requests to the Association at RSA Tower, Ste. 1310, P.O. Box 303017, Montgomery, AL 36130-3017.

Appendix B

CHLAMYDIOSIS TREATMENT OPTIONS FOR COMPANION BIRDS

Veterinarians can choose several methods for treating avian chlamydiosis (AC). Although these protocols are usually successful, knowledge in this area is evolving, and no treatment protocol guarantees safe treatment or complete elimination of infection by the etiologic agent *Chlamydia psittaci* in all avian species. Therefore, treatment should be supervised by a licensed veterinarian.

Methods of Treatment

Several methods of treating AC exist. The following are established as effective treatments:

Medicated Feed

The medicated feed should be the only food provided to the birds during the entire treatment. Birds' acceptance of medicated feed is variable. Thus, food consumption should be monitored. Acceptance may be enhanced by first adapting the birds to a similar, nonmedicated diet. The treatment begins when the birds accept the medicated feed as the sole food in their diet.

a) Medicated mash diets (i.e., ≥1% chlortetracycline [CTC] with ≤0.7% calcium) prepared with corn can be used.*
b) White millet seed, impregnated with 0.5 mg CTC/g of seed, may be used for budgerigar parakeets and finches only. It should be used for 30 days (Keet Life®; Hartz Mountain is the only manufacturer).
c) Pellets and extruded products containing 1% CTC may be used. They are available and appropriate for use in most companion birds. A pellet size should be selected that is appropriate for the size of bird being treated. The treatment period is 45 days.
d) A special diet may be necessary for birds belonging to a subfamily of psittacine birds known as Loriidae (i.e., lories and lorikeets) that feed on nectar and fruit in the wild.

Oral or Parenteral Treatments

Birds should be treated for a total of 45 days. Three such treatments are provided.

Oral doxycycline. Doxycycline is the drug of choice for oral treatment; either the monohydrate or calcium-syrup formulations may be used. Based on nonpeer-reviewed studies, dosage recommendations are as follows: 40–50 mg/kg by mouth once a day for cockatiels, Senegal parrots, and blue-fronted and orange-winged Amazon parrots; and 25 mg/kg by mouth once a day for African grey parrots, Goffin's cockatoos, and blue and gold and green-winged macaws. Precise dosages cannot be

*The recommended recipe is 2 pounds of rice, 2 pounds of hen scratch feed, and 3 pints of water, cooked for 15 minutes at full pressure in a pressure cooker. Add 10 mg chlortetracycline/g of feed after the cooked feed cools. Note that birds may find this diet unpalatable and may not accept it.

extrapolated for untested species; however, 25–30 mg/kg administered by mouth once a day is the recommended starting dose in cockatoos and macaws, and 25–50 mg/kg by mouth once a day is recommended in other psittacine species. If the bird regurgitates the drug, another treatment method should be used.

Injectable doxycycline. Intramuscular (IM) injection into the pectoral muscle is often the easiest method of treatment, but not all injectable doxycycline formulations are suitable for IM injection. All currently available formulations may cause irritation at the injection site. The Vibrovenos formulation (Pfizer Laboratories) is available in Europe and Canada and is effective if administered at doses of 75–100 mg/kg IM every 5–7 days for the first 4 weeks and subsequently every 5 days for the duration of the treatment. Anecdotal reports exist of the successful use of pharmacist-compounded injectable-doxycycline products in the United States. However, data are insufficient to determine precise dosage schedules. The injectable-hyclate formulation labeled for intravenous (IV) use in humans in the United States is not suitable for IM use, because severe tissue reactions will occur at the site of injection.

Injectable oxytetracycline. Limited information exists for the use of an injectable, long-acting oxytetracycline product (LA-200, Pfizer Laboratories). Current dosage recommendations are as follows: subcutaneous injection of 75 mg/kg every 3 days in Goffin's cockatoos, blue-fronted and orange-winged Amazon parrots, and blue and gold macaws. This dose may be suitable for other species but has not been tested. This product causes irritation at the site of injection and is best used to initiate treatment in ill birds or those that are reluctant to eat. After stabilization with oxytetracycline treatment, the birds should be switched to another form of treatment to reduce the muscle irritation that is caused by repeated oxytetracycline injection.

Experimental methods

Treatment protocols using fluoroquinolones, late-generation macrolides, pharmacist-compounded injectable doxycycline, and doxycycline-medicated feed are currently being investigated. Information about these treatment protocols may be available in the scientific literature or from avian veterinary specialists.

Sources of Medicated Feeds

Medicated feed is available from several sources. The National Association of State Public Health Veterinarians can provide a list of suppliers. Address requests to the Association at RSA Tower, Ste. 1310, P.O. Box 303017, Montgomery, AL 36130-3017.

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