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Psittacosis

Avian Chlamydiosis
Parrot Fever
Ornithosis




Psittacosis is the term used to describe human infection with *Chlamydophila psittaci* (formerly known as *Chlamydia psittaci*) a member of the family Chlamydiaceae. When avian are infected with *Chlamydophila psittaci*, the term avian chlamydiosis is used. The disease in avians is also known as parrot Fever and ornithosis.

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Overview


- Organism
- History
- Epidemiology
- Transmission
- Disease in Humans
- Disease in Animals
- Prevention and Control



In today's presentation we will cover information regarding the organism *Chlamydophila psittaci*, which causes psittacosis in humans and avian chlamydiosis in birds. We will discuss its history, epidemiology and transmission. We will also talk about species that it affects, clinical signs and necropsy signs observed. Finally, we will address prevention and control measures for psittacosis and avian chlamydiosis.

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The Organism

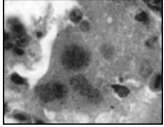



Chlamydophila psittaci is an obligate intercellular organism. The developmental cycle includes two forms: the elementary and the reticulate bodies. The elementary body is thought to survive for prolonged periods in the environment, but cannot replicate. After attaching to a susceptible host cell, the elementary body enters the cytoplasm and transforms into a larger flexible-walled form called the reticulate body. The reticulate body is noninfectious and incapable of extracellular survival. After infection, the reticulate bodies reorganize to form infectious elementary bodies that leave the cells in 48-72 hrs.

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The Organism

- *Chlamydophila psittaci*
- Obligate intracellular bacteria
- Elementary body
 - Infectious
 - Survive for months in environment
- Reticulate body
 - Non-infectious





www.dhss.state.mo.us/ehcdp/std_hiv/Chlamydia.gif
www.vet.uga.edu/vpp/Undergrad/turnerandrobbins/fig1.jpg (showing elementary bodies in hepatocytes)

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New Taxonomic Classification

- Genus *Chlamydia*
 - *C. trachomatis*
 - *C. muridarum*
 - *C. suis*
- Genus *Chlamydophila*
 - *C. abortus*
 - *C. felis*
 - *C. pecorum*
 - *C. pneumoniae*
 - *C. caviae*
 - *C. psittaci*



Under the new taxonomic classification *Chlamydiaceae*, has two genera: *Chlamydia* and *Chlamydophila*. *Chlamydia* genera includes *C. trachomatis*, *C. muridarum*, and *C. suis*. *Chlamydophila* includes the newly renamed strains of *C. abortus*, *C. felis*, *C. pecorum*, *C. pneumoniae*, *C. caviae*, and *C. psittaci*. *Chlamydophila psittaci* has eight known serovars; six have been primarily isolated in birds and two strains have been isolated in mammals. Identification of serovar may help to determine the source of infection.

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The Organism

- Resistant to drying
 - Remains infectious for months
 - Remains viable on surfaces for 2-3 weeks
 - Survives in turkey carcass for >1 yr.



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The Chlamydial organism is very resistant to drying. Infectivity of *C. psittaci* has been documented in canary feed for 2 months, in poultry litter for up to 8 months, straw and hard surfaces for 2-3 weeks, and in diseased turkey carcasses for less than 1 year. (Photo: USDA)

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History



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History

- 1879
 - First recognized human outbreak
 - 7 people in contact with sick parrots
- 1929-1930
 - 750 human cases
 - 20% mortality
 - Large scale importation of infected birds from Argentina
- 1935
 - Wild psittacines in Australia



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In 1879, Dr. A. Ritter was credited with recognition of the first outbreak of human psittacosis. He had seven ill patients, who had a history of recent contact with sick parrots. The greatest epidemic occurred in 1929-1930 and resulted in 750-800 sick humans. This outbreak was attributed to large scale importation of infected exotic birds from Argentina to Europe and to the United States. There was a 20% mortality rate associated with those outbreaks. Since the 1930 epidemic, numerous countries have instituted a complete import ban on psittacine birds. Smuggling has become common in the United States. In 1935, *Chlamydophila psittaci* was found to be prevalent in wild psittacines in Australia.

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Epidemiology



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Epidemiology

- Occurs worldwide
- 50-100 confirmed cases per year in U.S.
 - 1-2 deaths
 - True incidence unknown
- Nationally reportable in humans
- Pet store employees, bird owners, poultry processing plant workers



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Psittacosis occurs worldwide as a sporadic disease. In the United State, psittacosis is reportable in humans, but true incidence is unknown due to poor reporting compliance and frequent misdiagnosis. There are 50-100 confirmed cases per year (1-2 deaths per year), but some estimate as many as 100-200 cases per year is more likely. Pet store employees, owners of pet birds, and poultry processing plant workers account for the majority of the reported cases.

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Epidemiology

- 1988-2002
 - 923 cases in U.S.
 - Many cases unreported or misdiagnosed
- 1980's
 - 70% of cases with known source due to exposure to caged birds

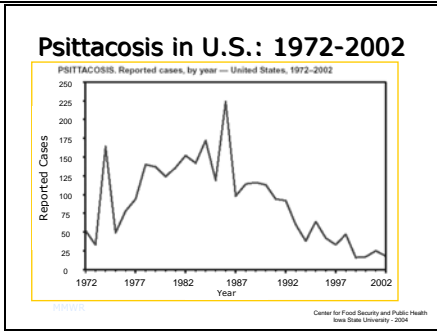


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From 1988 through 2002, the CDC received reports of 923 cases of Psittacosis, which is likely an under representation of the actual number of cases because psittacosis is difficult to diagnose and cases often go unreported. Bird fanciers and pet bird owners accounted for 43% of cases of psittacosis and pet shop employees for 10%. In the 1980s, about 70% of cases in which the source of infection was known was a result of exposure to caged birds.

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This chart depicts the annual cases in the United States, from 1972-2002. The cases numbers vary greatly from year to year due to periodic outbreaks. The increase in case numbers from the 1970-80's may be a result of increased use of diagnostic tests in respiratory patients. The decrease in cases in the 1990's may be due to improved diagnostic tests, to distinguish species of *Chlamydothila*, and better disease control methods. Data from the Summary of Notifiable Diseases 2002, CDC website.

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Populations at Risk

- Lab workers
- Veterinarians
- Avian quarantine workers
- Zoo workers
- Farmers
- Pregnant women
- Bird fanciers (pigeon fanciers too)
- Bird owners
- Pet shop employees
- Poultry slaughter and processing workers
- Wildlife rehab workers


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There are many specific occupational and recreational activities that could increase the risk of acquiring Psittacosis; a few of them are listed on this slide.

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Transmission




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Transmission to Humans

- Inhalation
 - Dried infective droppings
 - Secretions or dust from feathers
- Mouth-to-beak
- Direct contact
 - Handling plumage or tissues of infected birds
- Person-to-person transmission
 - Not proven
 - Venereal transmission reported



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C. psittaci is excreted in the feces and nasal discharges of infected birds. The organism is environmentally labile but can remain infectious for several months if protected by organic debris. Man is an incidental, dead-end host. Because human infection can result from transient exposure to infected birds or their droppings, the average person may be at risk without recalling or reporting having contact with birds. Infection may occur via inhalation of aerosols of dried infective avian excreta. Other means of exposure include mouth-to-beak contact and handling of infected birds' plumage and tissues. While feral pigeons in towns worldwide are commonly infected, zoonotic spread of infection from asymptomatic pigeons appears low. Person to person transmission has suggested but not proven. Venereal transmission has also been reported. Food borne transmission has not been documented.

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Disease in Humans

Psittacosis



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Human Disease: Psittacosis

- Incubation period: 1-4 weeks
- Range
 - Inapparent infection
 - Systemic infection with pneumonia
 - Pneumonia 30-60 years of age
- Common signs – abrupt onset
 - Fever, chills, headache, malaise, myalgia, sore throat, cough, dyspnea, splenomegaly, rash

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Incubation period in humans ranges 1 to 4 weeks, most patients develop symptoms after 10 days. Severity of clinical signs range from inapparent to systemic illness with severe pneumonia. Pneumonia occurs most commonly in adults 30-60 years old. Other signs include abrupt onset of fever, chills, headache, malaise, myalgia, nonproductive cough, breathing difficulty, chest tightness, splenomegaly (present in 1-10% of patients), and rash (truncal lesions resembling those of typhoid fever, pink macules 2-4 mm diameter).

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Clinical Signs

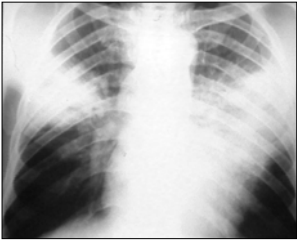
- May also see
 - Myocarditis, endocarditis
 - Arthritis, lethargy, hepatitis, epistaxis
 - Placentitis, fetal death
 - Encephalitis, jaundice, respiratory failure
 - Thrombocytopenia, coma, arthralgia

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After several days of untreated illness, lethargy and sluggish speech may be seen with coma or stupor. Other organ systems can be involved causing endocarditis, placentitis, myocarditis, hepatitis, arthritis, keratoconjunctivitis, and encephalitis. Respiratory failure, thrombocytopenia, and fetal death have been reported. Epistaxis and mucocutaneous manifestations frequently occur. Arthralgia is rare.

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45 year old male, rail station worker with Chlamydial pneumonia

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Radiograph from 45 year old man, admitted confused and feverish, diagnosed with Chlamydial pneumonia. He worked at a railway station in an environment contaminated by the droppings of urban pigeons.

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Diagnosis

- Confirmed case
 - Clinical signs + laboratory results
 - Culture
 - 4-fold rise in titer
 - IgM detected by MIF
- Probable case
 - Linked epidemiologically to confirmed case of Psittacosis
 - Single titer $\geq 1:32$

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Cases are confirmed on the basis of clinical signs of illness and laboratory results. The organism can be cultured from respiratory secretions, but it is only performed in a few labs due to technical difficulty and safety concerns. Analysis of paired titers with a 4-fold rise in titer being confirmatory can be performed using complement fixation tests (CF is the test most routinely used in laboratories for human cases) or microimmunofluorescence (MIF). A reciprocal titer of 16 of IgM using MIF also confirms infection. A probable case is one that is epidemiologically linked to a confirmed case of psittacosis, or if a single titer of 1:32 is found.

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Differential Diagnosis

- *Coxiella burnetii* (Q fever)
- *Legionella*
- *Chlamydia pneumoniae*
- *Mycoplasma pneumoniae*
- Influenza
- Tularemia



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Differential diagnosis of psittacosis pneumonia include infection with *Coxiella burnetii* (Q fever), *legionella*, *chlamydia pneumoniae*, *Mycoplasma pneumoniae* and other respiratory viruses such as influenza. Tularemia pneumonia should also be included as a differential.

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Treatment and Prognosis

- With treatment
 - 1-5% case-fatality rate
 - Tetracyclines are drug of choice
 - Remission of symptoms
 - Usually in 48-72 hours
 - Relapse possible
- Without treatment
 - May resolve in few weeks-months
 - 10-40% case-fatality rate

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With proper treatment, case fatality rates are 1%-5%. Tetracycline is the drug of choice for treatment. Remission of symptoms usually is evident within 48-72 hours, but relapse may develop. Without treatment symptoms may resolve in a few weeks to months. Without treatment the case fatality rate is 10%-40%.

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Gestational Psittacosis

- 14 documented cases
 - 12 from exposure to sheep (*C. abortus*)
 - 2 from psittacine birds (*C. psittaci*)



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There have been 14 reports of gestational psittacosis. These cases were reported prior to the reclassification of chlamydial organisms, thus serovar confirmation is not reported. It appears that two cases involved bird association most likely due to *C. psittaci* and 12 cases involved sheep and goat exposure to *C. abortus*. Photo: USDA

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Outbreak in Iowa

- Veterinary clinic in Des Moines
- Cockatoo purchased at a pet store
- 9 exposed veterinary personnel and 2 owners
 - 2 veterinary assistants and owner's wife developed illness
- Confirmed by complement-fixation tests
 - Fever, rales, and pneumonia (on x-ray)

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Index bird was third bird purchased by couple and in turn infected the earlier two purchased birds, one of which died.

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Outbreak in Iowa

- Index bird infected 2 others birds owned by couple, killing 1
- Treatment
 - Birds: 45 days with tetracycline
- All human cases recovered without complications

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Treated birds for 45 days with tetracycline. Treated the exposed people as well.

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Disease in Animals

Avian Chlamydiosis (AC)




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Avian Species Affected

- Isolated from over 100 avian species
 - Psittacines
 - Especially cockatiels and parakeets
 - Egrets, gulls, ratites
 - Pigeons, doves, mynah birds, sparrows
 - Turkeys, ducks
 - Rarely chickens



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Chlamydophila psittaci has been isolated from over 100 species of birds; most commonly from psittacine (parrot like) birds especially cockatiels and parakeets. The organism has also been identified in pigeons, chickens, turkeys, ducks, egrets, and gulls. There have been outbreaks on turkey and duck farms associated with human illness. It has also been seen in ratites.

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Avian Chlamydiosis

- Carriers may appear healthy
 - Shed intermittently
- Shedding activated by stress
 - Shipping, breeding crowding, chilling
- Shedding greatest in young birds



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C. psittaci is excreted in the feces and nasal discharges of infected birds. Birds can appear healthy but be carriers that shed intermittently. Shedding is highest among young birds and may be activated by stress (shipping, crowding, chilling, breeding).

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Avian Chlamydiosis

- Incubation period
 - 3 days to several weeks
- Latent infection
 - common
- Morbidity and mortality
 - vary with species and serotype



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For caged birds, time between exposure to *C. psittaci* and onset of illness ranges from three days to several weeks. Latent infections are common in birds and active disease may appear years after exposure. Morbidity and mortality varies with species and serotype. In turkeys, serovar D strains cause 50-80% morbidity and 5-30% mortality. Other serovars in turkeys usually result in 5-20% morbidity and mortality less than 50%. In ducks, morbidity may be up to 80% and mortality ranges from 0-30%. Concurrent infections or stress increase disease severity.

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Clinical Signs in Pet Birds

- Anorexia
- Weight loss
- Diarrhea
- Yellowish droppings
- Sinusitis
- Respiratory distress
- Nervous signs



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Birds may be asymptomatic, may have mild infections with diarrhea, or have mild respiratory signs. Common signs are anorexia, weight loss, yellowish droppings, sinusitis and nervous signs. There may also be residual disturbances in feathering in survivors.

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Clinical Signs in Turkey, Duck & Pigeon

- Depression
- Ruffled feathers
- Weakness
- Inappetence
- Nasal discharge
- Respiratory distress
- Yellow-green diarrhea
- Conjunctivitis
- Decreased egg production
- Ataxia-pigeons
- Trembling-ducks



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Clinical signs in turkeys, ducks, and pigeons include depression, ruffled feathers, weakness, inappetence, weight loss, nasal discharge, respiratory distress, yellowish-green or green diarrhea, and unilateral or bilateral conjunctivitis. Egg production may decrease. Nervous signs may include transient ataxia in pigeons and trembling or gait abnormalities in ducks.

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Diagnosis

- Diagnosis difficult
- Case definitions
 - Confirmed, probable, suspect
- Single test may not be adequate
 - Combination testing recommended
- Proper sample collection techniques critical for accurate results
- Consult an experienced avian veterinarian

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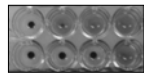
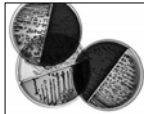
Diagnosis of avian chlamydiosis can be difficult, especially in the absence of clinical signs. Confirmed, probable and suspected case definitions are established. A single testing method might not be adequate. A combination of culture, antibody and antigen detection methods is recommended, especially when only one bird is tested. There is no epidemiologic evidence of increased risk to the very young, the elderly or immunocompromised, more rigorous testing should be used for birds in contact with these individuals. Consulting with an experienced avian veterinarian to select tests and interpret results is recommended. Proper sample collection techniques and handling are important for obtaining accurate test results.

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Diagnosis

- Pathologic diagnosis
- Culture
- Antibody tests
 - CF, EBA
- Antigen Tests
- ELISA, IFA, PCR
- RIM



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Diagnosis of avian chlamydiosis may include: pathologic diagnosis, culture, tests for antibody, tests for antigen and other tests such as RIM (rapid immunomigration). There are no gross pathognomonic lesions with *C. psittaci* but staining of tissue or impression smears may identify the organism. Culture is recommended in conjunction with other forms of diagnosis to avoid the limitations associated with other tests. Specialized lab facilities are required. Antibody tests include complement fixation and EBA which is elementary body agglutination. Antigen tests include ELISA, IFA and PCR. Some state diagnostic laboratories and veterinary colleges perform routine chlamydial diagnostics and should be consulted prior to specimen collection. [virology-online.com/ general/CFT.gif](http://virology-online.com/general/CFT.gif)

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Treatment for Pet Birds

- May be difficult
- Fatalities occur
- Supervised by licensed veterinarian in consult with avian specialist
- All birds treated 45 days
- Even with treatment
 - Latent infections can remain
 - Shedding may occur

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Treatment of avian chlamydiosis can be difficult and fatalities may occur. Although present treatment protocols are usually successful, knowledge is evolving and no protocol assures safe treatment or complete elimination of infection. All treatment should be supervised by a licensed veterinarian after consultation with an experienced avian veterinarian. All birds should be treated for 45 days. Sources of dietary calcium should be reduced if tetracyclines are used. Even with treatment, latent infections and shedding may continue.

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Prevention and Control



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Prevention and Control

- Educate and protect those at risk
 - Clothing, gloves, cap, HEPA filters
 - Wet carcass with water and detergent prior to necropsy
- Disinfect
 - 1:1000 quaternary ammonium compounds
 - 1% Lysol
 - 70% isopropyl alcohol
 - 1:100 bleach

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To prevent transmission of *C. psittaci* to persons and birds, the following control measures are recommended: Protect and educate those at risk. Persons in contact with birds need to know about the zoonotic nature of the disease. People at risk should wear protective clothing, gloves, surgical cap, HEPA filter mask when cleaning cages or handling birds. Disinfect the cages daily (easily killed) with 1:1,000 quaternary ammonium compounds, 1% Lysol, 70% isopropyl alcohol, or 1:100 bleach. It is important to wet the carcass with water and detergent prior to performing necropsies and work under a hood with an exhaust fan.

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Prevention and Control

- Maintain records of bird transactions
- Never purchase or sell sick birds
- Isolate newly acquired, ill or exposed birds at least 30 days
- Test birds before sale or boarding
- Practice preventative husbandry
- No vaccine

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Always maintain records of bird transactions (date buy or sell, transport, band id, etc) for not less than one year to aid in identifying sources of infected birds and potentially exposed persons. Never purchase or sell birds with clinical signs of illness. Isolate newly acquired, ill or exposed birds at least 30 days. Isolate birds coming back from bird shows. Test birds before sale or boarding. Discard wood, litter, and nest materials to reduce contamination from dust. Protect birds from undue stresses like chilling, shipping, poor husbandry, or malnutrition. A vaccine is not available for *C. psittaci*.

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Prevention and Control

- Large scale importation ended in 1993
 - Wild Bird Conservation Act
 - Limited imports/smuggling
- Quarantine of imports
 - USDA/APHIS
 - 30 days of tetracycline in feed
 - May not clear avian chlamydiosis from all birds

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Large scale commercial importation of psittacine birds from foreign countries ended in 1993 with the implementation of the Wild Bird Conservation Act. Limited importation still occurs and smuggled birds are a rare occurrence but a potential source of new AC infections. The USDA/APHIS regulates the importation of pet birds. The current minimum treatment protocols under these regulations are not always sufficient to clear avian chlamydiosis from all birds.

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Veterinarian's Responsibility

- Check state rules for reporting requirements
- Inform clients, employees, and co-workers about zoonotic risks
- Be alert to signs of psittacosis in humans
- AC is not a rare disease in birds
 - Consider AC for any lethargic bird with nonspecific signs of illness

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Requirements for reporting of *C. psittaci* vary with states and vets should follow local and state regulations or guidelines regarding case reporting. Veterinarians should work closely with authorities on investigations and inform clients, employees and coworkers about the zoonotic risks. Avian chlamydiosis is not a rare disease in birds and humans may show signs of infection at the same time as their animals. AC should be considered for any lethargic bird that has nonspecific signs of illness, especially if the bird was recently purchased. Humans with signs should be encouraged to seek medical care.

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Psittacosis: The Bioweapon

- Easily obtained
- Aerosolized
- Stable in the environment



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C. psittaci has previously been part of several country's bioweapons research programs. Some characteristics that may make it a good potential bioweapon include its stability in the environment, ease for aerosolization and ease to obtain (worldwide occurrence).

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