



## Speciation of *Chlamydophila* spp Nucleic Acid Recovered from Birds and Cats

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*Chlamydophila psittaci* (formerly *Chlamydia psittaci*) remains a common cause of ocular and respiratory disease, hepatitis and septicemia in companion birds. Chlamydiosis has been confirmed in approximately 100 bird species, with species in the Orders Psittaciformes and Columbiformes being most commonly infected among companion and aviary birds. Chlamydiosis also has been reported but is considered rare in captive canaries and finches (Order Passeriformes).<sup>1</sup>

The first documentation of chlamydial infections in humans is generally attributed to Juergensen, 1874.<sup>2</sup> During the early part of the last century, intracellular bacterial agents came to be designated “*Rickettsia*,” and so when the first *C. psittaci* isolate was described in 1930 it was called *Rickettsia psittaci*.<sup>3</sup> The first identified *C. trachomatis* isolate, *Rickettsia trachomae*, was characterized in 1935.<sup>3</sup> The association between chlamydial infections in humans and birds was discovered as a consequence of the 1929 pandemic of influenza-like disease, and led to description of *C. psittaci* as a zoonosis. *C. psittaci* and *C. trachomatis* were the only species accepted for the Approved Lists of Bacterial Names in 1980, but serological studies had already shown that there were chlamydial strains that would not fit into these two species;<sup>4,5</sup> and some of these strains were characterized in detail.<sup>6</sup> In 1988 and 1989, DNA-DNA hybridization assays resulted in the description of *C. pneumoniae*, currently the most well described cause of chlamydia-associated respiratory disease in humans.<sup>7,8</sup> Prior to this time, *C. pneumoniae* and *C. psittaci* pulmonary infections could only be distinguished when serotyping was carried out or antibiotic-sensitivity of isolates was assayed. Consequently, manuscripts describing the incidence of *C. psittaci* pulmonary infection in humans prior to 1989 may be unreliable. In 1999, nucleic acid analysis became the gold standard for identification of chlamydial species. Genetic analysis of chlamydial organisms that were once grouped as *C. psittaci* resulted in their separation into 4 distinct species including *Chlamydophila psittaci*, *Chlamydophila felis*, *Chlamydophila caviae* and *Chlamydophila abortus*.<sup>9</sup> This change



hindered interpretation of previous reports, although to a large extent it clarified taxon and host specificity. All publically available criteria and genetic data for chlamydiae were rapidly sorted into their new taxa.<sup>10</sup>

“A human is considered to have a confirmed case of psittacosis if clinical illness is compatible with psittacosis and the case is confirmed by one of three laboratory methods: 1) *C. psittaci* is cultured from respiratory secretions; 2) antibody against *C. psittaci* is increased by fourfold or greater (to a reciprocal titer of 32 between paired acute- and convalescent-phase serum collected at least 2 weeks apart) as demonstrated by complement fixation (CF) or microimmunofluorescence (MIF); or 3) immunoglobulin M antibody is detected against *Chlamydophila* spp by MIF (to a reciprocal titer of 16).”<sup>1</sup> Currently, most cases of human psittacosis are diagnosed by serologic methods using the CF test in conjunction with a history of exposure to birds. However, these complement-fixing antibodies are not species-specific and high CF titers can result from infection by other more common human-associated *Chlamydiaceae* including *C. pneumoniae* and *C. trachomatis*.<sup>1</sup> It has been suggested that a polymerase chain reaction (PCR)-based assays should be used to identify the species of *Chlamydiaceae* in serologically positive humans with clinical signs of psittacosis.<sup>1</sup> In the senior author’s consulting experience, many human diseases that have been subjectively diagnosed as psittacosis, typically based on serology and the patient’s history of exposure to companion birds, are definitively diagnosed as *C. pneumoniae* or *C. trachomatis* using more specific testing methods.

Historically, diagnosis of chlamydiosis in companion birds used various serologic assays for both epizootiologic studies and for indirect diagnosis of infection in individual birds. However, the serologic assays used for detecting anti-chlamydial antibodies in companion birds are even less specific than those used in humans and will not differentiate between strains of *Chlamydiaceae*. Birds with detectable antibodies should be considered serologically positive for *Chlamydophila* spp. and not *C. psittaci*.

Because humans are susceptible to *C. trachomatis* as well as *C. pneumoniae*, *C. psittaci* (typically from birds), *C. felis* (typically from cats) and *C. abortus* (typically from farm animals), a human that is serologically positive for *Chlamydophila* spp. may not be infected with a chlamydial strain of avian origin. In one study, using *C. psittaci* of feline origin as an antigen, bacterium specific antibodies were detected in 3.1% of the humans and in 5% of the small animal veterinarians tested.<sup>11</sup> One report suggested that a pet cat was infected with *C. psittaci* originating from a companion macaw maintained in the same home; however, the evidence was subjective.<sup>12</sup> If humans and cats can be infected with *Chlamydiaceae* originating from birds, then could birds be infected with chlamydial strains originating from humans or cats, and how frequently does orthozoonotic transmission occur?

To determine the prevalence of species of *Chlamydiaceae* in birds and cats, diagnostic samples



submitted to the Infectious Diseases Laboratory at the University of Georgia College of Veterinary Medicine were screened for the presence of chlamydial nucleic acid using a PCR-based assay designed to detect all species of *Chlamydiaceae*. A subsequent PCR-based assay designed to differentiate between *C. pneumonia*, *C. felis* and *C. psittaci* was used to determine which, if any, of these 3 species were present.

For a review of the diagnosis and control of chlamydial infections in humans and birds, one is referred to the Compendium of Measures to Control *Chlamydothyla psittaci* Infection Among Humans (Psittacosis) and Pet Birds (Avian Chlamydiosis), 2002 at ([www.avma.org/pubhlth/psittacosis.asp](http://www.avma.org/pubhlth/psittacosis.asp)).

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