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Clinical features of endemic community-acquired psittacosis

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Abstract

Following a large outbreak of community-acquired psittacosis in 2002 in residents of the Blue Mountains, New South Wales, Australia, we reviewed new cases in this area over a 7-year period from 2003 to 2009. Using the 2010 criteria from the Centers for Disease Control National Notifiable Diseases Surveillance System, 85 patients with possible psittacosis were identified, of which 48 were identified as definite or probable infection. Clinical features of these cases are summarized. In addition to *Chlamydia*-specific serology, specimens, where available, underwent nucleic acid testing for chlamydial DNA using real-time PCR. *Chlamydophila psittaci* DNA was detected in samples from 23 patients. Four of 18 specimens were culture positive. This is the first description of endemic psittacosis, and is characterized in this location by community-acquired psittacosis resulting from inadvertent exposure to birds. The disease is likely to be under-diagnosed, and may often be mistaken for gastroenteritis or meningitis given the frequency of non-respiratory symptoms, particularly without a history of contact with birds. Clinical characteristics of endemic and outbreak-associated cases were similar. The nature of exposure, risk factors and reasons for the occurrence of outbreaks of psittacosis require further investigation.

Keywords: Atypical pneumonia, *Chlamydia psittaci*, community-acquired pneumonia, medical geography, ornithosis, psittacosis
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Introduction

Among members of the chlamydiaceae family, there is now a single genus (*Chlamydia*) that includes three major human pathogens: *Chlamydophila pneumoniae*, *C. psittaci* and *C. trachomatatis* [1]. *Chlamydophila psittaci* is the agent of a multisystem disease called 'psittacosis' [2]. This zoonotic infection most commonly occurs in people with a history of exposure to birds in either the setting of occupational or companion animal exposure [3, 4]. It causes community-acquired pneumonia with a frequency of less than 2% [5, 6]. The features of psittacosis were extensively reviewed prior to the identification of *C. pneumoniae* as an alternative diagnosis of chlamydial pneumonia [7, 8]. It is recognized now that human respiratory infection can be caused by both *C. pneumoniae* and *C. psittaci*.

Micro-immunofluorescence (MIF) serology together with rapid ELISA screening has for many years been the mainstay of diagnosis of psittacosis and is reported to be more specific than complement fixation testing (CFT) [9]. Initial ELISA testing for *Chlamydia*-specific IgG and IgA may be used to screen specimens prior to the more laborious MIF testing, which is often reserved for testing acute and convalescent specimens in parallel. Recently, diagnostic criteria for psittacosis have been published by the USA Centers for Disease Control (CDC) National Notifiable Disease Surveillance System (NNDSS), classifying cases as confirmed or probable according to culture, species-specific nucleic acid testing (NAT) and serology (http://www.cdc.gov/nndss, under psittacosis).

The Blue Mountains region is west of Sydney, New South Wales, Australia, and is a heavily forested area with an altitude gradient from sea level to 1000 m. The human population resides close to the major roads and railway lines that traverse the mountains. Similar numbers of the population live below an altitude of 360 m (lower mountains) and above this altitude (upper mountains). Despite the presence of similar bird species populations in both regions the majority of cases of psittacosis occur in the upper mountains. The factors responsible for this remain unclear but may pertain to the environmental survival of *C. psittaci*. The entire Blue Mountains region abounds in bird life, particularly in psittacine birds, such as the crimson rosella (*Platycercus elegans*), the king parrot (*Alisterus scapularis*) and the sulphur-crested cockatoo (*Cacatua galerita*).

In 2002, an outbreak of 59 cases of serologically diagnosed (and hence probable) community-acquired psittacosis occurred [10]. Epidemiological risk factors included residence in the upper mountains, males between the ages of 40 and 60 years, recent sighting of birds and mowing lawns without a grass-catcher. It was suggested that mowing lawns and other selected outdoor activities may generate infective aerosols of bird material and secretions, an explanation also given for an outbreak of 16 cases in Bright, Victoria, Australia, in 1997 [11]. Both these Australian reports were criticized because they did not provide conclusive evidence that the infective agent was *C. psittaci*. In this study, we describe endemic community-acquired psittacosis and summarize the clinical features of confirmed and probable cases, using the 2010 CDC NNDSS definitions as the basis for diagnosis.

Methods

The Blue Mountains Local Government Area (BMLGA) was chosen as the location for this study. Psittacosis is notifiable to public health authorities in New South Wales, with cases consistently reported from the BMLGA. Notified cases were reviewed and classified as confirmed, probable or possible. Cases were classified as confirmed if the organism was cultured, or there was a fourfold rise in species-specific antibody (using MIF). Cases were classified as probable if there was a positive, species-specific, NAT result (using PCR) or a single serology result with a MIF titre equal to or greater than 128 (one dilution higher than the manufacturer's recommendation). Enzyme immunoassay (EIA) seropositivity was used as the trigger for performing MIF. To avoid low-level seropositive results, patients with MIF titres of 1:64 or less were regarded as possible cases only, and were excluded. Patients with only EIA evidence (cut-off ratio of 2.2) of chlamydial infection without species-specific confirmation by MIF or PCR were regarded as possible cases and not analysed further. Absence of alternative diagnoses and lack of positive species-specific PCR for other chlamydial species was required for inclusion.

Active surveillance for clinical cases of community-acquired psittacosis was implemented in 2002. People presenting to the Blue Mountains Hospital Emergency Department with community-acquired pneumonia or an unexplained febrile illness had throat swabs collected for chlamydial PCR and culture, as well as other specimens for serology and PCR. Chlamydial PCR was performed using a Corbett real-time platform with genus-specific [12, 13] and two species-specific primers [14–16]. More recently, an additional primer sequence based on the *INC A* gene was used [17]. PCR tests for *C. pneumoniae* and *C. trachomatis* DNA were performed in parallel, using primers based on the published species-specific sequences, to exclude inadvertent species cross-reactions [15, 16].

Limited numbers of specimens were available for culture: because of the potential laboratory risks, only those specimens that were PCR-positive were cultured. Specimens were cultured in a monkey green kidney cell line using two passages as described [14]. Chlamydial cultures were confirmed using both the genus-specific direct fluorescence assay *Pathfinder* (Biorad, Hercules, CA, USA) and the species-specific PCR.

Initial (acute) serology was performed using an EIA screen for chlamydial IgG and IgA (Medac, Wedel, Germany). The manufacturer's cut-off of 1.0 was raised to 2.2 following an in-house assessment that the specificity was increased at this level (data not shown). EIA testing, if positive, was followed by MIF IgG testing (Savyon, Ashod, Israel). Where acute and convalescent specimens were available, MIF assays were performed in parallel in one laboratory. *C. pneumoniae* and *C. trachomatis* MIFs were performed concurrently.

Follow-up public health surveys and reviews of inpatient medical records were used to determine clinical presentation and risk factors of cases. Where possible, patients were interviewed soon after the diagnosis and questioned about possible risk exposures to birds. Convalescent serology was requested 6 weeks after symptom onset. Re-presentations to hospital were recorded.

Results

Between January 2003 and December 2009, 84 cases of psittacosis in the BMLGA were notified to the regional public health unit. Twenty-one patients did not meet the diagnostic criteria of proven or probable psittacosis and were excluded. Four patients were not available for follow-up. Five patients who lived outside the BMLGA were excluded. Five patients had an alternative diagnosis (three with *C. trachomatis* and one