

# Three cases of atypical pneumonia caused by *Chlamydomphila psittaci*

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## ABSTRACT

Psittacosis is a zoonotic disease caused by *Chlamydomphila psittaci*. The most common presentation is atypical pneumonia. Three cases of pneumonia of varying severity due to psittacosis are described. All patients had a history of avian contact. The diagnosis was confirmed by molecular detection of *Chlamydomphila psittaci* in respiratory specimens. The cases showed good recovery with doxycycline treatment. Increased awareness of psittacosis can shorten diagnostic delay and improve patient outcomes.

Hong Kong Med J 2015;21:272–5

DOI: 10.12809/hkmj144321

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## Introduction

Psittacosis is a zoonotic disease caused by *Chlamydomphila psittaci*, an obligate intracellular pathogen belonging to the family Chlamydiaceae. Since its first description in 1879, zoonotic and enzoonotic outbreaks have been reported worldwide.<sup>1</sup> Transmission occurs through direct contact or inhalation of aerosols from dried faeces, feather dust, or respiratory secretions of infected birds. Individuals with occupational or recreational exposure to birds like bird fanciers and veterinarians are at greatest risk of infection. Person-to-person transmission is rare.<sup>2</sup> The disease can range from subclinical infection to fatal pneumonia. Here, we report three cases of atypical pneumonia caused by *C psittaci* in Hong Kong.

## Case reports

### Case 1

A 62-year-old retired male presented in March 2014 with fever, headache, myalgia, cough, and yellowish sputum for 6 days. He had underlying diabetes mellitus, hypertension, gout, and renal impairment. He visited the local bird market frequently and had purchased two parrots before onset of symptoms. The parrots were well all along. On presentation, he was alert and stable and his temperature was 38.4°C. The oxygen saturation was 96% on room air. Chest examination revealed left lower zone crepitations. Chest radiograph showed left lower zone consolidation. He was suspected of psittacosis and was treated with ceftriaxone and doxycycline. His sputum was positive for *C psittaci* by polymerase chain reaction (PCR). Nasopharyngeal swab and

sputum were also positive for influenza A virus subtype H3 by PCR. Oseltamivir was commenced. He was afebrile the next day and was discharged after 5 days of hospitalisation. Paired serum collected 12 days apart showed rising *Chlamydia* group titre from 40 to 80 by complement fixation test (CFT). The parrots could no longer be traced as the patient's son released them.

### Case 2

A 55-year-old male construction site worker with hypertension was admitted in February 2014 with a 1-week history of fever, headache, generalised bone pain, and cough. He had travelled to Shanwei in China and bought a live chicken from a wet market 2 weeks earlier. On examination, his vital signs were stable and had a temperature of 40°C. The oxygen saturation was 98% on room air. Chest examination was normal. Chest radiograph showed right upper zone opacities. He was treated as a case of community-acquired pneumonia with amoxicillin-clavulanate, doxycycline, and oseltamivir. Sputum culture showed growth of commensals only. Nasopharyngeal aspirate (NPA) was negative for influenza viruses, *Mycoplasma pneumoniae*, and *Chlamydomphila pneumoniae* by PCR. Oseltamivir was stopped. His fever subsided on day 3 and he was discharged after 4 days of hospitalisation. Complement fixation test of paired sera taken 2 weeks apart showed a rise in *Chlamydia* group titre from 20 to 80. Sputum was retrieved and was positive for *C psittaci* by PCR.

### Case 3

A 42-year-old female chef was hospitalised in February 2014 with fever, cough, yellowish and

blood-stained sputum, and breathing difficulty for 1 week. She had no underlying illness. One week prior to her admission, she had travelled to Zhaoqing in China and bought live goose and chicken from a wet market. On admission, she was in respiratory distress and her temperature was 39.2°C. The oxygen saturation was 90% on 100% supplemental oxygen via non-rebreathing mask. Chest examination yielded coarse crepitations over the right side. Chest radiograph revealed right middle and lower zone consolidation, and left patchy haziness (Fig). On the same day, she was transferred to the intensive care unit. She required mechanical ventilation and extracorporeal membrane oxygenation (ECMO). She was treated as a case of severe community-acquired pneumonia with piperacillin-tazobactam, doxycycline, and oseltamivir. Sputum culture showed growth of commensals only. Sputum, NPA, and tracheal aspirate were negative for influenza viruses, *M pneumoniae*, and *C pneumoniae* by PCR. Urine was negative for *Legionella pneumophila* and pneumococcal antigens. She gradually improved and was extubated 3 days later, and ECMO was stopped on day 7. She was discharged on day 24 of hospitalisation. Paired serum drawn 12 days apart showed rising *Chlamydia* group titre from 80 to 640 by CFT. Polymerase chain reaction for *C psittaci* was positive in her stored sputum.

The laboratory profiles of the three cases on admission are summarised in the Table.

## Discussion

Psittacosis is an uncommon disease in Hong Kong. Since 2008, this has been made as a statutory notifiable disease. There were 11 confirmed cases and six probable cases reported until 2013.<sup>3</sup> In 2012, there was an outbreak involving six staff working at the New Territories North Animal Management Centre in Sheung Shui.<sup>4</sup>

*Chlamydophila psittaci* is classified into nine genotypes (A to E, E/B, M56, WC) based on outer membrane protein A gene sequences, with differential host preference and virulence among the genotypes.<sup>1</sup> It has been described in at least 460 bird species from 30 orders.<sup>5</sup> Birds can shed the organisms when apparently healthy or overtly ill. Patient 1 had been exposed to asymptomatic parrots, belonging to the classic culprits, the psittacine birds (parrots, parakeets, budgerigars, cockatiels). Other domestic species—for examples, turkey, pigeon, goose, duck, chicken—can be affected and are often overlooked as potential reservoirs of infection.<sup>6</sup> In patients 2 and 3, psittacosis was not suspected initially although the patients had been exposed to poultry in China. *Chlamydophila psittaci* is an emerging pathogen among chicken.<sup>7</sup> In China, the prevalence of infection among market-sold chickens, ducks, and pigeons has been reported to be 13.32%, 38.92%

## 三宗由鸚鵡熱衣原體引起的非典型肺炎病例報告

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鸚鵡熱是一種由鸚鵡熱衣原體引起的疾病。本文報告三宗由鸚鵡熱引致的不同嚴重程度的非典型肺炎病例。全部個案曾接觸禽鳥，病人的呼吸道標本經分子化驗後，均證實含有鸚鵡熱衣原體。患者接受鹽酸多西環素治療後經已康復。若能提高警覺，可儘早診斷鸚鵡熱及改善治療效果。

and 31.09%, respectively.<sup>8</sup> The substantial zoonotic transmission risk from domestic species should also be recognised.

Psittacosis is a systemic illness that affects several organ systems, and atypical pneumonia as in our cases is the most common manifestation. Patients typically present with influenza-like symptoms, which include high fever, headache, myalgia, and dry cough. Patient 3 complained of blood-stained sputum, which may occur occasionally.<sup>1,9</sup> The headaches can be so severe as to suggest meningitis on presentation. Diarrhoea is common and can be the chief presenting complaint. Relative bradycardia,



FIG. Chest radiograph on admission shows right middle and lower zone consolidation (arrow), and patchy haziness over left lung (arrowheads) in case 3

TABLE. Laboratory parameters of our cases on admission

	Case 1	Case 2	Case 3	Reference range
White blood cell count (x 10 <sup>9</sup> /L)	11.2	7.4	5.5	3.7-9.3
Haemoglobin (g/L)	121	142	89	135-173
Platelet count (x 10 <sup>9</sup> /L)	353	132	227	160-420
Sodium (mmol/L)	135	136	138	136-145
Creatinine (µmol/L)	90	85	72	62-106
Alanine deaminase (IU/L)	34	58	54	<41
Aspartate deaminase (IU/L)	26	48	109	<40
Alkaline phosphatase (IU/L)	270	92	104	40-129
Bilirubin (µmol/L)	20	10	6	<21

Horder’s spots, and splenomegaly are characteristic physical signs. There may be disparity between the auscultatory findings and radiographic changes of pneumonia. Segmental consolidation in lower lobe is the most common radiographic abnormality although normal chest radiograph has been reported in over 20% of cases. Hilar lymphadenopathy and pleural effusion are rare.<sup>10</sup> The white cell count is usually normal or slightly raised, with mildly abnormal liver function. Our case presentations were consistent with psittacosis. However, it is indistinguishable clinically from other causes of atypical pneumonia like *C pneumoniae*. The severity ranged from mild-to-severe pneumonia requiring intensive care management and ECMO in our cases. Patient 1 had mild illness although co-infected with influenza A. This diversity of presentation is in agreement with other case series.<sup>9</sup> The mortality rate can be approximately 15% to 20% without appropriate treatment but if properly treated, it is rarely fatal.<sup>11</sup> Extrapulmonary complications such as endocarditis, myocarditis, renal disease, hepatitis, keratoconjunctivitis, arthritis, and encephalitis have also been described.

*Chlamydophila psittaci* is not covered during routine bacterial or viral workup. Definitive diagnosis can only be established by culture, serology, or PCR specifically targeting on *C psittaci*. Culture is time-consuming and requires level-3 biosafety facilities. Common serological assays include CFT, enzyme-linked immunosorbent assay, and microimmunofluorescence (MIF) test. The assays are neither sensitive nor specific but MIF test is regarded as more specific.<sup>12</sup> However, there are still considerable cross-reactions between different species of the Chlamydiaceae family.<sup>1</sup> Besides, a convalescent serum obtained at least 2 weeks apart is required to demonstrate the 4-fold rise in titre. In patient 1, the elevation in CFT titre was not significant and therefore diagnosis may be missed if relying on serology alone. Early use of doxycycline in this patient might have blunted the antibody

response.<sup>13</sup> In patients 2 and 3, serology results were available only retrospectively; PCR for *C psittaci* was performed subsequently to confirm the diagnosis. In our cases, a nested PCR based on 16S rRNA gene was used. The first-step PCR is genus-specific, followed by the second-step PCR that can detect *C psittaci* specifically.<sup>14</sup> This method was demonstrated to be sensitive and specific for detection of *C psittaci*. When encountering respiratory illness with suspicion of psittacosis, PCR testing on respiratory specimens can offer a rapid and specific diagnosis.

Tetracyclines, in particular doxycycline, are considered to be the treatment of choice. In patients presenting with community-acquired pneumonia, addition of doxycycline to a beta-lactam-based empirical regimen can provide coverage for both psittacosis and other atypical pathogens. Defervescence usually takes place within 48 hours of treatment. Our patients showed significant improvement by day 3 of doxycycline treatment. The commonly recommended duration of treatment is at least 10 to 21 days to prevent relapse.<sup>9</sup> Macrolides can be used as alternative therapy, but may be less efficacious in severe cases and gestational psittacosis.<sup>6</sup> Although quinolones have in-vitro activity against *C psittaci*, their clinical effectiveness remains to be determined.<sup>6</sup>

## Conclusion

Psittacosis often goes unrecognised because of the lack of distinctive symptoms and clinical suspicion. In patients with atypical pneumonia, a history of exposure to birds gives a very valuable diagnostic clue. Early diagnosis with PCR testing and timely initiation of appropriate antibiotics can reduce patient morbidity and mortality.

## Acknowledgement

We thank the Public Health Laboratory Services Branch of the Centre for Health Protection for providing the laboratory testing of psittacosis.

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