

Intersectoral action for health: preventing psittacosis spread after one reported case

V. L. FERREIRA¹, M. V. SILVA², B. R. BASSETTI², A. C. G. PELLINI³ AND T. F. RASO^{1*}

¹Departamento de Patologia, Faculdade de Medicina Veterinária e Zootecnia, FMVZ/USP, Av. Prof. Dr. Orlando Marques de Paiva, 87. Cidade Universitária 'Armando de Salles Oliveira', São Paulo-SP 05508-270, Brazil

²Instituto de Infectologia Emilio Ribas, Av. Dr. Arnaldo, 165 - Pacaembu, São Paulo-SP 01246-900, Brazil

³Centro de Vigilância Epidemiológica 'Prof. Alexandre Vranjac' - Av. Dr. Arnaldo, 351, 6° andar - sala 601 - Pacaembu, São Paulo-SP 01246-000, Brazil

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SUMMARY

Zoonotic diseases are a significant health threat for humans and animals. To better understand the epidemiology, etiology, and pathology of infectious agents affecting humans and animals combined approaches are needed. Here we describe an epidemiological investigation conducted by physicians and veterinarians after a reported case of psittacosis. Upon admission suffering from respiratory distress syndrome in a hospital and with a history of bird contact, a female patient was serologically diagnosed with psittacosis. After the case notification, veterinarians were able to investigate the source of infection by detecting *Chlamydia psittaci* in her pet cockatiel. The bird was hospitalized and successfully treated. In addition, the establishment where the pet bird was purchased was traced and through molecular techniques other birds intended to be sold as pets tested positive for *C. psittaci*. As a result, sanitary measures were applied and the establishment then was closed down. The birds intended for the pet commerce were treated and retested with negative molecular results for *C. psittaci*, thus avoiding disease propagation. Reliable data about zoonotic diseases can only be generated through the application of multidisciplinary approaches which take into account the epidemiological factors and interactions of humans, animals and their environments as an integrated system.

Key words: Birds disease, *Chlamydia psittaci*, pet bird, surveillance, zoonosis.

INTRODUCTION

Psittacosis is a zoonotic disease caused by an obligate intracellular Gram-negative bacterium *Chlamydia*

psittaci. Transmission of agent usually originates from close contact with infected birds, particularly psittacine birds such as parrots, cockatiels, parakeets and lovebirds, mostly in the context of pet birds. Human infection with *C. psittaci* usually occurs when a person inhales organisms that have been aerosolized from dried feces or respiratory tract secretions from a diseased bird or asymptomatic carrier [1]. Hence, handling the plumage and tissues of infected birds, cleaning cages and mouth to beak contact represent a zoonotic risk [2].

* Author for correspondence: Tânia Freitas Raso, Departamento de Patologia, Faculdade de Medicina Veterinária e Zootecnia, FMVZ/USP, Av. Prof. Dr. Orlando Marques de Paiva, 87, Cidade Universitária 'Armando de Salles Oliveira', São Paulo-SP 05508-270, Brazil.
(Email: tfraso@usp.br)

In humans, the onset of illness typically follows an incubation period of 5–14 days, but longer periods have been reported. The severity of the disease ranges from a mild, non-specific illness to a systemic illness with severe pneumonia. Humans with symptomatic infections typically have an abrupt onset of fever, chills, headache, malaise, and myalgia. A non-productive cough is usually present and can be accompanied by breathing difficulty and/or chest tightness. Most diagnoses are established by clinical presentation and positive antibodies against *C. psittaci* in paired sera using microimmunofluorescent (MIF) methods [1].

In most countries, psittacosis is a notifiable disease and must be reported within 48 h [3]. In Brazil, psittacosis is not a notifiable disease [4], this is one factor that might contribute to the difficulty in determining its impact in human health. This is of particular relevance when taken into account the number of pet birds, 37 million, according to the Brazilian Association of Industries of Pet Products [5]. Furthermore, since the first detection of *C. psittaci* in birds in Brazil in 2002 [6], it has been established that avian chlamydiosis is an endemic in the country, being reported in both captive and wild birds [7–9].

Studies reported in the medical literature demonstrated that combined approaches are needed to understand geographical distribution, transmission, and infection biology of zoonotic agents [3, 10]. Successful zoonosis control requires coordinated action across the traditional professional lines of veterinary and human medicine as well as science [11]. The current paper describes the epidemiological investigation of a severe case of psittacosis, from the clinical suspicion of the human case to the detection of *C. psittaci* infection. From that point on, also reaching the store and surveying the birds where the infected pet was purchased. Moreover, it discusses the importance of a multidisciplinary working team in order to promptly halt the spread of the disease.

CASE DESCRIPTION

A female patient, 19 years, was admitted to the Infectology Institute Emilio Ribas (IIER), São Paulo, Brazil, presenting acute respiratory distress syndrome. The patient had been well until 1 week prior to her admission, when she developed a productive cough, fever (38–39 °C) and progressive dyspnea with chest pain. The patient lived with her parents in São Paulo city and had no history of infectious

diseases, smoking, illicit drug use, or exposure to suspected ill individuals. Two days after admission, when talking to the patient's mother, physicians found out that about four previous weeks she had purchased a pet cockatiel (*Nymphicus hollandicus*), with which the patient maintained close interaction including mouth-to-beak contact. Thereby psittacosis was suspected. Upon admission, laboratory analysis revealed a C-reactive protein of 348.7 mg/l and blood arterial gas saturation of 89% in room air conditions. Furthermore, chest X-ray showed bilateral interstitial infiltrate. After the presumptive diagnosis of psittacosis, blood for *C. psittaci* serology was sampled and sent to the Psittacosis Research Group at the Pathology Department of São Paulo University (FMVZ/USP). Therapy with clarithromycin (500 mg twice a day) and ceftriaxone (1 g twice a day) was first administered then replaced to specific treatment with doxycycline (100 mg twice a day for 14 days). The patient stayed in the intensive care unit for 8 days with 50% oxygen administered by facemask and another 7 days in infirmary until complete recovery.

EPIDEMIOLOGICAL INVESTIGATION

After the serological confirmation of the case of human psittacosis, the veterinary investigation was started. According to the family, the bird was in good health, therefore they allowed the evaluation of the cockatiel only 6 days afterwards. Nonetheless, during the clinical examination by specialized veterinarian, the bird had mild blepharitis, a clinical sign commonly observed in cockatiels with avian chlamydiosis.

The epidemiological service of the IIER notified the case to the Epidemiological Surveillance Center (CVE) of São Paulo State, which involved other sectors in the investigation, as well as the Central Coordination of Health Surveillance (COVISA). In order to trace the source of infection and based on information suggested by family members, 8 days after diagnosis on the cockatiel this multidisciplinary team went to the pet shop where the birds was purchased. It was a small, unventilated illegal establishment in an area of socioeconomic deprivation. At this premises, several chickens (*Gallus gallus*), guinea-fowl (*Numida meleagris*), and muscovy ducks (*Cairina moschata*) were kept, slaughtered and sold clandestinely. Moreover, a few individuals of others avian species such as cockatiels, pigeons (*Columba livia*),

and budgerigars (*Melopsittacus undulatus*) were kept to be sold as pets. All birds were maintained in small enclosures in insalubrious environments, conditions that favours the agent dissemination. Despite this, the owner had no clinical signs of illness and there were no other employees on the premises.

METHODS

Laboratory investigation of human sample

Health professionals of the IIER collected the blood sample from the patient on the second day of admission (12 days after the onset of clinical signs) and placed the sample in Serum Separator Tubes. Next, the sample conditioned on ice (4 °C) was sent to the Psittacosis Research Group at FMVZ/USP. Upon arrival, sample was given a unique identifier number, aliquoted, and processed within 24 h. Serum sample was tested for immunoglobulin IgM and IgG against *C. psittaci* by MIF test kit (Focus Diagnostics, CA, USA) according to the manufactures' protocol. The serum sample was titrated in serial twofold dilutions up to 1 : 512. Titers >10 were considered positive for IgM and >16 were considered positive for IgG.

Laboratory investigation of bird samples

For *C. psittaci* molecular diagnosis cloacal and ocular swab samples were collected from the patient's sick cockatiel. In the illegal establishment, cloacal swab samples were taken from all bird species present there; that was pigeons (07), budgerigars (03), cockatiels (02), muscovy ducks (02), and guineafowl (01). In addition, there were 122 chickens and, which 10 of them had clinical signs of respiratory diseases and were sampled. Samples ($n = 25$) were placed in tubes containing sterile PBS (Phosphate Buffer Saline) until laboratory analysis.

The DNA was extracted from the swabs samples with Nucleic Acid and Protein Purification Kit[®] (Macherey–Nagel, GmbH & Co. KG, Germany), according to the manufacture's protocol. Brazilian strain from monk parakeets (*Myiopsitta monachus*) (Cpsi/Mm/BR01, GenBank number JQ926183.1) and ultrapure water were used as positive and negative controls, respectively. PCR was based on primers targeting a conserved region of *pmp* gene sequences [12]. Samples were analyzed by electrophoresis on 1.5% agarose gel (Uniscience[®], Brazil), stained with Gel RedTM (Uniscience[®], Brazil) 0.5 µg/10 ml and run

at 80 volts. Samples showing a 300 base pair DNA fragment under UV light were considered to be positive for *C. psittaci*.

RESULTS

Laboratory investigation of human sample

The patient presented positive *C. psittaci* IgG titer of 1 : 256 and IgM titer of 1 : 80.

Laboratory investigation of bird samples

The patient's sick pet cockatiel tested positive for *C. psittaci* (both cloacal and ocular samples), as well as the pigeons (07) and cockatiels (02) intended to be sold as pets at the illegal establishment. The birds (Columbiformes and Psittaciformes) kept in the pet shop were asymptomatic, although they were spreading the pathogen in the secretions. All the others birds tested were negative.

Control measures

The patient's pet cockatiel was taken to a veterinary clinic specialized in avian medicine and treated with doxycycline for 45 days. After that, the bird was presented with no clinical signs and was tested negative for *C. psittaci* by PCR.

Concerning the store where the pet cockatiel was purchased, the local Official Veterinary Service demanded the closure of the establishment since the place had no license and permits requirements to raise or sell animals or derivate products. *C. psittaci*-positive birds (pigeons and cockatiels) intended to be traded as pets were taken to the Zoonosis Control Center of São Paulo Municipality (CCZ/SP) and treated with doxycycline for 45 days also by a veterinarian specialized in avian medicine. All infected birds were retested upon antibiotic therapy completion and *C. psittaci*'s DNA was not detected in the molecular tests performed.

DISCUSSION

In the present case, a severe human psittacosis case was serologically confirmed; *C. psittaci* infection in the patient's pet cockatiel was determined as well as in other pet birds in the store where the cockatiel was purchased. This work was possible due to the effort of a multidisciplinary team composed by

veterinarians, physicians, and other health professionals from different official services and institutions.

The disease notification, as well as the investigation carried out in this study is not usually seen in psittacosis cases. Frequently clinicians, whose primary role is to treat a disease, can be more concerned with the clinical symptoms, pathophysiology and treatment of the disease rather than of how the pathogen infection was acquired [13]. At any rate, this investigation had repercussion among the hospital staff, emphasizing the importance of including this zoonotic disease in the differential diagnosis of community-acquired pneumonias (CAP).

In Brazil, there is no official records of human psittacosis, and in the literature there is only one prevalence study, which is related to occupational diseases. Antibodies anti-*C. psittaci* were investigated in 364 zoo workers from 10 different Brazilian states, finding 4.7% (17/364) seropositive cases [14]. Moreover, recently two domiciliary outbreaks related to pet birds were described in distinct regions in the country [15, 16]. In bordering countries, psittacosis prevalence studies have also been carried out. In central area of Argentina 21% (9/43) patients in whom psittacosis was suspected presented positive molecular results for *C. psittaci* [17]. In Venezuela, 8.3% (8/96) prevalence of *C. psittaci* infection was determined in individuals living in areas massive colonized by pigeons [18]. Some authors believe that psittacosis is an underestimate disease, given that even a brief exposure can lead to a systemic infection, and testing for *C. psittaci* is often not included in routine microbiological diagnostic panels for pneumonia [17, 19]. Besides, it is important to keep in mind that individuals with mild cases may not seek medical attention contributing to the lack of epidemiological information of this disease [20]. In the present case, the patient searched the hospital only 1 week after the onset of symptoms.

Note that the IIER is one of the largest infectious diseases centers in the country, whose medical staff is a reference in tropical medicine. Over there, psittacosis cases have been recognized, and thus reported to health surveillances agencies, after critically ill patients had undergone several other medical services without the definitive diagnosis [15, 21]. A possible explanation is that practitioners are not necessarily aware of the widespread occurrence and the zoonotic nature of avian chlamydiosis [2] neither of the popularity of birds as pets. In addition, even when they are, psittacosis might not be brought to light in first

place because contact with birds is not suspected or because the symptoms caused by the *C. psittaci* infection are similar to those of other respiratory pathogens [2].

Any epizootic or animal death that could lead to any occurrence of disease in humans should be reportable in Brazil [4]. Thus, despite some states' efforts to increase disease reporting by health care providers, some public health experts believe that under-reporting by providers is still a problem. Many health care providers do not fully understand their role in infectious disease surveillance, including the importance of prompt reporting of clinical and epidemiological information to relevant public health authorities [22].

Prompt notification is important to facilitate timely public health action [23], as observed in the present report. In this case, physicians assisted in the control of psittacosis through proper clinical diagnosis and treatment of the human patient, as well as notifying the disease, thus giving raise to the epidemiological investigation. In turn, veterinarians played a crucial role in evaluating, achieving the diagnosis and treating properly the patient's pet cockatiels. Conjointly, investigating *C. psittaci* infection and treating the birds from the illegal establishment, thus acting directly at the source of infection.

The work carried out in this study emphasizes an important practical implication, that is, physicians and veterinarians are the key professionals to recognize and report zoonotic events [24]. It might sound obvious, but in practice, there is a lack of communication between these two health care fields. Enhanced communication between hospital epidemiologists, and local medical and animal public health officials would not only help to expedite a local response, but also help to identify whether unusual diseases or outbreaks involving animals and humans were related or separate events. This is of paramount importance to avoid diseases dissemination, since without integrated approaches, diseases of people and animals can move more quickly [25].

In this case, additional possible psittacosis cases in owners of birds purchased from the retailer could not be identified. During the investigation period, no additional suspected psittacosis cases were notified to the official health authorities. Neither could the birds be tracked to the respective distributors, since the retailer could not provide any of this information. Ideally, for accurate identification of owners and suppliers of infected birds, retailers and suppliers should

maintain records identifying the origin and destination of birds [20]. Even so, the current investigation was effective in preventing psittacosis propagation, once infected birds intended for the pet commerce were tested, retained, treated, and retested. These data will support future official health decisions, such as, mandatory notification of psittacosis, increase surveillance and inspection in pet shops, and consequently a more efficient control of this zoonotic pathogen in birds.

Although case reports are based on an infection in a single patient, they may yield important epidemiologic information regarding the disease occurrence [26]. The authors believe that the increase in the number of reports of confirmed cases will contribute to highlight the importance of psittacosis among the CAP. The present study brings alertness about a potentially fatal zoonosis, which occurrence in Brazil should not be underestimated. Taking into account the number of pet birds maintained in the country, 37 million [5], along with the lack of regulations and inspection concerning pet birds breeding and trade, how many people might buy infected birds and get sick?

Lastly, it is important to think out that surveillance and diagnosis are indispensable, however, they do not stop disease – they only identify it. Veterinarians and physicians need to become involved in all aspects of the agent/host/environment causation triad [10, 25]. Only in this way, they can support and develop logical evaluations, design intervention strategies and ultimately truly effective prevention strategies.

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CONFLICT OF INTEREST

None.

ETHICAL STANDARDS

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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