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CASE REPORT

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# Atypical pneumonia caused by *Chlamydia abortus* in HIV patient: a case report

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## Abstract

**Background** *Chlamydia abortus*, as a pathogen of atypical pneumonia, is rare in humans, especially in HIV infection patients.

**Case presentation** We present the case of a 48-year-old man with a history of HIV infection who started high fever and developed pneumonia. The pathogen-targeted next-generation sequencing (ptNGS) results of bronchial lavage fluid showed *Chlamydia abortus* infection.

**Conclusion** This is the first report of *Chlamydia abortus* infection presented as atypical pneumonia in an AIDS patient.

**Keywords** *Chlamydia abortus*, Human, Atypical pneumonia, HIV

## Background

*Chlamydia abortus* is a non-motile obligate intracellular Gram-negative pathogenic bacterium that can cause abortion in late pregnancy in sheep, pigs, and cattle. It is one of the most serious pathogens that harm animal husbandry. Infection of animals with *Chlamydia* can cause a range of inflammatory diseases and symptoms such as arthritis, conjunctivitis, pneumonia, and miscarriage [1]. However, there are few reports on human diseases caused by *Chlamydia abortus*. In this report, we presented the first report of *Chlamydia abortus* infection in AIDS patients.

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## Case Presentation

A 48-year-old male worker presented to the clinic with fever and muscle aches and was given oseltamivir orally, given the prevalence of influenza. Two days later, the patient was admitted to the hospital with a high fever of 40 °C, which did not respond to paracetamol or ibuprofen. The patient had a 10-year history of AIDS and had been receiving regular antiretroviral therapy. Two years ago, antiretroviral therapy was changed to a single-tablet drug regimen: emtricitabine/tenofovir alafenamide/bictegravir, and maintained CD4+at about 300/μl for nearly three months, HIV-RNA was below the detectable level. Physical examination manifested as crackles during lower lung auscultation.

Serologic workup was supportive of leukocytosis at 10.70*10^9/L, neutrophil ratio 88.4%, lymphocyte ratio 3.6%; C-reactive protein was 113.06 mg/L; procalcitonin was 0.647ng/ml; interleukin 6 was 125.78pg/mL. Among the biochemical indicators, potassium was 3.26mmol/L, sodium was 126.2mmol/L, creatine kinase was 611.4U/L, and the rest were average. Novel coronavirus nucleic acid, Influenza A and B virus nucleic acid were negative. Fungal G test, fungal [1–3]-β-D glucan test was negative.

HIV -RNA was <100.00IU/ml; CD4+T cell count was 99/μl. *Cryptococcus* antigen and *Mycobacterium tuberculosis* interferon-gamma release assays were negative. The IgM antibodies of *Legionella pneumophila*, *Mycoplasma pneumoniae*, *Rickettsial Q fever*, and *Chlamydia pneumoniae* were negative; Blood cultures were negative. The lung computed tomography showed inflammation of the left upper lobe (Fig. 1. A-C). Considering community-acquired pneumonia, the patient received anti-infective therapy of Piperacillin Sodium and Tazobactam Sodium for injection of 4.5 g every 8 h.

During two days of antibiotic treatment, the patient continued to have a high fever of more than 39 °C. We considered that the patient had a history of bird keeping and adjusted the treatment program to azithromycin (500 mg every day). Two days after combined with azithromycin in patients with a drop in body temperature peak. On the 7th day after admission, the lung computed tomography showed that inflammatory foci appeared in the left lung's upper and lower lobes, and the scope of inflammatory exudative consolidation was expanded compared with the previous film (Fig. 1. D-F). On the 9th day of admission, we performed a bronchoscopy on the patient, and the pathogen-targeted next-generation sequencing (ptNGS) results of the bronchial lavage fluid reported *Chlamydia abortus* 69 reads, with a relative abundance of 11%. Continue oral azithromycin treatment for *Chlamydia abortus.* On the 14th day of admission, the lung computed tomography was noticeably better (Fig. 1. G-I). The patient successfully recovers with no pulmonary sequels half a year after being discharged from the hospital.

## Discussion

*Chlamydia* is an obligate intracellular bacterial pathogen and an important zoonotic pathogen that causes various mammalian, avian, and human infections. At present, *Chlamydia* can be divided into 14 species, and the most influential are *Chlamydia psittaci* and *Chlamydia abortus* [2].

In livestock, *Chlamydia abortus* is mainly transmitted through environmental contamination caused by aborting products, especially placentas and villi of dead/aborting lambs, which contain high levels of bacteria and vaginal secretions, can last up to 10 days after abortion [3].

In our literature review, 6 cases of *Chlamydia abortus* infection have been reported (including the current case) (Table 1). *Chlamydia abortus* is a zoonotic pathogen. It has been reported that *Chlamydia abortus* can also infect humans through respiratory tract transmission or direct contact, causing atypical pneumonia and abortion

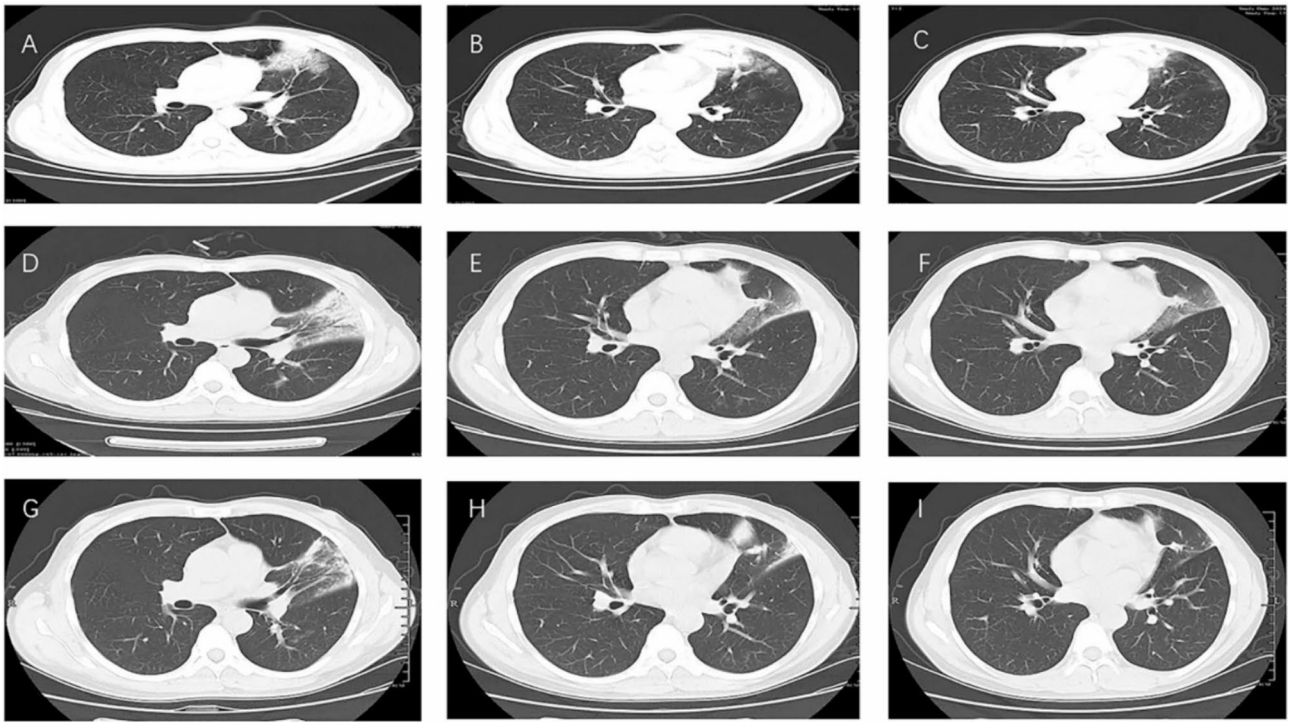


**Fig. 1** Changes of the lung computed tomography during hospitalization. On the day of hospitalization, the lung computed tomography showed inflammation of the left upper lobe (**A**-**C**). On the 7th day after admission, the lung computed tomography showed that inflammatory foci appeared in the left lung's upper and lower lobes, and the scope of inflammatory exudative consolidation was expanded compared with the previous film (**D**-**F**). On the 14th day after admission, the lung computed tomography was noticeably better (**G**-**I**)

**Table 1** Demographics, underlying conditions, clinical features, treatment, and outcomes of patients with Chlamydia Abortus infection

| Author (Year) | Age /sex | epidemiological history of exposure | Underlying conditions | Symptoms | Methods of diagnosis | Treatment (Duration) | Outcome |
|---|---|---|---|---|---|---|---|
| Ortega6 | 47/M | veterinarian | None | respiratory symptoms | ELISA /PCR | levofloxacin, clarithromycin | clinical recovery |
| Pichon N [4] | 27/F | Sheep | pregnant | ARDS | PCR | doxycycline | clinical recovery |
| Burgener AV [5] | 33/F | dead ovine fetus | pregnant | septic shock and ARDS | PCR | oral doxycycline | clinical recovery |
| Zhu [7] | 66/M | None | hepatic malignancy | Bloodstream infection and pneumonia | NGS | moxifloxacin, clarithromycin | improved |
| Fan 20239 | 51/M | chicken and duck breeding | None | pneumonia | mNGS | doxycycline | clinical recovery |
| Our case 2024 | 48/M | Bird keeping | HIV | pneumonia | ptNGS | azithromycin | clinical recovery |

in pregnant women [4]. N.Pichon et al. described a case of *Chlamydia*-induced abortion in a pregnant woman in rural France who developed a severe systemic infection with acute respiratory distress syndrome and had a miscarriage in 2020 [4]. After two years, similar cases have been reported in Switzerland in 2022 [5]. In 2016, Ortega reported the first case of atypical pneumonia in which C. abortus is thought to have played an aetiological role in Spain [6]. Zhu et al. l presented a patient with bloodstream infection and pneumonia caused by *Chlamydia abortus* in 2022 [7]. It has been reported that the lung CT of a male case showed high-density non-specific infiltration in the unilateral lung. The clinical manifestations of pulmonary infection caused by *Chlamydia abortus* were nonspecific. The risk factors of *Chlamydia abortus* pneumonia may include a history of exposure to poultry and immunodeficiency.

In most cases, *Chlamydia abortus* infection presents at the time of onset with symptoms such as fever, headache, nausea, vomiting, and weakness of the limbs. With the further aggravation of the disease, symptoms such as septic shock and respiratory failure may occur. Early diagnosis is crucial for the treatment effect.

The non-specific clinical manifestations and the limitations of traditional pathogen identification methods lead to missed diagnosis and even misdiagnosis of *Chlamydia* pneumonia, which may further lead to delayed treatment or unnecessary use of antibiotics. At present, PCR is the main diagnostic method for Chlamydia abortus infection reported in the literature. This diagnostic test is usually available in a veterinary diagnostic laboratory. Zhu et al. reported a patient with bloodstream infection and pneumonia caused by Chlamydia abortus confirmed by NGS in 2022 [7]. In recent years, ptNGS, as a high-throughput sequencing-based detection method, has performed well in diagnosing clinical infection pathogens. The ptNGS can detect different types of pathogens, such as bacteria, fungi, viruses, and parasites at one time, which is of great value for the rapid and accurate diagnosis of atypical pathogens [8]. Previous studies have demonstrated that ptNGS has many advantages such as sensitivity, timeliness, and economy. In mNGS, human nucleic acids can excessively consume sequence resources. However, ptNGS has the advantage of detection sensitivity independent of the size of the human genome, background bacteria, and pathogen genome. ptNGS has low detection cost, low sample transportation requirements, and can quantitatively detect pathogens.

Reports of PLWH human disease caused by *Chlamydia abortus* are extremely rare. Most of the cases reported so far are ordinary people without underlying diseases. To our knowledge, this is the first report of *Chlamydia abortus* infection in AIDS patients. Due to the small number of cases, there is still a lack of epidemiological data on the pathogenicity of *Chlamydia abortus* in humans, and the specific mechanism needs further study. The ptNGS has essential value in the early diagnosis and precise treatment of patients with unknown pathogen infections.

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#### Author contributions
L.L.Y. and M.Y.W. wrote the draft of the manuscript. M.Y.W. and H.W. generated the figure. L.L.Y., M.Y.W., H.W., and B.H.Z. all participated in editing and critical review of the manuscript.

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#### Data availability
The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

## Declarations

#### Ethics approval and consent to participate
Not applicable.

#### Consent for publication
Written informed consent was obtained from the patients for publication.

**Competing interests**
The authors declare no competing interests.

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