Review Article

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Rapid diagnosis of pulmonary Chlamydia psittaci infection using metagenomic next-generation sequencing: a case report and literature review

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Abstract

Objectives: To present the clinical diagnosis and treatment of a case of Chlamydia psittaci pneumonia, review relevant literature, assess the diagnostic value of metagenomic next-generation sequencing (mNGS) in this condition, and enhance clinical understanding of the disease.

Methods: A case of Chlamydia psittaci pneumonia treated at Tai'an Central Hospital, affiliated with Qingdao University, was analyzed. The terms "Chlamydia psittaci" and "pneumonia" were used to search PubMed for case reports published from 2019 to 2024, and 41 selected cases were summarized and analyzed.

Results: The patient, a 61-year-old female, was diagnosed with Chlamydia psittaci pneumonia through mNGS of alveolar lavage fluid. Following treatment with levofloxacin and doxycycline, she was discharged from the hospital. A review of the literature identified 41 related cases. The primary clinical manifestations of Chlamydia psittaci pneumonia included fever (100 %), cough (51.2 %), headache (17.1 %), and dyspnea (14.6 %). A history of poultry exposure was noted in 90.2 % of patients. Chest CT imaging revealed bilateral lung involvement in 10 patients (24.3 %), pleural effusion in seven patients (17.1 %), and unilateral lung inflammation in 31 patients (75.6 %). The diagnosis was achieved by mNGS in 38 patients. Most were treated with doxycycline, minocycline, or moxifloxacin, with favorable outcomes. Improvement was observed in 40 patients (97.6 %) following timely and accurate treatment.

Conclusions: In summary, mNGS is a primary method for detecting Chlamydia psittaci clinically. The main treatment for infections caused by this pathogen involves tetracyclines or combinations of tetracyclines and fluoroquinolones.

Keywords: Chlamydia psittaci; pneumonia; metagenomi next-generation sequencing(mNGS); case report; infection

Introduction

Chlamydia psittaci infection is a zoonotic disease that affects both humans and poultry [1]. Human infections are primarily caused by exposure to carrier birds or their contaminants. The infection typically presents with flu-like symptoms, including fever, chills, headache, and muscle soreness [2]. In severe cases, it can lead to respiratory failure, central nervous system disorders, severe pneumonia, and other complications [3]. Chlamydia psittaci is a rare cause of atypical community-acquired pneumonia, accounting for approximately 1 % of cases [4], with reports documented worldwide, including in China, Australia, and Europe [5, 6]. Chlamydia psittaci pneumonia has historically been underreported due to diagnostic challenges. Nonetheless, the application of metagenomic next-generation sequencing (mNGS) technology in recent years has led to a steady increase in reported cases [7]. Despite this, many hospitals have limited knowledge of the pathogen and lack experience in its diagnosis and treatment. This study presents a case of pneumonia caused by Chlamydia psittaci,

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which was rapidly diagnosed using mNGS technology. The patient received precise treatment and was discharged after recovery. Furthermore, relevant literature was reviewed to enhance understanding of this pathogen.

Case report

A 61-year-old female was admitted to the Tai'an Central Hospital, affiliated with Qingdao University on May 5, 2023, with a history of "fever for 5 days and wheezing for 2 days." Approximately 5 days prior, she experienced fever, nausea, vomiting, and drowsiness without any apparent cause, with a maximum recorded temperature of 39.2 °C. After taking ibuprofen orally for 2 days, her fever subsided. She then received intravenous infusions of "virazole" and stomach-protecting drugs (specific drugs unknown) at a local clinic. Over the subsequent 2 days, she developed wheezing and a dry cough. Seeking further diagnosis and treatment, the patient presented to the Tai'an Central Hospital, affiliated with Qingdao University, underwent evaluations in the emergency department, and was admitted to the Emergency Medical Intensive Care Unit (EICU) with a preliminary diagnosis of "respiratory failure and pulmonary infection".

The patient had a history of type 2 diabetes for over 3 years, managed with metformin and gliclazide tablets, with her blood glucose levels consistently monitored at approximately 360 mg/dL. She also had a 10-year history of hypertension, with the highest recorded blood pressure reaching 200/100 mmHg, and was on daily oral irbesartan. Laboratory tests conducted after admission revealed the following: blood gas analysis showed a pH of 7.37, an arterial oxygen partial pressure of 60.0 mmHg, an arterial carbon dioxide partial pressure of 24.0 mmHg, an HCO3 level of 13.9 mmol/L, a glucose level of 18.6 mmol/L, a lactate level of 2.40 mmol/L, and a potassium level of 3.7 mmol/L. Complete blood count revealed a white blood cell count of 7.76×10^9/L, a neutrophil ratio of 96 %, a lymphocyte ratio of 0.27 %, hemoglobin of 110 g/L, and a platelet count of 156×10^9/L. The erythrocyte sedimentation rate (ESR) was 87 mm/h, and total serum protein was reduced to 52 g/L. Blood potassium, sodium, chloride, liver, and renal function tests were within normal limits. C-reactive protein (CRP), procalcitonin(PCT) and interleukin-6 (IL-6) levels were significantly elevated at 283.82 mg/L, 2.02 ng/mL and 2,425.94 pg/mL, respectively. The reference ranges for these three inflammatory markers are 0–10 mg/L, 0–0.5 ng/mL and 0–7 pg/mL, respectively. So all three of these indicators are elevated. Both the galactomannan and β-D-glucan tests were negative. Blood culture, sputum culture, and IgM detection of respiratory pathogens showed no significant abnormalities. Chest CT revealed a large area of exudative lesions and lobar consolidation in the lower lobe of the right lung, with no volume reduction. A bronchial inflation sign was observed within the lesion. In addition, a small patchy lesion was noted in the left lung (Figure 1).

Medical history inquiry revealed that the patient's family raised pigeons, raising suspicion of potential Chlamydia psittaci infection. The patient was started on nasal high-flow oxygen inhalation and empirically treated with a combination of levofloxacin and doxycycline for anti-infection, spasmolysis, and asthma relief. Bronchoalveolar lavage fluid (BALF) was collected for examination on May 8, 2023. Microbiological analysis of the BALF showed normal bacterial communities in the oropharynx. Both the (1,3)-β-D-glucan (BDG) test and the galactomannan antigen test for BALF were negative. Five days later, BALF analysis using mNGS revealed sequence reads for *Streptococcus intermedius* (255), *Corynebacterium striatum* (4), *Pseudomonas aeruginosa* (2), Streptococcus pharyngitis (3), and Chlamydia psittaci (157).It was determined that the bacteria *S. intermedius*, *C. striatum*, *P. aeruginosa*, and Streptococcus pharyngitis were likely contaminants from the mouth during bronchoscopy sampling. Given the patient's history of close contact with pigeons and the detection of Chlamydia psittaci by mNGS, a diagnosis of Chlamydia psittaci pneumonia was confirmed. On May 5, 2023, doxycycline (100 mg) was administered in combination with levofloxacin (500 mg), resulting in the resolution of fever by the following day. On May 21, chest CT showed complete absorption of the lesion in the left lung and a slight patchy lesion in the right lung (Figure 1). The patient was discharged on May 23, 2023, following improvement.

Literature review

The PubMed database was searched for case reports of Chlamydia psittaci pneumonia from January 1, 2019, to May 1, 2024. A literature review was conducted on patients with Chlamydia psittaci pneumonia, summarizing the number of

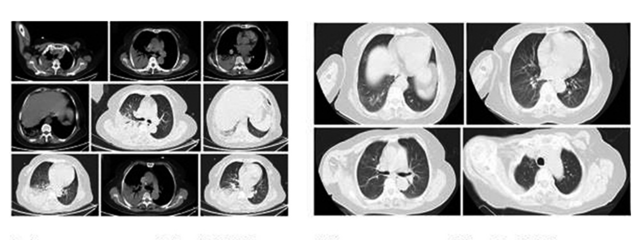

Figure 1: Chest CT of the patient before and after treatment.

cases, initial symptoms, history of contact with poultry, diagnostic methods, chest CT findings, anti-infective drug use, and clinical outcomes of the disease, providing a reference for future diagnosis and treatment. After excluding articles that did not provide the necessary information, 23 relevant articles were included, involving a total of 41 patients. All patients presented with fever (41/41, 100 %), 21 patients had cough (21/41, 51.2 %), while other symptoms included headache (7/41, 17.1 %), dyspnea (6/41, 14.6 %), abdominal pain (1/41, 2.4 %), and diarrhea (1/41, 2.4 %). A history of exposure to poultry, including chickens, ducks, and parrots, was reported in 37 cases (37/41, 90.2 %), while 4 cases had no clear poultry exposure history. Chest CT imaging showed bilateral lung involvement in 10 patients (10/41, 24.4 %), pleural effusion in seven patients (17.1 %), and unilateral lung inflammation in the majority of remaining patients (31/41, 75.6 %). One patient was diagnosed based on history, two by PCR, and the rest (38/41, 92.7 %) by mNGS. Most patients were treated with doxycycline, minocycline, moxifloxacin, and other antibiotics, with a favorable prognosis, with only one patient dying, as detailed in Table 1.

Discussion

Chlamydia psittaci is a Gram-negative intracellular bacterium that requires strict intracellular conditions for infection. It can be detected in the blood, feces, and tissues of various avian species, including parrots, pigeons, and turkeys. Although human-to-human transmission of Chlamydia psittaci has been reported [30], it is relatively rare. The incubation period for psittacosis is typically 7–15 days, with most patients having a history of bird exposure. As shown in Table 1, 90.2 % (37/41) of the patients had such exposure, and the patient in this case also had a history of contact with pigeons. Chlamydia psittaci infection commonly presents with non-specific symptoms such as fever, headache, and cough, but severe cases can progress to severe pneumonia and may lead to poor outcomes. In addition to respiratory tract infections, Chlamydia psittaci has been associated with lesions in other organs, including myocarditis [12, 31], encephalitis [8], pancreatitis [24], rhabdomyolysis [10] and ocular involvement [32]. Lung imaging in psittacosis patients typically shows varying degrees of infiltration, with unilateral lung involvement being more common. This review found that 17.1 % of patients had pleural effusion, as indicated in Table 1.

Methods for detecting Chlamydia psittaci infection include pathogen isolation and culture, routine polymerase chain reaction (PCR), and complement fixation assays. However, isolation and culture techniques for Chlamydia psittaci require stringent biosafety measures and specialized culture conditions, which are challenging to implement in general hospital laboratories. Of note, the culture rate for certain pathogens is often low, leading to difficulties in making a definitive diagnosis of many infectious diseases. In such cases, mNGS offers a valuable alternative. By analyzing BALF from patients with suspected infection, mNGS can overcome the limitations of traditional methods, providing a rapid and accurate diagnosis even when conventional pathogen culture fails. Interestingly, mNGS is an advanced microbial detection technology characterized by its high pathogen detection rate, broad pathogen coverage, and rapid results. It has been widely utilized in the identification of unknown and special pathogens. Herein, Chlamydia psittaci was detected in BALF through mNGS, based on the patient's history of exposure to poultry, providing the foundation for targeted treatment. Notably, 92.7 % of the patients in the literature review were diagnosed using mNGS, as shown in Table 1. As a result, mNGS has become one of the primary methods for detecting Chlamydia psittaci.

mNGS utilizes high-throughput sequencing technology to compare microbial nucleic acid sequences in a sample with existing microbial sequences in databases, enabling efficient and accurate identification of suspected pathogens. This method offers a wide range of detection and rapid results, making it particularly useful for identifying unknown or rare microorganisms [33]. Multiple studies have demonstrated [34–37] that mNGS can significantly enhance the positive detection rate of pathogenic bacteria, with sensitivity ranging from 50 to 100 % and specificity between 60 and 70 %. Compared to traditional methods, mNGS has a higher negative predictive value when the result is negative [38]. Additionally, mNGS can be applied to a wide range of clinical samples, including peripheral blood, cerebrospinal fluid, throat swabs, sputum, BALF, tissue, urine, and stool. Among these, BALF is the recommended specimen for detecting pathogens in lower respiratory tract infections [39]. Generally, after excluding colonizing and contaminating bacteria, the higher the number of microbial nucleic acid sequences detected and the greater the relative abundance, the higher the reliability of the results. Since Chlamydia psittaci is an intracellular bacterium and not a colonizer of the respiratory tract, even a small amount of DNA detected can be considered indicative of infection, provided contamination is excluded [40, 41]. At the same time, mNGS is susceptible to contamination from samples from other parts of the body and environmental microorganisms, making sample separation and collection particularly critical. Positive results from mNGS often detect multiple pathogens simultaneously, and interpreting these results can be challenging as it may be unclear whether the

Table 1: Summary of 41 cases of pulmonary Chlamydia psittaci infection.

Author	Reported Time	Country	Number of reported cases	Clinical feature	History of exposure to poultry	Methods	Anti-infective drugs	CT Chest	Clinical Outcome
Yunfeng Shi [8]	2021	China	1	Fever Headache Dyspnea	No	mNGS	Doxycycline Moxifloxacin Azithromycin	Both lungs pleural effusion	Improved
Zhu Man Du [9]	2023	China	1	Fever Headache	Yes	mNGS	Moxifloxacin	The lower lobe of the right lung	Improved
Anbing Zhang [10]	2024	China	1	Fever cough	Yes	mNGS	Moxifloxacin	Both lungs	Improved
Jinmeng Dai [11]	2023	China	6	Fever 5 patientes cough 1 patient headache	Yes	mNGS	Doxycycline	1 patient on both lungs 5 patients on the one lung	Improved
XiaomingYang [12]	2023	China	1	Fever Headache Cough	Yes	mNGS	Doxycycline	The lower lobe of the right lung	Improved
Wenwu Yao [13]	2023	China	1	Fever Cough	Yes	mNGS	Moxifloxacin Azithromycin	Both lungs	Improved
Wan Xu [14]	2023	China	4	Fever Cough Headache	Yes	mNGS	Minocycline Moxifloxacin Azithromycin	Unilateral lung	Improved
Nini Dai [4]	2023	China	2	Fever Cough Dyspnea	Yes	mNGS	Minocycline Azithromycin	The right lung	Improved
Jundi Wang [15]	2022	China	1	Fever Cough	Yes	mNGS	Doxycycline	The left lung	Improved
Y F Qi [16]	2021	China	1	Fever	Yes	mNGS	Doxycycline	Both lungs	Improved
Yinxia Wu [17]	2023	China	4	Fever	Yes	mNGS	Minocycline	Pleural effusion	3patients improved 1 patient died
Changquan Fang [18]	2022	China	1	Fever Dyspnea	Yes	mNGS	Doxycycline Moxifloxacin	Both lungs	Improved
Chunhua Luo [19]	2022	China	2	Fever Cough	No	mNGS	Doxycycline	The upper lobe of the right lung	Improved
Yidan Gao [20]	2022	China	1	Fever	No	mNGS	Moxifloxacin Clarithromycin	The lower lobe of the left lung	Improved
G F Liu [21]	2022	China	1	Fever Cough	Yes	mNGS	Moxifloxacin Cefoperazone sulbactam	The lower lobe of the right lung	Improved
Zheng Wang [22]	2023	China	2	Fever Diarrhoea Cough	Yes	mNGS	Doxycycline Azithromycin	The right lung	Improved
Changquan Fang [23]	2023	China	1	Fever Dyspnea	Yes	mNGS	Doxycycline Azithromycin	Both lungs	Improved
Changquan Fang [24]	2023	China	1	Fever Dyspnea Bellyache	Yes	mNGS	Doxycycline Levofloxacin	The left lung	Improved
Changquan Fang [25]	2022	China	1	Fever Cough Dyspnea	Yes	mNGS	Omadacycline	The lower lobe of the right lung	Improved
Zhifen Yang [26]	2021	China	1	Fever	Yes	mNGS	Doxycycline Moxifloxacin Meropenam	The lower lobe of the right lung Pleural effusion	Improved

Table 1: (continued)

Author	Reported Time	Country	Number of reported cases	Clinical feature	History of exposure to poultry	Methods	Anti-infective drugs	CT Chest	Clinical Outcome
Sulochana Khadka [27]	2022	Nepal	1	Fever Headache	Yes	Medical history	Doxycycline	Unilateral lung	Improved
Rachael Zuzek [28]	2021	Australia	1	Fever Cough	Yes	PCR	Doxycycline	The left lung	Improved
Jing Cao [29]	2023	China	5	Fever Cough	Yes	PCR	Moxifloxacin Azithromycin	Unilateral lung	Improved

pathogens are contaminants, colonizers, or true causative agents of disease. Therefore, clinicians must interpret mNGS results in conjunction with the patient's clinical symptoms and medical history. Furthermore, the high cost of mNGS limits its widespread use, and it cannot fully replace conventional methods of pathogen detection. Nevertheless, for patients with pneumonia of unknown etiology, early mNGS testing to identify the pathogen, followed by targeted antibiotic therapy, can significantly improve patient outcomes.

Pneumonia caused by Chlamydia psittaci generally has a favorable prognosis when treated appropriately. As indicated in Table 1, the majority of cases were cured, with only one patient (2.4 %, 1/41) reported to have died. However, severe infections can progress rapidly, leading to respiratory failure and multi-organ involvement. According to clinical guidelines, tetracycline antibiotics are the first-line treatment for Chlamydia psittaci infections [28]. Doxycycline and minocycline are commonly used in humans due to their effective doses and relatively low risk of adverse effects. Other recommended treatments for Chlamydia psittaci pneumonia also include macrolides and quinolones.In the current case, after one week of treatment with doxycycline and levofloxacin, the patient showed significant improvement, with rapid symptom resolution and marked absorption of pulmonary lesions.

Conclusions

In conclusion, for patients with complex diseases where pathogens are difficult to identify, the early use of mNGS technology can help make a more rapid and accurate clinical diagnosis, enhancing efficacy and improving patient prognosis.

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Research ethics: The local Institutional Review Board deemed the study exempt from review.

Informed consent: Informed consent was obtained from all individuals included in this study.

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References

1. Zhang Z, Zhou H, Cao H, Ji J, Zhang R, Li W, et al. Human-to-human transmission of Chlamydia psittaci in China, 2020: an epidemiological and aetiological investigation. Lancet Microbe 2022;3:e512–20.
2. Beeckman DS, Vanrompay DC. Zoonotic Chlamydophila psittaci infections from a clinical perspective. Clin Microbiol Infect 2009;15:11–7.
3. Knittler MR, Sachse K. Chlamydia psittaci: update on an underestimated zoonotic agent. Pathog Dis 2015;73:1–15.
4. Dai N, Li Q, Geng J, Guo W, Yan W. Severe pneumonia caused by Chlamydia psittaci: report of two cases and literature review. J Infect Develop Ctries 2022;16:1101–2.
5. Wang L, Shi Z, Chen W, Du X, Zhan L. Extracorporeal membrane oxygenation in severe acute respiratory distress syndrome caused by *Chlamydia psittaci*: a case report and review of the literature. Front Med (Lausanne) 2021;8:731047.
6. Kong CY, Zhu J, Lu JJ, Xu ZH. Clinical characteristics of Chlamydia psittaci pneumonia. Chin Med J (Engl). 2021;134:353–5.
7. Duan Z, Gao Y, Liu B, Sun B, Li S, Wang C, et al. The application value of metagenomic and whole-genome capture next-generation sequencing in the diagnosis and epidemiological analysis of psittacosis. Front Cell Infect Microbiol 2022;12:872899.
8. Shi Y, Chen J, Shi X, Hu J, Li H, Li X, et al. A case of chlamydia psittaci caused severe pneumonia and meningitis diagnosed by metagenome next-generation sequencing and clinical analysis: a case report and literature review. BMC Infect Dis 2021;21:621.
9. Du ZM, Chen P. Co-infection of Chlamydia psittaci and Tropheryma whipplei: a case report. World J Clin Cases 2023;11:7144–9.
10. Zhang A, Lao X, Liang J, Xia X, Ma L, Liang J. Case report: pneumonia caused by Chlamydia psittaci and cryptococcus Co-infection. Infect Drug Resist 2024;17:845–9.

11. Dai J, Lian X, Mo J, Li X, Mo W, Wang H, et al. Case report: a clinical case study of six patients with *Chlamydia psittaci* pneumonia. Front Cell Infect Microbiol 2023;13:1084882.
12. Yang X, Liu Z, Liu X, Li Q, Huang H, Li R, et al. Chlamydia psittaci pneumonia-induced myocarditis: a case report. Infect Drug Resist 2023;16:4259–64.
13. Yao W, Yang X, Shi J, Yang Z, Yao Y, Kou J, et al. Case Report: a case of *Chlamydia psittaci* infection in an HIV patient. Front Cell Infect Microbiol 2023;13:1185803.
14. Xu W, Wang Q, Li L, Zhu B, Cai Q, Yi X, et al. Case Report: metagenomic next-generation sequencing applied in diagnosing psittacosis caused by Chlamydia psittaci infection. Front Cell Infect Microbiol 2023;13: 1249225.
15. Wang J, Zhu Y, Mo Q, Yang Y. Case Report: a Chlamydia psittaci pulmonary infection presenting with migratory infiltrates. Front Public Health 2022;10:1028989.
16. Qi YF, Huang JL, Chen JH, Huang CP, Li YH, Guan WJ. Chlamydia psittaci pneumonia complicated with rhabdomyolysis: a case report and literature review. Zhonghua Jiehe He Huxi Zazhi 2021;44:806–11.
17. Wu Y, Xu X, Liu Y, Jiang X, Wu H, Yang J, et al. Case Report: clinical analysis of a cluster outbreak of chlamydia psittaci pneumonia. Front Cell Infect Microbiol 2023;13:1214297.
18. Fang C, Xu L, Tan J, Tan H, Lin J, Zhao Z. Case Report: *Chlamydia psittaci* pneumonia complicated by Guillain-Barré syndrome detected using metagenomic next-generation sequencing. Front Cell Infect Microbiol 2023;12:1070760.
19. Luo C, Lin Y, Chen C, Liu Y, Sun X. Diagnosis of severe *Chlamydia psittaci* pneumonia by metagenomic next-generation sequencing: 2 case reports. Respir Med Case Rep 2022;38:101709.
20. Gao Y, Zhang X, Liu J, Gong L, Chen G, Zhou X. Chlamydia psittaci pneumonia complicated with organizing pneumonia: a case report and literature review. IDCases 2022;30:e01584.
21. Liu GF, Cui P, Huang JJ. One case report of Chlamydia psittaci pneumonia. Chin J Ind Hyg Occup Dis 2022;40:300–3.
22. Wang Z, Chen C, Lu H, Wang L, Gao L, Zhang J, et al. Case report: clinical characteristics of two cases of pneumonia caused with different strains of Chlamydia psittaci. Front Cell Infect Microbiol 2023;13:1086454.
23. Fang C, Xu L. Chlamydia psittaci pneumonia-induced pulmonary thrombosis: a case report. Infect Drug Resist 2023;16:7063–9.
24. Fang C, Xie Y, Mai H, Xu L. Acute abdominal pain as the first symptom of *Chlamydia psittaci* pneumonia complicated by acute pancreatitis: a case report. Front Med (Lausanne) 2023;10:1253859.
25. Fang C, Xu L, Tan J, Tan H, Lin J, Zhao Z. Omadacycline for the treatment of severe *Chlamydia psittaci* pneumonia complicated with multiple organ failure: a case report. Infect Drug Resist 2022;15:5831–8.
26. Yang Z, Wang S, Xing D, Zhang H. Pregnancy combined with severe pneumonia caused by Chlamydia psittaci infection - a case report. Ginekol Pol 2021;92:743–4.
27. Khadka S, Timilsina B, Pangeni RP, Regmi PR, Thapa AS. Importance of clinical history in the diagnosis of psittacosis: a case report. Ann Med Surg (Lond) 2022;82:104695.
28. Zuzek R, Green M, May S. Severe psittacosis progressing to suspected organizing pneumonia and the role of corticosteroids. Respir Med Case Rep 2021;34:101486.
29. Cao J, Xie X, Lei Y, Li S, Song X, Lei Y, et al. Epidemiological and clinical characteristics of a family cluster of psittacosis: a case report. IDCases 2023;33:e01845.
30. Deng F, Lin Q, Xu X, Li C, Xu J, Nie H. A case report of healthcare-associated psittacosis. J Infect Dev Ctries 2023;17:571–7.
31. Bendjelloul I, Lourtet-Hascoët J, Galinier JL, Charbonneau H, Robinet N, Fourcade C, et al. Chlamydia psittaci endocarditis: a case report and literature review. Infect Dis Now 2023;53:104687.
32. Gholap RS, Engelmann AR, Munir WM. Chlamydia psittaci -induced reactive infectious mucocutaneous eruption with ocular involvement. Eye Contact Lens 2023;49:572–4.
33. Jing C, Chen H, Liang Y, Zhong Y, Wang Q, Li L, et al. Clinical evaluation of an improved metagenomic next-generation sequencing test for the diagnosis of bloodstream infections. Clin Chem 2021;67:1133–1143.
34. Miao Q, Ma Y, Wang Q, Pan J, Zhang Y, Jin W, et al. Microbiological diagnostic performance of metagenomic next-generation sequencing when applied to clinical practice. Clin Infect Dis 2018;67(suppl_2): S231–40.
35. Wu X, Li Y, Zhang M, Li M, Zhang R, Lu X, et al. Etiology of severe community-acquired pneumonia in adults based on metagenomic next-generation sequencing: a prospective multicenter study. Infect Dis Ther 2020;9:1003–15.
36. Wang Q, Miao Q, Pan J, Jin W, Ma Y, Zhang Y, et al. The clinical value of metagenomic next-generation sequencing in the microbiological diagnosis of skin and soft tissue infections. Int J Infect Dis 2020;100: 414–20.
37. Li Y, Sun B, Tang X, Liu Y, He H, Li X, et al. Application of metagenomic next-generation sequencing for bronchoalveolar lavage diagnostics in critically ill patients. Eur J Clin Microbiol Infect Dis 2020;39:369–74.
38. Qian M, Zhu B, Zhan Y, Wang L, Shen Q, Zhang M, et al. Analysis of negative results of metagenomics next-generation sequencing in clinical practice. Front Cell Infect Microbiol 2022;12:892076.
39. Burnham P, Gomez-Lopez N, Heyang M, Cheng AP, Lenz JS, Dadhania DM, et al. Separating the signal from the noise in metagenomic cell-free DNA sequencing. Microbiome 2020;8:18.
40. Gao Q, Li L, Su T, Liu J, Chen L, Yi Y, et al. A single-center, retrospective study of hospitalized patients with lower respiratory tract infections: clinical assessment of metagenomic next-generation sequencing and identification of risk factors in patients. Respir Res 2024;25:250.
41. Tang J, Tan W, Luo L, Xu H, Li N. Application of metagenomic next-generation sequencing in the diagnosis of pneumonia caused by Chlamydia psittaci. Microbiol Spectr 2022;10:e0238421.