DOI: 10.7860/JCDR/2026/84908.23561

Case Report

Microbiology Section

# *Raoultella ornithinolytica* causing Lung Abscess Complicated by Pyopneumothorax in an Immunocompetent Young Girl: A Rare Case Report

CHARU NAYYAR[1], PIYUSH PAREEK[2], VARSHA CHALAVARYA[3], DIMPLE KAPOOR[4], NEELAM GULATI[5]



## ABSTRACT

*Raoultella ornithinolytica* is a Gram-negative, non motile, aerobic, encapsulated bacterium belonging to the family Enterobacteriaceae that resembles *Klebsiella*. This bacterium is present in soil and aquatic environments and seldom causes Healthcare-Associated Infections (HAIs). However, clinical features and outcomes of human infections caused by *R. ornithinolytica* have been reported for only a limited number of cases. Present case is of 19-year-old female, presented with fever, productive cough, and right-sided chest pain since one year, which was earlier treated with oral antibiotics but symptoms did not completely resolve. Chest X-ray showed right-sided air-fluid level suggestive of hydropneumothorax, for which an Intercostal Chest Tube (ICDT) was inserted in the right pleural cavity which drained about one litre of thick pus initially. Pus sample was sent for microbiological analysis. The results confirmed a *Raoultella ornithinolytica* (*R. ornithinolytica*) infection, which was treated with intravenous piperacillin-tazobactam and gentamicin according to the sensitivity pattern. Contrast-Enhanced Computed Tomography (CECT) chest revealed large thick walled abscess, requiring surgical intervention. The patient's condition improved after oral trimethoprim-sulphamethoxazole therapy and surgery. *R. ornithinolytica* can cause serious community-acquired infections even in healthy individuals, as demonstrated by this rare case of lung abscess with pyopneumothorax. Accurate diagnosis, antimicrobial susceptibility testing, and timely surgical management are critical for favourable outcomes. Increased awareness and reporting are essential to better understand its clinical impact.

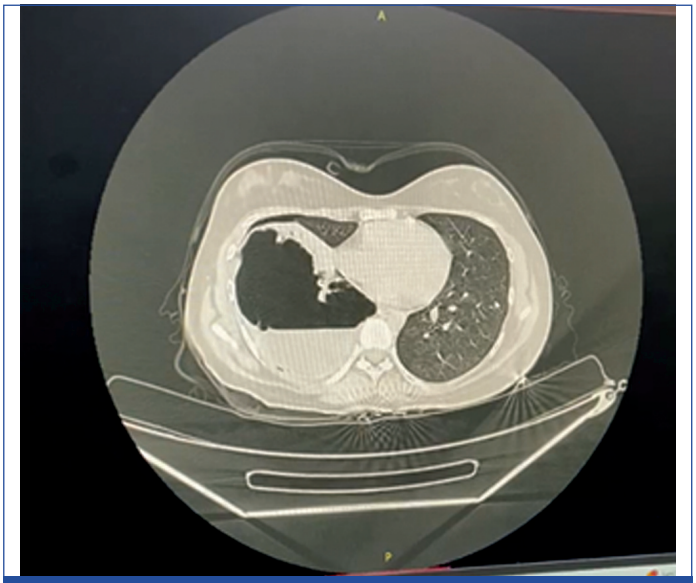
**Keywords:** Community-acquired infections, Intercostal chest tube, Pyopnuemothorax

## CASE REPORT

A 19-year-old female with no significant co-morbidities, was admitted to the pulmonary department with complaints of fever, productive cough, and right-sided chest pain since one year, which was earlier treated with oral antibiotics but symptoms did not completely resolve. The patient had received prolonged treatment from local practitioners, including multiple undocumented antibiotic courses. Over the course of one year, the condition was managed as non resolving pneumonia, before ultimately progressing to a lung abscess with associated pyopneumothorax. Symptoms persisted throughout this period. Two weeks before presentation, she experienced increased right-sided chest pain and worsening dyspnoea. The patient's vital signs were a blood pressure of 110/70 mmHg, pulse rate of 112 bpm, $SpO_2$ of 88% on room air, and respiratory rate of 32 beats/min.

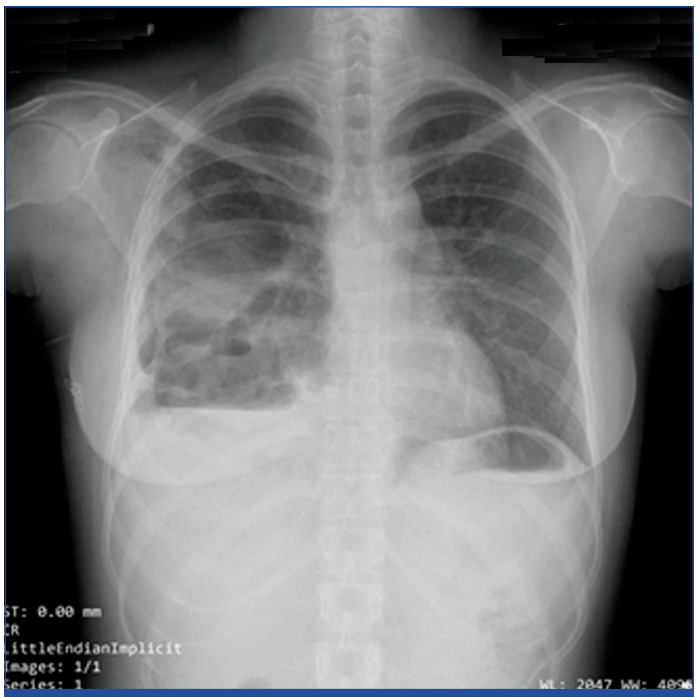
Physical examination revealed remarkable findings of decreased chest movement on right-side and succussion splash on auscultation. The results of blood tests at admission were an increased total leukocyte count of 16,500/$mm^3$ (neutrophil predominant), haemoglobin of 12.8 g/dL, ESR of 82 mm/hr. Chest X-ray showed right-sided air-fluid level suggestive of hydropneumothorax. An ICDT was inserted in the right pleural cavity which drained about one litre of thick pus initially. Pus sample was sent for microbiological analysis. Direct gram stain demonstrated pus cells and gram negative bacteria. Lactose fermenting colonies were demonstrated on MacConkey agar identified by Vitek 2 Compact (Biomerieux) as *Raoultella ornithinolytica* with 99% possibility. The sensitivity pattern showed sensitive to trimethoprim-sulphamethoxazole (MIC ≤20), gentamicin (MIC ≤1), tigecycline (MIC ≤0.5), piperacillin-tazobactam (MIC=8); resistant to cefepime (MIC ≥32), meropenem (MIC ≥16) as per Clinical Laboratory Standard Institute (CLSI 2025) [1]. She was started on intravenous piperacillin-tazobactam 4.5 g tds and gentamicin 40 mg bd according to the sensitivity pattern. She was given these antibiotics for a total duration of six weeks. Gradually, her fever subsided, chest tube output reduced over time, but the air fluid level persisted. Contrast-Enhanced Computed Tomography (CECT) thorax was advised, revealing a 100 × 121 mm thick walled abscess cavity with a fluid level in the right lung [Table/Fig-1].

The size of the abscess was approximately 10 cm, for which telephonic opinion was taken from a thoracic surgeon, and was



**[Table/Fig-1]:** CT scan of chest. A 100 × 121 mm thick walled abscess cavity with a fluid level is seen in the right lung.

advised surgical intervention. She was referred to higher centre on oral trimethoprim-sulphamethoxazole therapy, with ICDT in situ for further surgical management. Surgical procedure of Video Assisted Thoracic Surgery (VATS) and decortications was performed. There, the abscess cavity was identified, opened, necrotic tissue excised, and the cavity irrigated extensively. The pus sample sent for investigation, also isolated *R. ornithinolytica*. Gradually, chest tube output decreased and was removed [Table/Fig-2]. Duration of antibiotic (intravenous piperacillin-tazobactam 4.5 g tds and gentamicin 40 mg bd) before referral was eight days and total duration of antibiotics was six weeks. At 3-month follow-up, she remained asymptomatic with an expanded lung on imaging.




**[Table/Fig-2]:** Chest X-ray postsurgery and ICDT removal.

## DISCUSSION

*Raoultella ornithinolytica* is a gram-negative, non motile, aerobic, encapsulated bacterium belonging to the family Enterobacteriaceae. Initially classified under the genus *Klebsiella* as *K. ornithinolytica*, it was reclassified as *Raoultella* in 2001 based on phylogenetic analyses of 16S rRNA and *rpoB* gene sequences. The nomenclature reflects its ability to produce ornithine decarboxylase [2-4].

*R. ornithinolytica* is widely distributed in the natural environment, including water, soil, and plant surfaces, and has also been detected in animals. In clinical settings, it has been isolated from hospital environments and identified as part of the normal flora of the human gastrointestinal and respiratory tracts [5-8]. One notable characteristic of this organism is its ability to decarboxylate histidine into histamine, which can lead to symptoms such as nausea, vomiting, and diarrhoea [9].

Although *R. ornithinolytica* is an uncommon human pathogen, it has been implicated in a wide spectrum of infections, including respiratory and urinary tract infections, gastroenteritis, pancreatitis, cholangitis, bacteraemia, enteric fever, osteoarticular infections, and soft-tissue infections. These infections have been reported across both adult and paediatric populations [3,5,7,9], While community-acquired infections are rare, hospital-acquired cases are increasingly recognised [6,10-12].

Most infections are reported in individuals with underlying conditions such as malignancy, immunosuppression, diabetes mellitus, recent trauma, or a history of surgical intervention [5,6,10]. Importantly, the organism has also been associated with severe and potentially life-threatening infections in neonates, particularly in preterm infants [4]. According to current literature, *R. ornithinolytica* generally remains susceptible to a broad range of antimicrobial agents, including cephalosporins, aminoglycosides, quinolones, sulfonamides, β-lactam/β-lactamase inhibitor combinations, carbapenems, and carbapenem/β-lactamase inhibitor combinations. However, the organism exhibits intrinsic resistance to aminopenicillins due to the presence of chromosomally encoded class A β-lactamases. In addition, it has demonstrated the capacity to acquire resistance mechanisms via horizontal gene transfer, including genes encoding Extended-Spectrum B-Lactamases (ESBLs) and carbapenemases-posing a challenge in clinical management [5].

Infections caused by *R. ornithinolytica* have been documented at various anatomical sites, including bloodstream infections, urinary tract infections (notably catheter-associated), respiratory tract infections, gastrointestinal and biliary infections, skin and soft-tissue infections, osteoarticular infections, and central nervous system involvement [6,7]. A substantial proportion of reported cases involve patients with compromised immunity, such as those with malignancies, on immunosuppressive therapy, or of advanced age [13,14].

In contrast, the case presented herein involved a patient with a lung abscess in the absence of any identifiable immunocompromising condition or co-morbidity. Such occurrences highlight the need for close surveillance and reporting of similar cases to better elucidate the clinical spectrum and risk factors associated with *R. ornithinolytica* infections.

The formation of a lung abscess suggests the involvement of both host and microbial factors contributing to tissue necrosis, cellular damage, and degradation of the extracellular matrix. While host immune responses- particularly neutrophils and macrophages- can release matrix metalloproteinases, it remains a pertinent question whether certain pathogens, including *R. ornithinolytica*, possess proteolytic enzymes or cytotoxic factors that may directly mediate tissue destruction [5].

*R. ornithinolytica* has been reported from various sites of infection but few are reported from lung diseases. Seng P et al., reported 24% cases of pneumonia and pleural effusion from 112 established cases of *R. ornithinolytica* [12]. Boattini M et al., also reported six cases of pneumonia among 25 cases by this organism [15].

A few isolated reports of respiratory illnesses caused by *R. ornithinolytica* across the world is summarised in [Table/Fig-3].

Hinchcliffe N et al., reported a 38-year-old HIV positive male patient who had history of intravenous drug use presenting with complaints of chest pains, cough with sputum production, weight loss and chest X-ray showing right basal lung abscess. Sputum culture and 16S rRNA analysis of lung biopsy demonstrated *Raoultella ornithinolytica*. Intravenous cefazolin was started and patient improved in four weeks [5]. Van Cleve JR et al., reported two post trauma cases who had developed ventilator associated pneumonia during the hospital stay. Bronchoalveolar lavage sample was cultured which showed isolation of *Raoultella ornithinolytica* in both the cases. The patients were treated with broad spectrum antibiotics and recovered completely [10].

In the case presented here, the patient presented with a right-sided hydropneumothorax, for which ICD was placed. Microbiological analysis of the pleural fluid yielded *Raoultella ornithinolytica*. Although there was a reduction in drainage volume, a persistent air-fluid level on serial imaging prompted further evaluation with CECT of the thorax. This revealed a right-sided lung abscess measuring approximately 10 cm in diameter.

According to established clinical guidelines, lung abscesses exceeding 6 cm are unlikely to resolve with conservative management alone and typically warrant surgical intervention. Consequently, a telephonic consultation was conducted with a thoracic surgeon, and the patient was referred to a tertiary care centre while being maintained on oral trimethoprim-sulfamethoxazole (co-trimoxazole). At the referral facility, surgical exploration was performed, revealing

| Ref | Place (Time) | Age/sex | Diagnosis | Co-morbidities | Sample | Treatment | Outcome |
|---|---|---|---|---|---|---|---|
| Van Cleve JR et al., [10] | USA (2018) | 39y/M | Ventilator Associated Pneumonia (VAP) | Following trauma | Bronchoalveolar Lavage (BAL) | Piperacillin-tazobactam | Improved |
| Van Cleve JR et al., [10] | USA (2018) | 50y/M | VAP | Following trauma | BAL | Cefepime | Improved |
| Hinchcliffe N et al., [5] | UK (2022) | 38y/M | Lung abscess | HIV positive | CT guided lung biopsy No growth on culture. 16srRNA seq | Cefazolin | Improved |
| Present study | India (2026) | 19y/F | Lung abscess complicated by pyopneumothorax | Nil | Pleural fluid | Piperacillin-tazobactam, gentamicin | Improved |

**[Table/Fig-3]:** Few isolated cases of pulmonary infections with *Raoultella ornithinolytica*.

a large abscess cavity with necrotic debris, which was debrided and irrigated extensively.

Following surgical intervention, the patient showed progressive clinical improvement. Drain output decreased, the ICD was removed, and (chest X-ray) radiological evidence confirmed re-expansion of the right lung. This case underscores the clinical significance of prompt imaging, accurate microbiological identification, and the role of specialist input- even via telephonic consultation- in guiding timely referral and definitive management. Notably, electronic sharing of clinical records and imaging facilitated seamless coordination with the higher centre, enabling expeditious surgical intervention.

## CONCLUSION(S)

This case illustrates that *Raoultella ornithinolytica* can cause pleural infections, including pyopneumothorax, even in young and immunocompetent individuals. With the availability of automated microbiological identification system like Vitek 2 Compact and Matrix-Assisted Laser Desorption/Ionization Time-of-Flight (MALDI-TOF), the diagnosis of this bacteria has become easier. Early microbiological diagnosis and sensitivity-guided therapy are critical for successful outcomes.

## REFERENCES


[1] Clinical Laboratory Standard Institute. M100. 35th Edition. CLSI 2025. Available from: https://clsi.org/shop/standards/m100/.
[2] Drancourt M, Bollet C, Carta A, Rousselier P. Phylogenetic analyses of Klebsiella species delineate Klebsiella and Raoultella gen. nov., with description of Raoultella ornithinolytica comb. nov., Raoultella terrigena comb.nov.and Raoultella planticola comb. nov. Int J Syst Evol Microbiol. 2001;51(3):925-32.
[3] Belodu R, Renushri BV, Kiran TS, Vijayakumar G. Raoultella ornithinolytica: A case series of clinical presentations and its role in various infections from a tertiary care centre in Tumkur, Karnataka, India. J Clin Diagn Res. 2024;18(3):DR01-DR04.
[4] Chen X, Zhou X, Cao J, Ma K, Xia Z. A case report of community-acquired Raoultella ornithinolytica infection in a healthy, young individual. BMC Infect Dis. 2021;21(1):1095.
[5] Hinchcliffe N, Benbow A, Moshiri T, Thompson J, Venkatesan P. Isolation of Raoultella ornithinolytica in a HIV positive patient with a lung abscess. Access Microbiology. 2022;4(6):acmi000365.
[6] Hountis P, Papakanderaki E, Kanakakis K, Goule S, Chounti M. Clinical significance of positive Raoultella ornithinolytica and Staphylococcus hominis cultures in a post lobectomy patient. A case report. Monaldi Arch Chest Dis. 2018;88:885.
[7] Zhou F, Bai K, Liu C, Xu F, Li J, Pi D. Raoultella ornithinolytica infection in the pediatric population: A retrospective study. Front Pediatr. 2020:8:362.
[8] Sekowska A, Dylewska K, Gospodarek E, Bogiel T. Catheter-related blood stream infection caused by Raoultella ornithinolytica. Folia Microbiologica. 2015;60(6):493-95.
[9] Hajjar R, Ambaraghassi G, Sebajang H, Schwenter F, Su S-H. Raoultella ornithinolytica: Emergence and resistance. Infect Drug Resist. 2020;13:1091-104.
[10] Van Cleve JR, Boucher BA, Smith DV, Croce MA. Ventilator associated pneumonia caused by Raoultella ornithinolytica in two immunocompetent trauma patients. Respir Med Case Rep. 2018;24:135-37.
[11] Hadano Y, Tsukahara M, Ito K, Suzuki J, Kawamura I, Kurai H. Raoultella ornithinolytica bacteremia in cancer patients: Report of three cases. Intern Med. 2012;51(22):3193-95.
[12] Seng P, Boushab BM, Romain F, Gouriet F, Bruder N, Martin C, et al. Emerging role of Raoultella ornithinolytica in human infections: A series of cases and review of the literature. Int J Infect Dis. 2016;45:65-71
[13] Abd El-Ghany WA. A spotlight on Raoultella ornithinolytica: A newly emerging life-threatening zoonotic pathogen. Int J One Health. 2021;7(1):01-05.
[14] Baek J, Park MJ, Lee HY, Kang S. Raoultella ornithinolytica in a healthy, young person: Rapidly progressive sinusitis with orbital and intracranial involvement. Eur J Case Rep Intern Med. 2023;10(10):003987.
[15] Boattini M, Almeida A, Cardoso C, Cruz CS, Machado C, Vesza Z, et al. Infections on the rise: Raoultella spp., clinical and microbiological findings from a retrospective study, 2010-2014. Infect Dis (Lond). 2016;48(1):87-91.



**PARTICULARS OF CONTRIBUTORS:**
1. Associate Professor, Department of Microbiology, Dr. SS Tantia Medical College and Research Hospital, Sri Ganganagar, Rajasthan, India.
2. Assistant Professor, Department of Respiratory Medicine, Dr. SS Tantia Medical College and Research Hospital, Sri Ganganagar, Rajasthan, India.
3. Senior Resident, Department of Respiratory Medicine, Dr. SS Tantia Medical College and Research Hospital, Sri Ganganagar, Rajasthan, India.
4. Professor, Department of Pathology, Dr. SS Tantia Medical College and Research Hospital, Sri Ganganagar, Rajasthan, India.
5. Associate Professor, Department of Microbiology, Government Medical College and Hospital, Chandigarh, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**
Dr. Neelam Gulati,
Sector 32, Chandigarh, Punjab, India.
E-mail: drneel222@gmail.com



**PLAGIARISM CHECKING METHODS:** [Jain H et al.]
- Plagiarism X-checker: Oct 15, 2025
- Manual Googling: Feb 05, 2026
- iThenticate Software: Feb 07, 2026 (6%)

**ETYMOLOGY:** Author Origin

**EMENDATIONS:** 7

**AUTHOR DECLARATION:**
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Oct 14, 2025**
Date of Peer Review: **Dec 14, 2025**
Date of Acceptance: **Feb 10, 2026**
Date of Publishing: **Jun 01, 2026**