Case Report

Unusual Localization of an Emergent Bacterium, 
Raoultella ornithinolytica

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1. Introduction

Raoultella ornithinolytica is a gram-negative, capsulate, 
aerobic, and nonmotile bacterium belonging to the family 
Enterobacteriaceae. Three species of Raoultella, initially 
classified as Klebsiella, exist, R. electrica, R. planticola, and R. 
terrigena [1, 2]. These bacteria have been isolated from 
aquatic environments, fish, and ticks, where it can produce 
histamine because of histidine decarboxylase enzyme and 
can contaminate food, especially not well conserved fish and 
pork [3]. Histamine toxicity produces symptoms that include 
flushing of skin, headache, pruritus, and abdominal 
cramping [3]. This rare but emergent bacterium can cause a 
wide spectrum of clinical manifestations. For instance, 
human infections caused by R. ornithinolytica are rare but 
can be responsible for bacteraemia, especially in patient with 
malignancies and immunodeficiencies [4, 5]. Furthermore, 
R. ornithinolytica is responsible for urinary, bile tract, tracheal, bronchial, and lungs infections in patients with 
immunodeficiency. The majority of cases reported in the 
literature are community acquired infections, especially 
nosocomial [6]. Neonatal sepsis is rare; however, it can be 
severe if not treated [7], as well as septic arthritis of the 
temporomandibular joint. In a case report after an early but 
temporary response to the antibiotic therapy, this bacterium 
leads to a complete demolition of the articulation [8]. R. 
ornithinolytica not only expresses β-lactamase, which provides 
resistance to commonly used β-lactam antibiotics but 
can also acquire genes for multi-drug resistance [8, 9].

Only a few ear, nose, and throat cases complaining 
difficulty in swallowing, pain in the throat, rhinosinusitis, 
and dysphonia are described in the literature. We described
the first case in the literature of isolated external otitis (EO) sustained by *R. ornithinolytica* in an immunocompetent host.

### 2. Case Presentation

A 54-year-old Caucasian man presented to our hospital with a 7-day history of right otalgia and purulent otorrhea without any systemic symptoms or fever. In order to control pain, the patient was previously treated with acetaminophen alone for 3 days.

There was no significant family, social, or medical history except for a myringoplasty for tympanic membrane perforation of the right ear performed 7 years earlier and a septoplasty performed 5 years earlier.

On physical examination, the patient’s blood pressure was found to be 125/70 mmHg, pulse was 80 beats per minute, temperature was 36°C, and respiratory rate was 16 breaths per minute.

We observed pain on tragus pressure, whereas no paralysis of cranial nerves was observed. The right outer ear canal contained purulence with significant hyperemia and edema of skin. Tympanic membrane was impossible to visualize due to the narrowing of the outer ear canal. The rest of the head and neck examination, including the left ear, was normal.

Laboratory data at admission revealed a hemoglobin level of 14 g/dl and white blood cell count of 14,700 per microliter with 70% neutrophils. Inflammation markers were high: erythrocyte sedimentation rate (ESR) was 25 mm/h (normal range 0–22 mm/h) in the first hour, and the level of C-reactive protein (CRP) was 15 mg/L (normal range < 3.0 mg/L).

The computed tomography scan did not show soft alterations nor mastoid, skull base, and bony changes suggestive of malignant external otitis. (Figure 1). We performed right ear swab for culture examination; meanwhile, we started empirical therapy with topical administration of neomycin for 7 days, without any clinical improvement.

The cultural examination showed the presence of a *R. ornithinolytica* infection. *R. ornithinolytica* isolates were identified with MALDI-TOF MS [10].

On the seventh day, as soon as the susceptibility profile of *R. ornithinolytica* was available (Table 1), we started a systemic therapy with ciprofloxacin 500 mg twice a day for 10 days, and topical therapy using 5 ear drops composed by 3% boric acid in 70% alcohol and 5 drops of levofloxacin twice a day for 10 days, after that we observed a complete resolution of symptoms. In addition, the right ear otomicroscopy showed a dry cavity with only a small granulation on the upper anterior quadrant of the tympanic membrane that disappeared after ten more days of boric acid drops. The six months follow-up did not show recurrence.

### 3. Discussion

We describe a case of culture-confirmed *R. ornithinolytica* external otitis, defined as diffuse inflammation of the external ear canal, which may also involve the pinna or tympanic membrane, in an immunocompetent man. *R. ornithinolytica* is a rare gram-negative aerobic bacillus belonging to the *Enterobacteriaceae* family. It represents an emergent cause of human infections. Virulence factors involved in the pathogenicity of *R. ornithinolytica* are its ability to adhere to human tissues converting histidine to histamine and to form biofilms [11–14]. Generally, *R. ornithinolytica* infections are observed in patients with diabetes, immunodepression, or oncological diseases [15]. These infections can cause sepsis, arthritis, urinary tract, and throat impairments; they can be severe and rarely occur in an immunocompetent host [11]. There are only a few cases of EO caused by *R. ornithinolytica* reported in the literature, but no one isolated [11]. To our knowledge, this is the first case described of isolated external otitis sustained by *R. ornithinolytica* in an immunocompetent host. All in all, *R. ornithinolytica* is not considered a virulent pathogen *per se*, but its ability to develop antibiotic resistance can cause severe complications [4, 7, 16]. Hence, the need is to identify the type of bacterium in order to set up the most appropriate therapeutic protocol. This is precisely what we did in our case, especially in the light of the failure of the initially

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**Figure 1:** The computed tomography (CT) did not show bone alterations or changes suggestive of malignant external otitis.

**Table 1: Susceptibility of *R. ornithinolytica*.**

<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>MIC</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin</td>
<td>≥32</td>
<td>R</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>≥32</td>
<td>R</td>
</tr>
<tr>
<td>Amoxicillin/clavulanic acid</td>
<td>≥32</td>
<td>R</td>
</tr>
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<td>Gentamicin</td>
<td>≤1</td>
<td>S</td>
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<td>Nalidixic acid</td>
<td>&gt;16</td>
<td>R</td>
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<td>Ciprofloxacin</td>
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<td>Ceftriaxone</td>
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<td>R</td>
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<td>Cefotaxime</td>
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<td>Ceftriaxidime</td>
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</tr>
<tr>
<td>Trimethoprim/sulfamethoxazole</td>
<td>&gt;32</td>
<td>R</td>
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</table>

MIC: minimum inhibitory concentration.
attempted empirical therapy with neomycin. The reported case, based on the susceptibility profile, presented multi-drug resistance (Table 1).

Moreover, in our patient, we did not find any correlation with previous myringoplasty surgery.

The American Academy of Otolaryngology–Head and Neck Surgery Foundation (AAO-HNSF) developed a clinical practice guideline recommending the use of topical preparations for initial therapy of diffuse, uncomplicated EO, whereas systemic antimicrobial therapy should be used in case of extension outside of the ear canal or in the presence of risk factors like diabetes, prior radiotherapy, or immune compromise [17]. However, in our case report we started a systemic therapy based on antimicrobial susceptibility for the lack of therapeutic response to topical therapy.

In our opinion, the culture test is mandatory to choose the proper therapy and to avoid potential severe complications as sepsis, arthritis, and meningitis. Indeed, systemic therapy prevents spreading of the infection, whereas topical therapy medicates the local district. We also recommend toilette of outer ear canal before starting and during the treatment, to provide higher efficacy of the local treatment.

In conclusion, otologists should take into consideration the infection sustained by this bacterium because they can be severe and can occur not only in immunocompromised patients but also, although rarely, in an immunocompetent host.

In our opinion, physicians should be aware of the high rates of antimicrobial resistance of R. ornithinolytica as demonstrated by antimicrobial susceptibility in our case report. Further studies have to be done to understand the entity of the diffusion of this bacterium.

**Conflicts of Interest**

The authors declare that they have no conflicts of interest.

**References**


