



# The Brazilian Journal of INFECTIOUS DISEASES

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## Case report

# *Rothia aeria* endocarditis in a patient with a bicuspid aortic valve: case report

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## ARTICLE INFO

### Article history:

Received 11 April 2014

Accepted 6 May 2014

Available online 4 June 2014

### Keywords:

*Rothia aeria*

Endocarditis

Intestinal translocation

Molecular diagnosis

## ABSTRACT

*Rothia aeria* is an uncommon pathogen mainly associated with endocarditis in case reports. In previous reports, endocarditis by *R. aeria* was complicated by central nervous system embolization. In the case we report herein, endocarditis by *R. aeria* was diagnosed after acute self-limited diarrhea. In addition to the common translocation of *R. aeria* from the oral cavity, we hypothesize the possibility of intestinal translocation. Matrix-assisted laser desorption ionization-time of flight mass spectrometry and genetic sequencing are important tools that can contribute to early and more accurate etiologic diagnosis of severe infections caused by Gram-positive rods.

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## Introduction

*Rothia* is a genus of Gram-positive, non-acid-fast bacteria proposed by George and Brown in 1967. This genus grows well under aerobic conditions on BHI agar. Young colonies are smooth, tending to become rough, dry, convex and adherent to the culture medium when mature. The bacterial cells can appear coccoid, cocco-bacillary or filamentous. The species *Rothia aeria* was characterized in 2004 after isolation from the Russian space station Mir. Initially, it was known as *Rothia dentocariosa genomovar II*.<sup>1</sup> *R. aeria* is known to colonize human oral cavity, but has also been identified in duodenal biopsy as

a colonizer of the upper gastrointestinal tract.<sup>2</sup> To our knowledge, this is the sixth case report of endocarditis by *R. aeria*.

## Case report

A previously healthy 25-year-old man presented with acute self-limited diarrhea for three days after a trip to Salvador, Brazil. After diarrhea resolution, he started to experience daily fever spikes. He visited a physician who prescribed levofloxacin 500 mg daily for seven days with symptom improvement. However, fever recurred after stopping

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<http://dx.doi.org/10.1016/j.bjid.2014.05.001>

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**Table 1 – Summarized case reports of *Rothia aeria* clinical infections.**

Author/Year	Reference	Disease	Risk factor/chronic dz	Age	Treatment	Outcome
Hiraiwa T et al. Japan. 2013	3	Endocarditis (positive aerobic blood cultures)	Renal transplantation due to renal cell carcinoma on tacrolimus and everolimus use	63 years	Penicillin G 8 weeks	Brain septic embolization as complication  Survived
Thiyagarajan A et al. UK. 2013	4	Endocarditis (positive aerobic blood cultures)	Dental caries and gingivitis Not reported on abstract	61 years	Benzylpenicillin + Rifampicin + Gentamicin	Brain septic embolization as complication  Survived
Crowe A et al. Australia. 2013	5	Endocarditis (positive aerobic blood cultures)	Ex-smoker Hypertension	48 years	Benzylpenicillin + Gentamicin 2 weeks; Benzylpenicillin + Ceftriaxone 8 weeks; Rifampicin + Ciprofloxacin 12 weeks	Brain septic embolization as complication  Spleen, left kidney infarction Right renal artery and hepatic artery aneurysms  Survived
Tarumoto N et al. Japan. 2012	6	Endocarditis	Smoking	40 years	Ceftriaxone + Gentamicin	Died on 15th day of hospital admission of brainstem hemorrhagic complication
Holleran K and Rasiah S. Australia. 2012	7	Endocarditis	Not reported	48 years	Not reported	Died of hemorrhagic complication
Falcone EL et al. USA. 2012	8	Neck abscess	X-linked chronic granulomatous disease and prednisone use for colitis	18 years	Amoxicillin- probenecid for 2 months	Survived
Verrall AJ et al. New Zealand. 2010	9	Dental decay and shoulder articulation infection	Dental caries Methotrexate and hydrocortisone for rheumatoid arthritis	88 years	Penicillin for 14 days	Survived
Michon J et al. France. 2010	10	Acute bronchitis	Anti-TNF therapy (etanercept) for rheumatoid arthritis	66 years	Amoxicillin + Moxifloxacin for 1 week	Survived
Hiyamuta H et al. Japan. 2010	11	Pulmonary cavitary infection	Steroid and azathioprine therapy for neurosarcoidosis	53 years	Penicillin for 8 weeks + Amoxicillin for 5 months	Survived
Monju A et al. Japan. 2009	12	Neonatal sepsis	Mother underwent decayed tooth extraction 4 days before delivery	3 h of life	Ampicillin + Cefotaxime for 11 days	Survived

levofloxacin. He sought further medical assistance on the 4th week of illness. Examination was remarkable for a grade 2/6 aortic murmur and an enlarged spleen. Transesophageal echocardiography showed a bicuspid aortic valve with significant regurgitation and a vegetation of 4 mm. Two blood culture samples obtained from different venous sites both yielded Gram-positive rods. Empirical treatment with ampicillin 2 g q4h and vancomycin, initial loading dose of 25 mg/kg and maintenance dose of 15 mg/kg q12h, was started due to initial organism identification as *Rothia* spp. After complete identification of the bacteria as *R. aeria*, vancomycin

was discontinued. Ampicillin was maintained because antimicrobial susceptibility test showed a 0.032 mcg/mL minimum inhibitory concentration (MIC) for penicillin. This isolate was susceptible to all of the tested antimicrobials (ciprofloxacin 1 mcg/mL, gentamicin 1.5 mcg/mL, linezolid 0.38 mcg/mL, and vancomycin 1.5 mcg/mL), except for daptomycin with a MIC of 6.0 µg/mL. Endocarditis treatment was uneventful. The patient progressively improved, fever completely resolved and inflammation markers normalized. Ampicillin was stopped after five weeks and follow-up echocardiography revealed complete resolution of the vegetation.

## Discussion

*Rothia* is a genus of Gram-positive, non-acid-fast bacteria proposed by George and Brown in 1967. This genus grows well under aerobic conditions on BHI agar. Young colonies are smooth, tending to become rough, dry, convex and adherent to the culture medium when mature. The bacterial cells can appear coccoid, cocco-bacillary or filamentous. The species *R. aeria* was characterized in 2004 after isolation from the Russian space station Mir. Initially, it was known as *R. dentocariosa genomovar II*.<sup>1</sup> *R. aeria* is known to colonize human oral cavity, but has also been identified in duodenal biopsy as a colonizer of the upper gastrointestinal tract.<sup>2</sup> To our knowledge, this is the sixth case report of endocarditis by *R. aeria*.

After a literature search of *R. aeria* infections, our case is the eleventh case report of clinical infection and the sixth case report of endocarditis.<sup>3-12</sup> The case reports include five cases of endocarditis,<sup>3-7</sup> one case of neck abscess,<sup>8</sup> one case of shoulder joint infection<sup>9</sup>; two cases of lung infection<sup>10,11</sup>; and one case of neonatal sepsis,<sup>12</sup> as shown in Table 1. Three cases had a previous history of dental caries and the neonatal sepsis occurred after maternal tooth extraction.<sup>3-9</sup> These previous case reports show that *R. aeria* is capable of infecting various body sites and also show that infection by this agent is probably more in immunocompromised patients, as some patients were on immunosuppressive medications.<sup>3,8-11</sup> All five case reports of endocarditis by *R. aeria* had central nervous system embolic complications; two cases had fatal central nervous system hemorrhage.<sup>3-7</sup> In one recent case report of mitral valve endocarditis with confirmed brain septic emboli, prompt antibiotic treatment and urgent metallic mitral valve replacement may have prevented further complications and allowed the patient to be successfully discharged on outpatient antibiotic treatment.<sup>4</sup> So far, our case is the only *R. aeria* endocarditis infection where embolic complications have not occurred.

*R. aeria* and *R. dentocariosa* are both known to colonize unhealthy oral cavities. They may then translocate into blood and disseminate, causing endocarditis or other infection in individuals at risk.<sup>3,9,12</sup> Our patient had excellent dental hygiene and had not been submitted to any dental procedures in the last six months. Some studies have suggested colonization of the small intestine (duodenum) by this bacteria and its role in gluten metabolism.<sup>2</sup> Therefore, considering that this patient initially presented with acute self-limited diarrhea, we hypothesized that endocarditis may have resulted from intestinal translocation and infection of the thickened bicuspid aortic valve.

In our clinical case, initial identification after blood culture on agar revealed a Gram-positive rod, which was identified by Vitek 2 as *R. aeria*. Since *R. aeria* is a rarely reported human pathogen and due to commonly inconclusive results of the biochemical identification of Gram-positive rods, it was reasonable to confirm diagnosis by molecular methods. Gene sequence analysis by MicroSeq Library identified *R. aeria* with a 99.98% match. Additionally, the sequence was compared to those of other *Rothia* species available at the GenBank database – <http://www.bacterio.net/qr/rothia.html>.<sup>13</sup> The highest similarity index (99.77%) was observed with a deposit pertaining to the type strain *R. aeria* (GenBank accession CP001368.1).

The same result was obtained when performing a local BLAST using the *Rothia* species 16S rRNA nucleotide sequence. The second highest similarity (98.62%) was observed with the GenBank deposit CP002280.1, corresponding to the type strain of *R. dentocariosa*. Early identification of *R. aeria* can also be achieved using matrix-assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS).<sup>5,8</sup>

Treatment of *R. aeria* infection is variable and dependent on the assisting physicians and susceptibility tests, as we have seen from the case reports (Table 1). All case report isolates were shown to be sensitive to penicillins, which seemed to be the drugs of choice in some of the cases.<sup>3,8-11</sup> One case was initially treated with a combination therapy of benzylpenicillin, rifampicin and gentamicin. Our patient promptly responded to treatment with ampicillin after antibiotic susceptibility results according to the Clinical and Laboratory Standards Institute (CLSI) guidelines.<sup>14</sup>

In conclusion, we summon attention to the seemingly high embolic complications of endocarditis by *R. aeria*. Therefore, *R. aeria* endocarditis should be promptly managed with adequate antibiotic treatment and surgical valve replacement whenever necessary in order to improve patient prognosis. In addition to common translocation of *R. aeria* from the oral cavity, we hypothesize the possibility of intestinal translocation. MALDI-TOF MS and genetic sequencing are important tools that can contribute to early and more accurate etiologic diagnosis of severe infections caused by Gram-positive rods.

## Conflicts of interest

The authors declare no conflicts of interest.

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