

First Case Report of Sepsis Due to *Rothia aeria* in a Neonate[∇]

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***Rothia aeria*, a gram-positive coccoid- to rod-shaped bacterium with irregular morphology, is an extremely rare causative organism of infections in humans. We report the first case of *R. aeria* sepsis clinically manifested in a female neonate soon after birth.**

CASE REPORT

A female neonate, weighing 3,152 g, was born to a 30-year-old healthy mother, gravida 1, para 1, at full term by spontaneous vaginal delivery with Apgar scores of 9 and 10 at 1 and 5 min, respectively. She had no history of intrauterine device use. Aside from 4 days prior to delivery, when she underwent a decayed tooth extraction with no following antibiotic treatment, the pregnancy was uneventful. Routine vaginal cultures at 30 gestational weeks were not significant. One hour prior to delivery, artificial rupture of her amniotic membrane released clear amniotic fluid, and intrapartum monitoring revealed no evidence of fetal distress. Soon after birth, mild tachypnea, retraction, and grunting were noticed in the neonate. At 3 h after birth, the neonate was transferred to our hospital as symptoms worsened. At admission, we detected moderate restlessness and irritability with mild cyanosis even under 30% inspired oxygen, a temperature of 37.8°C, a pulse rate of 150 beats per minute, and a respiratory rate of 100 breaths per minute. A chest radiograph revealed diffuse bilateral infiltrates and some pleural effusion in the lung fields despite the absence of pleocytosis in the cerebrospinal fluid. Laboratory findings for the peripheral venous blood on admission are displayed in Table 1. Following a sepsis work-up, the neonate was treated with respiratory treatment of nasal directional positive airway pressure with 30% inspired oxygen and with combination chemotherapy of ampicillin (200 mg/kg/day) and cefotaxime (150 mg/kg/day). At 2 days after birth, the respiratory symptoms decreased dramatically, and the inspired oxygen concentration was weaned to room air despite the persistent presence of mild emphysematous findings in the lung fields on a chest radiograph. Blood work results thereafter regarding the inflammation are displayed in Table 2. The venous blood specimen collected in a Bactec Peds Plus/F bottle (Becton Dickinson Diagnostic Instrument Systems) at admission was registered positive for a gram-positive bacillus after 4 days of incubation in an automated blood culture system (Bactec 9240; BD Diagnostics Systems). The isolate was eventually identified as *Rothia aeria* at 10 days after birth. Each culture taken from the

throat, body surface, rectum, and cerebrospinal fluid was negative. The placenta was not available for pathological and bacteriological analyses, as it was discarded soon after delivery. At 13 days after birth, the neonate was discharged in good health after an 11-day course of intensive antibiotic chemotherapy.

Discussion. To the best of our knowledge, this is the first report of a *Rothia aeria* culture in human blood. *R. aeria*, isolated for the first time from the air and condensation water sampled in the Russian space station Mir in 1997, is an aerobic, gram-positive, coccoid, coccobacillary or filamentous bacterium (6).

Common biochemical characteristics and antibiotic sensitivities of *R. aeria* are displayed in Tables 3 and 4, respectively. The antimicrobial susceptibility of the organism was assessed using the disk diffusion method. Because there are no Clinical and Laboratory Standards Institute (CLSI) criteria for *Rothia* spp., categorical interpretations (susceptible, intermediate, or

TABLE 1. Laboratory data on admission

Marker	Level
White blood cell count (/ μ l).....	3,500
Band cells (%).....	3
Segmented cells (%).....	23
Eosinophilic leukocytes (%).....	2
Basocytes (%).....	1
Monocytes (%).....	3
Lymphocytes (%).....	68
Red blood cell count (10 ⁴ cells/ μ l).....	454
Hemoglobin (g/dl).....	16.4
Hematocrit (%).....	46.8
Platelet count (10 ⁴ cells/ μ l).....	29.4
Total protein (g/dl).....	5.4
Total bilirubin (mg/dl).....	2.8
Lactate dehydrogenase (IU/liter).....	417
Albumin (g/dl).....	3.6
Alanine aminotransferase (IU/liter).....	11
Aspartate aminotransferase (IU/liter).....	41
Creatine kinase (IU/liter).....	486
C-reactive protein (mg/dl).....	0.05
Haptoglobin (mg/dl).....	<5.0
Immunoglobulin G (mg/dl).....	1,118
Immunoglobulin M (mg/dl).....	9.2
pH.....	7.27
PCO ₂ (mmHg).....	48
PO ₂ (mmHg).....	41
Base excess (mEq/liter).....	-4.9
HCO ₃ (mEq/liter).....	22.0
Glucose (g/dl).....	66
Lactate (mg/dl).....	2.9

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TABLE 2. Clinical course of inflammatory markers

Day	Inflammatory marker levels			
	White blood cell count (per μ l)	Platelet count (10^4 cells/ μ l)	C-reactive protein (mg/dl)	Haptoglobin (mg/dl)
0	3,500	29.4	0.05	<5.0
1	14,980	25.7	4.74	11.3
2	19,050	26.2	7.55	45.3
10	14,270	57.2	0.06	<5.0

resistant) for disk diffusion tests were the CLSI interpretative criteria for staphylococci (3).

In Similarity to *Actinomyces* species, *Rothia* species are considered to be normal inhabitants of the oral cavities of humans (1) and rarely cause serious infections (e.g., endocarditis [2], sepsis [11], dialysis-related peritonitis [9], endophthalmitis [8], arthritis [7], and pneumonia [10]). A recent report documented a case of intrauterine fetal death at full term with a possible association to *R. dentocariosa* (5). However, we were unable to find any reported case of infections aside from sepsis due to *R. aeria*, although there was a report of *R. aeria* colonization on the tongue of a healthy adult (4).

In the present case, the identification of the organism was confirmed by sequencing the 16S rRNA gene, and DNA sequences were compared to published sequences retrieved from the GenBank database (National Center for Biotechnology Information, National Library of Medicine, Bethesda, MD).

Given the early onset of symptoms after birth and the absence of the organism in cultures other than blood upon admission, we suspect that direct hematogenous placental infection through the maternal blood supply or infectious placental contiguity from the uterine wall lesion was the more likely route of bacterial entry, as opposed to birth canal exposure at delivery or antecedent amniotic fluid infection. *Actinomyces* species, part of the normal vaginal flora, have been iso-

TABLE 3. Characteristics of *Rothia aeria*

Characteristic	Presence or absence
Nitrate reduction	-
Pyrazinamidase	+
Alanine-phenylalanine-proline arylamidase	+
Alkaline phosphatase	-
β -Glucuronidase	-
β -Galactosidase	-
α -Glucosidase	+
<i>N</i> -Acetyl-D-glucosaminidase	-
Esculin hydrolysis	+
Urease activity	-
Gelatin hydrolysis	-
Catalase	-
Fermentation of:	
Glucose	+
D-Ribose	-
D-Xylose	-
D-Mannitol	-
Maltose	+
Lactose	-
Saccharose	+
Glycogen	-

TABLE 4. Antibiotic susceptibility of *Rothia aeria*

Antibiotic	Susceptibility ^a
Penicillin	S
Piperacillin	S
Ampicillin	S
Ampicillin-clavulanic acid	S
Cefazolin	S
Cefotiam	S
Flomoxef	S
Cefdinir	S
Imipenem	S
Erythromycin	S
Clindamycin	R
Minocycline	S
Gentamicin	S
Vancomycin	S
Sulfamethoxazole-trimethoprim	S
Lomefloxacin	S

^a S, susceptible; R, resistant.

lated with increasing frequency from females with intrauterine device-related pelvic infections, but given the mother's good health and the lack of intrauterine device use, it is unlikely that a preceding maternal uterine wall infectious lesion was present. The most likely explanation may be that the organism originated in the socket of the decayed tooth extracted 4 days prior to delivery and then traveled through the maternal bloodstream to cause placental infection and neonatal sepsis soon after birth. We were unable to validate the origin of the organism, as the mother did not agree to submit an additional vaginal or oral swab for cultures after the sepsis diagnosis was confirmed.

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