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Chryseobacterium gleum Isolation from Respiratory Culture Following Community-Acquired Pneumonia

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Patient: Male, 61-year-old
Final Diagnosis: Hospital-acquired infection
Symptoms: Fatigue • fever • respiratory distress
Medication: —
Clinical Procedure: Respiratory culture with gram stain
Specialty: Infectious Diseases

Objective: Rare disease

Background: *Chryseobacterium gleum* (*C. gleum*) is a rare but concerning device-associated infection that can cause urinary tract infections and pneumonia. It produces a biofilm and has intrinsic resistance to a wide array of broad-spectrum agents. Risk factors include neonate or immunocompromised states, intensive care unit admission for more than 21 days, broad-spectrum antibiotic exposure, indwelling devices, and mechanical ventilation.

Case Report: A 61-year-old cachectic man presented in the United States with community-acquired pneumonia and immediately decompensated, requiring ventilator support. Despite starting broad-spectrum antibiotics, the patient developed fever, leukocytosis, and additional desaturation episodes. The patient's respiratory culture grew numerous *C. gleum* and few *Stenotrophomonas* (*Xanthomonas*) *maltophilia*. He also had a positive urine streptococcal pneumonia antigen. Broad-spectrum agents were discontinued after prolonged treatment due to a continued worsening clinical picture, and the patient was started on trimethoprim-sulfamethoxazole to cover *C. gleum*. The patient showed rapid clinical improvement on trimethoprim-sulfamethoxazole, with resolution of symptoms on post-discharge follow-up.

Conclusions: To the best of our knowledge, this is the first case report of a documented case of a patient with *C. gleum* respiratory infection successfully treated solely with trimethoprim-sulfamethoxazole. The expedient identification of *C. gleum* is essential for proper treatment. The literature has consistently shown isolated respiratory *C. gleum* strains to be largely susceptible to fluoroquinolones, piperacillin-tazobactam, or trimethoprim-sulfamethoxazole.

MeSH Keywords: Catheter-Related Infections • Cross Infection • Drug Resistance, Microbial • Gram-Negative Bacterial Infections

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/921172

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Background

Chryseobacterium gleum, of the family *Flavobacterium*, is a non-fermentative, gram-negative bacillus. It primarily causes infections such as urinary tract infections and pneumonia, largely in immunocompromised patients and neonates [1]. The genus' ability to thrive in aqueous environments and form biofilms makes it a potential pathogen in patients on ventilators and in those with central lines, thus contributing to healthcare-associated and device-associated infections [2]. Their intrinsic resistances to broad-spectrum agents, including carbapenems, aminoglycosides, and colistin, are of further concern [3].

The SENTRY Antimicrobial Surveillance Program first identified *C. gleum* as a medically relevant pathogen; however, it was the least frequently isolated species of the *Chryseobacterium* genus, with only 2 identified strains in 16 countries over the 5-year study period [4]. While remarkably rare, a growing number of case reports demonstrate its isolation in respiratory cultures in Europe and Southeast Asia [5]. Here, we describe the case of a patient admitted in the United States with multifocal community-acquired pneumonia later found to have *C. gleum* isolated from a sputum sample and successfully treated with trimethoprim-sulfamethoxazole.

Case Report

A 61-year-old man with a history of supra-glottic laryngeal cancer (T2M0N0) status after chemoradiation 3 years prior presented to the Emergency Department with a 2-day history of fatigue, weakness, chills, and altered mental status. His past history was relevant for chronic obstructive pulmonary disease (COPD) not on home oxygen, stroke without dysphagia, hyperlipidemia, and a post-traumatic right above-knee leg amputation from a gunshot wound over a decade ago that was treated and otherwise uncomplicated.

Initial vital signs showed the patient to be afebrile, hypoxic, hypotensive, and tachycardic. The patient was visibly short of breath and tachypneic on physical examination. Pulse oxygenation saturation was 86% on non-rebreather. He was cachectic, with temporalis muscle wasting. The results of a neck exam were unremarkable. Bilateral rhonchi were present on lung examination. An initial chest radiograph demonstrated diffuse bilateral infiltrates. Point-of-care testing for Influenza A was positive. The patient was started on oseltamivir and broad-spectrum antibiotics, including ceftriaxone, azithromycin, and vancomycin, to cover for community-acquired pneumonia, as well as possible post-influenza staphylococcal pneumonia. He was placed on bi-level positive airway pressure (BiPAP) after desaturating to 76% on non-rebreather, and was admitted to the medical intensive care unit for further management.

Table 1. Susceptibilities to *Chryseobacterium gleum* isolate in the present study.

Antimicrobial agent	MIC µg/ml	Interpretation*
Amikacin	32	Resistant
Aztreonam	>16	Resistant
Cefepime	>16	Resistant
Ceftazidime	2	Resistant
Ceftriaxone	>32	Resistant
Gentamicin	>8	Resistant
Imipenem	4	Resistant
Meropenem	Resistant**	Resistant
Piperacillin-tazobactam	8/4	Susceptible
Tobramycin	>8	Resistant
Trimethoprim-sulfamethoxazole	≤0.5/9.5	Susceptible

* Breakpoint interpretation based on Clinical and Laboratory Standards Institute guidelines for non-fermentative gram-negative bacilli protocol; ** MIC numerical value was not reported by the laboratory service.

Blood cultures obtained on initial admission showed no growth throughout the admission.

On the second day of admission, the patient was taken off BiPAP and placed on a high-flow nasal cannula. Vancomycin was discontinued on hospital day 3, and the patient was transferred to the medical floor. Shortly after transfer, he had a desaturation episode requiring use of a VentiMask for oxygen support. He was afebrile at this time, but was found to have new-onset leukocytosis (12.1 K/mm^3 with neutrophilic predominance of 10.5 K/mm^3). A physical exam demonstrated bilateral crackles and bronchial breathing without evidence of edema. Respiratory sputum cultures obtained at this time grew numerous *Chryseobacterium gleum* and few *Stenotrophomonas* (*Xanthomonas*) *maltophilia*. Urine streptococcal pneumonia antigen was also found to be positive. The patient continued to be hypoxic and developed a fever. A repeat white blood cell count had increased to 15.7 K/mm^3. Azithromycin and ceftriaxone were discontinued after 8 days of continuous treatment, and trimethoprim-sulfamethoxazole was initiated due to the isolation of *Chryseobacterium gleum* in the respiratory culture. Two days later, the patient was improving, afebrile, and saturating well on nasal cannula. He was discharged home on the fourth day of trimethoprim-sulfamethoxazole therapy on nasal cannula to complete a total 7-day course of therapy. Upon post-hospital discharge follow-up, the patient was no longer reporting respiratory symptoms and did not require supplemental oxygen with nasal cannula.

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Table 2. Summary of reported susceptibilities and treatment of *Chryseobacterium gleum* isolates from the respiratory tract to date.

Author	Year	Country	Susceptibility Testing Interpretive Criteria*	Susceptibility profile**	Treatment	Response
Lambiase et al. [11]	2007	Italy	NCCLS: not specified	***Resistant: AMK, ATM, CAZ, CTX, FEP, GEN, IPM, MEM, SAM, TZP Sensitive: CIP, LVX, SXT	NA	NA
Virok et al. [12]	2014	Hungary	EUCAST: *Pseudomonas* spp.	***Resistant: AMK, DOR, GEN, IPM, MEM, TOB, TZP Sensitive: CAZ, CIP, FEP, LVX	CIP	Responded
Lo et al. [13]	2014	Taiwan	CLSI: other non-Enterobacteriaceae	***Resistant: AMK, AMS, CAZ, CFZ, CRO, CST, FEP, FOX, GEN, IPM, PIP, TZP Sensitive: CIP, MIN, SXT, TGC	NA	NA
Brkic et al. [14]	2015	Croatia	EUCAST: Gram-negative non-fermentative bacteria	Resistant: CST, DAP, IPM, MEM, VAN Sensitive: CAZ, CIP, FEP, TGC, TZP	TZP	Responded
Abdalhamid et al. [10]	2016	Saudi Arabia	CLSI: other non-Enterobacteriaceae	Resistant: AMK, CAZ, CIP, CST, FEP, GEN, IPM, MEM, TGC, TZP, VAN Sensitive: LVX, MIN, SXT	LVX	Responded
Rawat et al. [15]	2017	India	NA	Resistant: NA Sensitive: MIN, SXT, TZP	TZP+SXT	Responded
Jain et al. [5]	2017	India	CLSI: other non-Enterobacteriaceae	Resistant: AMX, CAZ, CFP, CLI, CRO, CST, CTX, DOX, ERY, FEP, GEN, IPM, MEM, TOB Sensitive: AMK, CIP, DOX, LVX, MIN, SXT, TZP, VAN	LVX	Responded
Miraz et al. [16]	2018	Turkey	CLSI: other non-Enterobacteriaceae	***Resistant: AMK, GEN, IPM, MEM Sensitive: CAZ, CIP, FEP, LVX, SXT, TZP	NA	NA
Present Study	2019	USA	CLSI: non-fermentative Gram-negative bacilli	Resistant: AMK, ATM, CAZ, CRO, FEP, GEN, IPM, MEM, TOB Sensitive: SXT, TZP	SXT	Responded

* CLSI – Clinical and Laboratory Standards Institute; EUCAST – European Committee on Antimicrobial Susceptibility Testing; NA – not available; NCCLS – National Committee for Clinical Laboratory Standards. ** AMK – amikacin; AMX – amoxicillin; ATM – Aztreonam; CAZ – ceftazidime; CFP – cefoperazone; CFZ – cefazolin; CIP – ciprofloxacin; CLI – clindamycin; CRO – ceftriaxone; CST – colistin; CTX – cefotaxime; DAP – daptomycin; DOX – doxycycline; DOR – doripenem; ERY – erythromycin; FEP – cefepime; FOX – cefoxitin; GEN – gentamicin; IPM – imipenem; LVX – levofloxacin, MIN – minocycline; MEM – meropenem; NA – not applicable; PIP – piperacillin; SAM – ampicillin-sulbactam; SXT – trimethoprim-sulfamethoxazole; TGC – tigecycline; TOB – tobramycin; TZP – piperacillin-tazobactam; VAN – vancomycin. *** Multiple strains reported, please see cited case report for detailed findings.

Discussion

Documented risk factors in adults for *C. gleum* include immunocompromised state, a prolonged hospitalization, and medical intensive care unit stay (greater than 21 days). The use of BiPAP and VentiMask have been described, with the hypothesis that these devices may harbor *C. gleum*. Exposure to broad-spectrum antibiotics, including treatment with vancomycin and ceftriaxone, has also been noted [6]. Our patient had several of these risk factors, including possible immune function compromise secondary to his malnourished state, antibiotic exposure, and use of BiPAP and VentiMask during portions of his admission. He did not, however, have an indwelling catheter or a prolonged hospital or medical intensive care unit stay. It is a possibility that our patient was exposed to *C. gleum* while in the medical intensive care unit on either BiPAP or hi-flow. No cultures of the devices were taken, so the mechanism of exposure cannot be definitively determined. The patient had no prior respiratory cultures, so it is unknown if he was a carrier of *C. gleum*. To the best of our knowledge, there is no evidence of a respiratory carrier state of *C. gleum* documented in the literature.

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A true pathogen must be differentiated from a colonizer. Colonization occurs when microbes exist on a carrier without causing infection [7], and is common in the upper respiratory tract, where large quantities of different bacteria exist [8]. Repeating a sample collection supports the notion that an isolated microbe is causing a patient's infection, but no specific guidelines for repeat cultures exist in the literature [5]. Although our patient's sputum showed numerous *C. gleum*, only 1 sample was obtained throughout his stay. The patient's worsening clinical picture, despite broad-spectrum antibiotics for over a week, his rapid improvement following trimethoprim-sulfamethoxazole therapy, coupled with the various risk factors for non-fermentative gram-negative bacilli, collectively support the theory that the *C. gleum* isolate was pathogenic.

The isolated strain showed susceptibility to piperacillin-tazobactam and trimethoprim-sulfamethoxazole, but was otherwise resistant to the remaining tested antibiotics as listed in Table 1, with breakpoint diffusions based on Clinical and Laboratory Standards Institute (CLSI) guidelines for non-fermentative gram-negative bacilli protocol. While resistance to carbapenems, aminoglycosides, and colistin is well documented within the genus, the isolate's resistance to ceftazidime and cefepime are noteworthy and concerning. A summary of other available case reports documenting susceptibilities and treatment of respiratory *C. gleum* pathogenic isolates is described in Table 2. Currently, there are no standardized break points for *Chryseobacterium spp*. in European Committee on Antimicrobial Susceptibility Testing (EUCAST) or CLSI guidelines for disc diffusion susceptibility testing, necessitating laboratories to adopt disc diffusion protocols for other classes of organisms including *Staphylococcus spp.* or non-fermentative gram-negative bacilli protocol [9,10].

To the best of our knowledge, our decision to treat a respiratory isolate of *C. gleum* solely with trimethoprim-sulfamethoxazole is a first in the literature. While the organism has consistently shown susceptibility to trimethoprim-sulfamethoxazole in various case reports, fluoroquinolones such as levofloxacin and ciprofloxacin or piperacillin-tazobactam (or a combination of these agents) are typically used for therapy (see Table 2). For this patient, both organisms isolated from the sputum culture were shown to be susceptible to trimethoprim-sulfamethoxazole. Rapid clinical improvement following treatment supports the diagnosis of *C. gleum* pneumonia.

Conclusions

C. gleum should be considered in patients with pneumonia who fail to respond to treatments for common pathogens and who have additional risk factors, including extended medical intensive care unit stay, immunocompromised state, indwelling catheter, antibiotic exposure, and mechanical ventilation. Sputum culture for identification can be helpful. When isolated, *C. gleum* should be considered as a possible pathogen and appropriate treatment initiated. The literature has consistently shown effective treatment to include fluoroquinolones, piperacillin-tazobactam, and trimethoprim-sulfamethoxazole.

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Conflicts of interest

None.

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