



WWJMRD 2018; 4(6): 44-46

www.wwjmr.com

International Journal

Peer Reviewed Journal

Refereed Journal

Indexed Journal

Impact Factor MJIF: 4.25

E-ISSN: 2454-6615

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## Microbiologic Characteristics and Resistance Profile of *Corynebacterium Striatum* Isolated in ICU Patients

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### Abstract

*Corynebacterium* species are found colonizing skin, other, and in the environment. More recently, due in part to improved microbiological techniques, the survival of immunocompromised patients and increased use of medical devices, the clinical importance of these microorganisms has been recognized, particularly as a cause of opportunistic infection. *C. striatum* can cause serious nosocomial infections in intensive care unit patients and may spread from patient to patient via the hands of attending personnel. Most reported *C. striatum* infections have been found in respiratory samples. A risk factor for acquiring the strain is intubation for longer than 24 h. We evaluated the microbiologic characteristics and resistance profiles of multidrug-resistant (MDR) *Corynebacterium striatum*. Accurate identification of microorganisms is not only important for treatment also very important for epidemiological purposes. Once the organism is identified, universal hygiene measures both in the environment and by caretakers should be observed to avoid further outbreak. Vancomycin is the only antibiotic with sure efficacy against *C. striatum*.

**Keywords:** *Corynebacterium striatum*, multidrug-resistance, ICU, respiratory infection

### Introduction

*Corynebacterium* species are found colonizing skin, other, and in the environment (1,2); they are considered normal flora and not potentially pathogenic. More recently, due in part to improved microbiological techniques, the survival of immunocompromised patients and increased use of medical devices, the clinical importance of these microorganisms has been recognized, particularly as a cause of opportunistic infection (3, 4). *C. striatum* can cause serious nosocomial infections in intensive care unit patients and may spread from patient to patient via the hands of attending personnel. A risk factor for acquiring the strain is intubation for longer than 24 h. In the last decades, in addition to *Corynebacterium diphtheriae*, the pathogenicity among *Corynebacterium* spp. has been reported associated with *Corynebacterium amycolatum* (5, 6) *Corynebacterium jeikeium*, *Corynebacterium macginleyi*, *Corynebacterium urealyticum*, *Corynebacterium pseudodiphtheriticum* and, less frequently with *Corynebacterium xerosis* (7). *Corynebacterium striatum* has been reported colonizing prostheses, catheter tips, and ventilator and feeding tubes, and it has been also identified as causative in cases of endocarditis, sepsis and bacteraemia (8-10). Until 1993 there were only three individual case reports of confirmed respiratory infections by *C. striatum* (11-13). Since then, numerous individual cases and various nosocomial infectious outbreaks of *C. striatum* have been reported 14-19 mostly in patients with chronic diseases requiring frequent and prolonged hospitalizations with repeated exposure to antibiotics against Gram-negative bacteria, organic obstructive disorders, or exposed to invasive procedures that disrupted the skin barrier. Most reported *C. striatum* infections have been found in respiratory samples, the vast majority of strains being multidrug-resistant. In general, *C. striatum* is resistant to penicillin but is susceptible to other  $\beta$ -lactams and vancomycin. Vancomycin was recommended as an empirical therapy for serious infections caused by corynebacteria (21). The optimal antimicrobial therapy for *C. striatum* infections is, However, controversial. In vitro susceptibility tests of tigecycline and linezolid show that

they are active against coryneform bacteria(22,23). At present, there is no ‘gold standard’ or guideline for the management of corynebacteria found in in vitro sensitivity tests. In light of the emergence of multidrug resistance and its involvement in nosocomial infections, appropriate interpretive criteria are needed for corynebacteria. We evaluated the microbiologic characteristics and resistance profiles, of multidrug-resistant (MDR) *C. striatum* strains.

**Material and Methods**

TSMU The first University clinic is multiprofile with 140-bed ward including 11-bed in Intensive care unit department. The clinic was open in 2015 april. *Corynebacterium striatum* was isolated in tracheal aspirates in three patients during March of 2018. An isolation of a pure culture and Gram staining was performed for sputum bacteriology according appropriate protocol. Specimens were cultured on Columbia agar with 5% sheep blood (bioMérieux, France) according to Gould, in the sector manner. After 18-24 hours of incubation at 37 ° C, clinica(bacteriological) laboratory identified bacteria as gram positive, catalase-positive rods-*Corynebacterium* spp and this cultures were send to the National CDC bacteriological laboratory for further identification to species levels. NCDC lab identified it by using the rapid

identification systems ( API-Coryne system, biomerieux) as *Corynebacterium striatum* and Antimicrobial Susceptibility Test(AST) was conducted through Kirby-Bauer method by using of standard discs (EUCAST guidelines2017). The following antibiotics were tested:penicillin, ciprofloxacin,moxifloxacin,gentamicine, vancomycine,clindamycine,tetracycline, linezolid,rifampicine.

**Results**

Only three *C. striatum* isolates were obtained from cultures of respiratory samples in 2018,in two man and one women with an age of 77, 76 and 61 years. All of them were ICU patients. They were intubated.They suffered an average of 10 hospital days before obtaining a positive culture. 77 year old men was admitted to our clinic ICU department with complane of right side pneumoniae, hipertension,chronic heart failure. 76 year old women ‘s diagnose was chronic heart failure, acute pneumoniae, hypertension, intracerebral hematoma. 61 year old men had acute respiratory failure and undergone operation of right side thoracotomy. In all patients empirically treatment was initiating with piperaciline/tazobactam, which was change with vancomicin accorging to antibiogram. One of patients died.

**Table: 1**

Patient No	Hospital stay	Age (years)/sex	Underlying illness	Clinical specimens	Days in ICU	Therapy	outcome
1	4	77/M	Chronic heart failure	Bronchial aspirate	4	Piperacilline/tazomactam-Vancomycin	
2	16	76/F	Acute pneumonia,Intracerebral hematoma	Bronchial aspirate	16	Piperacilline/tazomactam-Vancomycin	died
3	11	61/M	Acute respiratory failure	Bronchial aspirate	11	Piperacilline/tazomactam-Vancomycin	

All three *C. striatum* isolates were detected without accompanying microbiota. All isolates showed antibiotic multiresistance, defined as resistance to three or more different antibiotic families.

Antibiotics (Generic)	Interpretation	Disc content µg
Penicillin	R	1
Ciprofloxacin	R	5
Moxiofloxacin	R	5
Gentamicine	R	10
Vancomycine	S	5
Clindamycine	R	2
Tetracycline	R	30
Linezolid	S	10
Rifampicin	R	5

**S - Sensitive R-Resistance**

All the isolates exhibited the same pattern of antibiotic susceptibility, being resistant to penicillin, ciprofloxacin, moxifloxacin,gentamicine,clindamycine,tetracycline,rifampicin and all were exclusively sensitive to vancomycin and linezolid(picture1). *C. striatum* linezolid susceptibility is rarely performed in clinical microbiology laboratory, to our knowledge, linezolid resistance has never been reported for corynebacteria.

**Conclusion**

Appropriate and improved microbiological techniques can reveal the clinical importance of the microorganisms which were previously considered normal flora and not potentially pathogenic. *C. striatum* is an emerging multidrug-resistant, potentially pathogenic microorganism that is able to cause nosocomial infections and respiratory colonization in ICU patients. It can be transmitted between patients, from person to person, and via caretakers; The fact that all the isolates exhibited the same pattern of antibiotic susceptibility suggest that a single strain selected in the ICU was transferred from one patient to another. *C. striatum* infections should be treated according to the results of the antibiogram. Accurate identification of microorganisms is not only important for treatment also very important for epidemiological purposes. Once the organism is identified, universal hygiene measures, both in the environment and by caretakers, should be observed to avoid further outbreak. Vancomycin is the only antibiotic with sure efficacy against *C. striatum*.

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