

Draft Genome Sequence of *Corynebacterium striatum* 1961 BR-RJ/09, a Multidrug-Susceptible Strain Isolated from the Urine of a Hospitalized 37-Year-Old Female Patient

Ana L. Mattos-Guaraldi,^a Luis C. Guimarães,^b Carolina S. Santos,^c Adonney A. O. Veras,^b Adriana R. Carneiro,^b Siomar C. Soares,^d Juliana N. Ramos,^{a,e} Cassius Souza,^a Veronica V. Vieira,^f Raphael Hirata, Jr,^a Vasco Azevedo,^g Luis G. C. Pacheco,^c Artur Silva,^b Rommel T. J. Ramos^b

Faculty of Medical Sciences, Rio de Janeiro State University (UERJ), Rio de Janeiro, RJ, Brazil^a; Institute of Biological Sciences, Federal University of Pará (UFPA), Belém, PA, Brazil^b; Institute of Health Sciences, Federal University of Bahia (UFBA), Salvador, BA, Brazil^c; Department of Immunology, Microbiology and Parasitology, Institute of Biological Sciences and Natural Sciences, Federal University of Triângulo Mineiro, Uberaba, MG, Brazil^d; National Institute for Quality Control in Health, Oswaldo Cruz Foundation (INCQS-Fiocruz), Rio de Janeiro, RJ, Brazil^e; Institute Oswaldo Cruz Foundation, Oswaldo Cruz Foundation (IOC-Fiocruz), Rio de Janeiro, RJ, Brazil^f; Institute of Biological Sciences, Federal University of Minas Gerais (UFMG), Belo Horizonte, MG, Brazil^g

A.S. and R.T.J.R. contributed equally to this work.

***Corynebacterium striatum* commonly colonizes the normal skin and nasopharyngeal tract of humans; however, this potentially pathogenic bacterium has been identified as the causative agent of several nosocomial infections. The current study describes the draft genome of strain 1961 BR-RJ/09, isolated from the urine of a hospitalized patient from Brazil.**

Received 25 June 2015 Accepted 29 June 2015 Published 6 August 2015

Citation Mattos-Guaraldi AL, Guimarães LC, Santos CS, Veras AAO, Carneiro AR, Soares SC, Ramos JN, Souza C, Vieira VV, Hirata R, Jr, Azevedo V, Pacheco LG, Silva A, Ramos RTJ. 2015. Draft genome sequence of *Corynebacterium striatum* 1961 BR-RJ/09, a multidrug-susceptible strain isolated from the urine of a hospitalized 37-year-old female patient. *Genome Announc* 3(4):e00869-15. doi: 10.1128/genomeA.00869-15.

Copyright © 2015 Mattos-Guaraldi et al. This is an open-access article distributed under the terms of the [Creative Commons Attribution 3.0 Unported license](https://creativecommons.org/licenses/by/3.0/).

Address correspondence to Ana L. Mattos-Guaraldi, aguaraldi@gmail.com, or Rommel T. J. Ramos, rommelthiago@gmail.com.

Corynebacterium striatum is a Gram-positive bacterium that belongs to the CMNR group, which includes species of the genera *Corynebacterium*, *Mycobacterium*, *Nocardia*, and *Rhodococcus* (1). Pathogenic clones of *C. striatum*, mostly causing respiratory tract infections, have been identified in several nosocomial outbreaks reported in different countries (2–4). This microorganism has also been reported to be responsible for infections that include endocarditis, meningitis, and septic arthritis (2, 5). Many isolates of this emerging human pathogen already present a multidrug-resistant phenotype.

A recent study in Brazil (6) evaluated the antimicrobial susceptibility patterns of several *C. striatum* isolates recovered from hospitalized patients and, through pulsed-field gel electrophoresis (PFGE) analysis, identified clones associated with outbreaks and with multidrug resistance. In this context, the *C. striatum* 1961 BR-RJ/09 strain (PFGE type III, multidrug susceptible) was isolated from the urine of a hospitalized 37-year-old woman from Rio de Janeiro, Brazil (6). Genomic DNA of this isolate was extracted using the QIAamp DNA minikit (Qiagen) protocol, and genome sequencing was performed using an Ion Torrent Personal Genome Machine (PGM) System with a 318 chip and fragment libraries. The quality of reads was analyzed using the software FastQC (<http://www.bioinformatics.babraham.ac.uk/projects/fastqc>) and the *de novo* assembly was performed using MIRA v4.02 (7) and SPAdes v3.10 (8) assemblers, and curation to reduce the gaps was done with the Lasergene v11 Suite (DNASTar). The assembly produced 28 contigs with a total of 2,611,976 bp and 59.4% G+C content. The contigs were annotated using Rapid Annotations using Subsystems Technology (RAST) (9), which

identified 2,455 protein-encoding genes and 68 RNA genes. Among the annotated protein-encoding genes, a *narKHJI* gene cluster was identified with high similarity to the *Corynebacterium diphtheriae* narKGHJI operon, which is responsible for nitrate reductase (10), suggesting a similar anaerobic growth mechanism. This genome is part of an ongoing study of the comparative genomics, pathogenicity, and vaccine and drug targets of the species.

Nucleotide sequence accession number. This genome has been deposited in GenBank under the accession number [LAYR00000000](https://www.ncbi.nlm.nih.gov/nuclink/LAYR00000000).

ACKNOWLEDGMENTS

This work was supported by grants from the Brazilian Research Funding Agencies CNPq, CAPES (PROCAD 071/2013), and FAPESB (JCB0031/2013).

REFERENCES

- Dorella FA, Pacheco LG, Oliveira SC, Miyoshi A, Azevedo V. 2006. *Corynebacterium pseudotuberculosis*: microbiology, biochemical properties, pathogenesis and molecular studies of virulence. *Vet Res* 37:201–218. <http://dx.doi.org/10.1051/vetres:2005056>.
- Baio PV, Mota HF, Freitas AD, Gomes DL, Ramos JN, Sant'Anna LO, Souza MC, Camello TC, Hirata Junior R, Vieira VV, Mattos-Guaraldi AL. 2013. Clonal multidrug-resistant *Corynebacterium striatum* within a nosocomial environment, Rio de Janeiro, Brazil. *Mem Inst Oswaldo Cruz* 108:23–29.
- Renom F, Gomila M, Garau M, Gallegos MD, Guerrero D, Lalueca J, Soriano JB. 2014. Respiratory infection by *Corynebacterium striatum*: epidemiological and clinical determinants. *New Microbes New Infect* 2:106–114. <http://dx.doi.org/10.1002/nmi2.48>.
- Verroken A, Bauraing C, Deplano A, Bogaerts P, Huang D, Wauters G, Glupczynski Y. 2014. Epidemiological investigation of a nosocomial out-

- break of multidrug-resistant *Corynebacterium striatum* at one Belgian university hospital. *Clin Microbiol Infect* 20:44–50. <http://dx.doi.org/10.1111/1469-0691.12197>.
5. Bernard K. 2012. The genus *Corynebacterium* and other medically relevant coryneform-like bacteria. *J Clin Microbiol* 50:3152–3158. <http://dx.doi.org/10.1128/JCM.00796-12>.
 6. Souza Cd, Faria YV, Sant'Anna LdeO, Viana VG, Seabra SH, Souza MC, Vieira VV, Hirata Júnior R, Moreira LdeO, Mattos-Guaraldi AL. 2015. Biofilm production by multiresistant *Corynebacterium striatum* associated with nosocomial outbreak. *Mem Inst Oswaldo Cruz* 110: 242–248.
 7. Chevreux B, Wetter T, Suhai S. 1999. Genome sequence assembly using trace signals and additional sequence information, p 45–56. *In* Proceedings of the German Conference on Bioinformatics, GCB '99, October 4–6, Hannover, Germany.
 8. Bankevich A, Nurk S, Antipov D, Gurevich AA, Dvorkin M, Kulikov AS, Lesin VM, Nikolenko SI, Pham S, Prjibelski AD, Pyshkin AV, Sirotkin AV, Vyahhi N, Tesler G, Alekseyev MA, Pevzner PA. 2012. SPAdes: A new genome assembly algorithm and its applications to single-cell sequencing. *J Comput Biol* 19:455–477. <http://dx.doi.org/10.1089/cmb.2012.0021>.
 9. Aziz RK, Bartels D, Best AA, DeJongh M, Disz T, Edwards RA, Formsma K, Gerdes S, Glass EM, Kubal M, Meyer F, Olsen GJ, Olson R, Osterman AL, Overbeek RA, McNeil LK, Paarmann D, Paczian T, Parrello B, Pusch GD, Reich C, Stevens R, Vassieva O, Vonstein V, Wilke A, Zagnitko O. 2008. The RAST server: Rapid Annotations using Subsystems Technology. *BMC Genomics* 9:75. <http://dx.doi.org/10.1186/1471-2164-9-75>.
 10. Trost E, Blom J, Soares SdC, Huang I-H, Al-Dilaimi A, Schröder J, Jaenicke S, Dorella FA, Rocha FS, Miyoshi A, Azevedo V, Schneider MP, Silva A, Camello TC, Sabbadini PS, Santos CS, Santos LS, Hirata R, Mattos-Guaraldi AL, Efstratiou A, Schmitt MP, Ton-That H, Tauch A. 2012. Pangenomic study of *Corynebacterium diphtheriae* that provides insights into the genomic diversity of pathogenic isolates from cases of classical diphtheria, endocarditis, and pneumonia. *J Bacteriol* 194: 3199–3215. <http://dx.doi.org/10.1128/JB.00183-12>.