



Genome Sequence of *Acinetobacter baumannii* Strain 10441_14 Belonging to ST451, Isolated from India

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Acinetobacter baumannii resistance to carbapenems is of global concern. Here, we report the 3.9 Mb draft genome of a cerebrospinal fluid isolate of *A. baumannii* strain 10441_14 which is carbapenem resistant and belongs to ST451. This genome will further help in the understanding of the drug resistance mechanism, epidemiology, and pathology of this bacterium.

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A cinetobacter baumannii is one of the leading causes of nosocomial infections worldwide (1, 2). Multidrug resistance is a major public health concern, and is even more so in *A. baumannii* as it has the ability to develop resistance against almost all available antimicrobials (3). Carbapenems are widely being used as a treatment option for infections of *A. baumannii*. However, carbapenem-resistant *A. baumannii* has emerged as a serious challenge to health care systems globally as few treatment options are available (4).

Here, we present the genome sequence of the *A. baumannii* strain 10441_14, isolated from the cerebrospinal fluid of patient admitted into the neurosurgery ward of the Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, a tertiary care hospital in northern part of India. Multilocus sequence typing by scheme defined by Bartual et al. (5) shows that isolate 10441_14 belongs to ST451. ST451 belongs to clonal complex 92 (CC92), which corresponds to the international clone lineage II that is commonly observed among carbapenem-resistant *A. baumannii* in hospitals worldwide (6, 7).

For whole-genome sequencing, genomic DNA was isolated using a ZR Fungal/Bacterial DNA miniprep Kit (Zymo Research). The quality of DNA was assessed using NanoDrop (Thermo Scientific, Wilmington, MA, USA) and agarose gel electrophoresis and concentration were estimated using a Qubit 2.0 Fluorometer (Life Technologies). An Illumina sequencing library of genomic DNA was prepared using a Nextera XT sample preparation kit (Illumina, Inc., San Diego, CA, USA) with dual indexing adapters. The Illumina sequencing library was sequenced on an in-house Illumina Miseq (Illumina, Inc., San Diego, CA, USA) platform using the 2 \times 250 bp paired-end configuration. Sequencing of the DNA generated 2,521,072 reads, accounting for 365,553,621 bp. Raw reads were assembled using CLC Genomics Workbench v7.5 (CLC bio, Aarhus, Denmark) into 136 contigs with a genome size of 3,909,844 bp and average coverage 92.78×. N_{50} for the assembly is 61,813 bp and the genome has an average G+C content of 38.93%. The genome was annotated using the NCBI Prokaryotic

Genome Annotation Pipeline (http://www.ncbi.nlm.nih.gov/genome/annotation_prok/), which predicted 3,775 genes, 63 tRNAs, and 3 rRNAs.

A complete 16s rRNA gene sequence was retrieved from the genome by using RNAmmer v1.2 (8) and the average nucleotide identity (ANI) was calculated using Jspecies v1.2.1 (9). The *A. baumannii* strain 10441_14 has 16s rRNA identities of 99.97% and 97.7% ANI with the type strain *A. baumannii* ATCC 19606^T.

The genome information of *A. baumannii* 10441_14 will accelerate our understanding of the whole-genome-based phylogenetic and the comparative analysis of this globally important nosocomial pathogen.

Nucleotide sequence accession numbers. The draft genome sequence of *Acinetobacter baumannii* 10441_14 is available in DDBJ/EMBL/GenBank under accession no. LGYW00000000. The version described in this paper is the first version, LGYW01000000.

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REFERENCES

- Peleg AY, Seifert H, Paterson DL. 2008. Acinetobacter baumannii: emergence of a successful pathogen. Clin Microbiol Rev 21:538–582. http:// dx.doi.org/10.1128/CMR.00058-07.
- Dijkshoorn L, Nemec A, Seifert H. 2007. An increasing threat in hospitals: multidrug-resistant *Acinetobacter baumannii*. Nat Rev Microbiol 5:939–951. http://dx.doi.org/10.1038/nrmicro1789.
- Perez F, Hujer AM, Hujer KM, Decker BK, Rather PN, Bonomo RA. 2007. Global challenge of multidrug-resistant *Acinetobacter baumannii*. Antimicrob Agents Chemother 51:3471–3484. http://dx.doi.org/10.1128/ AAC.01464-06.

- Garnacho-Montero J, Amaya-Villar R, Ferrándiz-Millón C, Díaz-Martín A, López-Sánchez JM, Gutiérrez-Pizarraya A. 2015. Optimum treatment strategies for carbapenem-resistant *Acinetobacter baumannii* bacteremia. Expert Rev Anti Infect Ther 13:769–777. http://dx.doi.org/10.1586/ 14787210.2015.1032254.
- Bartual SG, Seifert H, Hippler C, Luzon MAD, Wisplinghoff H, Rodríguez-Valera F. 2005. Development of a multilocus sequence typing scheme for characterization of clinical isolates of *Acinetobacter baumannii*. J Clin Microbiol 43:4382–4390. http://dx.doi.org/10.1128/JCM.43.9.4382 -4390.2005.
- 6. Zarrilli R, Pournaras S, Giannouli M, Tsakris A. 2013. Global evolution of multidrug-resistant *Acinetobacter baumannii* clonal lineages. Int

J Antimicrob Agents 41:11–19. http://dx.doi.org/10.1016/ j.ijantimicag.2012.09.008.

- Qureshi ZA, Hittle LE, O'Hara JA, Rivera JI, Syed A, Shields RK, Pasculle AW, Ernst RK, Doi Y. 2015. Colistin-resistant *Acinetobacter baumannii*: beyond carbapenem resistance. Clin Infect Dis 60:1295–1303. http://dx.doi.org/10.1093/cid/civ048.
- Lagesen K, Hallin P, Rødland E, Stærfeldt H, Rognes T, Ussery D. 2007. RNammer: consistent annotation of rRNA genes in genomic sequences. Nucleic Acids Res 35:3100–3108.
- Richter M, Rosselló-Móra R. 2009. Shifting the genomic gold standard for the prokaryotic species definition. Proc Nalt Acad Sci USA 106: 19126–19131. http://dx.doi.org/10.1073/pnas.0906412106.