



Genome Sequence of the *Listeria monocytogenes* Food Isolate HPB913, Collected in Canada in 1993

Arthur W. Pightling,^{a*} Hugh Rand,^b Errol Strain,^b Franco Pagotto^a

Listeriosis Reference Centre, Microbiology Research Division, Bureau of Microbial Hazards, Food Directorate, Health Canada, Ottawa, Ontario, Canada^a; Center for Food Safety and Applied Nutrition, Biostatistics and Bioinformatics Branch, Office of Analytics and Outreach, U.S. Food and Drug Administration, College Park, Maryland, USA^b

* Present address: Arthur W. Pightling, Biostatistics and Bioinformatics Branch, Center for Food Safety and Applied Nutrition, Office of Analytics and Outreach, U.S. Food and Drug Administration, College Park, Maryland, USA.

Listeria monocytogenes is a pathogenic bacterium of importance to public health and food safety agencies. We present the genome sequence of the serotype 1/2a *L. monocytogenes* food isolate HPB913, which was collected in Canada in 1993 as part of an investigation into a sporadic case of foodborne illness.

Received 5 July 2016 Accepted 22 July 2016 Published 15 September 2016

Citation Pightling AW, Rand H, Strain E, Pagotto F. 2016. Genome sequence of the *Listeria monocytogenes* food isolate HPB913, collected in Canada in 1993. Genome Announc 4(5):e00911-16.doi:10.1128/genomeA.00911-16.

Copyright © 2016 Pightling et al. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International license.

Address correspondence to Franco Pagotto, Franco.Pagotto@hc-sc.gc.ca

isteria monocytogenes is a Gram-positive, pathogenic bacterium that is important to public health and food safety (1). L. monocytogenes can cause listeriosis when individuals with compromised immunities consume contaminated food (2, 3). Agencies tasked with securing the food supply are employing wholegenome sequencing for surveillance of L. monocytogenes in food and food processing facilities. Whole-genome sequence data have also proven useful for traceback investigations that seek to identify sources of sporadic and outbreak cases of listeriosis. In addition, researchers are utilizing comprehensive genome sequence analyses to investigate virulence factors that may influence the severity of listeriosis symptoms (4). Of particular interest are the serotype 1/2a strains of L. monocytogenes, which are commonly associated with listeriosis (5). We present the genome sequence of the serotype 1/2a L. monocytogenes food isolate HPB913, which was collected in Canada in 1993 as part of an investigation into a sporadic case of foodborne illness (National Center for Biotechnology Information [NCBI] BioSample no. SAMN03160826).

We generated Illumina sequence reads and submitted them to the NCBI Sequence Read Archive under accession number SRR1640166. We also assembled the reads with SPAdes v3.7.0 (6), using the BayesHammer error correction tool (7). This assembly yielded 82 contiguous sequences with 204.72-fold coverage. We removed one contiguous sequence from the final submission, as it is a run of adenine nucleotides. The submitted sequences have a combined length of 2,998,209 nucleotides and an N_{50} of 588,192 nucleotides. The largest sequence is 949,618 nucleotides in length. The GC content of all submitted sequences is 37.88 percent. The contiguous sequences were annotated with the NCBI Prokaryotic Genome Annotation Pipeline v3.3 (8). A total of 3,075 features were identified: 2,929 genes, 78 pseudogenes, one clustered regularly interspaced short palindromic repeat (CRISPR) array, seven rRNAs, 56 tRNAs, and four ncRNAs.

Pulsed-field gel electrophoresis indicates an AscI restriction digest pattern of LMACI.0001 and an ApaI pattern of

LMAAI.0001. The ribotype pattern is 21-S-4 or DUP-1045. We also performed *in silico* multilocus sequence typing (9, 10), using the database provided by Institut Pasteur (http://bigsdb.pasteur.fr /listeria/listeria.html), and predicted the sequence type to be 120 (abcZ - 5, bglA - 6, cat - 2, dapE - 29, dat - 5, ldh - 3, lhkA - 1) (11).

Accession number(s). This whole-genome shotgun project was deposited at DDBJ/EMGL/GenBank under the accession no. LZNK00000000. The version described in this paper is the first version, LZNK01000000.

FUNDING INFORMATION

This work, including the efforts of Franco Pagotto, was funded by Genomics R&D Initiative (4500834).

REFERENCES

- 1. Farber JM, Losos JZ. 1988. *Listeria monocytogenes*: a foodborne pathogen. CMAJ 138:413–418.
- Farber JM, Peterkin PI. 1991. *Listeria monocytogenes*, a foodborne pathogen. Microbiol Rev 55:476–511.
- Schlech WF III, Lavigne PM, Bortolussi RA, Allen AC, Haldane EV, Wort AJ, Hightower AW, Johnson SE, King SH, Nicholls ES, Broome CV. 1983. Epidemic listeriosis—evidence for transmission by food. N Engl J Med 308:203-206. http://dx.doi.org/10.1056/ NEJM198301273080407.
- Maury MM, Tsai YH, Charlier C, Touchon M, Chenal-Francisque V, Leclercq A, Criscuolo A, Gaultier C, Roussel S, Brisabois A, Disson O, Rocha EP, Brisse S, Lecuit M. 2016. Uncovering *Listeria monocytogenes* hypervirulence by harnessing its biodiversity. Nat Genet 48:308–313. http://dx.doi.org/10.1038/ng.3501.
- Kathariou S. 2002. *Listeria monocytogenes* virulence and pathogenicity, a food safety perspective. J Food Prot 65:1811–1829.
- 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 singlecell sequencing. J Comput Biol 19:455–477. http://dx.doi.org/10.1089/ cmb.2012.0021.
- 7. Nikolenko SI, Korobeynikov AI, Alekseyev MA. 2013. BayesHammer:

Bayesian clustering for error correction in single-cell sequencing. BMC Genomics 14(Suppl 1):S7. http://dx.doi.org/10.1186/1471-2164-14 -S1-S7.

- Angiuoli SV, Gussman A, Klimke W, Cochrane G, Field D, Garrity G, Kodira CD, Kyrpides N, Madupu R, Markowitz V, Tatusova T, Thomson N, White O. 2008. Toward an online repository of standard operating procedures (SOPs) for (meta)genomic annotation. OMICS 12:137–141. http://dx.doi.org/10.1089/omi.2008.0017.
- 9. Maiden MC, Bygraves JA, Feil E, Morelli G, Russell JE, Urwin R, Zvhang Q, Zhou J, Zurth K, Caugant DA, Feavers IM, Achtman M, Spratt BG. 1998. Multilocus sequence typing: a portable approach to the

identification of clones within populations of pathogenic microorganisms. Proc Natl Acad Sci U S A **95:**3140–3145. http://dx.doi.org/10.1073/ pnas.95.6.3140.

- Salcedo C, Arreaza L, Alcalá B, de la Fuente L, Vázquez JA. 2003. Development of a multilocus sequence typing method for analysis of *Listeria monocytogenes* clones. J Clin Microbiol 41:757–762. http://dx.doi.org/10.1128/JCM.41.2.757-762.2003.
- 11. Pightling AW, Petronella N, Pagotto F. 2015. The *Listeria monocytogenes* Core-genome sequence typer (LmCGST): a bioinformatic pipeline for molecular characterization with next-generation sequence data. BMC Microbiol 15:224. http://dx.doi.org/10.1186/s12866-015-0526-1.