

University of Groningen

## Draft Genome Sequences of Four *Bacillus thermoamylovorans* Strains Isolated from Milk and Acacia Gum, a Food Ingredient

Krawczyk, Antonina O; Berendsen, Erwin M; Eijlander, Robyn T; de Jong, Anne; Wells-Bennik, Marjon H J; Kuipers, Oscar P

*Published in:*  
Genome Announcements

*DOI:*  
[10.1128/genomeA.00165-15](https://doi.org/10.1128/genomeA.00165-15)

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2015

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Krawczyk, A. O., Berendsen, E. M., Eijlander, R. T., de Jong, A., Wells-Bennik, M. H. J., & Kuipers, O. P. (2015). Draft Genome Sequences of Four *Bacillus thermoamylovorans* Strains Isolated from Milk and Acacia Gum, a Food Ingredient. *Genome Announcements*, 3(2), 1-2. [e00165-15]. <https://doi.org/10.1128/genomeA.00165-15>

### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

*Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.*

# Draft Genome Sequences of Four *Bacillus thermoamylovorans* Strains Isolated from Milk and Acacia Gum, a Food Ingredient

Antonina O. Krawczyk,<sup>a,c</sup> Erwin M. Berendsen,<sup>a,b,c</sup> Robyn T. Eijlander,<sup>a,c</sup> Anne de Jong,<sup>a,c</sup> Marjon H. J. Wells-Bennik,<sup>b,c</sup> Oscar P. Kuipers<sup>a,c</sup>

Molecular Genetics, University of Groningen, Groningen, the Netherlands<sup>a</sup>; NIZO food research, Ede, the Netherlands<sup>b</sup>; Top Institute Food and Nutrition (TIFN), Wageningen, the Netherlands<sup>c</sup>

**The thermophilic bacterium *Bacillus thermoamylovorans* produces highly heat-resistant spores that can contaminate food products, leading to their spoilage. Here, we present the whole-genome sequences of four *B. thermoamylovorans* strains, isolated from milk and acacia gum.**

Received 9 February 2015 Accepted 13 February 2015 Published 26 March 2015

**Citation** Krawczyk AO, Berendsen EM, Eijlander RT, de Jong A, Wells-Bennik MHJ, Kuipers OP. 2015. Draft genome sequences of four *Bacillus thermoamylovorans* strains isolated from milk and acacia gum, a food ingredient. *Genome Announc* 3(2):e00165-15. doi:10.1128/genomeA.00165-15.

**Copyright** © 2015 Krawczyk 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/4.0/).

Address correspondence to Oscar P. Kuipers, o.p.kuipers@rug.nl.

*Bacillus thermoamylovorans* is a facultative thermophilic, facultatively anaerobic, amylolytic bacterium that was isolated from palm wine and characterized first in 1995 (1). The species is being studied because of its ability to produce lactic acid (2) and a thermostable lipase (3) as well as to degrade sewage sludge (4) and plant biomass (5). The bacterium was also found to contaminate gelatin extracts (6) and has been isolated on dairy farms (7, 8). *B. thermoamylovorans* forms spores (7) that are highly heat resistant; these can survive preservation treatments that are commonly used by the food industry, and upon germination and outgrowth, this can lead to food spoilage (8, 9).

Four strains of *B. thermoamylovorans*, isolated from food-stuffs in which spoilage occurred, were subjected to next generation whole-genome sequencing. The isolates were cultured overnight in brain heart infusion (BHI) broth (Difco) supplemented with vitamin B<sub>12</sub> at 50°C with shaking (220 rpm). After being harvested, the cell pellets were resuspended in SET buffer (75 mM NaCl, 25 mM EDTA, 20 mM Tris-HCl, pH 7.5). The cell suspensions were treated with lysozyme (2 mg/ml) and RNase (0.4 mg/ml) at 37°C for 30 min. Subsequently, the samples were incubated with proteinase K (0.5 mg/ml) and SDS (final concentration, 1%) at 55°C for 60 min. Genomic DNA was isolated from lysed cells by phenol-chloroform extraction and precipitation with isopropanol and sodium acetate (300 mM). Precipitated DNA was dissolved in TE buffer.

TABLE 1 *B. thermoamylovorans* sequenced strains and their sources

Strain no. <sup>a</sup>	Source	Accession no.
B4064	Acacia gum	JXLR00000000
B4065	Acacia gum	JXLS00000000
B4166	Milk	JXLT00000000
B4167	Milk	JXLU00000000

<sup>a</sup> Numbers refer to strain collections at NIZO food research and University of Groningen (Molecular Genetics).

**Nucleotide sequence accession numbers.** The genome sequences of the four *Bacillus thermoamylovorans* strains have been deposited as whole-genome shotgun projects at DDBJ/EMBL/GenBank under the accession numbers listed in Table 1.

## ACKNOWLEDGMENTS

We thank the NGS sequence facility of the University Medical Center of Groningen (UMCG) for performing the sequencing of the strains.

We thank Top Institute for Food and Nutrition for contributing to the funding of the project in theme 3: Safety and Preservation.

## REFERENCES

1. Combet-Blanc Y, Ollivier B, Streicher C, Patel BK, Dwivedi PP, Pot B, Prensier G, Garcia JL. 1995. *Bacillus thermoamylovorans* sp. nov., a moderately thermophilic and amylolytic bacterium. *Int J Syst Bacteriol* 45:9–16. <http://dx.doi.org/10.1099/00207713-45-1-9>.
2. Combet-Blanc Y, Dieng MC, Kergoat PY. 1999. Effect of organic complex compounds on *Bacillus thermoamylovorans* growth and glucose fermentation. *Appl Environ Microbiol* 65:4582–4585.
3. Deive FJ, Álvarez MS, Morán P, Sanromán MA, Longo MA. 2012. A process for extracellular thermostable lipase production by a novel *Bacillus thermoamylovorans* strain. *Bioprocess Biosyst Eng* 35:931–941. <http://dx.doi.org/10.1007/s00449-011-0678-9>.
4. Ivanov VN, Wang JY, Stabnikova OV, Tay ST, Tay JH. 2004. Microbiological monitoring in the biodegradation of sewage sludge and food waste. *J Appl Microbiol* 96:641–647. <http://dx.doi.org/10.1111/j.1365-2672.2004.02182.x>.
5. Koeck DE, Wibberg D, Maus I, Winkler A, Albersmeier A, Zverlov VV, Pühler A, Schwarz WH, Liebl W, Schlüter A. 2014. First draft genome sequence of the amylolytic *Bacillus thermoamylovorans* wild-type strain 1A1 isolated from a thermophilic biogas plant. *J Biotechnol* 192:154–155. <http://dx.doi.org/10.1016/j.jbiotec.2014.09.017>.
6. De Clerck E, Vanhoutte T, Hebb T, Geerinck J, Devos J, De Vos P. 2004. Isolation, characterization, and identification of bacterial contaminants in semifinal gelatin extracts. *Appl Environ Microbiol* 70:3664–3672. <http://dx.doi.org/10.1128/AEM.70.6.3664-3672.2004>.

7. Coorevits A, Logan NA, Dinsdale AE, Halket G, Scheldeman P, Heyndrickx M, Schumann P, Van Landschoot A, De Vos P. 2011. *Bacillus thermolactis* sp. nov., isolated from dairy farms, and emended description of *Bacillus thermoamylovorans*. *Int J Syst Evol Microbiol* 61:1954–1961. <http://dx.doi.org/10.1099/ijs.0.024240-0>.
8. Scheldeman P, Pil A, Herman L, De Vos P, Heyndrickx M. 2005. Incidence and diversity of potentially highly heat-resistant spores isolated at dairy farms. *Appl Environ Microbiol* 71:1480–1494. <http://dx.doi.org/10.1128/AEM.71.3.1480-1494.2005>.
9. Scheldeman P, Herman L, Foster S, Heyndrickx M. 2006. *Bacillus sporothermodurans* and other highly heat-resistant spore formers in milk. *J Appl Microbiol* 101:542–555. <http://dx.doi.org/10.1111/j.1365-2672.2006.02964.x>.