

Draft Genome Sequences of *Geobacillus stearothermophilus* Strains 22 and 53, Isolated from the Garga Hot Spring in the Barguzin River Valley of the Russian Federation

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***Geobacillus stearothermophilus* strains 22 and 53 were isolated from sediment samples isolated from the Garga hot spring (72°C) located in the valley of the river Barguzin (the Baikal region, Russian Federation) (54°19'3.72"N, 110°59'38.4"E).**

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In 2001, T. Nazina et al. described the genus *Geobacillus* and transferred six existing *Bacillus* species into it (*Geobacillus stearothermophilus*, *Geobacillus thermocatenulatus*, *Geobacillus thermoleovorans*, *Geobacillus kaustophilus*, *Geobacillus thermoglucosidarius*, and *Geobacillus thermodenitrificans*). They also proposed two new species for the genus: *Geobacillus subterraneus* and *Geobacillus uzunensis* (1). Subsequently, other new species were added to the genus *Geobacillus*: *Geobacillus toebii* (2), *Geobacillus debilis* (3), *Geobacillus lithuanicus* (4), and *Geobacillus gargensis* (5). The phylogeny of several other species is still uncertain (6).

Geobacillus stearothermophilus strains 22 and 53 were isolated from sediment samples isolated from the Garga hot spring (72°C) located in the valley of the river Barguzin (the Baikal region, Russian Federation) (54°19'3.72"N, 110°59'38.4"E).

For DNA isolation, bacterial culture was cultivated in a liquid medium containing 1% trypton and 0.5% yeast extract, and 8 mL of cell culture were pelleted by centrifugation and resuspended in 75 μ L of H₂O by intense pipetting. DNA preparations for genome sequencing were made using the GeneJET DNA purification kit (Fermentas) according to the manufacturer's instructions. The Nextera DNA sample prep kit (Illumina) was used to create libraries for genome sequencing. Genomic DNA was sequenced using the MiSeq Reagent kit version 2 (Illumina) in the Laboratory of Evolutionary Genomics of the Faculty of Bioengineering and Bioinformatics, Moscow State University.

De novo assembly of short reads into contigs was performed using SPAdes v3.1.0. Contigs shorter than 1,000 bp were deleted. Open reading frame (ORF) prediction and automatic annotation was performed using NCBI PGAAP (http://www.ncbi.nlm.nih.gov/genome/annotation_prok). For strain 22, a total of 199 contigs yielded a genome sequence 3.27 Mb long, and the G+C content was 52.6%. The draft genome sequence contained 3,121 genes, 2,992 coding sequences (CDS), 19 rRNAs (5S, 16S, 23S), 62 tRNAs, and one noncoding RNA (ncRNA). For strain 53, a total of 178 contigs yielded a genome sequence 3.27 Mb long, and the G+C content was 52.6%. The draft genome sequence contained

3,196 genes, 3,042 CDS, 25 rRNAs (5S, 16S, 23S), 79 tRNAs, and one ncRNA.

Phylogenetic analysis was performed using 16S rRNA sequences with the UPGMA algorithm implemented in MEGA v6. 16S rRNA sequences of *Geobacillus* type strains were found using the StrainInfo (<http://www.straininfo.net>) and GenBank (<http://www.ncbi.nlm.nih.gov/nucleotide>) databases. According to phylogenetic analysis, strains 22 and 53 can be assigned to species *Geobacillus stearothermophilus*.

Nucleotide sequence accession numbers. The draft genome sequence for *Geobacillus stearothermophilus* strain 22 has been deposited at DDBJ/EMBL/Genbank under the accession number JQCS00000000. The 199 contigs have been deposited under the accession numbers JQCS01000001 to JQCS01000199. The draft genome sequence for *Geobacillus stearothermophilus* strain 53 has been deposited in DDBJ/EMBL/Genbank under the accession number JPYV00000000. The 178 contigs have been deposited under the accession numbers JPYV01000001 to JPYV01000178.

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REFERENCES

- Nazina TN, Tourova TP, Poltarus AB, Novikova EV, Grigoryan AA, Ivanova AE, Lysenko AM, Petrunyaka VV, Osipov GA, Belyaev SS, Ivanov MV. 2001. Taxonomic study of aerobic thermophilic bacilli: descriptions of *Geobacillus subterraneus* gen. nov., sp. nov. and *Geobacillus uzunensis* sp. nov. from petroleum reservoirs and transfer of *Bacillus stearothermophilus*, *Bacillus thermocatenulatus*, *Bacillus thermoleovorans*, *Bacillus kaustophilus*, *Bacillus thermodenitrificans* to *Geobacillus* as the new combinations *G. stearothermophilus*, *G. th.* *Int. J. Syst. Evol. Microbiol.* 51: 433–446.
- Sung MH, Kim H, Bae JW, Rhee SK, Jeon CO, Kim K, Kim JJ, Hong SP, Lee SG, Yoon JH, Park YH, Baek DH. 2002. *Geobacillus toebii* sp. nov., a novel thermophilic bacterium isolated from hay compost. *Int. J. Syst. Evol. Microbiol.* 52:2251–2255.
- Banat IM, Marchant R, Rahman TJ. 2004. *Geobacillus debilis* sp. nov., a novel obligately thermophilic bacterium isolated from a cool soil environment, and reassignment of *Bacillus pallidus* to *Geobacillus pallidus* comb.

- nov. Int. J. Syst. Evol. Microbiol. 54:2197–2201. <http://dx.doi.org/10.1099/ijs.0.63231-0>.
4. Kuisiene N, Raugalis J, Chitavichius D. 2004. *Geobacillus lituanicus* sp. nov. Int. J. Syst. Evol. Microbiol. 54:1991–1995. <http://dx.doi.org/10.1099/ijs.0.02976-0>.
 5. Nazina TN, Lebedeva EV, Poltarauš AB, Tourova TP, Grigoryan AA, Sokolova DSh, Lysenko AM, Osipov GA. 2004. *Geobacillus gargensis* sp. nov., a novel thermophile from a hot spring, and the reclassification of *Bacillus vulcani* as *Geobacillus vulcani* comb. nov. Int. J. Syst. Evol. Microbiol. 54:2019–2024. <http://dx.doi.org/10.1099/ijs.0.02932-0>.
 6. Coorevits A, Dinsdale AE, Halket G, Lebbe L, De Vos P, Van Landschoot A, Logan NA. 2012. Taxonomic revision of the genus *Geobacillus*: emendation of *Geobacillus*, *G. stearothermophilus*, *G. jurassicus*, *G. toebii*, *G. thermodenitrificans* and *G. thermoglucosidans* (nom. corrig., formerly ‘thermoglucosidasius’); transfer of *Bacillus thermantarcticus* to the genus as *G. thermantarcticus* comb. nov.; proposal of *Caldibacillus debilis* gen. nov., comb. nov.; transfer of *G. tepidamans* to *Anoxybacillus* as *A. tepidamans* comb. nov.; and proposal of *Anoxybacillus caldiproteolyticus* sp. nov. Int. J. Syst. Evol. Microbiol. 62:1470–1485. <http://dx.doi.org/10.1099/ijs.0.030346-0>.