

Nucleotide sequences of 16S rRNA encoding genes from halophilic archaea *Halococcus morrhuae* NRC16008 and *Haloferax mediterranei* ATCC33500

Masahiro Kamekura and Yukio Seno

Noda Institute for Scientific Research, 399 Noda, Noda-shi, Chiba-ken, 278 Japan

Submitted May 19, 1992

DDBJ accession nos D11106 and D11107

The authors have reported that several strains of halophilic archaea, including *Hc.morrhuae* NRC16008 (NCMB746) and *Hf.mediterranei* R4 ATCC33500, produced extracellular halophilic proteases on agar plates containing 3 to 4 M NaCl (1). Later investigation showed that ten more unidentified halophilic archaeal strains recently isolated from saline samples exhibited extracellular protease activities. Since several complete and partial sequences of 16S rRNA encoding genes have been reported from halophilic archaea, the authors sequenced the genes of the above mentioned two species to enrich the 16S rRNA data base for the future use for the identification of the halophilic archaeal isolates.

Four primers were synthesized, 20 nucleotides long each, designed from very conserved regions of 16S rRNA of halophilic archaea (sense, 1–20 and 688–707; antisense, 720–739 and 1453–1472, numbering according to ref.2 for *Halobacterium cutirubrum* 16S rRNA), and used in PCR for the amplification of rDNA, approximately 740 and 785 bp. The partially overlapping rDNAs were sequenced by the dideoxy method with dye-labelled M13(–21) universal-primers using ABI 373A DNA sequencer. The result is shown in Figure 1 in an aligned form with a total of 164 substitutions including 5Ns. On the other hand *Hc.morrhuae* NRC 16008 16S rRNA differed from that of *Hc.morrhuae* ATCC17082 (3) in only 12 bases except for 5Ns, while there were 24 substitutions between *Hf.mediterranei* and *Hf.volcanii* (4).

ACKNOWLEDGEMENT

This work was supported by a grant-in-aid for cooperative research from the Ministry of Education, Science and Culture, Japan.

REFERENCES

1. Kamekura, M. and Seno, Y. (1990) *Biochem. Cell Biol.* **68**, 352–359.
2. Hui, I. and Dennis, P.P. (1985) *J. Biol. Chem.* **260**, 899–906.
3. Leffers, H. and Garrett, R.A. (1984) *EMBO J.* **3**, 1613–1619.
4. Gupta, R., Lanter, J.M. and Woese, C.R. (1983) *Science* **221**, 656–659.

```

Hmo ATTCCGGTGTACTCCGGGANNATTGCTACGCGGGTCCGATACGCC -50
Hfme ATTCCGGTGTACTCCGGGAGGTCATTGCTATTGGGGTCGATTAAGCC -50
ATGCTAGTTTACGGGTTTAGACCCGTAGCAATAGCTCCGTAAACAGTG -100
ATGCTAGTTTACGGGTTACAGGTTACACTCGTGGCGAAAGCTCAATACAGTG -100
GCCAAACTACCCTCGGACCGGATACCTCCGGGAAATGAGGTCATACC -150
GCCAAACTACCCTACAGAGACGATAAACCCTCGGAAATCGGGCTAATC -150
CAGATACTGCTTTTATGTAATACNDGAAGTCGGAACCGGCTCCGCCGC -200
TTCCATACGGGAGTCATGCTTGAATGCCGATCCGCCAAAGCTCCGCCGC -200
CGGAGCGTGACTTCCGCCGATTAAGTGAAGCGGTGGGTAACGCCAC -250
TGTAGGATGTGCTCCGCCGATTAAGTGAAGCGGTGGGTAACGCCAC -250
CGTCCGATAACCGTACCGGTTGTGAGAACAGAACCCGGAGCGGAT -300
GTCCTCAAATTCGATACCGGTTGTGAGAACAGAACCCGGAGCGGAT -300
CTGAGACAGATACCGGCCCTACCGGCGCAGCAGCGGAGAACCTTTA -350
CTGAGACAGATTCGCGCCCTACCGGCGCAGCAGCGGAGAACCTTTA -350
CAGTACCGGAGTGCATAAAGGAGCCCGGATCGAGGAGATACAGTC -400
CACTGCACCGGAGTGCATAAAGGAGCCCGGATCGAGGAGATACAGTC -400
CTGCGTTTGTGACCGTAAAGGAGCTCTGAGATAAGAGCTGGGAAAGC -450
CTGCGTTTGTGACCGTAAAGGAGCTCTGAGATAAGAGCTGGGAAAGC -450
CGGTCCAGCCCGCGGTAATACCGGAGCTCGAGTGAAGCCACTAT -500
CGGTCCAGCCCGCGGTAATACCGGAGCTCGAGTGAAGCCACTAT -500
ATTGGGCTAAAGGCTCCGTACCGGCGCATGAGGTTATCGGAAATCC -550
ATTGGGCTAAAGGCTCCGTACCGGCGCATGAGGTTATCGGAAATCC -550
ACCCGCTCAAGCGGTGACGCTCCCGGCGAAGCAGTCCGCTTGGGCGG -600
GCCAGCTCAACTGGCGGCTCCCGTGAAGACACATGCTTGGGCGG -600
GAGACGAGAGGATACGTCGCGGATAGGATGAAATCTGTATATCTGGA -650
AAGCTCGAAGGATACGTCGCGGATAGGATGAAATCTGTATATCTGGA -650
CGGACCCCGGTGGGAAAGCGCTCTGGAAGACGAGCCGAGCGGAGG -700
CGGACCCCGGTGGGAAAGCGCTCTGGAAGACGAGCCGAGCGGAGG -700
GAGCAAGGCTTGGGTCGGAAGCGGATTAAGTACCGGCTAGTCCAACT -750
GAGCAAGGCTTGGGTCGGAAGCGGATTAAGTACCGGCTAGTCCAACT -750
GTAAACGATGCTGCTAGGTTGGGCTTGGGCTACGAGCAGGCTGTGCG -800
GTAAACGATGCTGCTAGGTTGGGCTTGGGCTACGAGCAGGCTGTGCG -800
GTAAAGGAGCGGAGGAGCGGAGCGGCTTGGGATAGTCCGAAAGATGA -850
GTAAAGGAGCGGAGGAGCGGAGCGGCTTGGGATAGTCCGAAAGATGA -850
AACTTAAAGGAAATGGCGGAGGAGCTACACCGGAGGAGGCTCGGCT -900
AACTTAAAGGAAATGGCGGAGGAGCTACACCGGAGGAGGCTCGGCT -900
TAATGGACTCAAGCGGAGGAGCTACACCGGAGGAGGAGGAGGAGGAG -950
TAATGGACTCAAGCGGAGGAGCTACACCGGAGGAGGAGGAGGAGGAG -950
CAATGAGTGTGATGGGCTACTT-GAGCGACT-GAGAGGAGGAGGAGGAG -998
CGTCAAGTTGATGACCTTACCAGGAGGAGGAGGAGGAGGAGGAGGAG -998
CGCCGTACGCTGATACCGTGAAGCGGCTGTTAAGTCAAGCAAGGAGGA -1048
CGCCGTCAGCTGATACCGTGAAGCGGCTGTTAAGTCAAGCAAGGAGGA -1048
GACCCGCTGCTTAAATGGCAGCAAGGAGGAGGAGGAGGAGGAGGAGGAG -1098
GACCCGCTGCTTAAATGGCAGCAAGGAGGAGGAGGAGGAGGAGGAGGAG -1098
GAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1148
GAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1148
AGAAAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1198
AGTATGCCCGAATGGCGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1198
AGTATGCCCGAATGGCGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1198
GTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1248
ATGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1248
TTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1298
TTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1298
TTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1348
TTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1348
TTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1398
TTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1398
TTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1448
TTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1448
TTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1498
TTGGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAG -1498

```

Figure 1. Sequences of 16S rRNA encoding genes from *Halococcus morrhuae* NRC 16008 (National Research Council Canada) (Hmo) and *Haloferax mediterranei* ATCC33500 (Hfme). N, ambiguous bases; dashes, gaps required to maintain the alignment.