

# In Silico Analysis of the Enzymes Involved in Haloarchaeal Denitrification

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## Supplementary Material

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HmNarG 1 MSRNDAQLDGETTA-----E-SPPDDQANDAPEVGD-----PPGDPVDADSGVSRRTFLEGIGVASLLGIGTSAA-S
HmaNarG 1 -----MSRNDLTDD-EGDSAGISRRDFVRGLGAASLLGAT----GL
HlNarG 1 MSD-----SHDF-HDDSESTTGGIDAARRDFLKGIGLGAVLGLGGVSA-
HsNarG 1 MS-----DNQSNVDVENADESNSGVRRGFLKGLGLTTALGLTGTIG-
HpNarG 1 MTRNDSRDRTTDA--S-----T-DERTDGGAGGPDVGD-----PPGNPSSA--RLSRRGFLEGVGLASILGIGGASA-T
HaNarG 1 MTD-----RHEATE---RDESNLLSGVDRRGFLKGIGVAGLLGASGTGLA-
HmuNarG 1 -----MSEHDIDDRWMDSSGITRRDFVRGLGAASIVGAT----GL
HuNarG 1 -----MSDPTQSDSDTDGVSRRDFLLGAGAAGVVGATGLTVA-
HrNarG 1 MSE-----RHDTT--DESDGIEAARRDFLKGGLGAATAVGVTFGLG-
HliNarG 1 MTD-----TTDASDESTRDGSGAARRDFLKGVGAAAAVGATGLGSA-
HcNarG 1 MTDDHSTDLDTPPTDSTDSEATSDTDVSTDGVPASGASGGSSELRSDDGGAGVDVSRDFLKGVGAAAGVAGAGASGTGL
SsNarG 1 MSE-----RENENYRDSTSASATGDVSTARRDFLKGIGVASLLGATGTGLGA
AoPcrA 1 -----MVQMTRRGFLLASGATLL-GS-----
EcNarG 1 -----
SeNarG 1 -----
BcNarG 1 -----MK-----KK
BfNarG 1 MTI-----Q-----DRHASPGRSAQPAPEGTGSPGIDS-----PL
BpNarG 1 -----

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HmNarG 68 R-----DSLQFM-GGLKPVD--DPIGNYPYRDWEDLYREKWDWDSVSRSTHSMCTGSCSNVNVYKNGQVWREEQSGDYPR
HmaNarG 37 S----FADDGM-DGLEAVD--DPIGSYPYRDWEDLYREEDWDWDSVARSTHSMCTGSCSNVNVYKNGQVWREEQAGDYPT
HlNarG 44 -----DRQLDM-DGLEVVD--DPIGSYAYRDWEDLYREEDWDWDSSTARSTHSMCTGSCSNVYVRNGQVWRESQAGDYPQ
HsNarG 44 -----DELTQM-GGIENVDSYDYGSIYPYREWEDFYREKWDWDSVARSTHSMCTGSCSNVNVYKNGQVWREEQAADYPE
HpNarG 64 G----ETLFSM-DGLRPVD--DPIGEYPYREWEDLYREEDWDWDSVARSTHSMCTGSCSNVNVYKNGQVWREEQAGDYPR
HaNarG 44 -----DDFLRM-DGLEVVD--DPIGNYPYRDWEDLYREEDWDWDSSTARSTHSMCTGSCSNVYVRNGQVWRESQAGDYPR
HmuNarG 38 S----FADEEM-DGLQAVD--DPIGSYPYREWEDLYREEDWDWDSVARSTHSMCTGSCSNVNVYKNGQVWREEQAGDYPV
HuNarG 38 -----DRAL-DGLETVD--DPIGNYPYRDWEDFYREEDWDWDSVARSTHSMCTGSCSNVNVYKNGQVWREEQANDYPT
HrNarG 40 -----QQ-SEM-QSLEIVD--DPIGSYPYRDWEDLYREEDWDWDSKARSTHSMCTGSCSNVYVRNGQVWREEQAGDYPR
HliNarG 42 -----QDLTEM-TTLEVVD--DPIGDYPYRDWEDLYREEDWDGKARSTHSMCTGSCSNVYVRNGQVWREEQAGDYPR
HcNarG 81 A----QDFLQM-TRLQVVN--DPIGDYPYREWEDLYREEDWDWDSKARSTHSMCTGSCSNVNVYKNGQVWREEQAGDYPN
SsNarG 48 TGDELDEFFQL-DGIEVVD--DPIGDYPYRDWEDLYREQWDWDSSTARSTHSMCTGSCSNVYVRNGQVWREDQAADYPV
AoPcrA 21 -----SLSL-RTLA--AATDISGAFFEYSGWENFHRQTQSWDKKTRGAHLVCTGACPHFVYSKDGVMVREEQSKDIAP
EcNarG 1 MSKFLDRFRYFKQGETFADGHGQLLNTNRDWDGGRQVQHDKIVRSTHGMCTGSCSNVYVRNGVLTWETQQTIDYPR
SeNarG 1 --MGKFLNFFKP-TEKFNGNWSVLEHKSREWEKMYRERWSHEKVVRTTHGMCTGSCSNVYVRNGVITWENQQIDYPS
BcNarG 5 PSALMRRLKYFSP-IDRYNDNHTQETYEEDREWENVYRKRQHDKIVRSTHGMCTGSCSNVYVRNGVITWENQQIDYPS
BfNarG 31 FDALIGARRMFSRSEI SEDNRETHKVGGRSGDSFYRERWSHDKVVRSTHGMCTGSCSNVYVRNGVITWESQETDYP
BpNarG 1 MSHFLDRLKFMRSVKSTFSDGHGAVVDEDRRWENGYRSRWQHDKIVRSTHGMCTGSCSNVYVRNGVITWETQQTIDYPR

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HmNarG 141 FDES L P D P N P R G C Q K G A C Y T D Y V N A D Q R I K H P L K R V -----GERGEGKW  
HmaNarG 110 FDES L P D P N P R G C Q K G A C Y T D Y V N A D Q R V L H P L R R T -----GERGEGQW  
HlNarG 116 FDES L P D P N P R G C Q K G A C Y S D Y V N A D H R V L H P L R R T -----GERGEGMW  
HsNarG 118 INDEL P S S N P R G C Q K G A C Y T D Y V N A E Q R I T H P L R R V -----GERGEGKW  
HpNarG 137 FDES V P D P N P R G C Q K G A C Y T D Y V N A D E R I K H P L K R V -----GERGEGKW  
HaNarG 116 FDES V P D P N P R G C Q K G A C Y S D Y V N A D Q R I K Y P L R R T -----GARGEKW  
HmuNarG 111 IDEDL P D P N P R G C Q K G A C Y T D Y V N A D Q R V L H P L R R T -----GERGEGQW  
HuNarG 108 FDES L P D P N P R G C Q K G A C Y N D Y V D A E Q R V Q Y P M R R T -----GERGAGEW  
HrNarG 111 FDES L P D P N P R G C Q K G A C Y S D Y V N A D Q R I L H P L K R V -----GERGEGQW  
HliNarG 114 FDES L P D P N P R G C Q K G A C F T D Y V N A D Q R V T H P L R R T -----GERGEGKW  
HcNarG 154 FDES L P D P N P R G C Q K G A C Y T D Y V N A D Q R I K Y P M R R T -----GERGEGKW  
SsNarG 125 FDES L P N P N P R G C Q K G A C Y S D Y V N A D H R V L H P L R R T -----GERSGSKW  
AoPcrA 91 M-PN I P E Y N P R G C N K G E C G H D Y M Y G P H R I K Y P L I R V -----GERGEGKW  
EcNarG 81 TRPD L P N H E P R G C P R G A S Y S W Y L Y S A N R L K Y P M M R K R L M K M W R E A K A L - H - S D P V E A W A S I I E D A D K A K S F Q A R G R G G F  
SeNarG 78 CGPDMPEFEPFRGCPRGASFWSYIYSPLRVKYPYIRGKLLDLWTEALEE-QKGNRIAAWASIVENEEKAKQYKEARGKGGH  
BcNarG 84 TGPDMPDFEPFRGCPRGASFWSYIYSPLRVKYPYVRGVLWDMWQEEELQN-N-ESPLGAWKSIVENPEKARTYKQARGKGGF  
BfNarG 111 TGPDKPEYEPFRGCPRGASFWSYIYSPTRVRYPYVRSSELLRMFEEKAKAPGQDPVEAWKAIVSDPEKAMRYKRARGKGG  
BpNarG 81 TRADLPNHEPRGCPRGASYSWYVYSAQRVKYPMIRGRMLQMWRERARK--T-MDPIAAWESISQNPEKARRYKSVRLGLGGF

HmNarG 185 KRISWDEALTEIAEHVVDEVE-AGRYDAISGFTPIPAMSPVSVFASGSRLVNLGGVSHSFYDWYSLPPGQPITWGTQTD  
HmaNarG 154 ERISWDEALTEIAEHVIDEVQ-AGRYDAISGFTPIPAMSPVSVFASGSRLVNLGGVSHSFYDWYSLPPGQPITWGTQTD  
HlNarG 160 ERISWDEALTEIAEEVDVTR-AGEYDAISGFTPIPAMSPVSVFASGSRLINLLGGVSHSFYDWYSLPPGQPITWGTQTD  
HsNarG 162 KRISWDEALTEIAEKVIEEVQ-QGNYDAISGFTPIPAMSPVSVFASGSRLVNLGGVSHSFYDWYSLPPGQPITWGTQTD  
HpNarG 181 QRISWDEALTEIAEHVVGEVQ-AGRYDAISGFTPIPAMSPVSVFASGSRLINLLGGVSHSFYDWYSLPPGQPITWGTQTD  
HaNarG 160 QRISWDEALTEIAEKLVEEVT-AGRYDAISGFTPIPAMSPVSVFASGSRLVNLGGVSHSFYDWYSLPPGQPITWGTQTD  
HmuNarG 155 ERISWDEALTEIAEHVIDEVQ-AGRYDAISGFTPIPAMSPVSVFASGSRLVNLGGVSHSFYDWYSLPPGQPITWGTQTD  
HuNarG 152 ERISWDEALTEIAEHVIEEIQ-NGRYDAISGFTPIPAMSPVSVFASGSRLVNLGGVSHSFYDWYSLPPGQPITWGTQTD  
HrNarG 155 QRISWDEALTEIAEEVIDTVQ-AEEYDGISGFTPIPAMSPVSVFASGSRLVNLGGVSHSFYDWYSLPPGQPITWGTQTD  
HliNarG 158 ERISWDEALTEIAEEVIDAVE-DEEYDAISGFTPIPAMSPVSVFASGSRLINLLGGVSHSFYDWYSLPPGQPITWGTQTD  
HcNarG 198 QRISWDEALTEIAEHVVDEVE-AGRYDAISGFTPIPAMSPVSVFASGSRLVNLGGVSHSFYDWYSLPPGQPITWGTQTD  
SsNarG 169 ERISWDEALTEIAEEVIETVAEEENYDGISGFTPIPAMSPVSVFAGGSRLVNLGGVSHSFYDWYSLPPGQPITWGTQTD  
AoPcrA 134 RRATWEEALDMIADKCVDTIK-NHAPDCISVSPVPAVSPVSVFAGHRFAHYIGAHHTFYDWYGDHPTGQTQTCGVQGD  
EcNarG 159 VRSSWQEVNELIAASNVTIK-NYGPDRVAGFSPIPAMSMVSVASGARFSLIGGTCLSFYDWYCDLPPASPQTWGEQTD  
SeNarG 157 VRANWKDATDIIAAQILYTIK-KDGPDRVAGFSPIPAMSMISYASGARFINLLGGEMLSFYDWYADLPPASPQIWGEQTD  
BcNarG 162 VRANWDEVLLQVSAALLYTVL-KYGPDRVAGFSPIPAMSMLSHAAGSRFQMGGPMLSFYDWYADLPPASPQIWGDQTD  
BfNarG 191 VRASWDEAVELVAAAYVHTVK-EHGPDRATGFSPIPAMSQVSVSSGARFHLIGSSMLSFYDWYADLPPASPQVFGDQTD  
BpNarG 158 VRADWNTATEIIAANAYTIK-RYGPDRVAGFSPIPAMSMVSVYAAGARYLSLIGGACLSFYDWYCDLPPASPQVWGEQTD

HmNarG 264 NAESADWYNADYIIAWGSNINVTRIPDAKYFLESYNGTKRVGVFTDYSQTAIHTDEWLSPDSGTDTALALGMAQTIVDE  
HmaNarG 233 NAESADWHNADYIIAWGSNINVTRIPDAKYFLDAGYEGAKRVGIFTDYSQTAIHTDEWLSPHGGSDTALALGMAQTIVDE  
HlNarG 239 NAESADWYNADYIIAWGSNINVTRIPDAKYFLEAAYNGTKRVGVFTDYSQTAIHCDWLSPEPGTDTALALGMARTIVDE  
HsNarG 241 NAESADWYDADYIIAWGSNINVTRIPDAKFLEAAYKGTGRVGIIFTDYSQTAIHCDWLSPKAGSDAALALGMARTIVDE  
HpNarG 260 NAESADWYNADYIIAWGSNINVTRIPDAKYFLEAGYNGTKRVGVFTDYSQTAIHTDEWLSPEPGADTALALGMAQTIVSE  
HaNarG 239 NAESADWYNADYIIAWGSNINVTRIPDAKYFLEAGYNGTKRVGVFTDYSQTAIHCDWLGPEPGSDTALALGMARTIVDE  
HmuNarG 234 NAESADWHNADYIIAWGSNINVTRIPDAKYFLDAGYEGAKRVGIFTDYSQTAIHTDEWLAPEGGDTALALGMAQTIVDE  
HuNarG 231 NAESADWHNAEYIIAWGSNINVTRIPDAKYFLDAGYEGAKRVGVFSDYSQTAIHTDEWIAPDGTDTALALGMARTIVEE  
HrNarG 234 NAESADWYNSDYIIAWGSNINVTRIPDAKYFLEAAYNGTKRVGIFTDYSQTAIHTDEWISPEPGTDTALALGMARIVDE  
HliNarG 237 NAESADWYNADYIIAWGSNINVTRIPDAKYFLEAGYDGAKRVGIFTDYSQTAIHCDWLGPEPGSDTALALGMARTIVDE  
HcNarG 277 NAESADWYNADYIIAWGSNINVTRIPDAKFFLDAAAYNGTKRVGVFTDYSQTAIHTDEWLSPEGGTDTALALGMAQTIVDE  
SsNarG 249 NAESADWYNADYIIAWGSNINVTRIPDAKYFLEAAYDGTGRVGVFTDYSQTAIHCDWISPEPGTDTALALGMARTIVDE  
AoPcrA 213 TCETADWFNSKYIIILWGSNPTQTRIPDAHFLSEAQLNGAKIVISPDYNSSTIKVDKWIHPQPGTDGALAMAMAHVILKE  
EcNarG 238 VPESADWYNSSYIIAWGSNVPQTRTPDAHFFTEVRYKGTKTVAVTPDYAEIAKCLDLWLAPKQGTDAAMALAMGHVLMRE  
SeNarG 236 VPESADWYNASYIMMWGSNVPLTRTPDAHFMTEVRYKGAKVIVAPDYAENVKFADHWLAPHPGTDAAVAQAMTHVILQE  
BcNarG 241 VPESADWYNASYIMTWGSNVPMTTRTPDAHFLAEVRYKGTKVSVSPDFAESTKFADDWISVKQGTGALAMAMGHVILQE  
BfNarG 270 VPESGDWNNASYLMMWGSNVPLTRTPDAHWMMAEARYRGQKVISIAPDYAENVKFADEWLAPHPGTDAALAMAMGHTILRE  
BpNarG 237 VPESADWYNSSYLLVWGSNVPQTRTPDAHFFTEVRYKGTKTVAISSDYGEMVKFGDIWLAPKQGTDAALAMAMGHVVLKE

HmNarG 344 GLYD-----EAHLKEQTDMPLLVRQD-----TGKFLRASDVPSVNT---DADPEW-MLLMLDSNGRIREAPGSLG  
HmaNarG 313 GLHD-----EAHLKEQTDMPLLVRED-----TGKFLRASEVGL-AE---DADDPEK-VFVMVDADGTLRRAPGSLG  
HlNarG 319 GLHD-----EAHLKEQTDMPLLVRED-----TGKFLRASEVSGVGG---GADDPEK-VFVMRDASGNLRAAPGSLG  
HsNarG 321 GLHD-----EAHLKEQSDMPFLVRED-----TGKFLRVADVPSLST---S-GEAGK-VFAMVDQGNLNRNAPGSLG  
HpNarG 340 DLYD-----EAHLKEQTDMPLLVRQD-----TGKFLRASDVPSVNT---DADPEW-MLLMLDSNGRIREAPGSLG  
HaNarG 319 ELYD-----EAHLKEQTDMPLLVRED-----TGKFLRSADIRD-----GGDEN-VFVMQDADGTLRTAPGSLG  
HmuNarG 314 ELYD-----ESHLKEQTDMPLLVRED-----TGKFLRAGEVGL-AA---DADDPEK-VFVMVDGDELRRAPGSLG  
HuNarG 311 ELYD-----EAHLKEQSDMPLLVRND-----TGKFLRASEVPGLSV---AADEPEK-VFVMQDEGNLRAAPGSLG  
HrNarG 314 GLYD-----EAHLKEQTDMPLLVRAD-----TGKFLRVSDVPGLT---GADRPDQ-MFVMQDQGNLNRVAPGSLG  
HliNarG 317 GLYD-----EAHLKEQTDMPLLVRED-----TGKFLRASEVSGLDV---DADPEK-VFVMQDADGALRPAPGSLG

HcNarG 357 DLHD-----EAHLKEQTDMPLLVRED-----TGKFLRASEVPSVGD---DVRPEK-TFVMVDSEGLRMAPGSLG  
 SsNarG 329 GLYD-----EPHLKEQTDMPLLVRED-----TGKFLRASEI-GLDV---DADRPDH-VFVMQDQAGELRAAPGSLG  
 AoPcrA 293 KLYD-----AHSLEQTDLSYLVRS-----TKKFLREADVVAGG-----SKDK-FYFWNAKTGKPVIPKGSWG  
 EcNarG 318 FHLDNPSQYFTDYVRRYTDMPMLVMLEERD-GYYAAGRMLRAADLVDAIG---QENNPEWKTVAFN-TNGEMVAPNGSIG  
 SeNarG 316 YYENQPNDFINAKQYSDMPFVIMLDEDE-NGYKAGFLRASDLGMS-----GENNEWKPVIQDKLSQQLLVNGTMG  
 BcNarG 321 FYVDNQVEYFTKYAQYTDFFFFVTLKQKG-DQFVADRFLNAADIGRE-----TKLGEWKPVLWNENTNDFATPHGTMG  
 BfNarG 350 FYVDRQEPYFESYSTQYTDLPFLVQLEQRDDGSLVPGKFLVASEAGTAITDEAETEHADFKPMLFDATQAPAVPGGTLG  
 BpNarG 317 FHASNQSAFYFRDYVKQYTDMPMLVLRERD-GALVPDHFLRASHLAASLS---EANHPEWKTLAIDAATGDIVAPNGSIG  
  
 HmNarG 406 ERDGGQKDYS-----KSI-----ELDFDPQL---DGETTVQQTQ  
 HmaNarG 374 ERDGGQKDYS-----ASI-----ELDFDPQL---SVERSVDTD  
 HlNarG 381 DRDGGQHDAS-----ASI-----ELGDFPQL---SAEGSVSTT  
 HsNarG 382 NRDGGKDDDS-----ASI-----ALDFDPRL---DVNQSVDLQ  
 HpNarG 402 ERDGGQKDYS-----KSI-----ELDFDPRL---GAETTVQTT  
 HaNarG 376 NRAGKYDSE-----ASI-----ELEFDPQL---AVDRTVSTG  
 HmuNarG 375 ERDGGQHDPE-----SSI-----ELDFDPQL---GVERSVETD  
 HuNarG 373 EREAKYDDS-----LSI-----ELDFDPQL---AVEDTVGTT  
 HrNarG 376 ERDGGYDPS-----ESI-----SLNDFPQL---AVERSVQTT  
 HliNarG 379 ERDGGYDDS-----VSI-----ELDFDPQL---AVERAVDTT  
 HcNarG 419 DRDGGNDPE-----SSI-----ELDFDPRL---SVERSVDLA  
 SsNarG 390 ARDGGQHDAT-----ASI-----DLDFDPQL---AVERTVSTS  
 AoPcrA 351 DQPEKKGSP-----VGFLGRN---TFAPFKGYI---DLGDLDPAL---EGKFNMQLL  
 EcNarG 393 FRWGEK-----GKWNLEQRDGKTGEETELQLSLLGSQDEIAEVGFPPYFGGDGTEHFNKVELENVLLHKLFPVKRLQLA  
 SeNarG 389 QRWEEG-----KKWNLEKLETE-DGTPIDPMLSMVESDYHVETIQFPYFSSG-----DGIFERPIATRTIQLA  
 BcNarG 394 SRWDNE-----KKWNLEKLEDEETGEKIDPRLSLLGMEESIGTVQIPIYFSDDG-----NKVLERTIPVKVMTE  
 BfNarG 430 HRF SAD-----GEGRWNLLELGD-----LEPTLSLLGHHEDEVAEVLPRFDTVGQGG-----RGDVPGRGVVPTV---  
 BpNarG 393 FRWGEAAHNGGEKVGWRWNLEMKDSGSGRAIDPRLSLVDAHDEIVDVGFPPYFGGEH-----EAVLARRVPAKRVALA  
  
 HmNarG 435 SG----RVQVRTVWAE LR-----DEL-ANWDPEMVHEETTGVKETYQRIAREFAEA-----DKAKII  
 HmaNarG 403 EG----SVAVRSVWENLT-----DEL-SQYTPDVVHEETGVGENTYQRVAREFAEA-----DAAKII  
 HlNarG 410 DS----GQVSVRTVWDNLR-----EEL-ATYTPHEVNEVTGVGRETHQEVAREFAEV-----DRAKII  
 HsNarG 411 DG----SVQVRSVWVSHVT-----EEL-SNYTPERVHELTRVGEETHQEIAREFANV-----DKGKII  
 HpNarG 431 DG----SVEVRTVWVNLRL-----DEL-SRYDPETVHEMTGVGRETYQRVAREFAEV-----DRAKII  
 HaNarG 405 -D----GDVVRTVWVLRRL-----DEL-ATYTPYVNEESGVGQETHQRVAREFAQA-----ERAKII  
 HmuNarG 404 DG----EVAVRSVWENLR-----EEL-SQYTPAFVHEETGVGENTYQRVAREFADA-----DAAKII  
 HuNarG 402 DG----EVAVTSVWVNNLR-----EEL-ANYTPEYVADETVGKETHQKAREFADV-----DRGKII  
 HrNarG 405 -D----GEVQVRSVWVNNLN-----DEL-ANYTPEYIYEETGVGEQTHQEIAREFAEA-----EKAKII  
 HliNarG 408 -D----GAVERTSVWVNNLR-----DEL-SAYTPERVNEITGVGEQTHQTIAREFAEV-----DRAKII  
 HcNarG 448 DGADADSVAVRSVWENLR-----DEL-SEYTPFVTDETTGVGEETYQRVAREFAEA-----DKAKII  
 SsNarG 419 -D----GPVAVRSVWVNNLR-----DEL-STYTPHEVHELTVGVRQTHQEIAREFADV-----DRAKII  
 AoPcrA 394 DG----KTVEVRPVFEILK-----SRLMADNTPKAAKITGVTAKAITEAREFATA-----KPSMII  
 EcNarG 465 DG----STALVTTVYDLTLANYGLER-GLNDVNCATSYDDVKAYTPAWAEQITGVSRSQIIRIAREFADNADKTHGRSMII  
 SeNarG 451 NG----EEVKIATVYDLMTSQQYGVQR-FEHELEATSYDDASSKYTPAWQEQITGIKKELVTVKAKEFAQNAIDTGGGRSMII  
 BcNarG 457 EG----EVFVTTVYDLTLANYGVNR-GLGGQEQKDFND-DVPFPAWQEKITGVKRELI IQIAREFAQNAVDNNGRSMII  
 BfNarG 489 ----AGRLVTTVFDLLAEYGVGREGLPGQWASGLDADALYTPAWQEGITGVPGQAAAARIAREFAQNAVDSGGRSMII  
 BpNarG 464 DG----TSALVATVYDLQMANYGVDQ-GLGGPNVAASYDDIPYTPAWQEKHTGVARHLVIQVAREFADNADRTRGKSMVI  
  
 HmNarG 487 QGKGVNDWYHNDLGNRAIQLLVTLTGNLGEQGTGLDHYVGQEKIWTFHGWKTLSPFTGKV---RGVPTTLWTTYHAGIL-  
 HmaNarG 455 HGKGVNDWYHNDLGNRAIQLLVTLTGNLGPDTGLDHYVGQEKIWSFHGWKLSFPTGNV---RGVPTTLWTFHAGIL-  
 HlNarG 463 HGKGVNDWYHNDLGNRAIQLLVTLTGNLGRQGTGLDHYVGQEKIWTYSGWQSLSPFTGSV---RGVPTTLWTTYHSDII-  
 HsNarG 463 HGKGVNDWYHNDLGNRAIQLLVTLTGHI GRQGTGFDHYVGQEKIWTYNGWQSLSPFTESV---RAVPTTLWTFYHGDIL-  
 HpNarG 483 QGKGVNDWYHNDLGNRAIQLLVTLTGNLGRQGTGLDHYVGQEKIWHHGWQTLSPFTGKV---RGVPTTLWTTYHAGIL-  
 HaNarG 457 HGKGVNDWYHNDLANRAIQLLVTLTGNLGRQGTGLDHYVGQEKMWASHGFSELSYPTGNV---RGVATTLWTFYHAGIL-  
 HmuNarG 456 HGKGVNDWYHNDLGNRAIQLLVTLTGNLGEPTGLDHYVGQEKIWTFHGWKTLSPFTGSV---RGVPTTLWTFYHAGIL-  
 HuNarG 454 HGKGVNDWYHNDLGNRAIQLLVTLTGHI GRNGTGV DHYVGQEKIWTFNWKTLSPFTGSV---RGVPTTLWTFYHAGIL-  
 HrNarG 457 HGKGVNDWYHNDLGNRAIQLLVTLTGNLGEQGTGLDHYVGQEKIWTFKGWKNLSFPTGSV---RGVPTTLWTFYHAGIL-  
 HliNarG 460 HGKGVNDWYHNDLGNRAIQLLVTLTGNLGRQGTGLDHYVGQEKIWTYNGWQKLSFPTGSV---RGVPTTLWTFYHAGIL-  
 HcNarG 504 HGKGVNDWYHNDLGNRAIQLLVTLTGNLGEQGTGLDHYVGQEKIWTFHGWQTLSPFTGSV---RGVPTTLWTFYHAGIL-  
 SsNarG 471 HGKGVNDWYHNDLGNRAIQLLVTLTGNLGRQGTGLDHYVGQEKIWTFHGWQTLSPFTGSV---RGVPTTLWTFYHCDVL-  
 AoPcrA 448 CGGGTQHWWYSYDVLRLAMHLLTALTGTEGTNGGGMNHYIGQKPAFVAGLVALAFPEGVN-KQRFQCTTIWYIHAENV-  
 EcNarG 541 VGAGLNHWYHLDNMNRYGLINMLIFCGCVGSGGGWAHYVGQEKLRPQTGWQPLAFALDQWRPARHMNSTSYFYNHSSQWR  
 SeNarG 527 MGAGINHWFSNDTIYRSILNLVLLCGCQGVNGGGWAHYVGQEKRCRPIEGWNTIAFAKDWQGPRLQNGTSWFFYFATDQWK  
 BcNarG 531 VGAGINHWFSNDTIYRAVLNLVLLVGAQGVNGGGWAHYVGQEKFGPAKGWQTAMAKDWQGPPLQNGTSFFYFVTDQWR  
 BfNarG 564 MGAGTNHWFHSDTIYRSFLTLTNLCGTQGVNGGGWAHYVGQEKVRPITGWAHLANALDWSRPPRQMCQTTWYMHADQWR  
 BpNarG 540 VGAALNHWYHNDMIYRGIINLLMCGCIGQSGGGWAHYVGQEKLRPQFGWAPLAFALDWSRPPRQMNNGTSFFYNHSTQWR  
  
 HmNarG 563 -----DN---TDPDTAAKIRESIDKGWMPVYPEER-----  
 HmaNarG 531 -----DN---TDPDTAEKIRESIDKGWMPVYPEER-----  
 HlNarG 539 -----DN---VDEETADRIREAI DRDWMVPVYPEER-----  
 HsNarG 539 -----GN---VEPDTRQRIQESIDNGWMPVYPKER-----

HpNarG 559 -----DN---TDPDTAAKIRESIDRGWMPVYPAER-----  
 HaNarG 533 -----DN---TDEDTARRIRESVDNGWMPLYPAER-----  
 HmuNarG 532 -----DN---TDPDTAEKIRESIDEGWMPVYPEER-----  
 HuNarG 530 -----EN---TDAETRKRKIEEAVEKDWMPVYPEER-----  
 HrNarG 533 -----DN---TDPDTAAKIREKSGWMPLYPSER-----  
 HliNarG 536 -----EN---TDPDTAAKIREKSGWMPLYPSER-----  
 HcNarG 580 -----DN---TDEDTAAKIREKIKDWMPVYPEER-----  
 SsNarG 547 -----DN---ADPETTRRVREAIENDWMPVYPEER-----  
 AoPcrA 526 -----DEIISSDIDTEKYLRDSITTGQMPNMPEQG-----  
 EcNarG 621 YETVTAEELLSPMAKSRYTGH-LIDFNVAERMGWLPAPQLGTNPLTIAGEAEKAGMN----PVDYTVKSLKEGSIRF  
 SeNarG 607 YEEENVDKLKSPLAENIKHQHP--ADYNVTAARMGWLPSPYQFNKNSLLFGEEAKDEGDDSNAILQKAIESVKNKDTQF  
 BcNarG 611 YEDTPVGHLASPVEGNSRYQH--GDYNVLTARLGLWLPSTYPTFERNGIELYKEAVAAGATTQEEIGKYVAQKLKEKELKF  
 BfNarG 644 YDRFGADTLAATT-GAGSFADMTTADAVALSQRIGWQPFPPQFDISSLDVADRAAEAGRE----TVPWLVDALKGDSVRF  
 BpNarG 620 HEKLAUGEILGPTADASKYAGMTLLDLNAKSERMGWLPAPQLGRNPLDVVDEAERAGKE----PVAYAVEMLKSDKLAF

HmNarG 590 ----DNGSRPDPPTMFVWRGNYFNQA-KGNVA-----VEE-----QLWPKLDLVVDINFR  
 HmaNarG 558 ----DDGNRPDPSTMFVWRGNYFNQA-KGNVA-----LEE-----QLWPKLDLVVDINFR  
 HlNarG 566 ----DDGSRPDPVLFMWRGNYFNQS-KGNVA-----IEE-----RLWPKLDLIVDINFR  
 HsNarG 566 ----EDGSRPDPSTMFVWRGNYFNQA-KGGA-----IEN-----VLWPKLDLIVDINFR  
 HpNarG 586 ----EDGSRPDPSTMFVWRGNYFNQA-KGNVA-----VEE-----ELWPKLDLVVDINFR  
 HaNarG 560 ----PNGSRPDPSTMFVWRGNYFNQA-KGNVA-----VEE-----TLWPKLDLVVDINFR  
 HmuNarG 559 ----EDGSRPDPSTMFVWRGNYFNQA-KGNVA-----VEE-----QLWPKLDLVVDINFR  
 HuNarG 557 ----GDGTRPDPSTMFVWRGNYFNQA-KGNVA-----VEE-----VLWPKLDLVVDINFR  
 HrNarG 560 ----EDGTRPDPSTMFVWRGNYFNQA-KGNVA-----VEE-----ELWPKLDLVVDINFR  
 HliNarG 563 ----DDGSRPDPSTMFVWRGNYFNQA-KGGA-----VEE-----ELWPKLDLVVDINFR  
 HcNarG 607 ----EDGSRPDPSTMFVWRGNYFNQA-KGNVA-----VEE-----ELWPKLDLVVDINFR  
 SsNarG 574 ----ADGSRPDPSTMFVWRGNYFNQA-KGNVA-----VEE-----QLWPKLDLVVDINFR  
 AoPcrA 556 ----RDPKVFFVYRGNWLNQA-KQKY-----VLE-----NLWPKLELIVDINIR  
 EcNarG 696 AAEPENGKNHPRNLF IWRSNLLGSSGKGHEFMLKYLLEHGIQGGDLGQGGVGPKEEVDWQDNGLEGKLDLVVTLDFR  
 SeNarG 685 AIEDPDLRKNHPKTLFVWRNLSISSAKQYFMKHLGARSGLMAEPN--EDDKPEEIKWRED-TEGKLDLVSLDFR  
 BcNarG 689 AIEDPDKNKNFPRNLFVWRANLSSSGKGHEFLKHLGTTNGLMNDSD--DSLPEEIKWHEEAPEGKLDLNLDFR  
 BfNarG 719 AAEDIDAPENFPRIWSIWRANTLGSSAKGQYFFRHLLGVDSSAAEEET--PEEFPRDVRWREDAPIGKVDLMLTLDFR  
 BpNarG 696 ACDDPDNPANFPRNMFVWRNLSISSGKGHEFLKYLLEGTQNALFSDEA--DALKPSEVQVR-DAAEGKLDLAVLDFR

HmNarG 635 MDSTAMYSDIVLPTASHYEKHDLSMTDMHTYVHPFTPAVEPLGESKTDWQIFRELAQKIQEVATERGVEPISDRKFD---  
 HmaNarG 603 MDSTAMYSDIVLPAASHYEKYDLSETDMHTYVHPFTPAVEPLGEAKTDWEIFRLLAEKIQERAQERGVEPIEDRKFD---  
 HlNarG 611 MDSSALYSDIVLPTASHYEKHDLSMTDMHSYVHPFTPAVEPLGESKTDWQIFRELAQKIQEVATERGIDPIEDRSFD---  
 HsNarG 611 MDSTALYSDIVLPTASHYEKHDLSMTDMHSYVHPFTPAVEPLGESKTDWEIFRLIAKKVQEIATERNLSPIQDREFD---  
 HpNarG 631 MDSTAMYSDIVLPTASHYEKHDLSMTDMHSYVHPFTPAVEPLGESKTDWQIFRELAQKIQEVATDRDVEPIPDQRFD---  
 HaNarG 605 MDSTALYSDIVLPTASHYEKYDLSETDMHSYVHPFTPAVEPLGESKTDWEIFRLLAEKIQEIATERGLAPVQDRKFD---  
 HmuNarG 604 MDSTAMYSDIVLPAASHYEKHDLSMTDMHTYVHPFTPAVEPLGEAKSDWEIFRLLAEKIQERAQERGVEPVEDRSFD---  
 HuNarG 602 LDSTALYADIVLPAASHYEKHDLSMTDMHTYVHPFTPAVEPLGESKSDWQIFRELAQKIQEIARDRIDPIDDRKFD---  
 HrNarG 605 MDSTAMNADIVLPAASHYEKHDLSMTDMHTYVHPFTPAVEPLGDSKTDWQIFRELAQKIQALATERGIDPVPDRKFD---  
 HliNarG 608 MDSTALNSDIVLPTASHYEKHDLSMTDMHSYVHPFTPAVEPLGESKTDWQIFRELAQKIQELAEERGTEPVDPRKFD---  
 HcNarG 652 MDSTALYSDIVLPAASHYEKYDLSETDMHSYVHPFTPAVEPLGEAKTDWQIFRDLAEKIQEVAQERGVEPIDDRKFD---  
 SsNarG 619 MDSSALYSDIVLPSASHYEKHDLSMTDMHTYVHPFTPAVEPLGESKTDWQIFRELAQKIQELAEERGIEPVPDRKFD---  
 AoPcrA 596 MDSTALYSDIVLPSASHYEKHDLSMTDMHTYVHPFTPAVEPLGESKTDWQIFLALAKRVEMAARKKYEKFNDEKFK--  
 EcNarG 776 LSSTCLYSIDIILPTATWYKDDMNTSDMHFPIHPLSAVDPAAWEAKSDWEIYKAIKKFSEVCVGH-LGKETDIVTLPIQ  
 SeNarG 761 MTATPLYSDIVLPAATWYKHDLSSTDMHFFIHPFNPAIDPLWESRSDWDIYKTLKAVSEMAKDYLPKGKFDVVTPLG  
 BcNarG 766 MAGTALYSDIVLPASTWYKHDLSSTDMHFFIHPFNPAIGSPWEARSWNIFTSLKAVSLLAKKIDLEPMKEVVATPLL  
 BfNarG 797 MTSHTLHSDVLPASTWYKHDLSSTDMHFFIHSFNPAISNPWESRTDWTWAAISERFSELARDH-LGTRTDVVALALQ  
 BpNarG 772 MSTTCLYGDIVLPTATWYKDDLSMTDMHFFIHLPLSEAVQPLWESKTDWEIYKTIKKFSELAPGY-LGTRRDLVCTPLL

HmNarG 712 --REIDLQSVYDDYVRDWETGE-----  
 HmaNarG 680 --RTIDLTTIYDDYVRDWETGE-----  
 HlNarG 688 --REIDLQSVHDDYVRDWETGE-----  
 HsNarG 688 --RQIDLTSVHDDYVRNWPDE-----  
 HpNarG 708 --REIDLRSHDDYVRDWASDE-----  
 HaNarG 682 --REIDLQSVYDDYVRDWLTGE-----  
 HmuNarG 681 --REIDLTTIYDDYVRDWETGE-----  
 HuNarG 679 --RQIDLQSVHDDYVRDWVSE-----  
 HrNarG 682 --REIDLQSVHDDYVRDWQTE-----  
 HliNarG 685 --RRIDLRSDYDDYVRDWLDDE-----  
 HcNarG 729 --REIDLQSIYDDYVRDWSEDE-----  
 SsNarG 696 --RDIDLQSVHDDYVRDWETGE-----  
 AoPcrA 673 --WVRDLNLSNWNQM-----TM-----  
 EcNarG 855 HDSAAELA-QPLD-VKDWKKGECDLIPGKTAPHIMVVERDYPATYERFTSIGPLMEKIGNGGKGIANTQSEMDLLRLKLN  
 SeNarG 841 HDSKQEIS-TEYGIKVDWSKGEIEGVPGKTMPPNFSIVERDYTIYDKFVTVGPKLEKGIAGHVSYSVSEYEELKSIV  
 BcNarG 846 HDTPQELA-QPLGKIKDWSKGECEPIPGKTMPPQHVVVERDYKTIYDKMTALGPNAGKQPIGFKGISWSAEKEYEQLKSKL

BfNarG 876 HDTPDAMA-TPHGRVRDWKKGECEAVPGLTMPALVEVERDYTVQHAKFTSIGPLLEEKGMTTKGLTYDVSQYVAELGALN  
BpNarG 851 HDTPEGELG-QPFE-PKDWRRGECDLIPGKTAPSMTVVERNYADIYKKFTSIGPLLDKLGNGGKGINWNTEHEVKEIGALS

HmNarG 732 -----EGALAEDRAACEYILEHSEESNPA-----DSDEQITFADTVEQPQRLL  
HmaNarG 700 -----EQGLVEDKAAAEFILEHSEETNPE-----GSDEQITFDDIDEQPQRFL  
HlNarG 708 -----AGALAEDRAACEYILENSEETNPS-----DSDERITFEDIDEQPRRFP  
HsNarG 708 -----SGALKEDKAASEFILDHSEETNPE-----GSDSQITFDDTVEHPRRFE  
HpNarG 728 -----RGALAEDRAACEYILDHSEESNPE-----GTDERITFADTVEQPRRL  
HaNarG 702 -----EGALEADRAACEFILDHSEETNPQ-----DVDDRITFDQIEEQPRRFL  
HmuNarG 701 -----EGALEDGREASEFVLEHSEESNPA-----DSDEQITFADTVEQPQRLE  
HuNarG 699 -----DGALEDRAACEAILEHSTETNPD-----DG-GEITFADTVDPQORFE  
HrNarG 702 -----DGALAQDKAAAEYILEHSEESNPS-----DTDEQLTFDEIDEEPKRLL  
HliNarG 705 -----AGALAEDEAAAEFILENSEETNPE-----GTDERITFADVDEQPRRL  
HcNarG 749 -----EGALAEDRAACEYILEHSEESNPE-----GTDEQITLDDTIDQPQRLL  
SsNarG 716 -----PGGLADDRAAAEYILDHSEETNPE-----GTNERITFDDIDDQPRRFL  
AoPcrA 687 -----DGKLAEDEAAQYILDNAPQS-----KGITIQLMREKPRQRFK  
EcNarG 933 YTK----AEGPAKGQPMNLTAIDAEMILTAPETNGQVAVKAWAALSEFTGRDHTHALNKEDEKIRFRDIAQAPRKII  
SeNarG 920 GTWNDNTISVKNDRPRIDTARKVADVILNISSATNGKLSQKSIEDLENQTMELKDISKERASEKISFLNITSQPREVI  
BcNarG 925 GVVRTDT---IAKGCPDIKEAINAAEAVALTSSTTNGHMAVKAWEALEKQTDLKLRLDLAEERECECTFEGITTAQPKTVI  
BfNarG 955 GVH---RSGPAAGRPKIEDLQACEFIALSGTTNGHMATQGFRTLEKRTGTMHDLAAEHGKRISFADTKAAPVPPV  
BpNarG 929 DTVA---EPGVSRGRPRLDTAIDAEMILTAPETNGHVAVKAWDALSKI TGRDHTHLAVGREHDKIRFRDVAQAPRKII

HmNarG 775 EAGDHWTSIEDGEAYAPWKDFVQDKNPWPTVTGRQQYYIDHDWFLELGEELPTHKEGPE-----N-TGGDYPM  
HmaNarG 743 EAGDHWSSDIKDDEAYVPWQDYVDHKNPWPTFTGRQQYYIDHDWYLELGEELPTHKEGPE-----N-TGGDYPL  
HlNarG 751 KAGDHWTSIEDGEAYTPWQSYVQDKPEWPTFTGRQQYYIDHDWFLDLGEELPTHKDAPT-----LQDKSEYPL  
HsNarG 751 AAGDHWTSPLIEEGKPYTPWKRYVQKKNPWPTFTGRQQYYIDHDWFLDLGEAVPTYKEPEV-----LQSEQEYPL  
HpNarG 771 EAGDHWTSIDIEGEAYMPWKDFVQEKNPWPTVTGRQQYYVDHDWFLELGEQLPTHKEGPT-----K-TGGDYPM  
HaNarG 745 ATGDHWTSPIIEGEAYTPWKQFVQDKPEWPTFTGRQQYYIDHDWFLDLGEELPTHKQPTN-----EQDPDEYPL  
HmuNarG 744 AAGDHWTSIDIEDGAPYVPWQDYVQDKPEWPTFTGRQQYYVDHDWFLELGEELPTHKEGPQ-----D-TGGDYPL  
HuNarG 741 AAGDHWTSIDIEDGTAYAPWKDFVQDKPEWPTLTGRQQYYIDHDWFLDVEQLPTHKRPVE-----TNDQSEYPL  
HrNarG 745 ATGDHWTSIDIEDGEAYTPWKRYVQDKPEWPTFTGRQQYYIDHDWFLELDEQLPTHKQGPV-----LQEKSEYPL  
HliNarG 748 EAGDHWSSDIEGEAYTPWKDYVQDKNPWPTFTGRQQYYIDHDWFLELDEQLPTHKEAPV-----LQEKSEYPL  
HcNarG 792 EAGDHWTSIDIEDGEAYTPWQNYVQDKPEWPTFTGRQQYYVDHDWYLELGEELPTHKEGPA-----N-TGGSYPL  
SsNarG 759 ATGDHWTSIDIEGEAYAPWKDYVQDKQPWPTFTGRQQYYIDHDWFLELDEQLPTHKQAPT-----LQDKADYPL  
AoPcrA 724 ---SNWTSPLKEGVPYTPFYQYFVVDKKPWPTLTGRQQFYLDHDTFFDMGVELPTYKAPI-----DADKYPF  
EcNarG 1009 SS-PTWSGLEDEHVSYNAGYTNVHELIPWRTLGRQQYLYQDHQWMRDFGESLLVYRPPIDTRSVKEVIGQKSNNGNEKAL  
SeNarG 1000 PT-AVFPGSNKDGRRYSPFTTNVERLVPFTLNPEDEAERGIEDGDTVRIYNDVGEVEIQAKRYPSPGEPGTARMYFAWE  
BcNarG 1002 TS-PAFTGSEKGGRRYSPFTTNVERLIPWRTITGRQSFYLDHDMMKEFGETMATFKPILQHKPFRKSRPEVEG--KEITL  
BfNarG 1031 TS-PEWSGSETGGRRYSPFTINVERKKPWHTLTGRQHLYLDHDMWLEMGEALPVFRPPLDMTALFGKTPGHTDGTISIV  
BpNarG 1006 SA-PTWSGLESEEVSYNAGYTNVHELIPWRTLGRQQFYQDHRWMLDFGEGSCAYRPAIDTKTVAPLHKRMPNGQPELVL

HmNarG 843 EYNTPHGRWAIHSTWRDSEKLLRLQRGEPLLYLHPEDAERGIEDGDSVEVFNDLAEVELQAKIYPSSQRGTARMYFAWE  
HmaNarG 811 SYNTPHGRWSIHSTWRDDTKMLRLQRGEPPVYLNPDAAQQRGIEDGDTVEVYNDLGSVEVQAKIYPSSPEPGTVRHFFSWE  
HlNarG 820 RYNTPHGRWSIHSTWRDSEKMLRLQRGEPIVYLNPEDEMERGIEDGDTVRIYNDVGEVEIQAKRYPSPGEPGTARMYFAWE  
HsNarG 820 QYNTPHGRWSIHSTWRDNKHMRLRLQRGEPIVYMHPPDDAERGIEDGDTVRIYNDLDEIEVSVKIYPSAQPGVAKLYFAWE  
HpNarG 839 EYNTPHGRWSIHSTWRDNEKLLRLQRGEPPVYLNHPEDAERGIEDGDAVEVFNDLAEVELQAKLYPSSQRGTARMYFAWE  
HaNarG 814 RYNTPHGRWSIHSTWRDNETLLRLQRGEPPVYLNPDAAARDVEDGDTVRLYNDLGSVELQVKIYPSPGEPGTARMYFAWE  
HmuNarG 812 SYNTPHSRWSIHSTWRDNETKMLRLQRGEPTVFLNPEDEAERGIEDGDTVEVYNDMGSEVQAKIYPSPGDPGTVRHFFSWE  
HuNarG 810 RYNTPHGRWSIHSTWRDSEKMLQLNRGEPPVFIHPEDAKHARGIEDGDTVEIYNDLATIEANAKLYPASEPGTVRHFFSWE  
HrNarG 814 GYNTPHGRWSIHSTWRDNTKMLRLQRGEPPVYLNPEDEAERGIEDGDTVRVYNDLGSVEVQAKIYPSPSEPGTVRHFFSWE  
HliNarG 817 GYNTPHSRWSIHSTWRDSTKMLRLQRGEPTVYLNPEDAEVRDIEDGDTVRVYNDLGSVEVQAKIYPSPGEPGTVRHFFSWE  
HcNarG 860 SYSTPHSRWSIHSTWRDNETMLNLQRGEPTVFLNPQDAERGIEDGDTVEVFNDLGSVEVQAKIYPSPSEPGTVRHFFSWE  
SsNarG 828 RYNTPHGRWSIHSTWRDSEKMLRLQRGEPPVYLNPDMAERGIEDGDTVRVYNDLGEVEVQAKRYPSPSEPGTARMYFAWE  
AoPcrA 787 RFNSPHSRHSHVSTFKDNVLMRLQRGGPSIEMSPDLAKPLGKNDNWVEAWNNGHKVICRVKIRNGEQGRVSMWHCPE  
EcNarG 1088 NFLTPHQKWIHSTYSDNLLMLTLGRGGPVVWLSEADAKDLGIADNDWIEVFNSNGALTARAVVSQRPVPAGMTMMYHAQE  
SeNarG 1079 RYLTPHGKWNHSTYQDNERMLTLFRGGPVVWISNEDAADHGINDNDWLEVYNRNGVVTARAVTSHRMPRGTMFMYHAQD  
BcNarG 1079 NYLTPHNKWSIHSMYFDSLPLMLTLFRGGPTVVMNKEADAAGVADNDWIECFNRNGVVVARAVVTHIRPRGMAFMHHAQD  
BfNarG 1110 RYLTPHNKWAHSMYQENFFMMNLGRGQNIWMSVEDAEAVGITDNDWVEAVNRNGVVSARAVVSHRMPRGTAFFMHGQE  
BpNarG 1085 NWITPHQKWIHSTYSDNLRMLTLGRGGPVVWISAEAAQAGIRDNDWVEVFVNGVLTARAVVSQRPVPAAGMLMYHAQE

HmNarG 923 RFQFD-----SDSNFNSLVPYMKPTQLVQYPEDSGEHLHFFPNYWGPTGVNSDVRVDVRKAGGGDE-----  
HmaNarG 891 KFQYP-----DRDNFNTLVPMYMKPTQLVQYPEDTGEHLHFFPNYWGPTGVNSDVRVDVRPSGGDTE-----  
HlNarG 900 RFQFP-----DRNNFNSLVSVMYMKPTQLVQYPEDTGEHLHFFPNYWGPTGVNSDVRVEVEKVADADQEGS-----  
HsNarG 900 RFQFP-----SRGNFNTLVGMYMKPTQLVQYPADSGEHLFVVPNYWGPTGVNSDVHVEVELVEDEATGEGTATTTAQ  
HpNarG 919 RFQFP-----TDSHFNSLVPYMKPTQLVQYPEDTGEHLHFFPNYWGPTGVNSDVRVDVRKKGDDGG-----  
HaNarG 894 KFQFA-----SRNNFNTLVPMYMKPTQLVQYPEESGEHLFSFPNYWGPTGVNSDVRVEVEKIDGGDGE-----  
HmuNarG 892 KFQYP-----GRDNFNTLVPMYMKPTQLVQYPEDTGEHLHFFPNYWGPTGVNSDVNVVRLTDGQSGSGDEQ-----  
HuNarG 890 RYQYP-----SRNNFNSLIPMYMKPTQLVQYPEDSGEHLHFFPNYWGPTGVNSDVRCDIRPKEGGDD-----

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HrNarG      894  KFQYP-----DRDNFNTLVPMYMKPTQLVQYPEDTGEHLHFFPNYWGPTGVNSDVRVEVERVDDGSGSTGGQGGD--
HliNarG     897  RFQYP-----DRNNFNSLVPMYMKPTQLVQYPEDTGEHLHFFPNYWGPTGVNSDVRVEVEKVEEGAASGDDARSV--
HcNarG      940  KFQYP-----DRDNFNTLVPMYMKPTQLVQYPEDTGEHLHFFPNYWGPTGVNSDVRVDVRPAEQGESEGESDGDG--
SsNarG      908  RFQYP-----DRGNFNSLVPLYMKPTQLVQYPEDTGEHLHFFPNYWGPTGVNSDVRVEVERVGGGSDDDGDDGD--
AoPcrA      867  LYMDL-----LTGGSQSVCPVRINPTNLVG---NYGHLFFRPNYGPGSQRDVRVNVKRYIGATPISF-----
EcNarG     1168  RIVNLPGSEITQQRGGIHSVTRITPKPTHMIG---GYAHLAYGFNYGTGVSNRDEFVVRKMKMKN-IDWLDGEGNDQV
SeNarG     1159  KHIETPGSEITDTRGGSHNAPTRIHLPKPTQLVG---GYAQISYHFNYGPIGNQRDEYVAVRKMKE-VNWLED-----
BcNarG     1159  RHINVPGTKLTSNRGGTHNSPTRIHVKPTHMIG---GYGQLSYGFNYGPTGNQRDLNVVIRKLKE-VDWLED-----
BfNarG     1190  RTVNVPLTERDGKRGGITNSLTRIMIKPSHLIG---GYAQLSFAFNYYGPTGNQRDEVTMIRKRTPAVEY-----
BpNarG     1165  KIVNVPGAQTSKRGGIHSVTRITPKPTHMIG---GYAQQAYGFNYGTGVSNRDEYVIVRKMNR-VDWLEEPLNEGA

HmNarG      -----
HmaNarG     -----
HliNarG     -----
HsNarG      972  DQNGSSGTTTA-----NQTTANSGMTMTTSGTTDGTASNETTTSSESTSTNATASGNTSDLDVIPGDSPDEASGG
HpNarG      -----
HaNarG      -----
HmuNarG     959  --RESVGVRPAGGDDQ-----
HuNarG      -----
HrNarG      964  -AQ-----
HliNarG     967  -GDGLSLERGDGTGPGDPAAGDAETDSRGALGRVSDLLGGDD-----
HcNarG     1010  -EETAADLRLADGGDPPDGS--TVDA-----DGGEQS-----
SsNarG      978  -DGGSGG---DGGGDGGEA-----
AoPcrA      -----
EcNarG     1243  QE--SVK-----
SeNarG      -----
BcNarG      -----
BfNarG      -----
BpNarG     1240  EQ-----

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**Figure S1.** Complete alignment of NarG sequences *Escherichia coli* (EcNarG; Protein NCBI ID: WP\_000032939.1; UniProt: P09152), *Bacillus cereus* (BcNarG; Protein NCBI ID: WP\_000729051.1), *Staphylococcus epidermidis* (SeNarG; Protein NCBI ID: WP\_011082781.1), *Brachyбактерium faecium* (BfNarG; Protein NCBI ID: WP\_015775897.1), *Burkholderia pseudomallei* (BpNarG; Protein NCBI ID: WP\_004555870.1), *Azospira oryzae* (AoPcrA; Protein NCBI ID: WP\_014235273.1; UniProt: G8QM55), *Halococcus salifodinae* (HsNarG; Protein NCBI ID: EMA48671.1), *Halorhabdus utahensis* (HuNarG; Protein NCBI ID: WP\_012795090.1), *Haloferax mediterranei* (HmNarG; Protein NCBI ID: WP\_004056332.1), *Halo geometricum pallidum* (HpNarG; Protein NCBI ID: WP\_008385261.1), *Halosimplex carlsbadense* (HcNarG; WP\_006885135.1), *Haloarcula marismortui* (HmaNarG; Protein NCBI ID: WP\_011223493.1), *Halomicrobium mukohataei* (HmuNarG; Protein NCBI ID: WP\_015763420.1), *Halogramum amylolyticum* (HaNarG; Protein NCBI ID: WP\_089826390.1), *Halorientalis regularis* (HrNarG; Protein NCBI ID: WP\_092694237.1), *Halorubrum lipolyticum* (HliNarG; Protein NCBI ID: WP\_008003395.1), *Halobellus limi* (HlNarG; Protein NCBI ID: SEF60617.1), and *Salinigranum salium* (SsNarG; Protein NCBI ID: WP\_152042447.1). The TAT consensus sequence is underlined, twin arginine 'RR' is highlighted in yellow, hypothetical amino terminal residue of *Haloferax mediterranei* NarG is shown in green. His and Cys residues involved in FS0 cluster coordination are highlighted in cyan. The conserved residues in the gate substrate tunnel are highlighted in red, the catalytic aspartate is highlighted in gray whereas Lys that could form an electron transfer pathway bridge between FS0 and MoCo cofactor are in magenta. The amino acids with a possible role in substrate binding, reduction potential regulation of FS0 and proton donor during catalysis are highlighted in olive. The percentages of identity among haloarchaeal NarGs are comprised between 70% and 86%, with a coverage between 96% and 100%. The percentages of identity between haloarchaeal and bacterial NarGs are ranged between 34% and 36%, with a coverage between 91% and 94%.

HmNirK 1 -----MLSTT**RR**RTL---QLLGLGG-VAS**SLAG**CASEAPTAAQSL-----DQT---EETTPAQQESPKIVEQVAANPT  
 RpNirK 1 MSRLHTVRS~~LM~~RAGLI-----SVVLGALLA-----GTAAR-----AASAKLPDGF~~GP~~PRG--EPIHAVLTSP  
 NgAniA 1 -----MKRQAL-----AAMIASL**FAL**AACGGEPAAQAPAE~~TPA~~ASAEAASSAAQATAETPAGELPVIDAVTTHAP  
 HliNirK 1 ----MSQDLS**RR**KMV---AALGIGA-VG**AVAGC**IGAPVNAEPTP-----AAETTPAVTPELDPAREVDADRIAADPT  
 NbNirK 1 ---MTHSATID**RR**RML---QVLGATG-AA**AIAGC**IATENTAPDEG-----NGSSADEID~~GL~~PAAESVDVDSVLADPT  
 NaNirK 1 MTTVATQPTT**NR**RAVI---HTIGGAG-AI**ALAGC**LSDDPPEADSV-----ESEADTAPEEERPAEPVLDRIAADPM  
 HhNirK 1 ---MTTIQAN**RR**QFM---QAIGATG-AV**AVAGC**LGNDDVSGS-----STTSESEGLPAAEAVDVRVARDPT  
 HasNirK 1 --MTRRTHSK**PRR**RFL---QTAGAAT-AL**AVAGC**LGSGSDGDSADRS----TGDDTDSTDEASATAATSV~~VD~~DRIADPT  
 HaeNirK 1 -----MFRST**RR**KVL---QTLGVTGAAG**SLAGC**PAPQSDTDP-----TPQVDGMPKEVDRVASDPT  
 SsNirK 1 -----MVRT**TR**RSVL---EALGVGG-AA**AVAGC**AANAPTAADTE-----RQR---TAME---QNAKPTVDRVAADPT  
 HlNirK 1 -----MFAT**TR**RTL---QALGLGG-AA**SLAGC**ASNAPTAEGST-----A-T---DAPEQTTTPKPVDTDRIAADPT  
 HpNirK 1 ----MTYTT**TR**RVL---QGMVAGT-AG**ALAGC**TVGAPLDDVQV-----AEPLNVGFEP**SLAAK**APVDVDRVAADPR  
 HaNirK 1 -----MQASTSAFVLVAFVGEV-G-AV**AVAGC**LSTTNTGQISV-----DS--VATPGSLTGALPVDVDRIAADPT  
 HmaNirK 1 ---MSTIPTAT**RR**RVL---EALGVGT-A-**ALAGC**ASAPGAKEQAT-----EAETTPQEPAMNAQQTVDRIAADPT  
 HuNirK 1 ---MSSIPVAT**TR**RVL---QALGVGG-AA**ALAGC**GASSD~~TD~~DQ-P-----AENTSPTEPHMNDPQMTD~~VD~~RIAADPT

HmNirK 61 DIPDPITRSEPT~~EV~~DVTLRPEEVTAEEVEGVTFYMTYNGQVPGPFIRVRQGD~~TV~~NLTFENPEEN-SMP**IN**VD**FH**AVAGP  
 RpNirK 57 LVPPPVNRTYPAKVIVELEVVEKEMQISEGVSYTFWTFGGTVPGSFIRVRQGD~~TV~~FHLKKNHPSS-KMP**NI**DLHGVGTGP  
 NgAniA 66 EVPPAIDRDYPAKVRVKMETVEKTMKMDGVEYRYWTFDGDVPGMRIRVREGD~~TV~~EVFESNNPSS-TVP**IN**VD**FH**AATGQ  
 HliNirK 65 DVPAPVDWDEPRDH~~DIAL~~RTEKELVAEIEPGVTFKYMTFEGQVPGPMIRVRRGDTVNLRF~~EV~~PADDNSDI**IN**VD**FH**AVYGP  
 NbNirK 67 DIPAPVDWDEPREHDITIECTEHIAEIEPGVTFHFMTFEGQVPGPMVRVREGD~~TV~~NLTFRVPEESNM**YAI****NI**VD**FH**AVYGP  
 NaNirK 70 DIPPPVDWDEPRTHEITLESIEVTAEEVPGVTVDFMTYDGQIPGPMVRVREGD~~TV~~ELTFAVPEEHNV**VD**DA**HA**IYGP  
 HhNirK 62 DIPAPVDWDEPREHDITLETEQMTAEIEPGVTFDFMTFGGQIPGPMVRVRRGDRVNLRF~~EV~~PEIDINMD**IN**VD**FH**AVYGP  
 HasNirK 71 DIPDPVDWDEPREHDITIEFERLTAEIEPGVTFKYMTFEGQVPGPMIRVRQGD~~RV~~NLTFDVPEDLNVEAHNMD**FH**AVYGP  
 HaeNirK 55 DVPDPIDRDQPKTHDITLQAQEVIAPIEEGNTFHFMTFDGQVPGPMIRVRQGD~~TV~~NLTFENLKSS-NLP**IN**VD**FH**AVYGT  
 SsNirK 58 DIPGPIQRSTPTTVDVTLRPEEVTAEIEDGVTFYMTYNGQVPGPFIRVRKGD~~TV~~DLTFENPSGN-ALP**IN**VD**FH**AVAGP  
 HlNirK 60 DIPDPIDRDSPAEVDVTLRTEEVVAEEVEGVTFYMTYNGRVPGPFI~~RV~~RQGD~~TV~~NLTFENAESN-SLP**IN**VD**FH**AVAGP  
 HpNirK 65 DIPKPI~~TR~~SKPATVPVELETREAVAEIEPDVTFQYMTFNGQVPGPFIRTRVGD~~TV~~EVTIRNHES-AM**AN**VD**FH**ACRGP  
 HaNirK 63 AIPGPI~~MR~~TTPETVVVELETRELVAEVEPGVTFYMTFDNQIPGPFIRTRVGD~~TV~~DLTVTNHPDN-SMP**NI**DLH**SV**RGP  
 HmaNirK 65 AIPDPIDRSEPKTVSVEMTTKEQVAEIEPGVTFYMTFDGQIPGPMIRVRRGDT~~VEL~~ITNEEGN-SMP**NI**DLH**AV**RGP  
 HuNirK 65 DVPDPIDRSSPATVNVELETRELVAEVEPGVTFYMTFDNQVPGPLIRVRKGD~~TV~~NMTVTSHEDN-TMP**NI**DLH**AV**RGP

HmNirK 140 GGGAEATMTNPGE-TVKIRFKATYPGAIY**HC**AVPNMD**HI**SAG**MF**GLILVEPPEGLPEVDKEVYIGQHELYTDKKAGKK  
 RpNirK 136 GGGAA~~SFT~~APGH-ESQFTFKALNEGIYV**HC**ATAPVGM**HI**ANG**MY**GLILVEPPEGLPKVDHEYYVMQGDFFYTAGKYREK  
 NgAniA 145 GGGAAATFTAPGR-TSTFSFKALQPGLY**HC**AVAPVGM**HI**ANG**MY**GLILVEPK~~EG~~LPKVDKEFYIQGDFFYTKGKGAQ  
 HliNirK 145 GGGAVDTTLVPGDEAAELSFRAEFPGLFY**HC**AVPAMDH**VSS**GM**FG**AILVEPEAGLPAVDRELYLGQHELYTKGDLGEK  
 NbNirK 147 GGGAEHTTLRPGDEEATISARMDYAGSHY**HC**AVPNMD**HI**SAG**MF**GLILVEPKDGLPEVDRELYLGQHELYTDGDTGEE  
 NaNirK 150 GGGAEATTLSPGDEPARLTFRAEFPGVHIY**HC**AVPNMD**HI**SAG**MF**GLILVEPAEGLPEVDREFYVGQHELYTDGEAGEE  
 HhNirK 142 GGGADATTIAPGDAAEISFTA**EY**AGAFY**HC**AVPNMD**HI**SAG**MF**GTILVEPEEGLPEVDHEFYLGQHELYTEGEAGEE  
 HasNirK 151 GGGADATTIAPGDPAQISFTA**EY**AGVFIY**HC**AI**PN**MD**HI**SAG**MF**GSILVEPEDGLPEVDREFYLGQHELYTDGDLGEE  
 HaeNirK 134 GGGSEATDANPGE-TNTVKFQARYPGAFIY**HC**AVPNLDY**HI**SSGM**FG**MIIVVEPEDGFPEVDREFYLGQHELYTQQHHGAE  
 SsNirK 137 GGGAEATMTAPGE-TARLRFKATYPGAIY**HC**AVPNMD**HI**SAG**MF**GIILVEPEEGMPAVDHELYLGQHELYTDKEAGES  
 HlNirK 139 GGGAEATTTAPGE-SADLRFKATYPGAIY**HC**AVANMD**HI**SAG**MF**GLILVEPPEGMPEVDHEIYIGQHELYTNESAGEE  
 HpNirK 144 GGGAEATTVNPGE-EKRLRFKVTPGAFVY**HC**AVANVDY**HI**SSGM**FG**ILILVEPEEGLPAVDREFYLGQMEVYTNGAAGDE  
 HaNirK 142 GGGAE~~DTM~~VMMPGE-TKRITFKVTPGLFVY**HC**AVPNLDY**HI**SAG**MF**AILVEPEEGLPPVDHEFYLGQHELYTTGETGEQ  
 HmaNirK 144 GGGAEASMTVPGQ-TKTRFKATYPGAFIY**HC**AVPNLD**HI**SSGM**FG**MIILVEPK~~EG~~LPEVDHEFYFGQHELYTTGDTGEK  
 HuNirK 144 GGGAEASMVAPGE-TETFQFKATYPGAFIY**HC**AVPNLDY**HI**SAG**MY**GLILVEPEDGLPEVDHELYFGQNELYTTGDVSDQ

HmNirK 219 GKHNFDFEAMRNEEPTYVVMNGEKYAWTDAG-RGPAATVNTGETVRVFFVDGGPNLSS**FF****PI**GSVWETLYPDGSLSTDP  
 RpNirK 215 GLQPFDMKAIDERPSYVLFNGAEGALTGDK----ALHAKVGETVRI**FV**GNNGGNL**VSS****FF****VI**GAIFDQVRYEGGTN--V  
 NgAniA 224 GLQPFDMKAVAEQPEYVVFNGHVGAIGADN----ALKAKAGETVRMYVGNNGGNL**VSS****FF****VI**GEIFDKVYVEGGKL--I  
 HliNirK 225 GHHA~~F~~DHGAMLDEDPYVVFNGEHHGFTEDR-RGGI-GA**AV**GESVRVFFVNGGN**QSS****W****PI**GNVWSRLYRDGDLVSP  
 NbNirK 227 GHHSYDFDAGAAEDPTYVLFNGEAYGLTEDGTHGPM-HAEVGETVRLHFANGGNL**LSS****W****PI**GNVFSRLYRDGDLSDP  
 NaNirK 230 GHHAYDFDATADEDPYVLLNGEVGALTEDG-HGPM-YAEVGETVRVYFANGGNL**TSAL****PI**GNVWSRYRDGDLSE  
 HhNirK 222 GHHGFD~~F~~DAMQSEDPYVTFNGQAYAF**PDG**-LGPM-KANTGETARVYFANGGNL**TSAL****PI**GNVWSRYRDGDLISEP  
 HasNirK 231 GHHGFD~~F~~DAMLAEQPTYVVFNGQAYGFTEDG-VGPM-HAEVGETARVYFANGGNL**LSS****W****PI**GNVWSRYRDGDLLEP  
 HaeNirK 213 GRLNFDIEGMNNEEPTYVLFNGEKYPYIPDK-YGSL-EAETGETVRVFLVVGPNY**SSN****FF****PI**GNIWKRAYRDGAVVDSP  
 SsNirK 216 GKHRFDMQAMKREEPTYVVMNGEQYAL**TPDG**-HGTAATVSTGDTVRYTFVTGGPNL**TSS****FF****PI**GNVWEELYPEGSLTTRP  
 HlNirK 218 GHHEFD~~M~~ASMRSEPTYVLMNGEKYAWTPAG-RGPAV**TAG**TDETVRVFFVDGGPNL**ASS****FF****PI**GSVWEELYPDGSLSTEP  
 HpNirK 223 GHHEFD~~F~~FETMAAEDPTYVLLINGEKY**AI**GPQG-YDEM-RVRTDET**TVRI**YAVGGPN**QFSS****FF****HA**IGGVWDEVYPQGS**LASEP**  
 HaNirK 221 GHHEFD~~F~~EAMAREDATYVLLINGEKY**AI**GPQG-YNDM-QMTVGETARVYFAVGGPNL**LSS****FF****PI**GSVWDEVYPQGAIGSDP  
 HmaNirK 223 GHHD~~F~~DM**EAM**AAEPTYVLMNGEKY**AI**TPDR-HGSP-SMQVGETARVYFVTGGPNL**DSS****FF****PI**GSVWDEVWQQGS**IAGPP**  
 HuNirK 223 GHHD~~F~~MD**AM**TAAEPTYVLMNGESRAITENR-YGPV-TVDVGD**TARV**YFVNGGNL**TSS****FF****PI**GVWDEVHPQGGIGGPP



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HmNirK      298 QTHIQTRLVPPGSTTVATMSSSPVPGDFKLVDHSLSRVTRKGCMAVIRAEGPEDPEIFDPNPE-----
RpNirK      289 QKNVQTTLIPAGGAADVVKFTARVPGSYVLVDHSIFRAFNKGAMAILKIDGAENKLVYSGKELDSVYLGDRAAPNMSAVTK
NgAniA      298 NENVQSTIVPAGGSAIVEFKVDIPGNYITLVDHSIFRAFNKGALGQLKVEGAENPEIMTQKLSDTAYAGSGAASAPASAP
HliNirK     303 GRYVETTAVAPGTATVGEMELPIPGPIKIVDHALSRAGRKGALAVVDVEGEPNSDVYDPGSDE-----
NbNirK      306 ARNVETTPVAPGTVTMAEMEMKVPVPGVKIVDHALSRAGRKGALAVIDVDGEANPDIYNPDA-----
NaNirK      308 GRNVETNPVAPGTVVAGEMELPVPGPVKIVDHALSRVVRKGMIGVIDVEGEPNPAVYDDES-----
HhNirK      300 DRNIETAPVAPGTTTVGEMEFVPGPVKIVDHALSRVVRKGMIGVIDVEGEPNPAVYDDES-----
HasNirK     309 DRNIETAPVAPGTTAAAEMEFVPGPVKIVDHALSRAGRKGALAVIDVEGEEQPEIYDNP-----
HaeNirK     291 ERYVQTMKVPVPGSCMIGTMDLPVPERIYLVVDHALSRYARRGLGAYLDITGEERPDIYDPSDMDASEDEEGPFY-----
SsNirK      295 ETHVQTKPVAPGSTTIATMSFVPVGNFKLVDHALSRVARKGCMIAIVTAEGEERPDIFDPNPEQ-----
HlNirK      297 QTHIQTRVPPGSTAIATMNSFPVPGDFKLVDHSLSRVARKGCMIAIVTAEGEERPEIFDPDPA-----
HpNirK      301 HRYVQTPVLPVPGSAAVVTARFPVPGDYKLVVDHALSRVARKGALAVLRAEGPANPDLPDPEDGDE-----
HaNirK      299 HRFVQTPVLPVPGSAVIAILSAPVPGPIKLVVDHALSRVARKGCLAAIDVQGEEDPEIYDPEPAQG-----
HmaNirK     301 NRYVQTPVLPVPGSCAIAITLHAEVPGPIKLVVDHALSRVARKGTMAIINREGAANPDVFEPEA-----
HuNirK      301 HRNIQTPVMPGSAITATMHFEVPGPVKLVVDHALSRVARKGLLAVVEAGDARPDLPDPDP-----

HmNirK      -----
RpNirK      369 ATQASVSGTLTVQDQVQAGRALFAGTCVCHQNGAGLPGVFPPLAKSDFLAADPKRAMNIVLHGLNGKIKVNGQEYDSV
NgAniA      378 AASAPAA--A-----SEKSVY-----
HliNirK     -----
NbNirK     -----
NaNirK     -----
HhNirK     -----
HasNirK     -----
HaeNirK     -----
SsNirK     -----
HlNirK     -----
HpNirK     -----
HaNirK     -----
HmaNirK     -----
HuNirK     -----

HmNirK      -----
RpNirK      449 MPPMTQLNDDEVANILTYVLNSWDNPGGRVSAEDVKKVRAQPAPAKAVAEH
NgAniA      -----
HliNirK     -----
NbNirK     -----
NaNirK     -----
HhNirK     -----
HasNirK     -----
HaeNirK     -----
SsNirK     -----
HlNirK     -----
HpNirK     -----
HaNirK     -----
HmaNirK     -----
HuNirK     -----

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**Figure S2.** Complete alignment of NirK sequences of *Ralstonia pickettii* (RpNirK; Protein NCBI ID: WP\_039373687.1; UniProt: B2UHR8), *Neisseria gonorrhoeae* (NgAniA; Protein NCBI ID: WP\_003705926.1; UniProt: Q5F7A4), *Halorubrum lipolyticum* (HliNirK; Protein NCBI ID: WP\_049911241.1), *Natnolimnionius barhuensis* (NbNirK; Protein NCBI ID: WP\_054863730.1), *Natronococcus amylolyticus* (NaNirK; Protein NCBI ID: WP\_005555322.1), *Halobiforma haloterrestis* (HhNirK; Protein NCBI ID: WP\_089787040.1), *Halopiger aswanensis* (HasNirK; Protein NCBI ID: WP\_120243376.1), *Haloplanus aerogenes* (HaeNirK; Protein NCBI ID: WP\_121921915.1), *Salinigranum salinum* (SsNirK; Protein NCBI ID: WP\_152041973.1), *Halobellus limi* (HlNirK; Protein NCBI ID: WP\_103992402.1), *Haloferax mediterranei* (HmNirK; Protein NCBI ID: WP\_004059594.1), *Halogeometricum pallidum* (HpNirK; Protein NCBI ID: WP\_049916781.1), *Halogramum amylolyticum* (HaNirK; Protein NCBI ID: WP\_170864849.1), *Haloarcula marismortui* (HmaNirK; Protein NCBI ID: WP\_011224471.1), *Halorhabdus utahensis* (HuNirK; Protein NCBI ID: WP\_012795101.1). The TAT consensus sequence [ST]RRxFLK is underlined, twin arginine 'RR' is highlighted in yellow and lipoprotein consensus sequence [LVI][ASTVI][GAS]C is in bold. The catalytic amino acids are highlighted in magenta, whereas amino acids involved in type 1 copper and type 2 copper coordination centers are highlighted in green and cyan, respectively. The consensus sequence SSFHV/I/P is underlined. The percentages of identity of *Ralstonia pickettii* NirK and *Neisseria gonorrhoeae* AniA with *Haloferax mediterranei* NirK are 27% and 36%, with a coverage of 95% and 97%, respectively; while haloarchaeal NirKs presents percentages of identity among them ranged between 49% and 79%, with a coverage between 98% and 100%.



HmNirK	1	-----MLSTTRRRTLQLLGLGGVASLAGCASEPTAAQSLD-----Q---TEEPTPAQQESPKIVEQVAANPTDIP-
NgAniA	1	-----MKRQALAAAMIASLFALACGGEPAAQAPAEPAASAEAAASSAAQATAETPAGELPVIDAVTTHAPEVP-
RpNirK	1	-MSRLHTVRSIMRAGLISVVLGALLA-----GTAARAAS-----AKLPGDFGPPRGEPIHAVLTSPLLPV-
PtNirK	1	--MKIQPNKHTLWLPLIAI----LFS-----GNLL-----AASNKTEQAIIITPPPMVP-
AxNirK	1	----MNALRPTL-----LAAALA-----FTMAAGTAW-----AQDADKLPHTKVTLVAPPQVHP
AcNirK	1	MTEQLQMTRRTMLAGAA---LAGAVA-----PLLHTAQAHAAAGAA-----AAAGAAPVDISTLPRVKVDLVKPPFVHA
AfNirK	1	MAEQMQISRRTILAGAA---LAGALA-----PVLATTSAWGQGAV-----R--KATAAEIATALPRQKVELVDPPFVHA
HmNirK	64	-DPITRSEPTVDVTLRPEEVTAEEVE-EGVTFTYMTYNGQVPGFFIRVRQGDVTNLTFFENPEENSMPHNVDHFHAVAGPGG
NgAniA	69	-PAIDRDYPAKVRVKMETVEKTMKMD-DGVEYRYWTFDGDVPGRMIRVREGDTVEVEFSNNPSSSTVPHNVDFHAATGQGG
RpNirK	60	-PPVHRNYPKVVIVELEVVEKEMQIS-EGVSYTFWTFGGTVPGSFIRVRQGDVTEFHLKNHPSSKMPHNI DLHGVTGPGG
PtNirK	44	-PAINRDHS AKVVINLETREQVGRIA-DGVEYVFWSFGETVPGSFIRVREGDEIEFNLSNHPSSKMPHNI DLHAVTGPGG
AxNirK	46	HEQATKSGPKVVEFTMTIEEKKMVIDDKGTTLQAMTFNGSMPGPTLVVHEGDYVQLTLVNPATNAMPHNVDFHGATGALG
AcNirK	66	HDQVAKTGPRVVEFTMTIEEKKLVIDREGTEIHAMTFNGSVPGPLMVVHENDYVELRLINPDNTNLLHNIDFHAATGALG
AfNirK	64	HSQVAEGGPKVVEFTMVIEEKKIVIDDAGTEVHAMAFNGTVPGPLMVVHQDDYLELT LINPETNTLMHNI DFHAATGALG
HmNirK	142	GAEATMTNPGETVKIRFKATYPGAYIIYHCAVPN-MDMHISAGMFGLILVEPPEGLPE-----VDKEVYIGQHELYTDK
NgAniA	147	GAAATFTAPGRTSTFSFKALQPGLYIYHCAVAP-VGMHIANGMYGLILVEPKEGLPK-----VDKEFYIVQGDFYTKG
RpNirK	138	GAASSFTAPGHESQFTFKALNEGIYVYHCATAP-VGMHIANGMYGLILVEPPEGLPK-----VDHEYYVMQGDIFYTAG
PtNirK	122	GAESSFTAPGHTSTFNFKALNPGLYIYHCAVAP-VGMHIANGMYGLILVEPKEGLAP-----VDREYYLVQGDFYTKG
AxNirK	126	GAKLTNVNPGEQATLRFKADRSGTFVYHCAPEGMVPWHVVSMSGTLMVLPDGLKD <b>PQGGKPLH</b> YDRAYTIGEFDLIYIPK
AcNirK	146	GGALTQVNPGEETTLRFKATKPGVFVYHCAPEGMVPWHVTSGMNGAIMVLPDGLKD <b>EKGQPLTY</b> DKIYYVGEQDFYVVK
AfNirK	144	GGGLTEINPGEKTI LRFKATKPGVFVYHCAPPGMVPWHVVS GMNGAIMVLPREGLHD <b>GKGKALT</b> YDKIYYVGEQDFYVPR
HmNirK	214	KAGKKGK-----H-NFDFEAMRNEEPTYVVMNGEKYAWTDAGRGPAATVNTGETVRVFFVDGGPNLSSSFHPIGSVWE
NgAniA	219	KKGAQGL-----Q-PFDMDKAVAEQPEYVVFNGHVGAIA GD--NALKAKAGETVRMYVGNNGGNLVSSSFHVIGEIFD
RpNirK	210	KYREKGL-----Q-PFDMEKAIDERPSYVLFNGAEGALTGD--KALHAKVGETVRIFVGNNGGNLVSSSFHVIGEIFD
PtNirK	194	EFGEAGL-----Q-PFDMAKAIDEDADYVVFNGSVGSTTDE--NSLTAKVGETVRLYI GNNGGNLVSSSFHVIGEIFD
AxNirK	206	GPDGKYK <b>DYATLAE</b> SYGDTVQVMRTLTPSHIVFNGKVGALTGA--NALTAKVGETVLLI--HSQANRDRTPHLIGGHGD
AcNirK	226	DEAGNYK <b>KYETPGE</b> AYEDAVKAMRTLTPTHIVFNGAVGALTGD--HALTAAVGERVLV--HSQANRDRTPHLIGGHGD
AfNirK	224	DENGKYK <b>KYEAPGD</b> AYEDTVKVMRTLTPTHVVFNGAVGALTGD--KAMTAAVGEKVLIV--HSQANRDRTPHLIGGHGD
HmNirK	286	TLYPDGSLSTDPQTHIQTRLVPPGSTTVATMSSSPVPGDFKLVDHSLSRVTRKGCMAVIRAEGPEDPEIFDPNPE-----
NgAniA	288	KVYVEGGKL--INENVQSTIVPAGGSAIVEFKVDIPGNYTLVDHSIFRAFNKGALGQLKVEGAENPEIMTQKLSDTAYAG
RpNirK	279	QVRYEGGTN--VQKNVQTTLIPAGGAAVVKFTARVPGSYVLVDHSIFRAFNKGALAILKIDGPESKLVYSGKELDSVYLG
PtNirK	263	TVYVEGGSL--KNHNVQTTLIPAGGAIVVEFKVEVPGTFILVDHSIFRAFNKGALAMLKVEGPDDHSIFTGKTAENVYLP
AxNirK	281	WVWETGKFANPPQRDLTFIRGGSAGAALYTFKQPGVYAYLNHNLI EAFELGAAGHIKVEGKWNDDLMKQIKAPAPIPR
AcNirK	301	YVWATGKFRNPDDLQDETWLPGGTAGAAFYTFRQPGVYAYVNHNLIEAFELGAAGHFVKTGEWNDDLMTSVVKPASM--
AfNirK	299	YVWATGKFNTPPDVDQETWLPGGAGAAGAFYTFQQPGIYAYVNHNLIEAFELGAAAHFKVTGEWNDDLMTSVLAPSGT--
HmNirK		-----
NgAniA	366	SGAASAPAASAPAASAPAASAS-----EKS VY-----
RpNirK	357	DRAAPNMSAVTKATEASVSGTLTVQDQVQAGRALFAGTCSVCHQGNAGLPGVFPPLAKSDFLAADPKRAMNIVLHGLNG
PtNirK	341	EGSAIQSLDNTF---TKITANNKDEQIRFGQRYVEANCMAHQANGEGIPGAFPPPLAKSDYLNNNPLLGVNAIIKGLSG
AxNirK	361	-----
AcNirK		-----
AfNirK		-----
HmNirK		-----
NgAniA		-----
RpNirK	437	KIKVNGQEYDSVMPMTQLNDEDEVANILTYVLNSWDNPGGRVSAEDVKKVRAQPAKAKAVAEH
PtNirK	417	PIKVNNVNYNGVMPAM-NLNDEDIANVITFVLNNWDNAGGKVS AEQVAKQRK-----
AxNirK		-----
AcNirK		-----
AfNirK		-----

**Figure S3.** Complete alignment of NirK sequences of *Alcaligenes xilosoxidans* (AxNirK; Uniprot: O68601), *Achromobacter cycloclastes* (AcNirK; Uniprot: P25006), *Alcaligenes faecalis* (AfNirK; Uniprot: P38501), *Haloferax mediterranei* (HmNirK; Protein NCBI ID: WP\_004059594.1), *Ralstonia pickettii* (RpNirK; UniProt: B2UHR8), *Pseudoalteromonas translucida* (PhNirK; Uniprot: Q3IGF7), *Neisseria gonorrhoeae* (NgAniA; UniProt: Q5F7A4). The linker loop is highlighted in yellow whereas coordination patterns around catalytic His residue, TRPHL and SSFHV/I/P, are in underlined.

HmNosZ 1 MSHNTSTP----DDESNESQQDPLSEYEALDALEKDETAGE---ETDLSLELPTLGLSRRDFMKAGAAVGAM---G  
WsNosZ 1 -----MQRLKQSLVVTAS---L  
MhNosZ 1 -----MKKR-----DDLTKDTPVEVSEGGLSRRRFMGAAALAGVA---  
HaiNosZ 1 MTQHTQR-PTS-----DEEPDEQ--QSGAADGFDSLPLGLRRDFMKAGAAVGGV---S  
NaNosZ 1 MTKSHASEP-----TTPPEPT--STTAVDDRDLPLFARIPRRDFMIAGAATGMM---G  
NhNosZ 1 MTDTHAS-----DTNGRST--ETTAVDDRDLPLFARIPRRDFMKAGAAAGAM---S  
NbNosZ 1 MTDTHD-----TAGGNST--RTAVEDDRDLPLFARIPRRDFMKAGAAAGAI---G  
HhNosZ 1 MSDTTPT-----DDRDAID--SETAAEKRDPLFSRIPRRDFMKAGAAAGAM---G  
NeNosZ 1 -----M-----TETNSPT-ES--TLDDTDSEDRDLPLFARIPRRDFMKAGAAATGAM---A  
NaiNosZ 1 MTQTHSDSDSS-----LETNRATDST--TDDSSSERDLPLFARIPRRDFMKAGAAATGAM---A  
HaeNosZ 1 ---MTDTEPDAGEMPEPDPAEKLLREHEAQLDELIADVEPPEDD--ATDDGVTLDLPLGLTLRRDLMKTGAAVGVA---T  
HbNosZ 1 MSSHDTSEGEGETDTKTERSAETLLSEHEAQLNALIADVQGPAD---AVETQLPNLGLGLRRDFMKAGAAVGV---G  
HpeNosZ 1 MSTNTD--TDEEERTERKDSEELFAEHEAQLNELLADVEGPDAP---EAESTLPSLGDGVTRRDVMKAGAAVGV---G  
HmaNosZ 1 -----MSKHETPRDPNEVLEEYETLDSVLAEVESPD EA--TTDDDISLGLPLGLSLRRDFMKAGVAAAGAM---G  
HgNosZ 1 -----MSDSTSSADSTDPERVVEEYENQLEDVLADVEET---TPRTDDDLSELEAGLQLRRDFLKAGAVAGAM---T  
HcNosZ 1 -----MSNDANDSSDAESLVEEHEQRINDLVADVDDPAELGADEDDGFSMQLAGLELRRDFMKAGAAATGLASAAG

HmNosZ 70 SIAGCTSLAGNDG----AGGTTTPHSNSGDPVDFHVPVPPGEHDEYYGFWSGGHSGDIRIYGLPSMRELTRIPVFNPEQAK  
WsNosZ 16 LALGTASLASDLQTI--MKERKLTEKDVLAATAKTYQPSGRKDEFVVFSSGGQSGQILVYGVPSMRKYKYGVFTPEPWQ  
MhNosZ 35 ---GATGLGTSVMSR-----ETWAAAAEEARNKAHVAPGELDEYYGFWSGGHQGEVRVLGVPSMRELMRIPVFNVD SAT  
HaiNosZ 49 GLAGCTSLLEEEEG-----TVS--AAPDHSIPPGEMDEYYAFLGGGQSGDIRVVGLPMSRELIRIPVVFQDSGR  
NaNosZ 48 SLAGCTGLLSDDEQ-----VSAADVTEVPPGEHDDYYAFLSGGHSGLDIRVYGVPSMRQLMRIPVFNVESAR  
NhNosZ 46 SLAGCTGLLSDDDM-----PAAADVADSVPPGELDDYYAFLSGGHSGLDIRVYGVPSMRQIMRIPVFNVESAR  
NbNosZ 45 SLAGCTNLLDEGET-----TAAADVADSVPPGELDEYYAFLSGGHSGLDIRVYGVPSMRQIMRIPVFNVESAR  
HhNosZ 46 SLAGCTGLLSDDDD-----LAAAGDVDSYVPPGEHDDYYAFLSGGHSGLDIRVYGVPSMRQLMRIPVFNVESAR  
NeNosZ 42 SLAGCTGLLGGDES-----TSLEDVKTDPKDPGEHDDYYAFLSGGHTGEIRVYGLPSMRQLMRIPVFNVESAR  
NaiNosZ 53 SMAGCTGLLGGDDS-----VSLEDVKTSPVEPGEHDDYYAFLSGGHTGEIRVYGLPSMRQLMRIPVFNVESAR  
HaeNosZ 73 SLAGCSFGGTGGGN-----GNGNGASTTDHKVPPGEHDDYYGFWSGGHSGEVRVVGIPSMRELRRIPVFNVESAR  
HbNosZ 74 SVAGCAGQGDS-----QGGTATPSSSHGDVDPHFVPPGEHDKYGFWSGGHSGEVRVVGIPSMRELTRIPVFNVESAR  
HpeNosZ 72 GLAGCAGLGNN-----TATESNSGGDVPDHKVPVPPGEHDEYYGFWSGGHAGDIRVYGVPSMRQLMRIPVFNVESAR  
HmaNosZ 66 SVAGCSALS--GGD--SSAG--SQSTPSSSGASHTVEPGEHDEYYGFWSGGHSGELRVIGIPSMRELTRIPVFNVESAR  
HgNosZ 68 GLAGCAGSLPTGGDG-----SNAANTGSDDVPEHRVPPGEHDEYYGFWSGGHSGEIRVLGIPSMRELTRIPVFNVESAR  
HcNosZ 72 AFAGCQ TALPDGKTPSDSGGGGGGSGASASHGHFVPPGEKDEYYGFWSGGHSGEIRVIGIPSMRELQRIPVFNVESAR

HmNosZ 145 GYGFDNQTTMESAGD-----YTWGDSSHPSLSETDGKYDGKYL FVNDKAHGRVARVNLKYFETDAITNIPNVQSVHG  
WsNosZ 94 GYGFDSDSKVLRQGDIRG--REINWGDTHHPNFTKNGEYVGDYLFINDKANPRIAVVNLHDFETTQIVVNPIMKSEHG  
MhNosZ 106 GWGITNESKEILGGDQ-----YLNDCCHPHISMTDGRYDGKYL FVNDKANTRVARIRLDMKTKITHIPNVQAIHG  
HaiNosZ 117 GYGHDESREMLEEAGG-----YTWGDTHHPRISQTDGDYDGRFAYVNDKANGRMARIDLTYFETDAIVDIPNQQTGHG  
NaNosZ 115 GYGFDDETHEMLQESGG-----YTWGDTHHPRVSTQDNEYDGEWLFVNDKANGRMARIDLKYFETDAIDLPNQQTGHG  
NhNosZ 113 GYGFDDETHMLQDAGG-----YTWGDTHHPRVSTQDNEYDGEWLFVNDKANGRMARVDLEYFETDAIDLPNQQTGHG  
NbNosZ 112 GYGFDDETHEMLQEAGG-----YTWGDTHHPRVSTQDNEYDGEWLFVNDKANGRMARIDLEYFETDAIDLPNQQTGHG  
HhNosZ 115 GYGDDRTSEMLEEAGG-----YSWGDTHHPRVSTQDNEYDGRWAFVNDKANGRMARIDLEYFETDAIVDIPNQQTGHG  
NeNosZ 109 GYGDDRTSEMLEDAGG-----YSWGDTHHPRVSTQDNEYDGRWAFVNDKANGRMARINLKYFETDAIVDIPNQQTGHG  
NaiNosZ 120 GYGDDRTSEMLEEAGG-----YTWGDTHHPRVSTQDNEYDGRWAFVNDKANGRMARIDLEYFETDAIVDIPNQQTGHG  
HaeNosZ 143 GYGHDEQTKVLRREGGDVGSVAGHEWGDTHHPILSESAGGDDYDGRYLWINDKVSGLRLARINLKYFETDAITDIPNMQACHG  
HbNosZ 147 GYGFDGTGEMLKDAGD-----YTWGDSSHPSLSETDGKYDGKYL FVNDKANGRVARVNLKYFETDAILDVPNVQSVHG  
HpeNosZ 142 GYGHDDRTTEMLEEAGD-----YTWGDSSHPSLSETDGKYDGKYL FVNDKANGRVARVNLTYFETDAIVDIPNVQSVHG  
HmaNosZ 139 GYGFTDGTQEMLEEAGG-----YSWGDTHHPNLSETDGKYDGKYL FVNDKANGRIARVNLTYFETDAITDVPNMQAIHG  
HgNosZ 142 GYGDDQTDMELEEAGD-----YTWGDTHHPNLSETDGKYDGKYL FVNDKANGRIARVNLKYFETDAITDVPNVQAVHG  
HcNosZ 152 GYGFDQDSSEMLEQAGD-----YTWGDTHHPNLSETDGKYDGKYL FVNDKANGRIARVNLKYFETDAIVDVPNVQCIHG

HmNosZ 219 CCIQ-SPDTEYVFANSEFRTPLPNDGR-DINNPDKYVSLFTALD-----PDSMEVLWQVEVDGNLDILD TD  
WsNosZ 172 GSFV-TPNTEYVIEASQYAAPLDHQYH----PIEYEAVFRAVTLWKFDYAKGKIDEKASFSLFPPYM-QDLS DAGK  
MhNosZ 180 LRLQKVPKTYVFCNAEFVIPQPNDDGT-DFSLDNS-YTMFTAID-----AETMDVAWQVIVDGNLNDNTADG  
HaiNosZ 191 SCAQ-LPDTDLIFGVGEFRAPIPNDGTGDLHDPDEYGAVALAID-----PESMNVEWEVLVDGNMNDGDSG  
NaNosZ 189 ACML-MPDSRYVFGVGEFRVPIPNDDGR-DLDDPSEYGSTLSAMS-----ADPFDHEWDVVRVDCNLDNGDSG  
NhNosZ 187 ACAL-MPDTRLIFGVGEFRVPIPNDDGR-DLEDPEYGSTLSAMS-----ADPFDHEWDVVRVDCNLDNGDSG  
NbNosZ 186 ACAL-MPDTRLIFGVGEFRVPIPNDDGR-DLEDPEYGSTLSAMS-----ADPFDHEWDVVRVDCNLDNGDSG  
HhNosZ 189 ACCL-LPDTKYVFGVGEFRVPMNDGQ-DLDDPENYTSTIAAIN-----PETMNVEWEVLVDGNMNDGDSG  
NeNosZ 183 ACCL-LPDTKYVFGVGEFRVPMNDGQ-DLDDPENYTSTIAAIN-----PETMNVEWEVLVDGNMNDGDSG  
NaiNosZ 194 ACCL-LPDTKYVFGVGEFRVPMNDGQ-DLDDPENYTSTIAID-----PETMNVEWEVLVDGNMNDGDSG  
HbNosZ 223 CSVQ-SPDTKYVVGGEFRVVPVNDGTTDFSDADSYWVFAALD-----PESMEVWQVVRVSGNLDNADSD  
HpeNosZ 221 CCIQ-SPDTEYVFANSEFRAPLPNDGR-DVDDPSKYVSLFSAID-----PESMDVLWQVKVSGNLDIADSD  
HmaNosZ 216 CCIQ-SPDTKYVVFANSEFRTPMPNDGR-DVNEPEEYVSVFSALD-----PESMDVLWQVEVDGQLDIVDSD  
HgNosZ 213 CCVL-SPDTKYVLNGGEFRAPLPNDGT-DAKNPDNYTSLFVAVD-----PDSMETQWQVKVDGNLDIVDTG  
HcNosZ 226 TTVL-SPDTKYVLNGGEFRAPLPNDGR-DVNNPEEYALFSAVD-----PESMETAWQVKVDGNLDIVDTG

HmNosZ 283 KDGRWAISSAYNDEEGV-----EIEEMTKNDRDFVKAFDVPAlQKAVDA-GNYKKVN--GIPVVDGTKESSLN-KG  
 WsNosZ 246 ESFGWAFTNSFNSEMYTGGIEKGLPPEFAGMSRNDTDYMHVYNQOMLEKLAQDPKNYKIYH-----GHRVISIEAAV  
 MhNosZ 244 YTGKYATSTCYNSERAV-----DLAGTMRNDRDWWVVFNVERIAAAVKA-GNFKTIGDSKVPVVDGRGES-----  
 HaiNosZ 256 KEGRYFFTGTYNSEGAV-----TEKGMTRSDRDDVKAFDIPRIEAAVEA-GDYETIN--EVPVVDGKRKSSLN-QG  
 NaNosZ 253 KDGWFFTTTSYNSEEGV-----TEREMTAADTDVVFANIPRIEDAIDA-GEYEEIN--GVPVVDGTEDSSLN-DG  
 NhNosZ 251 KNGWFFTTTSYNSEEGV-----TEAEMTAADTDVVFANIPRIEAAVDA-GEYETIN--GVPVVDGTEDSPLN-TG  
 NbNosZ 250 KYGEWFFTTSYNTEEA-VE-----TESEMTASDTDVVFANIPRIEDAIDA-GEFEEIN--GVPVVDGTEDSPLN-DG  
 HhNosZ 253 KQGRWFFATGYNSESAT-----TESGMSSSDTDWVKAFDVPAlEADAVEA-GEYEEIN--GVPVVDGTRDSALN-SG  
 NeNosZ 247 KEGRWFFTTGTYNSEHAT-----TQSEMSSSDTDWVKAFDVPAlEEAVEA-GEYDEM-VE--GVPVVDGTRDSALN-EG  
 NaiNosZ 258 KEGRWFFATGYNSEHAT-----TESEMSSSDTDWVKAFDVPAlEEAVEA-GDYDEIG--GVPVVDGTRDSSLN-ES  
 HaeNosZ 288 KEGNWAFAATGYNKEEAF-----EIDGMTHDDRDLNKAFDIEAIEAALDA-GEAEEIN--GVPVLDGRQDSPLT-SG  
 HbNosZ 285 KDGRWLLSSSYNDEEGV-----EIEEMTRDDRDSVKAFDVPAlQKAVDA-GKYEEVN--GVPVVDGTRESSLN-KG  
 HpeNosZ 280 KDGRWVLLSSSYNDEEGV-----EVEEMTKDDRDDVKAFDVPAlQELVDA-GEYEEVN--GVPVVDGTKESPHN-EG  
 HmaNosZ 277 KEGRWAISSAYNSEEAT-----DIQGMTKDDRDNVKAFDIPAlEQAVEN-GNYEEVN--GIPVVDGTQGSSTLN-QG  
 HgNosZ 280 KEGRWAISSAYNSEEAV-----EIEGMSHDDRDRYKAFDIPAlEQAVER-GKYEEVN--GVPVVDGTQSSTLN-KG  
 HcNosZ 290 KEGRWAISSCYNSEEAT-----EIQGMTRDDRDRYKAFDIPAlEQAVEN-GNYEEVN--GVPVVDGTRESSLN-SG

HmNosZ 350 DNPIVRYVPTPKSPHCVEVEFNGKYAMVAGKLSPTVSIIDIEKLGTA-----DPKDTIVGQPKLGLGP  
 WsNosZ 318 KAGALFLIPEPKSPHGVDSVDPDGRYIVVGGKLDTHASVYDFRRIKQLIDKKEFIGADPYGIPILDMKKTLLHQVELGLGP  
 MhNosZ 308 --EFTRYIPVKNPHGLNTPDNGKYFIANGKLSPTVSVIAIDKLDDLFE-----KIELRDTIVAEPELGLGP  
 HaiNosZ 323 DDPVHYIPTPKSPHGISVTPDNKYAIAAGKLDPTASVIQIDKIDEVD-----DPTDAIVGQPKLGLGP  
 NaNosZ 320 DEPLVRYIDVPTNPHGVSVTPDGRYAIASGKLDPTCTVIEIDRLNEVD-----DPNDIVGRVNVGNP  
 NhNosZ 318 SEPLVRYIDVPTNPHGVSVTPDGGYAIASGKLDPTCTTIEIDQLTEVD-----DPNDIVGRVNVGNP  
 NbNosZ 317 DEPLVRYIDVPTNPHGVSVTPDGEYAIASGKLDPTCTTIEVDQLNEVD-----DANDIAGRNVNVGNP  
 HhNosZ 320 DRPIVRYVDVAKSPHGVSVTPDNQYAIASGKLDPTATVIDIEQLAEVD-----DPNDIVARPTLGMGP  
 NeNosZ 314 DRPIVRYIDVSKSPHGVSVTPDGGYAIASGKLDPTATVIDIETLAEAD-----DPNESIVGRPRLGMGP  
 NaiNosZ 325 DRPIVRYLDVSKSPHGVSVTPDGGYAIASGKLDPTASVIDIETLADAD-----DPNDIVGRPRLGMGP  
 HaeNosZ 355 SDPIVHYIPTPKSPHGCDEVPSGTYYVTASGKLSPTVTMVEIDKIKEVD-----DPEDAIVGQPRVGMGP  
 HbNosZ 352 DNPLVRYIPTPKSPHCVEVTPDGGYIVAGKLSPTVSIIDIEKLGTE-----DPAKTIVGQPKLGLGP  
 HpeNosZ 347 DDPIVRYIPTPKSPHCVEVTPDGGYGMVAGKLSPTVSIIDIEKLATAD-----DPADTIVGQPKVGLGP  
 HmaNosZ 344 DRPVVKYIPTPKSPHCVEVGPNGDYAFIAGKLSPTVTMLDLNALADSS-----DPDEVVAGRPRVGLGP  
 HgNosZ 347 DRPIVRYVPTPKSPHCVEVEFNGDYAMIAAGKLSPTVTILDIDKLGEVS-----DPADAVVGRPKVGLGP  
 HcNosZ 357 DEPLVRYISTPKSPHCVEVGPDGKYAFIAGKLSPTVTMLDLKIGEVD-----DPADAVAGRPKVGLGP

HmNosZ 414 LHTTYDGR-GHAYTSLFIDSQVVKWDIETAINSPK-----KSEDAILGKIDVHYNPGHIQAIQAMSTEPTGDWLIVL  
 WsNosZ 398 LHTTYDAQDGIITYSLYVDSQIVKWDYKNL-----KVLDRVNVHYNIGHLDSMEGKSAPKPKGYALAL  
 MhNosZ 374 LHTTFDGR-GNAYTTLFIDSQVCKWNIADIAIKHYNG-----DKVNIYRQKLDVQYQPGHNSHSLTESRDADGKWLIVL  
 HaiNosZ 387 LHTAYDGR-GHAYTSLFIDSQVVKWDIEAAVEADA-----GSESPVIEKIDVHYNPGHLIAESYTEDPAGDWLISL  
 NaNosZ 384 LHTAYDGR-GHAYTTLFVDSQVVKWDIEAAVEAEK-----GSEDPVIEKHDVHYSPPGLIAAESYTGDPQGDWLIVL  
 NhNosZ 382 LHTAYDGR-GHAYTTLFVDSQVVKWDIDAAVEAEM-----GSADPVIQKEHVHYSPPGLIAAESYTGDPQGDWLIVL  
 NbNosZ 381 LHTAYDGR-GHGYTTLFVDSQVVKWDIEAAVDAEM-----GSADPVIQKEHDVHYSPPGLIAAESYTGDPQGDWLIVL  
 HhNosZ 384 LHTAYDGR-GHAYTTLFIDSQVVKWDIEAAVADYAPDDEPEGGDQESPAVVEKIDVHYNPGHLIAESYTAGDPQGDWLISL  
 NeNosZ 378 LHTAYDGR-GHAYTTLFIDSQVVKWDIEAAVEASE-----ESTDPVIEKIDVHYNPGHLIAESYTAGDPQGDWLISL  
 NaiNosZ 389 LHTAYDGR-GHAYTTLFIDSQVVKWDIEAAVEASE-----ESEDVPIEKVDVHYNPGHLIAESYTAGDPQGDWLISL  
 HaeNosZ 419 LHTTWDGR-GHGYTTLFIDSQIAKWIDIEQAVEAEK-----GSEEPVVGITDVHYNPGHLQAVEAETDPAGDWLVTTL  
 HbNosZ 416 LHTTYDDR-GHGYTSLFIDSQVVKWDIEKAVESPK-----GSEAILGKIDVHYNPGHIQAVQAMSVETPDGWLIVL  
 HpeNosZ 411 LHTTYDDR-GHAYTSLFIDSQVVKWDIEEAVNAEK-----GSEEPILGKIDVHYNPGHIQAVQAMSTEPEGNLVAL  
 HmaNosZ 408 LHTTFDGN-GHAYTSLFIDSQTVKWDIEAAVEAE-----GSEDSIEKQDVHYNPGHIQALEAMTTDPDGEWLIVL  
 HgNosZ 411 LHTTFDGN-GHAYTSLFIDSQAVKWIDIEKAVEAE-----GSTDPVIEKIDVHYNPGHIQAVKAMTTDPDGEWLISL  
 HcNosZ 421 LHTTFDGN-GHAYTSLFIDSQVAKWDIEEAAANAE-----GSSDPVIEKQDVHYNPGHIQALEAMTTDPDGEWLISL

HmNosZ 485 NKLSKDRFLPVGPIYPDNDQLIYIGNDKDDETGMELVSDHPV-YPEPHDAIFAADKIKPAKTWDAADYEG-----E  
 WsNosZ 461 DKLSIDRFNVPVGLPHQNLIDIGGP-----KMEIYDLPIPLGEPHDFVISIAADKLKPQVTPMGTNSR-----TGKQ  
 MhNosZ 446 SKFSKDRFLPVGPLHPENDQLIDISGE-----EMKLVDHGPT-YAEPHDCILVRRDQIKTKKIYERNDPYFASCRQA  
 HaiNosZ 458 NKLSKDRFLPVGPQHPENDQLIYIGDDE----AGMEHVKDSPA-HAEPHDASICHRSKLDPAKTYDPDDL-----  
 NaNosZ 455 NKLSKDRFLPVGPVFPENDQLFYIGDDE----AGMELVKDTPT-YPEPHDASIVRADRLDPASVYDPDDL-----  
 NhNosZ 453 NKLSKDRFLPVGPVFPENDQLFYIGDDE----AGMELVKDTPA-YPEPHDASIVRADRLDPASVYDPDDL-----  
 NbNosZ 452 NKLSKDRFLPVGPVFPENDQLFYIGDDE----AGMELVKDTPA-YPEPHDASIVRADRLDPASVYDPDDL-----  
 HhNosZ 463 NKLSKDRFLPVGPMHPENDQLIYIGDDE----EGMKLVKDTPT-YAEPHDASIVSADKLDPAKVYDPEDYDE-----  
 NeNosZ 449 NKLSKERFLPVGPMHPENDQLIYIGDDE----EGMSLVKDTPT-YAEPHDASIVSAEKLDPKVYDPEDYDE-----  
 NaiNosZ 460 NKLSKDRFLPVGPMHPENDQLIYIGDDE----EGMSLVKDTPT-YAEPHDASIVSAEKLDPKVYDPEDYDE-----  
 HaeNosZ 490 NKLSKDRFISVGPVHPDNDQLIAIGDAETETGMELVADHPV-HPEPHDCVFASRDKISPNNIWREDYDE-----E  
 HbNosZ 487 NKLSKDRFLPVGPIHPDNDQLIYIGNDKDNETGMELVSDHPV-YPEPHDAIMVHKDKLDPAKIWDADKYDE-----E  
 HpeNosZ 482 NKLSKDRFLPVGPIYPDNDQLIYIGNDKDDETGMELVADHPV-YPEPHDAIFAADKIEPATWDPEDYDE-----  
 HmaNosZ 479 NKLSKDRFLPVGPIMPNDQLIHIGQGE----KEMELVADHPA-YPEPHDCVFAHKDKIDAKKVYDKDYE-----  
 HgNosZ 482 NKLSKDRFLPVGPIHPDNDQLIHIGQGE----KEMELVADHPA-YPEPHDCVFADAEATISATTWDDYDE-----E  
 HcNosZ 492 NKLSKDRFLPVGPIHPDNDQLIHIGDGE----KEMEIVADHPA-YPEPHDCVFAHRDKINPATWDDADYDE-----E

HmNosZ 557 KEYVKESNS-RVERIDEETVEVYTSVKRSEYGLRDFTVKEGDEVTLTATNIEGSQDIVHGLAIPEHNVHLALAPQDTREA  
 WsNosZ 531 HEAMTLAQE-RVERKGNEVKIYGTILRSHINPEHVTVNKGDKVTFYLTNLERAQDETHGFAVSGYNVHASVEPGKTVAV  
 MhNosZ 519 KDGVTLE-SDNKVIRDGNKVRVYMTSVAPQYGMTDFKVKEGDEVTVYITNLDVMGVDVTHGFCMVNHGVSMEISPPQTASV  
 HaiNosZ 525 -EYDEGEE-TMERVGDDRVEIEMYSTRNKYGFQEMTVTEGDTIEMQVTNIETTSMDLHSAIPEHDVHMRVAPQETRKV  
 NaNosZ 522 -DFISADDEENFIERDGDQVRVEMYNQNRHFGFEDITVREGDEVITIRSTNIESEEDIHSLAIPQHDVNVKLAPQETREV  
 NhNosZ 520 -DFISTDDEDNFIERDGDVRVHVMHSQRNYFSFEDIAVQEGDAVTIRTNTNIEQTEDMLHSAIPEYDINVKIAPQETREV  
 NbNosZ 519 -EFISPDDDNFIERDGDVRVHVMYNARNTFGLEDIVVQEGDEVITIRSTNIEQEEDIHLSVAIPQHNVNIKLAPEQETREV  
 HhNosZ 530 -EYIEPDASD--I IREDGHVHVKMHSQRNEFGFQEVTVQEGDEVTFVTNIEQTPDVLHSLAIPHDVNIKLAPEQETREV  
 NeNosZ 516 -EFVDTEDVD--ISREDGRVHVKMYSTRNEFGFEVTVTEGDEVMTVTNIEQTPDILHSLAIPHDINMKLAPEQETREV  
 NaiNosZ 527 -EFISPEDND--ISRENGRVHVKMHSQRNQFGFTDVTVTEGDEVTFVTNIEQTPADLLHSLAIPYDINVNIKLAPEQETREV  
 HaeNosZ 562 KEYVTEDNS-RVERTGDRSVEVYTSVKRSEYGLRDFTVKEGDEVITITVTNIESSRDIHGLAIPQYAINLSIAPQDTRKV  
 HbNosZ 559 REYISEKNS-GIERLDDSTVEVNMSSKRSEFGLREFTVKEGDEVQMTVTNIEKSPDIHGVVAIPEHDINLALAPQDTREV  
 HpeNosZ 553 -EFVSEEDS-RVERVDDSTVEVYASVKRSEYGLRDFTVQEGDEVTLTATNIEGTQDIVHGLAIPHDVNLALAPQDTRQV  
 HmaNosZ 545 ETYITEEDS-GVERTGENSVHVKMTTKRSEFGLPDFTVQEGDEVKLSTTNIEGVQDIHGVVAIPEHDINYAVAPQDTREV  
 HgNosZ 550 KPFTVEKDS-GVERTGEQSVHVKSSVKRSEYGMSEFTVKEGDEVTLTNTNIEDVRDVIHGVVAIPEHDVNLAIAPQDTREV  
 HcNosZ 560 KPFTVTAENS-GVERTGENSVHVKASSKRSEYGMDFTVQEGDEVRLTNTNIEGVDRDIHGVVAIPEHDVNLAVAPQDTREV

HmNosZ 636 TFTADKPGVWIYCTYFCSALHLEMRSRMIVEPRT-----  
 WsNosZ 610 TFTADEEGVFPYYCTEFCSALHLEMMGYLYVKDPKKKYESVKELKLQKMSKEQLESEYKKVIATNKATDDVIQSVVKFLK  
 MhNosZ 598 TFTAGKPGVWYYCNYFCHALHMEMGGRMLVEKA-----  
 HaiNosZ 603 TFTADDPGVWIYCAHFCSALHLEMRSRLIVEPEE-----  
 NaNosZ 601 TFTADEPGVWIYCAHFCSALHLEMRSRLIVEPAD-----  
 NhNosZ 599 TFTADKPGVWIYCAHFCSALHLEMRSRLIVEPAD-----  
 NbNosZ 598 TFTADEPGVWIYCAHFCSALHLEMRSRLIVEPAD-----  
 HhNosZ 607 TFTADEPGVWYMYCAHFCSALHLEMRSRLIVEPAE-----  
 NeNosZ 593 TFTADEPGVWYMYCAHFCSALHLEMRSRLIVEPAE-----  
 NaiNosZ 604 TFTADEPGVWYMYCAHFCSALHLEMRSRLIVEPAE-----  
 HaeNosZ 641 TFTADEPGIYWAYCTYFCSALHLEMRSRMIVEPRD-----  
 HbNosZ 638 TFTADDPGVWIYCTYFCSALHLEMRSRMIVEPRD-----  
 HpeNosZ 631 TFTADEPGVWIYCTYFCSALHLEMRSRMIVEPSE-----  
 HmaNosZ 624 TFTADDPGVWIYCTYFCSALHLEMRSRMIVEPAEG-----  
 HgNosZ 629 TFTADEPGVWIYCTYFCSALHLEMRSRMIVEPRE-----  
 HcNosZ 639 TFTADDPGVWIYCTYFCSALHLEMRSRMIVEPSE-----

HmNosZ -----  
 WsNosZ 690 DKNYAKYPKVKSLVEDALDQYKGIGEVKAKADESYKKGDVNGAILWEYQVWQYMKTADVGLRAKNNLAKELATPMKPAA  
 MhNosZ -----  
 HaiNosZ -----  
 NaNosZ -----  
 NhNosZ -----  
 NbNosZ -----  
 HhNosZ -----  
 NeNosZ -----  
 NaiNosZ -----  
 HaeNosZ -----  
 HbNosZ -----  
 HpeNosZ -----  
 HmaNosZ -----  
 HgNosZ -----  
 HcNosZ -----

HmNosZ -----  
 WsNosZ 770 QKGEEAYLKGGCNGCHVIGQVSSGPDLTGVLSRHENA EKWVDFIKNPASKYEEDYVKTMINYFNL RMPNQHMNDQEIKD  
 MhNosZ -----  
 HaiNosZ -----  
 NaNosZ -----  
 NhNosZ -----  
 NbNosZ -----  
 HhNosZ -----  
 NeNosZ -----  
 NaiNosZ -----  
 HaeNosZ -----  
 HbNosZ -----  
 HpeNosZ -----  
 HmaNosZ -----  
 HgNosZ -----  
 HcNosZ -----

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HmNosZ      -----
WsNosZ      850 IIEYLKWIDENAGLF
MhNosZ      -----
HaiNosZ      -----
NaNosZ      -----
NhNosZ      -----
NbNosZ      -----
HhNosZ      -----
NeNosZ      -----
NaiNosZ      -----
HaeNosZ      -----
HbNosZ      -----
HpeNosZ      -----
HmaNosZ      -----
HgNosZ      -----
HcNosZ      -----

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**Figure S4.** Complete alignment of NosZ sequences of *Wolinella succinogenes* (*WsNosZ*; Protein NCBI ID: WP\_129545366.1; UniProt: Q5F7A4), *Marinobacter hydrocarbonoclasticus* (*MhNosZ*; Protein NCBI ID: WP\_039373687.1; UniProt: B2UHR8), *Halorubrum aidingense* (*HaiNosZ*; Protein NCBI ID: WP\_007998714.1), *Natronococcus amylolyticus* (*NaNosZ*; Protein NCBI ID: WP\_049891949.1), *Natrialba hulunbeirensis* (*NhNosZ*; Protein NCBI ID: ELY91737.1), *Natronolimnobius baerhuensis* (*NbNosZ*; Protein NCBI ID: WP\_087715262.1), *Halobiforma haloterrestis* (*HhNosZ*; Protein NCBI ID: WP\_089784324.1), *Natrinema ejinorensis* (*NeNosZ*; Protein NCBI ID: WP\_097381668.1), *Natronorubrum aibiense* (*NaiNosZ*; Protein NCBI ID: WP\_152944304.1), *Haloplanus aerogenes* (*HaeNosZ*; Protein NCBI ID: WP\_121921888.1), *Haloferax mediterranei* (*HmNosZ*; Protein NCBI ID: WP\_004056356.1), *Halogeometricum borinquense* (*HbNosZ*; Protein NCBI ID: WP\_163487366.1), *Halolamina pelagica* (*HpeNosZ*; Protein NCBI ID: SFP13007.1), *Haloarcula marismortui* (*HmaNosZ*; Protein NCBI ID: WP\_011222995.1), *Hagranum gelatinilyticum* (*HgNosZ*; Protein NCBI ID: WP\_089699362.1), *Halosimplex carlsbadense* (*HcNosZ*; Protein NCBI ID: WP\_006884108.1). The TAT consensus sequence [ST]RRxFLK is underlined and lipoprotein consensus sequence [LVI][ASTVI][GAS]C is in bold. Twin arginine 'RR' and hypothetical amino terminal residue of *Haloferax mediterranei* NosZ are highlighted in yellow and green, respectively. Conserved residues coordinating Cu<sub>A</sub> center atoms are highlighted in gray whereas conservative substitutions are highlighted in turquoise. Conserved His residues coordinating Cu<sub>Z</sub> center are highlighted in cyan and conserved Lys and Glu are in magenta. The percentages of identity of *Wolinella succinogenes* and *Marinobacter hydrocarbonoclasticus* NosZs with *Haloferax mediterranei* NosZ are 33% and 46%, respectively, with a coverage of 88% and 91% respectively, while haloarchaeal NosZ presents an identity range among them between 50% and 77% (coverage between 93 and 100%).

**Table S1.** Interaction distance (Angstroms) between the enzyme residues and the metal centres in NarG, NirK and NosZ templates and models.

<b>PcrA <i>Azospira oryzae</i>:</b> C64-S-Fe: 2.3 C68-S-Fe:2.4 H60-N-Fe:2.2 C102-S-Fe:2.2	<b>NarG <i>Haloferax mediterranei</i></b> C114-S-Fe: 2.2 C118-S-Fe:2.3 H110-N-Fe:2.0 C153-S-Fe:1.9	
Asp-Mo:2.0 Dithiolenes-Mo:2.2, 2.4, 2.4, 2.6	Asp-Mo:2.0 Dithiolenes-Mo:2.2, 2.4, 2.4, 2.6	
<b>NirK <i>Neisseria gonorrhoeae</i>:</b> H94-N-Cu:2.0 H143-N-Cu:1.9 C135-S-Cu: 2.1 M148-S-Cu:2.6	<b>NirK <i>Haloferax mediterranei</i></b> H129-N-Cu:2.1 H179-N-Cu:2.0 C170-S-Cu: 2.1 M183-S-Cu:2.6	Type 1 copper site
H99-N-Cu:2.1 H134-N-Cu:2.2 H289-N-Cu:2.3	H134-N-Cu:2.3 H169-N-Cu:2.3 H329-N-Cu:2.0	Type 2 cooper site
<b>NosZ <i>Marinobacter hydrocarbonoclasticus</i></b> H576-N-CuA:2.1 C611-S-CuA:2.3 W613-O-CuA:2.6 C615-S-CuA:2.3 H619-N-CuA:2.0 M622-S-CuA:2.47	<b>NosZ <i>Haloferax mediterranei</i>:</b> H614-N-CuA:2.3 C649-S-CuA:2.4 Y651-O-CuA:2.4 C653-S-CuA:2.5 H657-N-CuA:1.9 M660-S-CuA:2.0	Cu <sub>A</sub>
H129-N-CuZ:2.2 H130-N-CuZ:2.1 H178-N-CuZ:2.1 H320-N-CuZ:2.3 H375-N-CuZ:2.1 H426-N-CuZ:2.0 H487-N-CuZ:2.0	H168-N-CuZ:2.1 H169-N-CuZ:2.3 H217-N-CuZ:2.2 H364-N-CuZ:2.2 H415-N-CuZ:2.1 H465-N-CuZ:2.1 H532-N-CuZ:1.9	Cu <sub>Z</sub>