

F. nucleatum 1 MYK-----  
 F. periodonticum 1 MYK-----  
 E. coli 1 MNKRDAINHIRQFGGRLDRFRKSVGGSGDGGRNAPKRA-K---SSPK-PVNRKTNVFN  
 P. aeruginosa 1 MSANDLPRG-----P-EE-----GAPERKTREKPSQEQTDSWG-SFSAYLE  
 B. subtilis 1 MIK-----  
 M. tuberculosis 1 MRF-----  
 S. mutans 1 MIR-----  
 S. pneumoniae 1 MSLPLKMAV-----SFV-----TNQKE-----SMDTMIS  
 C. diphtheriae 1 MKL-----  
 B. longum 1 MRA-----  
 S. oneidensis 1 MSDNAKLTR-----SKLP-----ISG-RIVMFFI  
 C. acetobutylicum 1 MRV-----S  
 C. botulinum 1 MKI-----S  
 G. violaceus 1 MIQRVTT-----  
 V. fischeri 1 MAKRKPKNT-----QGA-----SNDGFWA

F. nucleatum 4 LFGYGLK-GIPYINRLKRRVY---AVVITVVALNIFISFSLNKSITNEKIFNSFIVAD  
 F. periodonticum 4 LFGYGLK-DIPYINRLKRRVY---ITVITVSLNIFISFSLNKKVSKETLINSFIIVD  
 E. coli 55 QVRYAFHGAIQDLKSKPFATFLTVMVAISLTLPSVCYMYKYNQAATQYYPSQIIVY  
 P. aeruginosa 40 SHRASLVLSIRRLFGHPFGSFFTLVMGITLISLPMGLSLLINVERIIGGSWQRAAQISLF  
 B. subtilis 4 ILGRHLRFISFKSLGRNTWMTFASISAVITVTLILVGVFLVIMINNMATNAEKQVEIKVL  
 M. tuberculosis 4 --GFLNVEITGFRNVTMTIAMLTTAISVGLFGGMLVVRADSSRAIYLDRVESQVF  
 S. mutans 4 RFFRHLWQSINKLKRNGWMTVAAVSSVITLILVGIFAAFLNTEKIASGIEKNVQINTY  
 S. pneumoniae 25 RFFRHLFAIKSLKRNGWMTVAAVSSVITLILVAIFASVIFNTAKLATDIENNVRVIVY  
 C. diphtheriae 4 --GFVFRFAFRGLGRNITMTIALITTAISLALLATGFLVNTMKTETKDIYLDREVIVQ  
 B. longum 4 RF--ITLSETWANLTRNLSMLLSLTLVTFISFLFIGASVLTQAQITKAKGDWYDKVEVIVW  
 S. oneidensis 24 RHVQQAMASGELWRSPVSLMTMAVLGVSLSLPAALQVLVKNMETITSSWNSAAEISLF  
 C. acetobutylicum 5 TLKLFIFDAIKSLKRNKTIATAAAATVAATLFIILGVCLLVILNKTGISDVRSKVQVQVY  
 C. botulinum 5 TLKYFVLSIKGLRRHKTLSASTATVAATLFIILGVFILLSMNVKQAVTEVESKVEATIV  
 G. violaceus 8 QVDYLLRFVAFGLRRNLWMIWSAVSTLAVLLFLLGLGRASWQIQDAVSDLGSRLFISLY  
 V. fischeri 20 THKKQAKLSFQELLRRPLGNMLTMAVITAMSLTLPSSMYLIGKNETIVASKWQAPSQVSLY

F. nucleatum 60 LQNNINQ-----D---KKNEIEKYILGNGVRSVRFMDKFSFKN-L  
 F. periodonticum 60 LQNNIDE-----E---KRNEIEKYILTIDGVRSVRFMDKSESFKN-L  
 E. coli 115 LQKTID-----DD---AAAGVVAQQAEOQVEKVNYSREDALGE-F  
 P. aeruginosa 100 LDLKTS-----EN---QGDLREQIERPDVIEAQLISREDAISE-L  
 B. subtilis 64 IDLTADQKA-----QDKLQNDIKEIKGQVTFSSKEKELDQ-L  
 M. tuberculosis 62 LTEDVSANDSS-----CDTT---ACKALREKIETRSVAVRFLNRQQAYDD-A  
 S. mutans 64 LQVDSKDNVKSYSVDSNDANKTVNPN---DYHKVYDQIKKEHVKSITFSSKDEQLEK-L  
 S. pneumoniae 85 IRKDVEDNSQTI-EK-E-GQVTNPN---DYHKVYDSLKNSTVKSIVTFSSKEEQYEK-L  
 C. diphtheriae 62 LNEIDVSANDKD-----CSSQ---ACRDVRDKLDGADGETVTYRSRQQSYDR-F  
 B. longum 62 LCPDGTQSANCASG-K---SPSANEITALQKTIRDEIND--VVSNIIDVYSKQDFYNTF  
 S. oneidensis 84 IDENRS-----EQ---TIQSLLTRIRTYPEVEKVVQYIDRNQALDE-F  
 C. acetobutylicum 65 FKDDITIDE-----QKIVLNKLADVPGITGTIKFESKSDALAK-F  
 C. botulinum 65 LKDDIKTEQ-----EKAIKDKINSVAVGEKVTYESKDKALAK-F  
 G. violaceus 68 LDPGVARA-----AAVEPDLRTVGVDEIKSVSKEQAWAA-L  
 V. fischeri 80 LQDDVA-----ET---KVQTLKSELERWKEIEAVQYIISPOEGLKE-L

F. nucleatum 98 QNELNIS---I---PESSNPLTDSLIVSVKDP---TLIGQIQETIE-----SREEVKIV  
 F. periodonticum 98 QNELNIS---I---PEASNPLTDSLIVSVKSA---ELNGVQEIIE-----AREEVKIV  
 E. coli 153 RNWSGFGGA-L--DMLEENPLPAVAVVIKPLDFQGTESNTIRDRIT----QINGIDIV  
 P. aeruginosa 138 QEQSGLGEA-L--KELPENPLPPVIVSVPKQI--DRAGLEARQQQA---ELPHVQQA  
 B. subtilis 102 VDSFGDSGKSLT-MKDQENPLNDAFVKTDDP---HDTPNVAKKIE---KMDHVYKV  
 M. tuberculosis 107 IRKFPQFK-D-V-A--GKDSFPASFVVKIENP---EQHKDFDTAMK---GQPGVLDIV  
 S. mutans 119 KKTMCDDW-NLF--DGDSNPLYDVYIVQTTSP---SEVKTIVAKALG---KISGVDSDV  
 S. pneumoniae 137 TEIMGDNW-KIF--EGDANPLYDAYIVEANAP---NDVKTVAEDAK---KIEGVSEV  
 C. diphtheriae 107 VEVFKDTPQLV-AETSPDALPAALHVRLEDP---LDTKPID-QVR----DMEQVDTI  
 B. longum 116 TKQYPNGE-FQG-RTLTAADDVQDSLWIKKDP---TKYQVSEVLS----GKEGVLDIV  
 S. oneidensis 122 QRLSGFGEA-L--AYLDKNPLPAVITVPTQRYSTPVGAREL---T----KIEREPEI  
 C. acetobutylicum 103 KQQLGNDNKTIVVEGMDTRNPPNSYVSVSDS---DYASGVKAKDKNGSTLDGIEKI  
 C. botulinum 103 KKQLGENNKSIAEGLEKENPLPNSIVRVEKP---ELVSKVGSIK----DMEGDQI  
 G. violaceus 103 KKDLGVRS-DPG-ESLGGNPLVDSLRVRIAQP---EAVAPIAAQIQ---QIEGVSEV  
 V. fischeri 118 SEHSGFEQA-L--LLDLSNPLPAVILVSPKTEWQGTQVNOVNRK---QQSYYNIV

F. nucleatum 143 YKD---ESYKQSKEQGFITSIAQIGSGVFSFFIALITIIIFNFGVAIE--FLNNANTGL  
 F. periodonticum 143 YKD---EPYKQSQEQSDIIRIAQIGSAVFSILIALVTIVIFNFGVAIE--FLNNANTGL  
 E. coli 205 RMD---DSWFARIAALTGLVGR--VSAMIGVLM---VAVFLVIGNSVRLSIFAR-RDSI  
 P. aeruginosa 188 QLD---LVWVERLSAILKLGERR--VFVGLTILL---VLTLLVVCNTIRLHIENR-RNEI  
 B. subtilis 152 TYG---KEEVSRLFKVVGVSRN--IGIALIIGL---VFTAFLLISNTIKITIFAR-RKEI  
 M. tuberculosis 153 LNQ---KELDRLFAVLGDSN--AAFAVALVQ---AIGAILLIANMVQVAAYTR-RTEI  
 S. mutans 167 AYG---GTDTRIFGLANFVRT--WCLAGTGLL---VIVAFLLISNTIRITILSR-RNEI  
 S. pneumoniae 185 QDG---GANTERLRFKLASFIRV--WCLGIAALL---IFIAAFLLISNTIRITIIISR-SREI  
 C. diphtheriae 156 VDQ---VDIDRGATDNLDAIRN--STFIFAATQ---AIAAFLLIVNMVQIAAFNR-REET  
 B. longum 165 TDQ---RQIFDPPFAVLRNRATA--VTAVLAGVM---VVVAALLTGTITIRMSAASR-RTEI  
 S. oneidensis 171 SFGRLDIWELERLQAVVRLER--TVMAIAALL---VLAVLVIGNTIRLAIMNR-RSEI  
 C. acetobutylicum 159 QDG---RELVNKITTITNTVQW--VGIATFIIL---AGVSLFLIGNTIKLTVYSR-RREI  
 C. botulinum 154 KDG---KEIVDKITKITNTLKW--NCVVLFLIL---IGVSLFLIGNTIKITVYSR-RREI  
 G. violaceus 152 SYG---SFAAQRLDQIQQARW--VGLALTAVL---GVATVAITSTIRLIVQSR-RKEI  
 V. fischeri 170 RLD---DDEWALRLDAIKHVAVV--VATTLAILM---FVAVFLVIGNTIRFNVLEQ-RDEI

F. nucleatum 198 DYAENRKSIRNLLSFTMSTVI-----GTLIFFNIVYVLFKRV-SHAN--FNSSML  
 F. periodonticum 198 DYRENRSKLNLIIPFSMASVV-----ATLIFFNIYIFFRKYV-INAN--FDSSLL  
 E. coli 256 NVQKLIGATDGFILRPFLYGGALIGFSGALLSLISEIVL-RSSA-VAEVAQVFGKFK  
 P. aeruginosa 239 EVIKLVGTTDGYVRRPFLYMGALYCHGAGILSWALLAYS LN-WINGS-VVNL SGLVGSDF  
 B. subtilis 203 EIMKLVGATNWFIRWPFLEGLLIGVFCSPVPIALVLS TYQYVIGW-VVPKVQGSFVSLI  
 M. tuberculosis 204 GIMRLVGASRWYQLPFLVEAMLAATMCGVGI AVAGLMV RALFL ENA-LNQ---FYQANL  
 S. mutans 218 QIMRLVGAKNGYIRTPFFFECAWVGLIGALIPAVVVGYLYIFAFEQ-FNPNLAAQNLSLY  
 S. pneumoniae 236 QIMRLVGAKNSYIRGPFLIEGAFIHLGAIAPSVLVFIYQIVYQS-VNKSIVGQNLMSI  
 C. diphtheriae 207 SIMRLVGASRWYQAPFVIEAMVAIFGAILSGLAIFGGKMWVDKT-LKG---LSDSL  
 B. longum 216 EIMRYVGASNWTIRLPFIEGALASLIGSVLSCLMLSAIVNVFVTGWLAKSVT--WIP-Y  
 S. oneidensis 225 EVMKLVGATEAFIQRPFLYTGIVYGVIGGILAWVINDLVW-YLDSA-LAELLGLVGSOL  
 C. acetobutylicum 210 GIMKYIGATDWFIRLPFVIEGMVIGLIGALVTILVVYNYRVLFNK-IRSSFL--TMNII  
 C. botulinum 205 GIMKYIGATDWFIRWPFVFEGLIIGLIGALIAIVLLYGYKAYAK-ASVGLI--EVSLL  
 G. violaceus 203 EVMQLVGATPLRISMPFIEGLAFGLACALIAWGLI EATSRVVAQKQ-LEL---LPFLQW  
 V. fischeri 221 QVMKLVGATNTEILRPYLYTGWFGLIGGFVAWLLTAITV-TLNGA-VDNVAVLSDSIF

F. nucleatum 247 S---LKEIILWHFGAIVINLLVWLPANVGRIEYAEEDDEDYDEFDFEYEE----DGD  
 F. periodonticum 247 S---LKEIFLWHIGAIGINFLVWLPANVGRIEYEEENDDDLE---YEFYEDEDKKDEF  
 E. coli 314 D---INGSFDECLLILLVCSMIGWVAAWLATVQHLRH-----FTPE-----  
 P. aeruginosa 297 G---LQGVPLDDGLSLTVGAVLIGWVAWLA VARHLRE-----LAPR-----  
 B. subtilis 262 P---YNPFVQVSLVLIATGAVIGVWGSLSIRKFLR-----V-----  
 M. tuberculosis 260 IAKVDYADLFIPTWLLLLGVAMSGTAYLTLRLYVR-----R-----  
 S. mutans 277 E---PSPFI FYLIGAMFIVGILIGALGSI L SMRRFLK-----I-----  
 S. pneumoniae 295 S---PDLFSPLMIALLFVIGVFIGSLGSGISMRRLK-----I-----  
 C. diphtheriae 263 IARVSNADWAVAPVAVIGIIFAATAQATLRWYVR-----K-----  
 B. longum 273 V---NQLTVLVISPFLLVGGAILLSITASTISIRRYLR-----A-----  
 S. oneidensis 283 E---MKSITFTELLQLVGLASFICWLGSYLSVRQHLS-----IEPS-----  
 C. acetobutylicum 267 Q---PSYVITFMSWEFLLAGMFI GALSIVVIRKFLD-----V-----  
 C. botulinum 262 N---PSVVLSSVLWIFVVLVIGVIGALSISIRKFLS-----V-----  
 G. violaceus 259 --QPSEPAAFTEPLILLGVGVALCMIGSLIAVRRAT-----R-----  
 V. fischeri 279 R---LVGFTWDESLLLLMLSSFCGLLAARISVLRHLKE-----IEPV-----

F. nucleatum 300 YDEFEDDED--  
 F. periodonticum 301 YDEFEDEDENY  
 E. coli -----  
 P. aeruginosa -----  
 B. subtilis -----  
 M. tuberculosis -----  
 S. mutans -----  
 S. pneumoniae -----  
 C. diphtheriae -----  
 B. longum -----  
 S. oneidensis -----  
 C. acetobutylicum -----  
 C. botulinum -----  
 G. violaceus -----  
 V. fischeri -----

### Figure S3: Wu et al.

**Bacterial FtsX homologs.** Shown is an alignment of amino acids of FtsX-like proteins. The GenBank accession codes are as follows: WP\_005903510.1 (*Fusobacterium nucleatum*); WP\_005974130.1 (*Fusobacterium periodonticum*); AAN82691.1 (*Escherichia coli*); WP\_070142117.1 (*Pseudomonas aeruginosa*); WP\_009968247.1 (*Bacillus subtilis*); CAA49620.1 (*Mycobacterium tuberculosis*); NP\_721693.1 (*Streptococcus mutans*); CXG39040.1 (*Streptococcus pneumoniae*); WP\_014318805.1 (*Corynebacterium diphtheriae*); WP\_011068337.1 (*Bifidobacterium longum*); WP\_011074182.1 (*Shewanella oneidensis*); WP\_010963820.1 (*Clostridium acetobutylicum*); WP\_011140650.1 (*Gloeobacter violaceus*); WP\_005421374.1 (*Vibrio fischeri*). The multiple sequence alignment is generated using T-coffee (<http://tcoffee.crg.cat/apps/tcoffee/do:regular>).