

Table S1. Presence of proteins of FtsK/HerA superfamily and their interaction partners in archaea and few bacteria

| Species | COG0420 SbcD/Mre11 | COG0419 SbcC/Rad50 | COG0433 HerA | COG1674 FtsK/SpoIIIE | COG1630 NurA | COG4974 XerC/D | COG0188 ParC/GyrA |
|---------------------|-----------------------|-----------------------|-----------------|-------------------------|-----------------|-------------------|----------------------|
| Aful | + | + | + | - | + | - | + |
| Halo | + | + | + | - | + | - | + |
| Mace | + | + | + | - | + | - | + |
| Phor/Paby/Pfur | + | + | + | - | + | - | - |
| Mthe | + | + | + | - | + | - | - |
| Mjan | + | + | + | - | + | - | - |
| Mkan | + | + | + | - | + | - | - |
| Tace/Ttvol | + | + | + | - | + | - | + |
| Pyro | + | + | + | - | + | - | - |
| Ssol | + | + | + | - | + | - | - |
| Aper | + | + | + | - | + | - | - |
| Naeq | + | + | + | - | + | - | - |
| Aaeo | + | + | + | - | + | - | + |
| Tmar | + | + | + | - | + | - | + |
| Syne | + | + | + | - ^c | + | - | + |
| Nost | + | + | + | - | + | - | + |
| Telo | + | + | + | - | + | - | + |
| Cau | + | + | + | - | + | ? | ? |
| Fnuc | + | + | + | - | - ^d | + | + |
| Drad/Tthe | + | + | + | + | + | + | + |
| Bhal | + | - | + | + | + | + | + |
| Llac | + | + | - | + | - | + | + |
| Spne | - | - | - | + | - | + | + |
| Bsub/Lino/Saur/Cace | + | + | - | + | - | + | + |
| Tten | + | + | - | + | - | + | + |
| Uure | - | - | - | + | - | + | + |
| Mpne/Mgen | - | - | - | + | - | + | + |
| Cglu | + | - | - | + | - | + | + |
| Mtub | + | - | + ^a | + | - | + | + |
| Ctra | - | - | - | + | - | + | + |
| Tpal | + | + | - | + | - | + | + |
| Bbur | + | + | - | + | - | + | + |
| Ctep | + | + | + ^b | + | + ^b | + | + |
| Ecol/Ypes | + | + | + ^a | + | - | + | + |
| Styp | + | + | - | + | - | + | + |
| Bucn | - | - | - | + | - | + | + |
| Vcho | + | + | - | + | - | + | + |
| Paer | + | + | + ^a | + | - | + | + |
| Hinf | - | - | - | + | - | + | + |
| Xfa | - | - | - | + | - | + | + |
| Nmen/Rsol | - | - | - | + | - | + | + |
| Hpyl/Cjen | - | - | - | + | - | + | + |

| | | | | | | |
|----------------|---|---|----------------|---|---|---|
| Hhep | - | - | + ^b | + | + | + |
| Smel | + | - | + ^a | + | - | + |
| Bmel/Mlot/Atum | - | - | + ^a | + | - | + |
| Rpro/Rcon | - | - | - | + | - | + |

Note: Archaea are shown by blue, Bacteria – by red; largely complementary patterns of HerA and FtsK / XerC/D and NurA are highlighted.

- a- YjgR family (does not show any conserved gene-neighborhood associations)
- b- CT1915 family (predicted endonuclease of novel restriction-modification system)
- c- Contains a distinct version of the FtsK clade, but not the classical FtsK
- d- Has the predicted Sir2-like nuclease instead of NurA

Species abbreviation is the following: Atum - *Agrobacterium tumefaciens*; Aaeo - *Aquifex aeolicus*; Bhal - *Bacillus halodurans*; Bsub - *Bacillus subtilis*; Bjap - *Bradyrhizobium japonicum*; Bbur - *Borrelia burgdorferi*; Cjej - *Campylobacter jejuni*; Ctra - *Chlamydia trachomatis*; Ctep - *Chlorobium tepidum*; Cglu - *Corynebacterium glutamicum*; Cace - *Clostridium acetobutylicum*; Drad - *Deinococcus radiodurans*; Ecol - *Escherichia coli*; Fnuc - *Fusobacterium nucleatum*; Hinf - *Haemophilus influenzae*; Hhep - *Helicobacter hepaticus*; Hpyl - *Helicobacter pylori*; Llac - *Lactococcus lactis*; Linn - *Listeria innocua*; Mlot - *Mesorhizobium loti*; Mlep - *Mycobacterium leprae*; Mtub - *Mycobacterium tuberculosis*; Mgen - *Mycoplasma genitalium*; Mpne - *Mycoplasma pneumoniae*; Nmen - *Neisseria meningitidis*; Nost - *Nostoc sp.*; Pmar - *Prochlorococcus marinus*; Paer - *Pseudomonas aeruginosa*; Rsol - *Ralstonia solanacearum*; Rcon - *Rickettsia conorii*; Rpro - *Rickettsia prowazekii*; Styp - *Salmonella typhimurium*; Smel - *Sinorhizobium meliloti*; Saur - *Staphylococcus aureus*; Spne - *Streptococcus pneumoniae*; Spyo - *Streptococcus pyogenes*; Syne - *Synechocystis sp.*; Tten - *Thermoanaerobacter tengcongensis*; Telo - *Thermosynechococcus elongatus*; Tmar - *Thermotoga maritima*; Tthe - *Thermus thermophilus*; Tpal - *Treponema pallidum*; Vcho - *Vibrio cholerae*; Xfas - *Xylella fastidiosa*; Ypes - *Yersinia pestis*; Aper - *Aeropyrum pernix*; Aful - *Archaeoglobus fulgidus*; Halo - *Halobacterium sp.*; Mjan - *Methanocaldococcus jannaschii*; Mkan - *Methanopyrus kandleri*; Mace - *Methanosarcina acetivorans*; Mthe - *Methanothermobacter thermautotrophicus*; Nequ - *Nanoarchaeum equitans*; Paer - *Pyrobaculum aerophilum*; Paby - *Pyrococcus abyssi*; Pfur - *Pyrococcus furiosus*; Phor - *Pyrococcus horikoshii*; Ssol - *Sulfolobus solfataricus*; Taci - *Thermoplasma acidophilum*; Tvol - *Thermoplasma volcanium*;