

Table S3. Homologues of *virX* in other bacteria

| Bacterial strains                                   | <i>virX</i><br>copy | Taxonomy  |
|---|---------------------|---|
| <i>Bacteroides capillosus</i> ATCC 29799            | 1                   | Bacteroidetes/Chlorobi group; Bacteroidetes; Bacteroidia; Bacteroidales |
| <i>Chloroflexus aggregans</i> DSM 9485              | 2                   | Chloroflexi; Chloroflexi (class); Chloroflexales; Chloroflexaceae       |
| <i>Chloroflexus aurantiacus</i> J-10-fl             | 2                   | Chloroflexi; Chloroflexi (class); Chloroflexales; Chloroflexaceae       |
| <i>Chloroflexus</i> sp. Y-400-fl                    | 2                   | Chloroflexi; Chloroflexi (class); Chloroflexales; Chloroflexaceae       |
| <i>Roseiflexus castenholzii</i> DSM 13941           | 3                   | Chloroflexi; Chloroflexi (class); Chloroflexales; Chloroflexaceae       |
| <i>Roseiflexus</i> sp. RS-1                         | 3                   | Chloroflexi; Chloroflexi (class); Chloroflexales; Chloroflexaceae       |
| <i>Herpetosiphon aurantiacus</i> ATCC 23779         | 2                   | Chloroflexi; Chloroflexi (class); Herpetosiphonales; Herpetosiphonaceae |
| <i>Dehalococcoides ethenogenes</i> 195              | 2                   | Chloroflexi; Dehalococcoidetes  |
| <i>Dehalococcoides</i> sp. BAV1                     | 2                   | Chloroflexi; Dehalococcoidetes  |
| <i>Dehalococcoides</i> sp. CBDB1                    | 2                   | Chloroflexi; Dehalococcoidetes  |
| <i>Dehalococcoides</i> sp. GT                       | 2                   | Chloroflexi; Dehalococcoidetes  |
| <i>Dehalococcoides</i> sp. VS                       | 2                   | Chloroflexi; Dehalococcoidetes  |
| <i>Dehalogenimonas lykanthroporepellens</i> BL-DC-9 | 3                   | Chloroflexi; Dehalococcoidetes  |
| <i>Ostreococcus lucimarinus</i> CCE9901             | 1                   | Eukaryota; Viridiplantae; Chlorophyta; Mamiellophyceae; Mamiellales     |
| <i>Ostreococcus tauri</i>                           | 1                   | Eukaryota; Viridiplantae; Chlorophyta; Mamiellophyceae; Mamiellales     |
| <i>Acidobacterium capsulatum</i> ATCC 51196         | 1                   | Fibrobacteres/Acidobacteria group; Acidobacteria; Acidobacteria (class) |
| <i>Acidobacterium</i> sp. MP5ACTX8                  | 1                   | Fibrobacteres/Acidobacteria group; Acidobacteria; Acidobacteria (class) |

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| Acidobacterium sp. MP5ACTX9                       | 1 | Fibrobacteres/Acidobacteria group; Acidobacteria; Acidobacteria (class)         |
| Terriglobus saanensis SP1PR4                      | 1 | Fibrobacteres/Acidobacteria group; Acidobacteria; Acidobacteria (class)         |
| Candidatus Solibacter usitatus Ellin6076          | 1 | Fibrobacteres/Acidobacteria group; Acidobacteria; Solibacteres; Solibacterales; |
| Candidatus Koribacter versatilis Ellin345         | 1 | Fibrobacteres/Acidobacteria group; Acidobacteria; unclassified Acidobacteria    |
| Bacillus sp. NRRL B-14911                         | 1 | Firmicutes; Bacilli; Bacillales; Bacillaceae                                    |
| Lactobacillus amylolyticus DSM 11664              | 1 | Firmicutes; Bacilli; Lactobacillales; Lactobacillaceae                          |
| Lactobacillus delbrueckii subsp. lactis DSM 20072 | 1 | Firmicutes; Bacilli; Lactobacillales; Lactobacillaceae                          |
| Ruminococcaceae bacterium D16                     | 1 | Firmicutes; Clostridia; Clostridiales   |
| Clostridium acetobutylicum ATCC 824               | 1 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium acetobutylicum DSM 1731               | 1 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium beijerinckii NCIMB 8052               | 5 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium botulinum A str. ATCC 19397           | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium botulinum A str. ATCC 3502            | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium botulinum A str. Hall                 | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium botulinum A2 str. Kyoto               | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium botulinum A3 str. Loch Maree          | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium botulinum B str. Eklund 17B           | 7 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium botulinum B1 str. Okra                | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium botulinum Ba4 str. 657                | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium botulinum E1 str. 'BoNT E Beluga'     | 7 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |
| Clostridium botulinum E3 str. Alaska E43          | 7 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae                           |

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| <i>Clostridium botulinum</i> F str. Langeland      | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium botulinum</i> NCTC 2916             | 2 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium butyricum</i> 5521                  | 6 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium butyricum</i> E4 str. BoNT E BL5262 | 6 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium carboxidivorans</i> P7              | 7 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium cellulolyticum</i> H10              | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium cellulovorans</i> 743B              | 5 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium kluyveri</i> NBRC 12016             | 1 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium leptum</i> DSM 753                  | 1 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium ljungdahlii</i> DSM 13528           | 2 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium methylpentosum</i> DSM 5476         | 1 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium novyi</i> NT                        | 1 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium papyrosolvens</i> DSM 2782          | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium perfringens</i> ATCC 13124          | 4 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium perfringens</i> B str. ATCC 3626    | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium perfringens</i> C str. JGS1495      | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium perfringens</i> CPE str. F4969      | 2 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium perfringens</i> D str. JGS1721      | 2 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium perfringens</i> E str. JGS1987      | 4 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium perfringens</i> NCTC 8239           | 2 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |
| <i>Clostridium perfringens</i> NCTC 823951         | 1 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae |

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| <i>Clostridium perfringens</i> SM101              | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae    |
| <i>Clostridium perfringens</i> str. 13            | 4 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae    |
| <i>Clostridium</i> sp. 7_2_43FAA                  | 6 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae    |
| <i>Clostridium sporogenes</i> ATCC 15579          | 3 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae    |
| <i>Clostridium thermocellum</i> ATCC 27405        | 1 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae    |
| <i>Clostridium thermocellum</i> DSM 2360          | 1 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae    |
| <i>Clostridium thermocellum</i> JW20              | 1 | Firmicutes; Clostridia; Clostridiales; Clostridiaceae    |
| <i>Eubacterium limosum</i> KIST612                | 1 | Firmicutes; Clostridia; Clostridiales; Eubacteriaceae    |
| <i>Eubacterium siraeum</i> 70/3                   | 1 | Firmicutes; Clostridia; Clostridiales; Eubacteriaceae    |
| <i>Eubacterium siraeum</i> DSM 15702              | 1 | Firmicutes; Clostridia; Clostridiales; Eubacteriaceae    |
| <i>Eubacterium siraeum</i> V10Sc8a                | 1 | Firmicutes; Clostridia; Clostridiales; Eubacteriaceae    |
| <i>Heliobacterium modesticaldum</i> Ice1          | 4 | Firmicutes; Clostridia; Clostridiales; Heliobacteriaceae |
| <i>Candidatus Desulforudis audaxviator</i> MP104C | 1 | Firmicutes; Clostridia; Clostridiales; Peptococcaceae    |
| <i>Desulfitobacterium hafniense</i> DCB-2         | 3 | Firmicutes; Clostridia; Clostridiales; Peptococcaceae    |
| <i>Desulfitobacterium hafniense</i> Y51           | 3 | Firmicutes; Clostridia; Clostridiales; Peptococcaceae    |
| <i>Desulfotomaculum acetoxidans</i> DSM 771       | 1 | Firmicutes; Clostridia; Clostridiales; Peptococcaceae    |
| <i>Desulfotomaculum kuznetsovii</i> DSM 6115      | 1 | Firmicutes; Clostridia; Clostridiales; Peptococcaceae    |
| <i>Desulfotomaculum reducens</i> MI-1             | 2 | Firmicutes; Clostridia; Clostridiales; Peptococcaceae    |
| <i>Desulfotomaculum ruminis</i> DSM 2154          | 2 | Firmicutes; Clostridia; Clostridiales; Peptococcaceae    |
| <i>Syntrophobotulus glycolicus</i> DSM 8271       | 1 | Firmicutes; Clostridia; Clostridiales; Peptococcaceae    |
| <i>Thermincola</i> sp. JR                         | 1 | Firmicutes; Clostridia; Clostridiales; Peptococcaceae    |

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| <i>Acetivibrio cellulolyticus</i> CD2                             | 3 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Anaerotruncus colihominis</i> DSM 17241                        | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Ethanoligenens harbinense</i> YUAN-3                           | 3 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Faecalibacterium cf. prausnitzii</i> KLE1255                   | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Faecalibacterium prausnitzii</i> L2-6                          | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Faecalibacterium prausnitzii</i> A2-165                        | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Faecalibacterium prausnitzii</i> M21/2                         | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Faecalibacterium prausnitzii</i> SL3/3                         | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Ruminococcus albus</i> 7                                       | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Ruminococcus albus</i> 8                                       | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Ruminococcus bromii</i> L2-63                                  | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Ruminococcus flavefaciens</i> FD-1                             | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Ruminococcus sp.</i> 18P13                                     | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Subdoligranulum variabile</i> DSM 15176                        | 1 | Firmicutes; Clostridia; Clostridiales; Ruminococcaceae                  |
| <i>Dethiobacter alkaliphilus</i> AHT 1                            | 1 | Firmicutes; Clostridia; Clostridiales; Syntrophomonadaceae              |
| <i>Syntrophomonas wolfei</i> subsp. <i>wolfei</i> str. Goettingen | 2 | Firmicutes; Clostridia; Clostridiales; Syntrophomonadaceae              |
| <i>Syntrophothermus lipocalidus</i> DSM 12680                     | 1 | Firmicutes; Clostridia; Clostridiales; Syntrophomonadaceae              |
| <i>Tepidanaerobacter sp.</i> Re1                                  | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Thermoanaerobacter brockii</i> subsp. <i>finnii</i> Ako-1      | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Thermoanaerobacter ethanolicus</i> CCSD1                       | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Thermoanaerobacter ethanolicus</i> JW 200                      | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |

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| <i>Thermoanaerobacter italicus</i> Ab9                              | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Thermoanaerobacter mathranii</i> subsp. <i>mathranii</i> str. A3 | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Thermoanaerobacter pseudethanolicus</i> ATCC 33223               | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Thermoanaerobacter</i> sp. X513                                  | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Thermoanaerobacter</i> sp. X514                                  | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Thermoanaerobacter</i> sp. X561                                  | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Thermoanaerobacter tengcongensis</i> MB4                         | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Thermoanaerobacter wiegelii</i> Rt8.B1                           | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Moorella thermoacetica</i> ATCC 39073                            | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacteraceae |
| <i>Caldicellulosiruptor bescii</i> DSM 6725                         | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Caldicellulosiruptor hydrothermalis</i> 108                      | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Caldicellulosiruptor kristjanssonii</i> 177R1B                   | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Caldicellulosiruptor kronotskyensis</i> 2002                     | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Caldicellulosiruptor lactoaceticus</i> 6A                        | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Caldicellulosiruptor obsidiansis</i> OB47                        | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Caldicellulosiruptor owensensis</i> OL                           | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Caldicellulosiruptor saccharolyticus</i> DSM 8903                | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Thermoanaerobacterium thermosaccharolyticum</i> DSM 571          | 2 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Thermoanaerobacterium xylanolyticum</i> LX-11                    | 2 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Thermosediminibacter oceani</i> DSM 16646                        | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |
| <i>Mahella australiensis</i> 50-1 BON                               | 1 | Firmicutes; Clostridia; Thermoanaerobacterales; Thermoanaerobacterales  |

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| Phascolarctobacterium sp. YIT 12067         | 1 | Firmicutes; Negativicutes; Selenomonadales; Acidaminococcaceae |
| Acetonema longum DSM 6540                   | 3 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |
| Centipeda periodontii DSM 2778              | 1 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |
| Megamonas hypermegale ART12/1               | 1 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |
| Mitsuokella multacida DSM 20544             | 1 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |
| Selenomonas artemidis F0399                 | 1 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |
| Selenomonas flueggei ATCC 43531             | 1 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |
| Selenomonas noxia ATCC 43541                | 1 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |
| Selenomonas sp. oral taxon 137 str. F0430   | 1 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |
| Selenomonas sp. oral taxon 149 str. 67H29BP | 1 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |
| Selenomonas sputigena ATCC 35185            | 1 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |
| Thermosinus carboxydivorans Nor1            | 1 | Firmicutes; Negativicutes; Selenomonadales; Veillonellaceae    |

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The 51-aa amino acid sequence deduced from *virX* was searched in a non-redundant protein database using blast-p program (Expect > 1e-4)