SIANN: Strain Identification by Alignment to Near Neighbors

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Abstract

Next-generation sequencing is increasingly being used to study samples composed of mixtures of organisms, such as in clinical applications where the presence of a pathogen at very low abundance may be highly important. We present an analytical method (SIANN: Strain Identification by Alignment to Near Neighbors) specifically designed to rapidly detect a set of target organisms in mixed samples that achieves a high degree of species- and strain-specificity by aligning short sequence reads to the genomes of near neighbor organisms, as well as that of the target. Empirical benchmarking alongside the current state-of-the-art methods shows an extremely high Positive Predictive Value, even at very low abundances of the target organism in a mixed sample. SIANN is available as an Illumina BaseSpace app, as well as through Signature Science, LLC. SIANN results are presented in a streamlined report designed to be comprehensible to the non-specialist user, providing a powerful tool for rapid species detection in a mixed sample. By focusing on a set of (customizable) target organisms and their near neighbors, SIANN can operate quickly and with low computational requirements while delivering highly accurate results.

Introduction

There are many different methods that characterize the mixture of organisms present within a metagenomic dataset. Such datasets are generated when a complex environmental sample is processed by a “next-generation” high-throughput genome sequencing protocol, and they consist of large numbers of short nucleotide sequences. Each sequence represents a small fragment of a randomly selected genome from the very large collection of genomes present in the source sample. Those sequences indicate the presence of one organism or another according to their similarity to a set of known reference genomes. While a given sequence may be unique to one species, it also may be found in diverse organisms across the tree of life. Therefore, one analytical challenge (among many) is to take that collection of sequences (likely numbering in the millions) and accurately determine what species are present in the sample. Here we describe a novel method (SIANN: Strain Identification by Alignment to Near Neighbors) that is specifically designed to rapidly detect a set of targeted organisms from a metagenomic dataset by aligning reads to genomic regions that are unique at the strain or species level.

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The analytical question motivating a particular piece of metagenomic bioinformatic analysis may vary widely by user and sample type (Segata, et al., 2013). For example, the function of the human gut microbiome may depend on the relative abundance of hundreds of species of bacteria and the types of metabolic genes they contain (Wu, et al., 2011; Schloissnig, et al., 2013). In contrast, the clinical treatment of a patient may depend on whether or not a particular virus, or a consortium of co-infecting pathogens, is/are detected in their blood. It is this second class of presence/absence questions that SIANN is designed to address. SIANN is appropriate for situations in which a user wants to know whether a particular organism or set of organisms is present in a sample, but isn't interested in the functions encoded in their genomes, the relative abundance of each organism, or any other more in-depth analysis.

Methods

Approach

Metagenomic classification methods are based on a wide variety of theoretical underpinnings. The basic varieties include alignment of reads to various nucleotide databases or exact matching to nucleotide or protein signature sequences (or *kmers*). A representative set of recent methods are described in Table 1 (also see Bazinet & Cummings 2012).

Name	Method	Reference
MEGAN	Alignment to large nucleotide database	Huson, et al., 2011
PhymmBL	Alignment to large nucleotide database with interpolated Markov models	Brady & Salzberg, 2011
Metaphyler	Alignment to clade-specific marker genes	Liu, et al., 2011
MetaPhlAn	Alignment to clade-specific marker genes	Segata, et al., 2012
LMAT	Nucleotide kmer matching	Ames, et al., 2013
Kraken	Nucleotide kmer matching	Wood & Salzberg, <i>in submission</i>
Sequedex	Protein kmer matching	Berendzen, et al., 2012
mOTU	Alignment to universal marker genes	Sunagawa, et al., 2013
Phylosift	Insertion into reference nucleotide and protein alignments	Darling, et al., <i>in preparation</i>

Table 1. Summary of methods for metagenomic classification.

Overall, these methods are designed to either classify individual reads to, and/or predict the total abundance of, clades (e.g. genus or species) across the entire tree of life. They generally require reference databases that are very large and/or require a large amount of processing to generate. The gap SIANN is designed to fill is when the entire tree of life is irrelevant, and only predefined subsets of organisms need to be detected. For an underlying method we chose read alignment to diagnostic genomic regions because the algorithms for read alignment are highly parallelizable and have been optimized heavily by the community at large (the current implementation of

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SIANN uses bowtie2 [Langmead & Salzberg, 2012] for the alignment function, but can be adapted to any alignment algorithm). This approach is distinct from using clade-specific marker genes (Segata, et al., 2012) because unique regions that are larger, smaller, or outside of genes can also be used. Furthermore, this approach supports the rapid construction of custom databases using reference genome sets that require only minimal user-supplied structure.

To understand the principle at work, consider a set of reads that have been aligned to the genomes of several strains belonging to two species. Some regions of those genomes are species-specific, some are strain-specific, and some are shared (Figure 1a). When a set of reads is aligned to those genomes such that each read is placed in as many locations as it has a match (at a reasonably stringent threshold), visual inspection of the distribution of reads yields an intuitive understanding of the true source organism as Species I/Strain B (Figure 1b). If Strain B were not present in the reference database, it would still be clear that the organism was an unknown strain of Species I.

Figure 1. A) For a group of strains belonging to two different species, some regions may be unique to each species (region 1), while other regions may be unique to strains within each species (regions 2 and 3). B) A set of reads are aligned to these genomes, and the ones that align in a species- or strain-specific manner are identified by the combination of genomes to which they align. In this example, Strain B of Species I is the organism identified.

The unique identification of a species or strain is quantified by the proportion of the genome that is determined to be species- or strain-specific (defined as reads that are aligned to regions that are species- or strain-specific). Each species and strain is then assigned a numerical measure of the proportion that is covered by these diagnostic reads, and that proportional measure is compared to the ideal case, where sequences from a single organism (generated *in silico*) are aligned against the database in an identical manner. After that normalization factor is applied, the resulting score indicates whether the source sample contained any of the organisms in the reference database.

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The analysis is conducted independently on both the species and the strain level, so that if the true strain is not present in the database, the species of origin will still be identified. While many methods consider the complete taxonomic tree and assign reads to the least common ancestor, SIANN considers only two taxonomic levels: species and strain, throwing out anything that is not unique at one of those levels and thus obviating many of the confounding factors introduced by manually curated taxonomies.

The example shown in Figure 1b indicates that species-specific reads are identified as reads that align to one species (Species I, in that case) but not the other. If Species II were not present in the example shown in Figure 1b, a much larger number of reads would be assigned as "species-specific," when in fact those regions are shared with other species. Therefore, the ability of this method to identify strain- and species-specific sequences is a direct function of the inclusion of near neighbors in the reference database. This characteristic is shared among many classification algorithms, but it is of particular note for this method when users have an opportunity to construct their own database.. In order to detect a target species with a high degree of specificity (reducing false positives), it is necessary to include other related species in the reference database. Only by parallel alignment to those near neighbors can the redundant sequences be separated from the species-specific ones. For example, in order to detect *Bacillus anthracis* in a sample, it would be necessary to include other species of *Bacilli* in the reference database so that the presence of *B. cereus* or *B. thuringiensis* in a sample does not lead to a false call for *B. anthracis*.

The nomenclature of genus, species, and strain is potentially problematic because it does not correspond to a consistent degree of evolutionary distance or genomic distinctiveness. The ability to distinguish two organisms by any method using genomic sequence data is proportional to the amount of each genome that is shared or unique. One might assume that any two organisms of the same species will have a relatively predictable amount of shared genomic identity. However, some pairs of organisms from the same species may have less in common than other pairs of organisms from different species or even genera. This ambiguity impacts SIANN in two ways. If two organisms have very little genomic sequence to distinguish them, the sensitivity of SIANN to detect either one will diminish (the rate of false negatives will increase as the likelihood of sequencing unique regions decreases). Conversely, if an organism is extremely dissimilar to the near neighbors selected for the database, the specificity with which SIANN detects that organism will decline (the rate of false positives will increase as the number of related genomes available in the database decreases). For example, if a database contained only *E. coli* and *B. anthracis*, a sample containing *B. cereus* would be misidentified as containing *B. anthracis*. In the intended use case, a database targeting *B. anthracis* would contain *B. cereus* and a number of other near neighbors to prevent that kind of misidentification. It would be convenient to say that

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an ideal database can be made by calculating the ideal genetic distance between all references and then finding an ideal set of organisms to make up that database, but the behavior of any database will be governed by the particular genomes of the organisms it encounters in the wild. Because not all organisms evolve in the same manner (differences in mutation rate, horizontal gene transfer, recombination, etc), the suitability of a database and method to detect a given organism can only be determined by thorough validation and benchmarking, as well as updating the reference database as needed. Users of SIANN may construct their own custom databases to include newly identified genomes or specific subsets of genomes that best suit their research interests.

Steps to construct a custom database:

1. Select a set of target organisms
2. Gather a set of genome sequences for those target organisms as well as a matched set of near neighbors
3. Using those reference genome sequences as an input, SIANN will:
 - a. Construct a reference index for alignment
 - b. Simulate a set of reads from each genome
 - c. Align each of those simulated read sets to all of the reference genomes
 - d. Calculate the proportion of each reference genome that is strain- or species-specific
 - e. [If two organisms do not have a minimal amount of unique sequences that exceeds the rate of sequencing error, SIANN asks that all but one of those organisms are removed from the database to eliminate redundancy. Note that the user can provide a single representative genome with multiple strain names so that the redundant strain names are not lost.]

The files contained within each SIANN database are a compressed genomic index and a list containing the proportion of each reference genome that was found to be strain- or species-specific during database construction.

To run SIANN:

1. Select a pre-made SIANN database and a set of sequences to be analyzed, and
2. SIANN will:
 - a. Align each of the reads against the reference genomes
 - b. Calculate the proportion of each reference genome that is strain- or species-specific within those reads
 - c. Compare that proportion to the simulated ideal case generated during database creation

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- d. Calculate the probability that the given results could be generated by random chance
- e. Report the normalized proportion and non-parametric statistic of likelihood for each strain and species in the reference database. The normalized proportion of the genome covered by strain- or species-specific reads is the primary statistic reported by this tool.

Benchmarking

The performance of SIANN (version 1.6) was tested in comparison to the following state-of-the-art metagenomic classification programs: LMAT (version 1.2), MetaPhlAn (version 1.7.7), and Kraken (version 0.9.1b). All of the programs in Table 1 were investigated for this effort, and three were chosen based on their ability to run on our high-performance computing cluster with an execution time and memory requirement that would be suitable to a clinical lab. Each program was run on a set of 600 simulated datasets generated by MetaSim (Richter, et al., 2008). Each dataset consisted of 15,000,000 reads (100bp single-ended) with Illumina-simulated error (fourth-degree polynomial) (Korbel, et al., 2009). The 600 datasets were broken into 12 sets of 50 replicates. Each of the 12 sets contained organisms at different levels of abundance as shown in Table 2. Organisms were specifically chosen in pairs so that the ability to distinguish these near neighbors could be determined. The abundances were staggered at 4-fold intervals so that a wide range could be evaluated. All known species of near neighbors for each of

Organism	1	2	3	4	5	6	7	8	9	10	11	12
<i>Bacillus anthracis</i>	0.074%	0.30%	1.2%	4.7%	19%	76%						
<i>Bacillus cereus</i>							0.074%	0.30%	1.2%	4.7%	19%	76%
Hanta virus		1.2%	4.7%	19%	76%	0.074%	0.30%					
Rift valley fever virus	0.30%							1.2%	4.7%	19%	76%	0.074%
<i>Clostridium botulinum</i>			19%	76%	0.074%	0.30%	1.2%	4.7%				
<i>Clostridium difficile</i>	1.2%	4.7%							19%	76%	0.074%	0.30%
<i>Listeria fleischmannii</i>				0.074%	0.30%	1.2%	4.7%	19%	76%			
<i>Listeria monocytogenes</i>	4.7%	19%	76%							0.074%	0.30%	1.2%
Monkeypox virus					1.2%	4.7%	19%	76%	0.074%	0.30%		
Vaccinia virus	19%	76%	0.074%	0.30%							1.2%	4.7%
<i>Yersinia enterocolitica</i>						19%	76%	0.074%	0.30%	1.2%	4.7%	
<i>Yersinia pestis</i>	76%	0.074%	0.30%	1.2%	4.7%							19%

Table 2. The abundance of each target organism in each set of simulated datasets. Each set is indicated by the number in the top row, and was generated with 50 replicates.

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the 12 target organisms were included in the reference database used by SIANN for this benchmarking ("Target Pathogen Database") and are shown in Appendix 1.

Each program outputs a distinct measure. Kraken and LMAT both count the reads assigned to each taxon, MetaPhlAn calculates the abundance, and SIANN outputs a measure of the proportion of diagnostic genomic regions present. To put these measures on an even footing, we empirically calculated the false positive rate for each method over all 600 samples, at each possible measure of output. Because each dataset is made up of known organisms, any result can be classified as true or false. Therefore, for any possible result (say, 513 reads classified by LMAT or 1.6% abundance assigned by MetaPhlAn), one can calculate the proportion of calls with at least the same amount of support that were correct (True Positives/[True Positives+False Positives]), over all of the 600 datasets. That measure is commonly given as Positive Predictive Value (PPV). For each program, the results can be translated from the raw value into a PPV that is based on this empirical measure of error. The key item of interest is the PPV value for the results that we know to be true positives, the defined spike organisms. Another way of describing this approach is to say that the results of each program have been normalized to the false positive error rate that was empirically observed. If another set of samples were generated, the PPV vs. raw value curve (Figure 2) would likely fall differently, but in this case it gives us a means of comparing a diverse set of methods against the same ground truth. If method 1 detects an organism with a higher PPV than method 2 does, it means that method 1 has fewer false positives in the range that it reports true positives, which is the definition of utility in this setting.

For each method, PPV was calculated as a function of raw output value. Briefly, this was done by compiling the output for all 600 samples, labeling each result as false or true based on the sample set that it came from, and then calculating (at each possible value of output) what the proportion of TP/[TP+FP] was for results with at least that level of raw output. Some simplification steps were taken, such as focusing on the species-level assignments (for comparison with methods that do not perform strain assignment), and only taking the top hit for each species from each dataset. Custom R and BASH scripts were used for the data compilation and analysis.

Results

The relationship of raw output value to PPV is shown for each of the four methods in Figure 2. The point at which PPV is very close to 1 (where 95% of results are true positives) is ~41,000 reads for Kraken, ~2,800 reads for LMAT, ~38% abundance for MetaPhlAn, and 0.21 for SIANN. For SIANN this means that having 38% of the species-unique genome covered by reads resulted in the vast majority of calls being accurate.

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Figure 2. Relationship of reported value for each program (horizontal axis, log scale) to the empirically-determined Positive Predictive Value (PPV), shown on the vertical axis. While the exact values depend on the test data used, the general values at significant cutoff values (0.8, 0.9, 0.95 PPV) remain relatively constant across different datasets (data not shown).

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Figure 3. The Positive Predictive Value (PPV, vertical axis) is shown for each organism (boxes on right), at each level of known abundance (horizontal axis, see Table 2), and each program (boxes at top), across a maximum of 50 replicates (indicated by the size of each point). Note that the reference database for MetaPhlan does not include viruses, and the reference database for Kraken does not include RNA viruses

extremely unlikely that a 300bp exact match would arise due to random chance, and so the user could say with confidence that the organism of interest is found within the sequence data (not considering contamination, horizontal gene transfer, etc). However, such an approach is not currently implemented in an automated method, and many of the steps needed to make that assertion are performed manually by a domain expert, including alignment to near neighbors and ensuring that the read does not fall within a transposon, plasmid, etc. Therefore, while one could say that a single read is all that is needed to state with high PPV that an organism is present, the amount of reads assigned in an automated manner needed to achieve that level of PPV will number in the thousands (Fig 2).

For read-assignment methods (such as LMAT and Kraken), manual inspection of the results may yield a different understanding of confidence than is presented here, or in any automated analysis. For example, while each read that is assigned by LMAT and Kraken fall above a certain cutoff for species-specificity, some individual reads may be much more specific than others. One could

identify a read that aligns to a single species of bacteria with 100% accuracy over its 300bp length, with the next closest match being only 90% similar. It is

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The next phase of benchmarking was to determine how many raw input reads were needed to achieve the threshold for high PPV. To demonstrate this we plotted the known abundance of each spike organism against the PPV value generated by each method (Figure 3). Each point (an organism at a known level of abundance) is comprised of a maximum of 50 replicates, where the diameter of each point increases with an increasing number of replicates. For demonstration purposes we are showing two pairs of bacteria and three viruses. Recall that for each of the pairs of bacteria (and the two poxviruses) any sample containing one did not contain the other (as shown in Table 1). The empty boxes result from the organisms not being called at any abundance. For MetaPhlAn, that is a result of no viruses being included in the version of the reference database available for this analysis. Kraken assigned no reads to Hanta virus because viral RNA genomes were not included in this version of the reference database (personal communication with D. Wood). This emphasizes the point that a) the ability to create custom databases targeting organisms of interest can be valuable, and b) the performance of any method must be benchmarked against each potential target of interest.

All methods were able identify the bulk of organisms in their databases at high abundances (75% and 18%, Figure 3), however performance varied considerably at lower abundances and depended on the particular organism and method used. SIANN detected each organism at high confidence, even at levels as low as 0.3% and 0.07% of the total.

Discussion

The process of detecting trace amounts of a specific organism in a complex mixture of DNA is challenging enough for an expert, but that pales in comparison to the difficulty of accomplishing the same certainty of detection in an automated manner. The results presented here show that SIANN rapidly detects the presence of a given set of organisms with a high degree of specificity and sensitivity. For example, at the 95% confidence (PPV) cutoff of 0.2, SIANN reliably detects all of the organisms tested here at as low as 0.3% abundance. This strong performance is likely due to the fact that SIANN is able to use a method (read alignment to whole genomes) that would be far too computationally costly if it were applied to the entire collection of known genomes. By focusing on a set of (customizable) target organisms and their near neighbors, SIANN can operate quickly and with low computational requirements while delivering highly accurate results.

SIANN is available on Illumina's BaseSpace (www.basespace.illumina.com) as a NativeApp, with the database tested here (Appendix 1), as well as a database made from the NCBI representative set of prokaryotic genomes (ftp://ftp.ncbi.nlm.nih.gov/genomes/genome_reports/) (Appendix 2) and the complete set of NCBI viral genomes (<ftp://ftp.ncbi.nlm.nih.gov/refseq/release/viral/>) (Appendix 3).

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BaseSpace was chosen as an appropriate release platform because while the entire set of software and dependencies can be deployed by the user from within a graphical user interface, the actual computation takes place in a controlled 'cloud' environment. Such a distribution strategy obviates the need to satisfy the multiple software or OS dependencies that often arises with academic computational methods. Results for SIANN are compiled into a report format, showing both the organisms that surpass 95% confidence, as well as the closest strain match for each species. The default view masks the raw data output, so that the results are human-readable and do not present extraneous information. While the code for execution and database-construction on a users system is available from Signature Science, LLC, additional databases on the BaseSpace platform can be made available upon request.

There is a neverending list of questions that one could ask of metagenomic sequencing data generated from important samples. Instead of answering them all, we demonstrate a technique with a very narrow focus that is able to report with a high degree of confidence whether a given set of organisms is present in a sample. These results are presented to the user in a comprehensible format, and accessible on a commonly-used web platform. The world of bioinformatics will continue to progress and develop more sophisticated tools for metagenomic analysis, and we hope that the utility of SIANN will convince others to package and benchmark their tools in a way that they can be used with confidence by the larger public, as well as the research community.

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Appendices

Appendix 1: Target Pathogen Database

Arenaviridae	Arenavirus	Bacillus cytotoxicus NVH 391-98	Bunyaviridae	Phlebovirus Rift-Valley-fever-virus
Golden-Gate-virus		Bacillus mycoides DSM 2048	Burkholderia	cenocepacia
Arenaviridae	Arenavirus Lujovirus	Bacillus mycoides Rock1-4	HI2424	
Arenaviridae	Flexal-virus segment-L	Bacillus thuringiensis BMB171	Burkholderia	cenocepacia
Arenaviridae	New-world-arenaviruses Allpahuayo-virus	Bacillus thuringiensis Bt407	J2315	
Arenaviridae	New-world-arenaviruses Chapare-virus	Bacillus thuringiensis HD-771	Burkholderia	cenocepacia
Arenaviridae	New-world-arenaviruses Guanarito-virus	Bacillus thuringiensis serovar chinensis CT-43	MC0-3	
Arenaviridae	New-world-arenaviruses Junin-virus	Bacillus thuringiensis serovar konkukian 97-27	Burkholderia cepacia GG4	
Arenaviridae	New-world-arenaviruses Machupo-virus	Brucella abortus A13334	Burkholderia gladioli BSR3	
Arenaviridae	New-world-arenaviruses Sabia-virus	Brucella ceti B1 94	Burkholderia glumae BGR1	
Arenaviridae	New-world-arenaviruses Tacaribe-virus	Brucella ceti M13 05 1	Burkholderia mallei	mallei
Arenaviridae	New-world-arenaviruses Whitewater-Arroyo-virus	supercont1 22	2002721280	
Arenaviridae	Old-world-arenaviruses lppy-virus	Brucella melitensis ATCC 23457	Burkholderia mallei	ATCC 10399
Arenaviridae	Old-world-arenaviruses Lassa-virus	Brucella melitensis bv 1 str 16M	NCTC 10247	
Arenaviridae	Old-world-arenaviruses Mopeia-virus-AN20410	Brucella ovis ATCC 25840	Burkholderia mallei SAVP1	
Asfarviridae	African-swine-fever-virus Benin-971-pathogenic-isolate	Brucella suis 1330	Burkholderia multivorans	
Asfarviridae	African-Swine-Fever-Virus	Brucella suis ATCC 23445	ATCC 17616	
Bacillus anthracis A2012 Bant 02 1		Bunyaviridae Akabane-virus segment-M	Burkholderia oklahomensis	C6786
Bacillus anthracis Ames Ancestor		Bunyaviridae Hantavirus Andes-virus	Burkholderia oklahomensis	EO147
Bacillus anthracis Sterne		Bunyaviridae Hantavirus Dobrava-Belgrade-virus-strain-DOBV-Ano-Poroia-Afl9-1999	Burkholderia pseudomallei	1026b
Bacillus cereus 03BB102		Bunyaviridae Hantavirus Hantaan-virus	Burkholderia pseudomallei	1106a
Bacillus cereus AH187		Bunyaviridae Hantavirus Puumala-virus	Burkholderia pseudomallei	1710b
Bacillus cereus AH820		Bunyaviridae Hantavirus Seoul-virus-strain-Seoul-80-39-clone-1	Burkholderia pseudomallei	668
Bacillus cereus ATCC 14579		Bunyaviridae Hantavirus Sin-Nombre-virus	Burkholderia pseudomallei	BPC006
Bacillus cereus B4264		Bunyaviridae Hantavirus Thottapalayam-virus	Burkholderia pseudomallei	K96243
Bacillus cereus F65185		Bunyaviridae Hantavirus Tula-virus	Burkholderia pyrrocinia CH-67	
		Bunyaviridae Nairovirus Crimean-Congo-hemorrhagic-fever-virus	Burkholderia thailandensis	ATCC 700388
		Bunyaviridae Nairovirus Dugbe-virus	Burkholderia thailandensis	E264
			Burkholderia thailandensis	MSMB121
			Campylobacter coli JV20	
			Campylobacter fetus subsp fetus 82-40	
			Campylobacter jejuni RM1221	

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Campylobacter jejuni subsp doylei 26997	Coccidioides posadasii CPA 0020	Coxiella burnetii Dugway 5J108 111
Campylobacter jejuni subsp jejuni 81-176	Coronaviridae	Coxiella burnetii RSA 493
Campylobacter jejuni subsp jejuni NCTC 11168 ATCC 700819	Alphacoronavirus Bat- coronavirus-HKU2	Diplorickettsia massiliensis 20B CS 1
Campylobacter upsaliensis JV21	Coronaviridae	Ehrlichia canis str Jake
Clostridium acetobutylicum DSM 1731	Alphacoronavirus Feline- infectious-peritonitis-virus	Ehrlichia chaffeensis str Arkansas
Clostridium botulinum A str ATCC 3502	Coronaviridae	Ehrlichia chaffeensis str Sapulpa ctg90
Clostridium botulinum BKT015925	Alphacoronavirus Human- coronavirus-229E	Ehrlichia ruminantium str Gardel
Clostridium botulinum B str Eklund 17B	Coronaviridae	Ehrlichia ruminantium str Welgevonden
Clostridium botulinum E3 str Alaska E43	Alphacoronavirus TGEV- Purdue-P115	Escherichia coli APEC O1
Clostridium botulinum F str 230613	Coronaviridae Bafinivirus	Escherichia coli BL21 DE3
Clostridium botulinum H04402 065	White-bream-virus	Escherichia coli B str REL606
Clostridium difficile 2007855	Coronaviridae	Escherichia coli ETEC H10407
Clostridium difficile 630	Betacoronavirus Bovine- coronavirus	Escherichia coli O104H4 str 2011C-3493
Clostridium difficile B11	Coronaviridae	Escherichia coli O157H7 str EC4115
Clostridium difficile B19	Betacoronavirus Murine- hepatitis-virus-strain-A59	Escherichia coli O157H7 str Sakai
Clostridium perfringens ATCC 13124	Coronaviridae	Escherichia coli O7K1 str CE10
Clostridium perfringens SM101	Betacoronavirus Murine- hepatitis-virus-strain-JHM	Escherichia coli O83H1 str NRG 857C
Clostridium perfringens str 13	Coronaviridae	Escherichia coli str K-12 substr MG1655
Clostridium symbiosum WAL- 14163	Betacoronavirus SARS- coronavirus	Filoviridae Ebolavirus
Clostridium symbiosum WAL- 14673	Coronaviridae Coronavirinae	Bundibugyo-ebolavirus
Clostridium tetani E88	Munia-coronavirus-HKU13- 3514	Filoviridae Ebolavirus Cote- d'Ivoire-ebolavirus
Clostridium thermocellum ATCC 27405	Coronaviridae	Filoviridae Ebolavirus Ebola- virus-Mayinga-Zaire
Clostridium thermocellum DSM 1313	Gammacoronavirus Avian- infectious-bronchitis-virus	Filoviridae Ebolavirus Reston- ebolavirus
Clostridium tunisiense TJ C661	Coronaviridae	Filoviridae Ebolavirus Sudan- ebolavirus
Clostridium ultunense Esp	Gammacoronavirus Turkey- coronavirus	Filoviridae Marburgvirus Lake- Victoria-marburgvirus-Musoke
Coccidioides immitis H5384	Coronaviridae	Flaviviridae Alkhurma-virus
Coccidioides immitis RMSCC 2394	Coronaviridae	Flaviviridae Classical-swine- fever-virus
Coccidioides immitis RS	Breda-virus	Flaviviridae Dengue-virus 1
Coccidioides posadasii C735 delta SOWgp	Coronaviridae unclassified- coronaviruses Bat- coronavirus-BM48-31-BGR- 2008	Flaviviridae Dengue-virus 2
Coccidioides posadasii CPA 0001	Coronaviridae unclassified- coronaviruses Bovine- respiratory-coronavirus-AH187	Flaviviridae Dengue-virus 3
	Coronaviridae unclassified- coronaviruses Human-enteric- coronavirus-strain-4408	Flaviviridae Dengue-virus 4
	Coxiella burnetii CbuG Q212	Flaviviridae Japanese- encephalitis-virus genome
		Flaviviridae Karshi-virus

SIANN: Strain Identification by Alignment to Near Neighbors

Flaviviridae Langat-virus	Listeria monocytogenes FSL R2-561	Poxviridae Lumpy-skin-disease-virus NI-2490
Flaviviridae Louping-ill-virus	Listeria monocytogenes La111	Poxviridae Molluscipoxvirus
Flaviviridae Murray-Valley-encephalitis-virus	Listeria seeligeri FSL N1-067	Molluscum-contagiosum-virus-subtype-1
Flaviviridae Omsk-hemorrhagic-fever-virus	Listeria seeligeri serovar 12b str SLCC3954	Poxviridae Orthopoxvirus
Flaviviridae Powassan-virus	Listeria welshimeri serovar 6b str SLCC5334	Camelpox-virus
Flaviviridae St-Louis-encephalitis-virus	Paramyxoviridae Avulavirus	Poxviridae Orthopoxvirus
Flaviviridae Tick-borne-encephalitis-virus	Newcastle-disease-virus-B1	Cowpox-virus
Flaviviridae Usutu-virus	Paramyxoviridae Henipavirus	Poxviridae Orthopoxvirus
Flaviviridae West-Nile-virus	Hendra-virus	Ectromelia-virus
Flaviviridae Yellow-fever-virus	Paramyxoviridae Henipavirus	Poxviridae Orthopoxvirus
Francisella cf novicida Fx1	Nipah-virus	Monkeypox-virus-Zaire-96-I-16
Francisella noatunensis subsp orientalis str Toba 04	Paramyxoviridae Menangle-virus	Poxviridae Orthopoxvirus
Francisella novicida U112	Paramyxoviridae Morbillivirus	Taterapox-virus
Francisella philomiragia subsp philomiragia ATCC 25015	Measles-virus	Poxviridae Orthopoxvirus
Francisella philomiragia subsp philomiragia ATCC 25017	Paramyxoviridae Peste-des-petits-ruminants-virus	Vaccinia-virus
Francisella tularensis subsp holarctica F92	Paramyxoviridae Respirovirus	Poxviridae Orthopoxvirus
Francisella tularensis subsp mediasiatica FSC147	Human-parainfluenza-virus-1	Variola-virus
Francisella tularensis subsp tularensis FSC198	Paramyxoviridae Respirovirus	Poxviridae Sheeppox-virus 17077-99
Herpesviridae Alcelaphine-herpesvirus 1	Human-parainfluenza-virus-3	Poxviridae Suipoxvirus
Herpesviridae Macacine-herpesvirus 1	Paramyxoviridae Respirovirus	Swinepox-virus
Listeria fleischmannii LU2006-1 c88	Sendai-virus	Puccinia graminis f sp tritici CRL 75-36-700-3
Listeria innocua Clip11262	Paramyxoviridae Rinderpest-virus strain-Kabete-O	Ralstonia pickettii 12D
Listeria innocua FSL J1-023	Paramyxoviridae Rubulavirus	Ralstonia pickettii 12J
Listeria ivanovii FSL F6-596	Human-parainfluenza-virus-2	Ralstonia solanacearum CFBP2957
Listeria ivanovii subsp ivanovii PAM 55	Paramyxoviridae Rubulavirus	Ralstonia solanacearum CMR15
Listeria marthii FSL S4-120	Human-parainfluenza-virus-4a	Ralstonia solanacearum GMI1000
Listeria monocytogenes 07PF0776	Paramyxoviridae Rubulavirus	Rathayibacter toxicus DSM 7488
Listeria monocytogenes 08-5578	Mumps-virus	Reoviridae African-horsesickness-virus segment-10
Listeria monocytogenes 10403S	Picornaviridae Foot-and-mouth-disease-virus -type-O	Rhabdoviridae Vesicular-stomatitis-Indiana-virus
Listeria monocytogenes ATCC 19117	Picornaviridae Swine-vesicular-disease-virus strain-HK70	Rhabdoviridae Vesicular-stomatitis-virus strain-NJ2075212NM
Listeria monocytogenes Finland 1998	Picornaviridae Swine-vesicular-disease-virus strain-NET192	Rickettsia bellii OSU 85-389
	Poxviridae Avipoxvirus	Rickettsia conorii str Malish 7
	Fowlpox-virus	Rickettsia prowazekii str Breinl
	Poxviridae Crocodylidpoxvirus	Rickettsia prowazekii str RpGvF24
	Nile-crocodilepox-virus	Rickettsia rickettsii str Arizona
	Poxviridae Goatpox-virus	Rickettsia typhi str B9991CWPP
	Pellor	Rickettsiella grylli gcontig 634
	Poxviridae Leporipoxvirus	
	Myxoma-virus	

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Salmonella bongori N268-08	Staphylococcus capitis SK14	Xanthomonas oryzae pv
Salmonella bongori NCTC 12419	Staphylococcus caprae C87	oryzae MAFF 311018
Salmonella enterica subsp arizonae serovar 62z4z23- str RSK2980	Staphylococcus carnosus subsp carnosus TM300	Xanthomonas oryzae pv oryzae PXO99A
Salmonella enterica subsp enterica serovar Dublin str CT 02021853	Staphylococcus epidermidis ATCC 12228	Xanthomonas vasicola pv vasculorum NCPPB 1326 scf 9767 4580
Salmonella enterica subsp enterica serovar Newport str SL254	Staphylococcus epidermidis RP62A	Yersinia aldovae ATCC 35236
Salmonella enterica subsp enterica serovar Paratyphi A str ATCC 9150	Staphylococcus equorum subsp equorum Mu2	Yersinia bercovieri ATCC 43970
Salmonella enterica subsp enterica serovar Typhimurium str LT2	Staphylococcus haemolyticus JCSC1435	Yersinia enterocolitica IP 10393
Salmonella enterica subsp enterica serovar Typhi str Ty2	Staphylococcus hominis SK119	Yersinia enterocolitica IP2222
Shigella boydii CDC 3083-94	Staphylococcus hominis subsp hominis C80	Yersinia enterocolitica subsp enterocolitica 8081
Shigella boydii Sb227	Staphylococcus lugdunensis HKU09-01	Yersinia enterocolitica subsp palearctica 105 5R
Shigella dysenteriae Sd197	Staphylococcus lugdunensis N920143	Yersinia frederiksenii ATCC 33641
Shigella flexneri 2002017	Togaviridae Alphavirus Barmah-Forest-virus	Yersinia intermedia ATCC 29909
Shigella flexneri 2a str 2457T	Togaviridae Chikungunya-virus	Yersinia kristensenii ATCC 33638
Shigella flexneri 2a str 301	Togaviridae EEEV-complex Eastern-equine-encephalitis-virus	Yersinia mollaretii ATCC 43969
Shigella flexneri 5 str 8401	Togaviridae Rubivirus Rubella-virus	Yersinia pestis A1122
Shigella sonnei 53G	Togaviridae SFV-complex O-nyong-nyong-virus	Yersinia pestis Antiqua
Shigella sonnei Ss046	Togaviridae Venezuelan-equine-encephalitis-virus	Yersinia pestis KIM 10
Staphylococcus arlettae CVD059 SARL c230	Togaviridae WEEV-complex Sindbis-virus	Yersinia pestis Pestoides F
Staphylococcus aureus 04-02981	Togaviridae Western-equine-encephalomyelitis-virus	Yersinia pseudotuberculosis IP 31758
Staphylococcus aureus 08BA02176	Xanthomonas albilineans GPE PC73	Yersinia pseudotuberculosis IP 32953
Staphylococcus aureus subsp aureus N315	Xanthomonas axonopodis Xac29-1	Yersinia pseudotuberculosis PB1
Staphylococcus aureus subsp aureus NCTC 8325	Xanthomonas oryzae pv oryzae KACC 10331	Yersinia pseudotuberculosis YPIII
Staphylococcus aureus subsp aureus TW20		Yersinia rohdei ATCC 43380
Staphylococcus capitis QN1 Contig63		Yersinia ruckeri ATCC 29473

SIANN: Strain Identification by Alignment to Near Neighbors

Appendix 2: Viral Database

Abaca bunchy top virus DNA-C	Adoxophyes orana granulovirus	Alternanthera yellow vein virus satellite DNA beta
Abaca bunchy top virus DNA-M	Adoxophyes orana nucleopolyhedrovirus	Ambystoma tigrinum virus
Abaca bunchy top virus DNA-N	Aedes aegypti densovirus	Amsacta moorei entomopoxvirus L
Abaca bunchy top virus DNA-R	Aedes albopictus densovirus	Anguillid herpesvirus 1
Abaca bunchy top virus DNA-S	Aedes taeniorhynchus iridescent virus	Anopheles gambiae denonucleosis virus
Abaca bunchy top virus segment 2	Aeromonas phage 25	Antheraea pernyi nucleopolyhedrovirus
Abalone shriveling syndrome-associated virus	Aeromonas phage 31	Anticarsia gemmatalis nucleopolyhedrovirus
Abutilon Brazil virus DNA A	Aeromonas phage 44RR2.8t	Archaeal BJ1 virus
Abutilon Brazil virus DNA B	Aeromonas phage Aeh1	Ateline herpesvirus 3
Abutilon mosaic virus DNA A	Aeromonas phage phiO18P	Autographa californica nucleopolyhedrovirus
Abutilon mosaic virus DNA B	african cassava mosaic virus DNA A	Avian adeno-associated virus ATCC VR-865
Acanthocystis turfacea	african cassava mosaic virus DNA B	Avian adeno-associated virus strain DA-1
Chlorella virus 1	African green monkey polyomavirus	Avian endogenous retrovirus EAV-HP
Acheta domesticus densovirus	African swine fever virus	Azospirillum phage Cd
Acholeplasma phage L2	Ageratum enation virus	Bacillus phage 0305phi8-36
Acholeplasma phage MV-L1	Ageratum leaf Cameroon betasatellite	Bacillus phage AP50
Acidianus bottle-shaped virus	Ageratum leaf curl virus-G52	Bacillus phage B103
Acidianus filamentous virus 1	Ageratum yellow vein China virus-associated DNA beta	Bacillus phage Bam35c
Acidianus filamentous virus 2	Ageratum yellow vein Chinavirus	Bacillus phage BCJA1c
Acidianus filamentous virus 3	Ageratum yellow vein Hualian virus-TaiwanHsinchutom2003 DNA A	Bacillus phage Cherry
Acidianus filamentous virus 6	Ageratum yellow vein Sri Lanka virus segment A	Bacillus phage Fah
Acidianus filamentous virus 7	Ageratum yellow vein Taiwan virus	Bacillus phage GA-1
Acidianus filamentous virus 8	Ageratum yellow vein virusassociated DNA beta	Bacillus phage Gamma
Acidianus filamentous virus 9	Ageratum yellow veinvirus	Bacillus phage GIL16c
Acidianus rod-shaped virus 1	Agrotis epsilon multiple nucleopolyhedrovirus	Bacillus phage IEBH
Acidianus spindle-shaped virus 1	Agrotis segetum granulovirus	Bacillus phage phi105
Acidianus two-tailed virus	Agrotis segetum nucleopolyhedrovirus	Bacillus phage phi29
Actinomyces phage Av-1	Alcelaphine herpesvirus 1	Bacillus phage SPBc2
Actinoplanes phage phiAsp2	Aleutian mink disease virus	Bacillus phage SPO1
Acyrtosiphon pisum bacteriophage APSE-1	Allamanda leaf curl virus DNA-A	Bacillus phage SPP1
Adeno-associated virus-1	Alternanthera yellow vein virus DNA-A	Bacillus phage TP21-L
Adeno-associated virus-2		Bacillus phage WBeta
Adeno-associated virus-3		Bacillus prophage phBC6A51
Adeno-associated virus-4		Bacillus prophage phBC6A52
Adeno-associated virus-5		Bacillus virus 1
Adeno-associated virus-7		Bacteriophage Aaphi23
Adeno-associated virus-8		Bacteriophage APSE-2
Adoxophyes honmai NPV		Bacteriophage PSA
		Bacteriophage RB32
		Bacteroides phage B40-8

SIANN: Strain Identification by Alignment to Near Neighbors

Banana bunchy top virus DNA C	Begomovirus-associated DNA II	Burkholderia ambifaria phage BcepF1
Banana bunchy top virus DNA M	Begomovirus-associated DNA-III	Burkholderia phage Bcep 176
Banana bunchy top virus DNA N	Bettongia penicillata papillomavirus 1	Burkholderia phage Bcep1
Banana bunchy top virus DNA R	Bhendi yellow vein	Burkholderia phage Bcep22
Banana bunchy top virus DNA S	Bhubhaneswar virus DNA-A	Burkholderia phage Bcep43
Banana bunchy top virus DNA U3	Bhendi yellow vein Delhi virus 2004New Delhi DNA-A	Burkholderia phage Bcep781
Banana streak GF virus	Bhendi yellow vein mosaic virus-associated DNA beta	Burkholderia phage BcepB1A
Banana streak Mysore virus	Bhendi yellow vein mosaic Virus	Burkholderia phage BcepC6B
Banana streak OL virus	Bitter gourd leaf curl disease-associated DNA beta	Burkholderia phage BcepGomr
Banana streak virus genome	BK polyomavirus	Burkholderia phage BcepIL02
Banana streak virus strain Acuminata Vietnam	Blainvillea yellow spot virus DNA-A	Burkholderia phage BcepMu
Bandicoot papillomatosis carcinomatosis virus type 1	Blainvillea yellow spot virus DNA-B	Burkholderia phage BcepNazgul
Bandicoot papillomatosis carcinomatosis virus type 2	Blattella germanica densovirus	Burkholderia phage BcepNY3
Bat adeno-associated virus YNM	Blueberry red ringspot virus	Burkholderia phage KS10
Bdellovibrio phage phiMH2K	Bocavirus gorillaGBoV12009	Burkholderia phage KS9
Beak and feather disease virus	Bombyx mandarina nucleopolyhedrovirus	Burkholderia phage phi1026b
Bean calico mosaic virus DNA A	Bombyx mori densovirus 5	Burkholderia phage phi644-2 chromosome
Bean calico mosaic virus DNA B	Bombyx mori NPV	Burkholderia phage phiE12-2 chromosome
Bean dwarf mosaic virus DNA A	Bordetella phage BIP-1	Burkholderia phage phiE125
Bean dwarf mosaic virus DNA B	Bordetella phage BMP-1	Burkholderia phage phiE202 chromosome
Bean golden mosaic virus DNA A	Bordetella phage BPP-1	Burkholderia phage phiE255 chromosome
Bean golden mosaic virus DNA B	Bougainvillea spectabilis chlorotic vein-banding virus	Burkholderia prophage phi52237
Bean golden yellow mosaic virus DNA A	Bovine adeno-associated virus	Cabbage leaf curl virus DNA A
Bean golden yellow mosaic virus DNA B	Bovine adenovirus A	Cabbage leaf curl virus DNA B
Bean golden yellow mosaic virus DNA C	Bovine adenovirus B	Cacao swollen shoot virus
Bean golden yellow mosaic virus DNA D	Bovine adenovirus D	California sea lion anellovirus
Bean yellow dwarf virus putative genes V1	Bovine ephemeral fever virus	California sea lion polyomavirus 1
Beet curly top Iran virus-K	Bovine foamy virus	Callitrichine herpesvirus 3 strain CJ0149
Beet curly top virus-California Logan	Bovine herpesvirus 1	Camelpox virus
Beet mild curly top virus-Worland4	Bovine herpesvirus 4 long unique region	Campoletis sonorensis ichnovirus chromosome segment W
Beet severe curly top virus-Cfh	Bovine herpesvirus 5	Campoletis sonorensis ichnovirus segment B
	Bovine papillomavirus-1	Campoletis sonorensis ichnovirus segment C
	Bovine papillomavirus 3	Campoletis sonorensis ichnovirus segment D
	Bovine papular stomatitis virus	Campoletis sonorensis ichnovirus segment E
	Bovine parvovirus 2	
	Bovine Parvovirus	
	Bovine polyomavirus	

SIANN: Strain Identification by Alignment to Near Neighbors

Campoletis sonorensis ichnovirus segment F	Capra hircus papillomavirus type 1	Circovirus-like genome RW-E
Campoletis sonorensis ichnovirus segmentG2	Cardiospermum yellow leaf curl virus satellite DNA beta	Circovirus-like genome SAR-A
Campoletis sonorensis ichnovirus segment G	Caretta caretta papillomavirus 1	Circovirus-like genome SAR-B
Campoletis sonorensis ichnovirus segment H	Carnation etched ring virus	Citrus psorosis virus RNA1
Campoletis sonorensis ichnovirus segmentI2	Casphalia extranea densovirus	Citrus psorosis virus RNA2
Campoletis sonorensis ichnovirus segment I	Cassava vein mosaic virus	Citrus psorosis virus RNA3
Campoletis sonorensis ichnovirus segment J	Cauliflower mosaic virus	Citrus yellow mosaic virus
Campoletis sonorensis ichnovirus segment L	Cercopithecine herpesvirus 2	Clanis bilineata nucleopolyhedrosis virus
Campoletis sonorensis ichnovirus segment M	Cercopithecine herpesvirus 5 strain 2715	Clavibacter phage CMP1
Campoletis sonorensis ichnovirus segment N	Cercopithecine herpesvirus 9	Clerodendron yellow mosaic virus
Campoletis sonorensis ichnovirus segment O1	Cestrum yellow leaf curling virus	Clerodendrum golden mosaic
Campoletis sonorensis ichnovirus segment P	Chaetoceros salsugineum DNA virus	China virus DNA A
Campoletis sonorensis ichnovirus segment Q	Chayote yellow mosaic virus	Clerodendrum golden mosaic
Campoletis sonorensis ichnovirus segment T	Chicken anemia virus	China virus DNA B
Campoletis sonorensis ichnovirus segment U	Chickpea chlorotic dwarf virus	Clerodendrum golden mosaic virus DNA-A
Campoletis sonorensis ichnovirus segment V	Chilli leaf curl disease associated sequence virion	Clerodendrum golden mosaic virus DNA-B
Campoletis sonorensis ichnovirus segment Z	Chilli leaf curl Multan alphasatellite	Clostridium phage 39-O
Campoletis superhelical segment A	Chilli leaf curl virus	Clostridium phage c-st
Campoletis superhelical segment aprime	Chino del tomate virus DNA A	Clostridium phage phi3626
Canary circovirus	Chino del tomate virus DNA B	Clostridium phage phiC2
Canarypox virus	Chlamydia phage 3	Clostridium phage phi CD119
Canine adenovirus	Chlamydia phage 4	Clostridium phage phiCD27
Canine minute virus	Chlamydia phage Chp1	Clostridium phage phiCTP1
Canine oral papillomavirus	Chlamydia phage Chp2	Coconut foliar decay virus
Canine papillomavirus 2	Chlamydia phage PhiCPG1	Columbid circovirus
Canine papillomavirus 3	Chloris striate mosaic virus	Commelina yellow mottle virus
Canine papillomavirus 4	Choristoneura fumiferana DEF MNPV	Corchorus golden mosaic virus DNA-A
Canine papillomavirus 6	Choristoneura fumiferana MNPV	Corchorus golden mosaic virus DNA-B
Canine parvovirus	Choristoneura occidentalis granulovirus	Corchorus yellow spot virus DNA A
	Chrysodeixis chalcites nucleopolyhedrovirus	Corchorus yellow spot virus DNA B
	Circovirus-like genome BBC-A	Corchorus yellow vein virus- Hoa Binh DNA A
	Circovirus-like genome CB-A	Corchorus yellow vein virus- Hoa Binh DNA B
	Circovirus-like genome CB-B	Corynebacterium phage BFK20
	Circovirus-like genome RW-A	Corynebacterium phage P1201
	Circovirus-like genome RW-B	Cotesia congregata bracovirus segment Circle10
	Circovirus-like genome RW-C	Cotesia congregata bracovirus segment Circle11
	Circovirus-like genome RW-D	

SIANN: Strain Identification by Alignment to Near Neighbors

Cotesia congregata bracovirus segment Circle12	Cotesia congregata virus segment Circle6	Croton yellow vein virus
Cotesia congregata bracovirus segment Circle13	Cotesia congregata virus segment Circle7	Crow polyomavirus
Cotesia congregata bracovirus segment Circle14	Cotesia congregata virus segment Circle8	Cryptophlebia leucotreta granulovirus
Cotesia congregata bracovirus segment Circle15	Cotton leaf crumple geminivirus DNA B	Cucurbita yellow vein virus- associated DNA beta
Cotesia congregata bracovirus segment Circle17	Cotton leaf crumple virus DNA A	Cucurbit leaf crumple virus DNA A
Cotesia congregata bracovirus segment Circle19	Cotton leaf curl Alabad virus	Cucurbit leaf crumple virus DNA B
Cotesia congregata bracovirus segment circle1	Cotton leaf curl Bangalore virus-associated DNA beta	Culex nigripalpus NPV
Cotesia congregata bracovirus segment Circle20	Cotton leaf curl Bangalore virus segment A	Culex pipiens densovirus
Cotesia congregata bracovirus segment Circle21	Cotton leaf curl Burewala alphasatellite	Cyanophage PSS2
Cotesia congregata bracovirus segment Circle22	Cotton leaf curl Burewala betasatellite	Cyanophage Syn5
Cotesia congregata bracovirus segment Circle23	Cotton leaf curl Burewala virus-IndiaVehari2004	Cycad leaf necrosis virus
Cotesia congregata bracovirus segment Circle25	Cotton leaf curl Gezira alphasatellite	Cydia pomonella granulovirus
Cotesia congregata bracovirus segment Circle26	Cotton leaf curl Gezira beta	Cyprinid herpesvirus 3
Cotesia congregata bracovirus segment circle2	Cotton leaf curl Gezira Betasatellite	Deer papillomavirus
Cotesia congregata bracovirus segment Circle30	Cotton leaf curl Gezira virus	Deerpox virus W-1170-84
Cotesia congregata bracovirus segment Circle31	Cotton leaf curl Kokhran virus	Deerpox virus W-848-83
Cotesia congregata bracovirus segment Circle32	Cotton leaf curl Multan Virus	Deftia phage phiW-14
Cotesia congregata bracovirus segment Circle33	Cotton leaf curl Multan virus satellite DNA beta	Dendrolimus punctatus densovirus
Cotesia congregata bracovirus segment Circle35	Cotton leaf curl Multan virus satellite U36-1	Desmodium leaf distortion virus DNA A
Cotesia congregata bracovirus segment Circle36	Cotton leaf curl Rajasthan virus segment A	Desmodium leaf distortion virus DNA B
Cotesia congregata bracovirus segment circle3	Cotton leaf curl virus- associated DNA beta	Diadromus pulchellus
Cotesia congregata bracovirus segment Circle4	Cottontail rabbit papillomavirus	ascovirus 4a
Cotesia congregata bracovirus segment Circle5	Cowpea severe leaf curl- associated DNA beta	Diatraea saccharalis densovirus
Cotesia congregata bracovirus segment Circle9	Cowpox virus	Dicliptera yellow mottle virus DNA A
Cotesia congregata virus segment Circle18	Crassocephalum yellow vein virus-Jinghong	Dicliptera yellow mottle virus DNA B
	Croton yellow vein mosaic alphasatellite	Digitaria streak virus
	Croton yellow vein mosaic virus	Dioscorea bacilliform virus
	Croton yellow vein mosaic Virus satellite DNA beta	Dolichos yellow mosaic virus
		Dracaena mottle virus
		Duck adenovirus A
		Duck circovirus
		Duck hepatitis B virus
		East African cassava mosaic Cameroon virus DNA A
		East African cassava mosaic Cameroon virus DNA B
		East African cassava mosaic Kenya virus DNA A
		East African cassava mosaic Kenya virus DNA B

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East African cassava mosaic virus DNA A	Enterobacteria phage Min27	Enterococcus faecalis 62
East African cassava mosaic virus DNA B	Enterobacteria phage Mu	plasmid EF62pB
East African cassava mosaic Zanzibar virus DNA-A	Enterobacteria phage N15	Enterococcus faecalis 62
East African cassava mosaic Zanzibar virus DNA B	Enterobacteria phage N4	plasmid EF62pC
Ecotropis obliqua NPV	Enterobacteria phage P1	Enterococcus phage EF62phi
Ectocarpus siliculosus virus 1	Enterobacteria phage P22	Enterococcus phage EFAP-1
Ectromelia virus	virus	Enterococcus phage phiEf11
Emiliana huxleyi virus 86	Enterobacteria phage P2 virus	Enterococcus phage phiEF24C
Emilia yellow vein virus-associated DNA beta	Enterobacteria phage P4	Enterococcus phage phiFL1A
Emilia yellow vein virus-Fz1	Enterobacteria phage Phi1	Enterococcus phage phiFL2A
Enterobacteria phage 13a	Enterobacteria phage phiEco32	Enterococcus phage phiFL3A
Enterobacteria phage 933W	Enterobacteria phage phiEcoM-GJ1	Enterococcus phage phiFL4A
Enterobacteria phage alpha3	Enterobacteria phage phiP27	Enzootic nasal tumour virus of goats
Enterobacteria phage BA14	Enterobacteria phage phiX174 sensu lato	Epiphyas postvittana NPV
Enterobacteria phage BP-4795	Enterobacteria phage PRD1	Equid herpesvirus 1
Enterobacteria phage EcoDS1	Enterobacteria phage PsP3	Equid herpesvirus 2
Enterobacteria phage EPS7	Enterobacteria phage RB14	Equid herpesvirus 4
Enterobacteria phage epsilon15	Enterobacteria phage RB16	Equid herpesvirus 9
Enterobacteria phage ES18	Enterobacteria phage RB43	Equine papillomavirus 2
Enterobacteria phage Felix 01	Enterobacteria phage RB49	Eragrostis curvula streak virus
Enterobacteria phage Fels-2	Enterobacteria phage RB51	Eragrostis streak virus
Enterobacteria phage G4	Enterobacteria phage RB69	Erectites yellow mosaic virus DNA-A
Enterobacteria phage HK022	Enterobacteria phage RTP	Erectites yellow mosaic virus satellite DNA beta
Enterobacteria phage HK620	Enterobacteria phage Sf6	Erethizon dorsatum papillomavirus type 1
Enterobacteria phage HK97	Enterobacteria phage SfV	Erinaceus europaeus papillomavirus
Enterobacteria phage I2-2	Enterobacteria phage SP6	Erwinia amylovora phage Era103
Enterobacteria phage ID18	Enterobacteria phage SSL-2009a	Erwinia phage phiEa21-4
Enterobacteria phage ID2 MoscowID2001	Enterobacteria phage ST104	Escherichia coli bacteriophage rv5
Enterobacteria phage If1	Enterobacteria phage St-1	Escherichia phage D108
Enterobacteria phage Ike	Enterobacteria phage ST64T	Escherichia phage phiV10
Enterobacteria phage IME08	Enterobacteria phage T1	Eupatorium vein clearing virus
Enterobacteria phage JK06	Enterobacteria phage T3	Eupatorium yellow vein associated DNA beta
Enterobacteria phage JS10	Enterobacteria phage T4	Eupatorium yellow vein virus
Enterobacteria phage JS98	Enterobacteria phage T5	Euphorbia leaf curl virus DNA A
Enterobacteria phage JSE	Enterobacteria phage T7	Euphorbia yellow mosaic virus DNA A
Enterobacteria phage K1-5	Enterobacteria phage TLS	Euphorbia yellow mosaic virus DNA B
Enterobacteria phage K1E	Enterobacteria phage VT2-Sakai	Euproctis pseudoconsersa nucleopolyhedrovirus
Enterobacteria phage K1F	Enterobacteria phage WA13	European elk papillomavirus
Enterobacteria phage lambda	Enterobacteria phage WV8	
Enterobacteria phage LKA1	Enterobacteria phage YYZ-2008	
Enterobacteria phage M13	Enterococcus faecalis 62 chromosome	
	Enterococcus faecalis 62 plasmid EF62pA	

SIANN: Strain Identification by Alignment to Near Neighbors

Faba bean necrotic stunt virus DNA C	Frog adenovirus 1	Glypta fumiferanae ichnovirus segment B19
Faba bean necrotic stunt virus DNA M	Frog virus 3	Glypta fumiferanae ichnovirus segment-B1
Faba bean necrotic stunt virus DNA N	Galleria mellonella densovirus	Glypta fumiferanae ichnovirus segment B20
Faba bean necrotic stunt virus DNA R	Gallid herpesvirus 1	Glypta fumiferanae ichnovirus segment B21
Faba bean necrotic stunt virus DNA S	Gallid herpesvirus 2	Glypta fumiferanae ichnovirus segment B22
Faba bean necrotic stunt virus DNA U1	Gallid herpesvirus 3	Glypta fumiferanae ichnovirus segment B23
Faba bean necrotic stunt virus DNA U2	Gammapapillomavirus HPV127	Glypta fumiferanae ichnovirus segment B24
Faba bean necrotic stunt virus DNA U4	Geobacillus phage GBSV1	Glypta fumiferanae ichnovirus segment B25
Faba bean necrotic yellows virus DNA 10	Geobacillus virus E2	Glypta fumiferanae ichnovirus segment B26
Faba bean necrotic yellows virus DNA-1	Glossina pallidipes salivary gland hypertrophy virus	Glypta fumiferanae ichnovirus segment B27
Faba bean necrotic yellows virus DNA 2	Glypta fumiferanae ichnovirus segment A10	Glypta fumiferanae ichnovirus segment B28
Faba bean necrotic yellows virus DNA 4	Glypta fumiferanae ichnovirus segment A1	Glypta fumiferanae ichnovirus segment B29
Faba bean necrotic yellows virus DNA 5	Glypta fumiferanae ichnovirus segment A2	Glypta fumiferanae ichnovirus segment-B2
Faba bean necrotic yellows virus DNA 7	Glypta fumiferanae ichnovirus segment A3	Glypta fumiferanae ichnovirus segment B30
Faba bean necrotic yellows virus DNA 8	Glypta fumiferanae ichnovirus segment A4	Glypta fumiferanae ichnovirus segment B31
Faba bean necrotic yellows virus DNA 9	Glypta fumiferanae ichnovirus segment A5	Glypta fumiferanae ichnovirus segment B32
Faba bean necrotic yellows Virus	Glypta fumiferanae ichnovirus segment A6	Glypta fumiferanae ichnovirus segment B33
Feldmannia species virus	Glypta fumiferanae ichnovirus segment A7	Glypta fumiferanae ichnovirus segment B34
Felid herpesvirus 1	Glypta fumiferanae ichnovirus segment A8	Glypta fumiferanae ichnovirus segment B35
Felis domesticus papillomavirus type 1	Glypta fumiferanae ichnovirus segment A9	Glypta fumiferanae ichnovirus segment B36
Fenneropenaeus chinensis hepatopancreatic densovirus	Glypta fumiferanae ichnovirus segment B10	Glypta fumiferanae ichnovirus segment B37
Figwort mosaic virus	Glypta fumiferanae ichnovirus segment B11	Glypta fumiferanae ichnovirus segment B38
Finch circovirus	Glypta fumiferanae ichnovirus segment B12	Glypta fumiferanae ichnovirus segment B39
Finch polyomavirus	Glypta fumiferanae ichnovirus segment B13	Glypta fumiferanae ichnovirus segment-B3
Flavobacterium phage 11b	Glypta fumiferanae ichnovirus segment B14	Glypta fumiferanae ichnovirus segment B40
Fowl adenovirus A	Glypta fumiferanae ichnovirus segment B15	
Fowl adenovirus D	Glypta fumiferanae ichnovirus segment B16	
Fowlpox virus	Glypta fumiferanae ichnovirus segment B17	
Francolinus leucoscepus papillomavirus 1	Glypta fumiferanae ichnovirus segment B18	
Fringilla coelebs papillomavirus		

SIANN: Strain Identification by Alignment to Near Neighbors

Glypta fumiferanae ichtnovirus
segment B41
Glypta fumiferanae ichtnovirus
segment B42
Glypta fumiferanae ichtnovirus
segment B43
Glypta fumiferanae ichtnovirus
segment B44
Glypta fumiferanae ichtnovirus
segment B45
Glypta fumiferanae ichtnovirus
segment B46
Glypta fumiferanae ichtnovirus
segment B47
Glypta fumiferanae ichtnovirus
segment B48
Glypta fumiferanae ichtnovirus
segment B49
Glypta fumiferanae ichtnovirus
segment-B4
Glypta fumiferanae ichtnovirus
segment B50
Glypta fumiferanae ichtnovirus
segment B51
Glypta fumiferanae ichtnovirus
segment B52
Glypta fumiferanae ichtnovirus
segment B53
Glypta fumiferanae ichtnovirus
segment B54
Glypta fumiferanae ichtnovirus
segment B55
Glypta fumiferanae ichtnovirus
segment B56
Glypta fumiferanae ichtnovirus
segment B57
Glypta fumiferanae ichtnovirus
segment B58
Glypta fumiferanae ichtnovirus
segment B59
Glypta fumiferanae ichtnovirus
segment-B5
Glypta fumiferanae ichtnovirus
segment B60
Glypta fumiferanae ichtnovirus
segment B61
Glypta fumiferanae ichtnovirus
segment B62
Glypta fumiferanae ichtnovirus
segment B63

Glypta fumiferanae ichtnovirus
segment B64
Glypta fumiferanae ichtnovirus
segment B65
Glypta fumiferanae ichtnovirus
segment-B6
Glypta fumiferanae ichtnovirus
segment B7
Glypta fumiferanae ichtnovirus
segment B8
Glypta fumiferanae ichtnovirus
segment B9
Glypta fumiferanae ichtnovirus
segment C10
Glypta fumiferanae ichtnovirus
segment C11
Glypta fumiferanae ichtnovirus
segment C12
Glypta fumiferanae ichtnovirus
segment C13
Glypta fumiferanae ichtnovirus
segment C14
Glypta fumiferanae ichtnovirus
segment C15
Glypta fumiferanae ichtnovirus
segment C16
Glypta fumiferanae ichtnovirus
segment C17
Glypta fumiferanae ichtnovirus
segment C18
Glypta fumiferanae ichtnovirus
segment C19
Glypta fumiferanae ichtnovirus
segment-C1
Glypta fumiferanae ichtnovirus
segment C20
Glypta fumiferanae ichtnovirus
segment C21
Glypta fumiferanae ichtnovirus
segment C22
Glypta fumiferanae ichtnovirus
segment-C2
Glypta fumiferanae ichtnovirus
segment C3
Glypta fumiferanae ichtnovirus
segment C4
Glypta fumiferanae ichtnovirus
segment C5
Glypta fumiferanae ichtnovirus
segment C6

Glypta fumiferanae ichtnovirus
segment C7
Glypta fumiferanae ichtnovirus
segment C8
Glypta fumiferanae ichtnovirus
segment C9
Glypta fumiferanae ichtnovirus
segment D1
Glypta fumiferanae ichtnovirus
segment D2
Glypta fumiferanae ichtnovirus
segment D3
Glypta fumiferanae ichtnovirus
segment D4
Glypta fumiferanae ichtnovirus
segment D5
Glypta fumiferanae ichtnovirus
segment D6
Glypta fumiferanae ichtnovirus
segment D7
Glypta fumiferanae ichtnovirus
segment E1
Goatpox virus Pellor
Goose circovirus
Goose hemorrhagic
polyomavirus
Goose parvovirus
Gossypium darwinii
symptomless alphasatellite
DNA-alpha
Gossypium darwinii
symptomless virus DNA-A
Gossypium davidsonii
symptomless alphasatellite
DNA-alpha-B
Gossypium mustilinum
symptomless alphasatellite
DNA-alpha-B
Gossypium punctatum mild
leaf curl virus DNA A
Gossypium punctatum mild
leaf curl virus DNA B
Ground squirrel hepatitis virus
Gryllus bimaculatus nudivirus
Gull circovirus
Haemophilus phage HP1
Haemophilus phage HP2
Haloarcula hispanica
pleomorphic virus 1
Haloarcula phage SH1
Halomonas phage phiHAP-1

SIANN: Strain Identification by Alignment to Near Neighbors

Halorubrum phage HF2	Human adenovirus F	Hyperthermophilic Archaeal
Halorubrum pleomorphic virus 1	Human bocavirus 1	Virus 1
Halovirus HF1	Human bocavirus 2	Hyperthermophilic Archaeal
Hamster polyomavirus	Human bocavirus 3	Virus 2
Helicoverpa armigera granulovirus	Human bocavirus 4	Hyphantria cunea
Helicoverpa armigera multiple nucleopolyhedrovirus	Human erythrovirus V9	nucleopolyhedrovirus
Helicoverpa armigera-NPV	Human herpesvirus 1	Hyposoter fugitivus ichnovirus
Helicoverpa armigera NPV NNg1	Human herpesvirus 2	segment A1
Helicoverpa armigera nucleopolyhedrovirus G4	Human herpesvirus 3	Hyposoter fugitivus ichnovirus
Helicoverpa zea SNPV	Human herpesvirus 4	segment A2
Heliopsis virescens ascovirus 3e	Human herpesvirus 5 strain Merlin	Hyposoter fugitivus ichnovirus
Hepatitis B virus	Human herpesvirus 7	segment A3
Heron hepatitis B virus	Human herpesvirus 8	Hyposoter fugitivus ichnovirus
His1 virus	Human papillomavirus-18	segment B10
His2 virus	Human papillomavirus 1	Hyposoter fugitivus ichnovirus
Hollyhock leaf crumple virus	Human papillomavirus-2	segment B11
Honeysuckle yellow vein beta-JapanFukui2001	Human papillomavirus 54	Hyposoter fugitivus ichnovirus
Honeysuckle yellow vein mosaic beta-JapanMiyazaki2001	Human papillomavirus-5	segment B12
Honeysuckle yellow vein mosaic disease associated satellite DNA beta-Ibaraki	Human papillomavirus type 101	Hyposoter fugitivus ichnovirus
Honeysuckle yellow vein mosaic Virus	Human papillomavirus type 103	segment B13
Honeysuckle yellow vein mosaic virus-Kagoshima	Human papillomavirus type 108	Hyposoter fugitivus ichnovirus
Honeysuckle yellow vein mosaic virus satellite DNA beta	Human papillomavirus type-10	segment B14
Honeysuckle yellow vein virus-UK1	Human papillomavirus type 16	Hyposoter fugitivus ichnovirus
Horsegram yellow mosaic Virus DNA B	Human papillomavirus type 26	segment B15
Horsegram yellow mosaic virus	Human papillomavirus type 32	Hyposoter fugitivus ichnovirus
Horseradish curly top virus	Human papillomavirus type 34	segment B16
Human adenovirus 54	Human papillomavirus type 41	Hyposoter fugitivus ichnovirus
Human adenovirus AHuman adenovirus B1	Human papillomavirus type 48	segment-B1
Human adenovirus B2	Human papillomavirus type 49	Hyposoter fugitivus ichnovirus
Human adenovirus C	Human papillomavirus type-4	segment B2
Human adenovirus D	Human papillomavirus type 50	Hyposoter fugitivus ichnovirus
Human adenovirus E	Human papillomavirus type 53	segment B3
	Human papillomavirus type 60	Hyposoter fugitivus ichnovirus
	Human papillomavirus type 63	segment B4
	Human papillomavirus type 6b	Hyposoter fugitivus ichnovirus
	Human papillomavirus type 7	segment B5
	Human papillomavirus type 88	Hyposoter fugitivus ichnovirus
	Human papillomavirus type 90	segment B6
	Human papillomavirus type 92	Hyposoter fugitivus ichnovirus
	Human papillomavirus type 96	segment B7
	Human papillomavirus type-9	Hyposoter fugitivus ichnovirus
	Human parvovirus B19	segment B8
	Human T-lymphotropic virus 1	Hyposoter fugitivus ichnovirus
	Human T-lymphotropic virus 4	segment B9
		Hyposoter fugitivus ichnovirus
		segment C10

SIANN: Strain Identification by Alignment to Near Neighbors

Hyposoter fugitivus ichnovirus segment C11	Hyposoter fugitivus ichnovirus segment D4	Lactobacillus phage Lc-Nu
Hyposoter fugitivus ichnovirus segment C12	Hyposoter fugitivus ichnovirus segment D5	Lactobacillus phage LL-H
Hyposoter fugitivus ichnovirus segment C13	Hyposoter fugitivus ichnovirus segment D6	Lactobacillus phage LP65
Hyposoter fugitivus ichnovirus segment C14	Hyposoter fugitivus ichnovirus segment D7	Lactobacillus phage Lrm1
Hyposoter fugitivus ichnovirus segment C15	Hyposoter fugitivus ichnovirus segment D8	Lactobacillus phage Lv-1
Hyposoter fugitivus ichnovirus segment C16	Hyposoter fugitivus ichnovirus segment D9	Lactobacillus phage phiAT3
Hyposoter fugitivus ichnovirus segment C17	Hyposoter fugitivus ichnovirus segment E1	Lactobacillus phage phig1e
Hyposoter fugitivus ichnovirus segment C18	Hyposoter fugitivus ichnovirus segment E2	Lactobacillus phage phiJL-1
Hyposoter fugitivus ichnovirus segment C19	Hyposoter fugitivus ichnovirus segment G1	Lactobacillus prophage Lj928
Hyposoter fugitivus ichnovirus segment-C1	Ictalurid herpesvirus 1 strain Auburn 1	Lactobacillus prophage Lj965
Hyposoter fugitivus ichnovirus segment C20	Indian cassava mosaic virus DNA A	Lactobacillus prophage phiadh
Hyposoter fugitivus ichnovirus segment-C2	Indian cassava mosaic virus DNA B	Lactococcus phage 1706
Hyposoter fugitivus ichnovirus segment C3	Infectious hypodermal and hematopoietic necrosis virus	Lactococcus phage 4268
Hyposoter fugitivus ichnovirus segment C4	Infectious spleen and kidney necrosis virus	Lactococcus phage 712
Hyposoter fugitivus ichnovirus segment C5	Invertebrate iridescent virus 6	Lactococcus phage
Hyposoter fugitivus ichnovirus segment C6	Iodobacteriophage phiPLPE	ascphi28
Hyposoter fugitivus ichnovirus segment C7	Ipomoea yellow vein virus	Lactococcus phage blBB29
Hyposoter fugitivus ichnovirus segment C8	Jatropha leaf curl virus DNA A	Lactococcus phage blL170
Hyposoter fugitivus ichnovirus segment C9	Jatropha yellow mosaic India virus DNA-A	Lactococcus phage blL67
Hyposoter fugitivus ichnovirus segment D10	JC polyomavirus	Lactococcus phage BK5-T
Hyposoter fugitivus ichnovirus segment D11	Junonia coenia densovirus	Lactococcus phage c2
Hyposoter fugitivus ichnovirus segment D12	Kalanchoe top-spotting virus	Lactococcus phage jj50
Hyposoter fugitivus ichnovirus segment-D1	Kenaf leaf curl virus DNA A	Lactococcus phage KSY1
Hyposoter fugitivus ichnovirus segment D2	KI polyomavirus Stockholm 60	Lactococcus phage P008
Hyposoter fugitivus ichnovirus segment D3	Klebsiella phage KP15	Lactococcus phage P087
	Klebsiella phage KP32	Lactococcus phage phiLC3
	Klebsiella phage KP34	Lactococcus phage Q54
	Kluyvera phage Kvp1	Lactococcus phage r1t
	Kudzu mosaic virus DNA-A	Lactococcus phage sk1
	Kudzu mosaic virus DNA-B	Lactococcus phage TP901-1
	Lactobacillus johnsonii prophage Lj771	Lactococcus phage Tuc2009
	Lactobacillus phage A2	Lactococcus phage ul36
	Lactobacillus phage KC5a	Lactococcus prophage
	Lactobacillus phage Lb338-1	blL285
		Lactococcus prophage
		blL286
		Lactococcus prophage
		blL309
		Lactococcus prophage
		blL310
		Lactococcus prophage
		blL311
		Lactococcus prophage
		blL312
		Lamium leaf distortion associated virus
		Leucania separata nuclear polyhedrosis virus
		Leucas zeylanica yellow vein virus satellite DNA beta

SIANN: Strain Identification by Alignment to Near Neighbors

Lindernia anagallis yellow vein virus DNA-A	JamaicaWissadulaAugust Town DNA B	Mastomys natalensis papillomavirus
Lindernia anagallis yellow vein virus satellite DNA beta	Macroptilium mosaic Puerto Rico virus DNA A	Melanoplus sanguinipes entomopoxvirus
Listeria phage A006	Macroptilium mosaic Puerto Rico virus DNA B	Meleagrid herpesvirus 1
Listeria phage A118	Macroptilium yellow mosaic Florida virus DNA A	Melon chlorotic leaf curl virus DNA A
Listeria phage A500	Macroptilium yellow mosaic Florida virus DNA B	Melon chlorotic mosaic virus-associated alphasatellite
Listeria phage A511	Macroptilium yellow mosaic virus DNA A	Melon chlorotic mosaic virus DNA-A
Listeria phage B025	Macroptilium yellow mosaic virus DNA B	Melon chlorotic mosaic virus DNA-B
Listeria phage B054	Maize streak virus-ASouth Africa	Merkel cell polyomavirus
Listeria phage P35	Malachra yellow vein mosaic virus-associated satellite DNA beta	Merremia mosaic virus DNA A
Listeria phage P40	Mal de Rio Cuarto virus segment 9	Merremia mosaic virus DNA B
Listonella phage phiHSIC	Malvastrum leaf curl Guangdong virus	Mesta yellow vein mosaic Bahaich virus-IndiaBahaich2007 DNA A
Loofa yellow mosaic virus DNA A	Malvastrum leaf curl virus-associated defective DNA beta	Mesta yellow vein mosaic virus-associated DNA beta
Loofa yellow mosaic virus DNA B	Malvastrum leaf curl virus-G87	Mesta yellow vein mosaic virus DNA-A
Lucky bamboo bacilliform virus	Malvastrum yellow mosaic virus-associated DNA 1	Methanobacterium phage psiM2
Ludwigia leaf distortion betasatellite	Malvastrum yellow mosaic virus DNA-A	Methanothermobacter prophage psiM100
IndiaAmadalavalasaHibiscus2007	Malvastrum yellow mosaic virus satellite DNA beta	Microbacterium phage Min1
Ludwigia yellow vein virus-associated DNA beta	Malvastrum yellow vein Baoshan virus DNA-A	Microcystis phage Ma-LMM01
Ludwigia yellow vein virus DNA-A	Malvastrum yellow vein-virus	Microplitis demolitor bracovirus segment A
Luffa begomovirus associated DNA beta	Malvastrum yellow vein virus satellite DNA beta	Microplitis demolitor bracovirus segment B
Luffa puckering and leaf distortion-associated DNA beta	Malvastrum yellow vein Yunnan-virus	Microplitis demolitor bracovirus segment C
Lull virus	Malvastrum yellow vein Yunnan virus satellite DNA beta	Microplitis demolitor bracovirus segment D
Lumpy skin disease virus NI-2490	Mamestra configurata NPV-A	Microplitis demolitor bracovirus segment E
Lymantria dispar MNPV	Mamestra configurata NPV-B	Microplitis demolitor bracovirus segment F
Lymantria xylinia MNPV	Mannheimia phage phiMHa1	Microplitis demolitor bracovirus segment G
Lymphocystis disease virus 1	Maruca vitrata MNPV	Microplitis demolitor bracovirus segment H
Lymphocystis disease virus-isolate China	Mastomys coucha papillomavirus 2	Microplitis demolitor bracovirus segment I
Macacine herpesvirus 1		Microplitis demolitor bracovirus segment J
Macacine herpesvirus 3		Microplitis demolitor bracovirus segment K
Macacine herpesvirus 4		
Macacine herpesvirus 5		
Macaque simian foamy virus		
Macroptilium golden mosaic virus-		
JamaicaWissadulaAugust Town DNA A		
Macroptilium golden mosaic virus-		

SIANN: Strain Identification by Alignment to Near Neighbors

Microplitis demolitor bracovirus segment L	Mungbean yellow mosaic India virus DNA A	Mycobacterium phage Che9c
Microplitis demolitor bracovirus segment M	Mungbean yellow mosaic India virus DNA B	Mycobacterium phage Che9d
Microplitis demolitor bracovirus segment N	Mungbean yellow mosaic virus DNA A	Mycobacterium phage Cjw1
Microplitis demolitor bracovirus segment O	Mungbean yellow mosaic virus DNA B	Mycobacterium phage Cooper
Milk vetch dwarf virus segment 10	Murid herpesvirus 1	Mycobacterium phage Corndog
Milk vetch dwarf virus segment 11	Murid herpesvirus 2	Mycobacterium phage CrimD
Milk vetch dwarf virus segment-1	Murid herpesvirus 4	Mycobacterium phage D29
Milk vetch dwarf virus segment 2	Murine adenovirus 3	Mycobacterium phage DD5
Milk vetch dwarf virus segment 3	Murine adenovirus A	Mycobacterium phage ET08
Milk vetch dwarf virus segment 4	Murine pneumotropic virus	Mycobacterium phage Fruitloop
Milk vetch dwarf virus segment 5	Murine polyomavirus	Mycobacterium phage Giles
Milk vetch dwarf virus segment 6	Murine type C retrovirus	Mycobacterium phage Gumball
Milk vetch dwarf virus segment 7	Musca domestica salivary gland hypertrophy virus	Mycobacterium phage Halo
Milk vetch dwarf virus segment 8	Muscovy duck circovirus	Mycobacterium phage Jasper
Milk vetch dwarf virus segment 9	Muscovy duck parvovirus	Mycobacterium phage KBG
Mimosa yellow leaf curl virus- associated DNA 1	Mus musculus papillomavirus type 1	Mycobacterium phage Konstantine
Mimosa yellow leaf curl virus DNA-A	Mycobacterium phage 244	Mycobacterium phage Kostya
Mimosa yellow leaf curl virus satellite DNA beta	Mycobacterium phage Adjutor	Mycobacterium phage L5
Minute virus of mice	Mycobacterium phage Angel	Mycobacterium phage LeBron
Mirabilis mosaic virus	Mycobacterium phage angelica	Mycobacterium phage Llij
Miscanthus streak virus-91	Mycobacterium phage Ardmore	Mycobacterium phage Lockley
Molluscum contagiosum virus subtype 1	Mycobacterium phage Barnyard	Mycobacterium phage Myrna
Monkeypox virus Zaire-96-I-16	Mycobacterium phage Bethlehem	Mycobacterium phage Nigel
Morganella phage MmP1	Mycobacterium phage Boomer	Mycobacterium phage Omega
Mouse mammary tumor virus	Mycobacterium phage BPs	Mycobacterium phage Orion
Mouse parvovirus 1	Mycobacterium phage Brujita	Mycobacterium phage Pacc40
Mouse parvovirus 2	Mycobacterium phage Butterscotch	Mycobacterium phage PBI1
Mouse parvovirus 3	Mycobacterium phage Bxb1	Mycobacterium phage Peaches
Mouse parvovirus 4	Mycobacterium phage Bxz1	Mycobacterium phage PG1
Mouse parvovirus 5	Mycobacterium phage Bxz2	Mycobacterium phage Phaedrus
Mulard duck circovirus	Mycobacterium phage Cali	Mycobacterium phage Phlyer
	Mycobacterium phage Catera	Mycobacterium phage Pipefish
	Mycobacterium phage Chah	Mycobacterium phage PLOT
	Mycobacterium phage Che12	Mycobacterium phage PMC
	Mycobacterium phage Che8	

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Mycobacterium phage Porky	Okra yellow mosaic Mexico	Pelargonium vein banding
Mycobacterium phage	virus DNA B	virus
Predator	Okra yellow vein disease	Penaeus merguensis
Mycobacterium phage	associated sequence virion	densovirus
Pukovnik	Okra yellow vein mosaic virus	Penaeus monodon
Mycobacterium phage	Old World harvest mouse	hepatopancreatic parvovirus
Gyrzula	papillomavirus	Pepper curly top virus
Mycobacterium phage	Orangutan polyomavirus	Pepper golden mosaic virus
Ramsey	Orf virus	DNA A
Mycobacterium phage Rizal	Orgyia leucostigma NPV	Pepper golden mosaic virus
Mycobacterium phage	Orgyia pseudotsugata MNPV	DNA B
Rosebush	Oryctes rhinoceros virus	Pepper huasteco yellow vein
Mycobacterium phage	Ostreid herpesvirus 1	virus DNA A
ScottMcG	Ostreococcus tauri virus 1	Pepper huasteco yellow vein
Mycobacterium phage Solon	Ostreococcus virus OsV5	virus DNA B
Mycobacterium phage Spud	Ovine adenovirus A	Pepper leaf curl Bangladesh
Mycobacterium phage TM4	Ovine adenovirus D	virus segment A component
Mycobacterium phage Troll4	Ovine herpesvirus 2	Pepper leaf curl virus DNA-A
Mycobacterium phage	Ovine papillomavirus-1	Pepper leaf curl virus satellite
Tweety	Panicum streak virus-Karino	DNA beta
Mycobacterium phage U2	Panine herpesvirus 2 strain	Pepper leaf curl Yunnan virus
Mycobacterium phage	Heberling	satellite DNA beta
Wildcat	Papaya leaf curl China virus-	Pepper leaf curl Yunnan virus-
Mycoplasma phage MAV1	G8	YN323
Mycoplasma phage P1	Papaya leaf curl China virus	Pepper yellow dwarf virus-
Mycoplasma phage phiMFV1	satellite DNA beta	New Mexico
Myotis polyomavirus VM-2008	Papaya leaf curl Guandong	Pepper yellow leaf curl
Mythimna loreyi densovirus	virus-GD2 DNA A	Indonesia virus DNA-A
Myxococcus phage Mx8	Papaya leaf curl virus-	Pepper yellow leaf curl
Myxoma virus	associated DNA beta	Indonesia virus DNA-B
Myzus persicae densovirus	Papaya leaf curl-virus	Pepper yellow vein Mali virus
Nanovirus-like particle	Papiine herpesvirus 2	Periplaneta fuliginosa
Natralba phage PhiCh1	Paramecium bursaria	densovirus
Neodiprion abietis NPV	Chlorella virus 1	Petunia vein clearing virus
Neodiprion lecontei NPV	Paramecium bursaria	Phage cdtI
Neodiprion sertifer NPV	Chlorella virus AR158	Phage Gfsy-1
Oat dwarf virus	Paramecium bursaria	Phage Gfsy-2
OkLCV satDNA 10	Chlorella virus FR483	Phage phiJL001
Okra leaf curl disease	Paramecium bursaria	Phocoena spinipinnis
associated DNA 1	Chlorella virus NY2A	papillomavirus
Okra leaf curl Mali virus	Parvovirus H1	Phormidium phage Pf-WMP3
satellite DNA beta	Passionfruit severe leaf	Phormidium phage Pf-WMP4
Okra leaf curl virus-Cameroon	distortion virus DNA-A	Phthorimaea operculella
Okra mottle virus-Brazilokra	Passionfruit severe leaf	granulovirus
DNA A	distortion virus DNA-B	Pieris rapae granulovirus
Okra mottle virus-Brazilokra	Pasteurella phage F108	Planaria asexual strain-
DNA B	Peanut chlorotic streak virus	specific virus-like element
Okra yellow crinkle virus	Pedilanthus leaf curl virus-	type 1 large DNA segment
segment A	Pedilanthus	Planaria asexual strain-
Okra yellow mosaic Mexico	PakistanMultan2004	specific virus-like element
virus DNA A		type 1 small DNA segment

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Planococcus citri densovirus	Pseudomonas phage LBL3	Ranid herpesvirus 1 strain
Plutella xylostella granulovirus	Pseudomonas phage LIT1	McKinnell
Plutella xylostella multiple nucleopolyhedrovirus	Pseudomonas phage LKD16	Ranid herpesvirus 2 strain
Polyomavirus HPyV6	Pseudomonas phage LMA2	ATCC VR-568
Polyomavirus HPyV7	Pseudomonas phage LUZ19	Rauscher murine leukemia virus
Porcine adenovirus C	Pseudomonas phage LUZ24	Raven circovirus
Porcine circovirus 1	Pseudomonas phage LUZ7	RD114 retrovirus
Porcine circovirus 2	Pseudomonas phage M6	Reticuloendotheliosis virus
Porcine endogenous retrovirus E	Pseudomonas phage MP22	Rhesus monkey papillomavirus
Porcine parvovirus	Pseudomonas phage MP29	Rhizobium phage 16-3
Potato apical leaf curl disease-associated satellite DNA beta	Pseudomonas phage MP38	Rhodothermus phage RM378
Potato yellow mosaic	Pseudomonas phage PA11	Rhynchosia golden mosaic virus DNA A
Panama virus DNA A	Pseudomonas phage PAJU2	Rhynchosia golden mosaic virus DNA B
Potato yellow mosaic	Pseudomonas phage PaP2	Rhynchosia golden mosaic virus DNA A
Panama virus DNA B	Pseudomonas phage PaP3	Rhynchosia golden mosaic virus DNA B
Potato yellow mosaic Trinidad virus DNA A	Pseudomonas phage PB1	Yucatan virus DNA A
Potato yellow mosaic Trinidad virus DNA B	Pseudomonas phage Pf1	Rhynchosia golden mosaic virus DNA B
Potato yellow mosaic virus DNA A	Pseudomonas phage Pf3	Yucatan virus DNA A
Potato yellow mosaic virus DNA B	Pseudomonas phage phi-2	Rhynchosia golden mosaic virus DNA B
Prochlorococcus phage P-SSM4	Pseudomonas phage phiCTX	Yucatan virus DNA B
Propionibacterium phage B5	Pseudomonas phage phikF77	Rice tungro bacilliform virus
Propionibacterium phage PA6	Pseudomonas phage phiKMV	Roseobacter phage SIO1
Pseudaletia unipuncta granulovirus	Pseudomonas phage phiKZ	Roseophage DSS3P2
Pseudoalteromonas phage PM2	Pseudomonas phage PT2	Roseophage EE36P1
Pseudocowpox virus	Pseudomonas phage PT5	Rosss goose hepatitis B virus
Pseudomonas phage 119X	Pseudomonas phage SN	Rousettus aegyptiacus papillomavirus type 1
Pseudomonas phage 14-1	Pseudomonas phage YuA	Rudbeckia flower distortion virus
Pseudomonas phage 201phi2-1	Psittacid herpesvirus 1	Saccharum streak virus
Pseudomonas phage 73	Psittacus erithacus timneh papillomavirus	Saimiriine herpesvirus 2
Pseudomonas phage B3	Pumpkin yellow mosaic	Salmonella enterica bacteriophage SE1
Pseudomonas phage D3112	Malaysia virus DNA A	Salmonella phage c341
Pseudomonas phage-D3	Pyrobaculum spherical virus	Salmonella phage E1
Pseudomonas phage DMS3	Pyrococcus abyssi virus 1	Salmonella phage epsilon34
Pseudomonas phage EL	Rabbit fibroma virus	Salmonella phage Fels-1
Pseudomonas phage F10	Rabbit oral papillomavirus	Salmonella phage phiSG-JL2
Pseudomonas phage F116	Rachiplusia ou MNPV	Salmonella phage SETP3
Pseudomonas phage F8	Radish leaf curl virus satellite DNA beta	Salmonella phage ST64B
Pseudomonas phage gh-1	Radish leaf curl virus segment A	Sclerotinia sclerotiorum hypovirulence associated DNA virus 1
	Ralstonia phage p12J	Sea turtle tornovirus 1
	Ralstonia phage phiRSA1	Senecio yellow mosaic virus
	Ralstonia phage RSB1	Sheeppox virus 17077-99
	Ralstonia phage RSL1	Sheldgoose hepatitis B virus
	Ralstonia phage RSM1	Shigella phage phiSboM-AG3
	Ralstonia phage RSM3	Shrimp white spot syndrome virus
	Ralstonia phage RSS1	
	Ramie mosaic virus DNA-A	
	Ramie mosaic virus DNA-B	

SIANN: Strain Identification by Alignment to Near Neighbors

Sida golden mosaic Costa Rica virus DNA A	Sida yellow vein Vietnam virus satellite DNA beta	Spiroplasma phage SVTS2
Sida golden mosaic Costa Rica virus DNA B	Sida yellow vein virus DNA A	Spodoptera exigua MNPV
Sida golden mosaic Florida virus-Malvastrum DNA-A	Sida yellow vein virus DNA B	Spodoptera frugiperda ascovirus 1a
Sida golden mosaic Florida virus-Malvastrum DNA-B	Sida yellow vein virus satellite DNA beta	Spodoptera frugiperda MNPV virus
Sida golden mosaic Honduras virus DNA A	Siegesbeckia yellow vein Guangxi virus	Spodoptera litura granulovirus
Sida golden mosaic Honduras virus DNA B	Siegesbeckia yellow vein virus-GD13-associated DNA beta	Spodoptera litura NPV
Sida golden mosaic virus DNA-A	Siegesbeckia yellow vein virus GD13	Spodoptera litura nucleopolyhedrovirus II
Sida golden mosaic virus DNA-B	Simian adenovirus 1	Sputnik virophage
Sida golden mottle virus DNA-A	Simian adenovirus 3	Squash leaf curl China virus-B DNA-A
Sida golden mottle virus DNA-B	Simian foamy virus 3	Squash leaf curl China virus-B DNA B
Sida golden mottle virus DNA-B	Simian immunodeficiency virus SIV-mnd 2	Squash leaf curl Philippines virus segment A
Sida leaf curl virus-associated DNA 1	Simian retrovirus 4	Squash leaf curl Philippines virus segment B
Sida leaf curl virus-associated DNA beta	Simian T-cell lymphotropic virus 6	Squash leaf curl virus A component DNA
Sida leaf curl-virus	Simian T-lymphotropic virus 1	Squash leaf curl virus B component DNA
Sida leaf curl virus satellite DNA beta	Simian T-lymphotropic virus 3	Squash leaf curl Yunnan virus
Sida micrantha mosaic virus segment A	Simian virus 40	Squash mild leaf curl virus-Imperial Valley DNA A
Sida micrantha mosaic virus segment B	Singapore grouper iridovirus	Squash mild leaf curl virus-Imperial Valley DNA B
Sida mosaic Sinaloa virus DNA A	Sinorhizobium phage PBC5	Squash yellow mild mottle virus DNA B
Sida mosaic Sinaloa virus DNA B	Small anellovirus 1	Squirrel monkey polyomavirus
Sida mottle virus	Small anellovirus 2	Sri Lankan cassava mosaic virus DNA A
Sida yellow mosaic virus-China-associated DNA beta	Snake parvovirus 1	Sri Lankan cassava mosaic virus DNA B
Sida yellow mosaic-virus	Snow goose hepatitis B virus	Stachytarpheta leaf curl virus
Sida yellow mosaic Yucatan virus DNA A	Sodalis phage phiSG1	Staphylococcus phage 11
Sida yellow mosaic Yucatan virus DNA B	Sodalis phage SO-1	Staphylococcus phage 187
Sida yellow vein disease associated DNA 1	South African cassava mosaic virus DNA A	Staphylococcus phage 2638A
Sida yellow vein Madurai virus	South African cassava mosaic virus DNA B	Staphylococcus phage 29
Sida yellow vein Vietnam virus-associated DNA 1	Soybean chlorotic blotch virus DNA A	Staphylococcus phage 37
Sida yellow vein Vietnam virus DNA-A	Soybean chlorotic blotch virus DNA B	Staphylococcus phage 3A
	Soybean chlorotic mottle virus	Staphylococcus phage 42e
	Soybean crinkle leaf virus	Staphylococcus phage 44AHJD
	Spilanthes yellow vein virus DNA-A	Staphylococcus phage 47
	Spinach curly top virus	Staphylococcus phage 52A
	Spiroplasma kunkelii virus SkV1 CR2-3x	Staphylococcus phage 53
	Spiroplasma phage 1-C74	Staphylococcus phage 55
	Spiroplasma phage 1-R8A2B	Staphylococcus phage 66
	Spiroplasma phage 4	Staphylococcus phage 69

SIANN: Strain Identification by Alignment to Near Neighbors

Staphylococcus phage 71	Staphylococcus	prophage	Streptococcus	prophage
Staphylococcus phage 77	phi 12		MM1	
Staphylococcus phage 80alpha	Staphylococcus	prophage	Streptococcus	pyogenes
Staphylococcus phage 85	phi 13		phage 315.3	
Staphylococcus phage 88	Staphylococcus	prophage	Streptomyces phage mu16	
Staphylococcus phage 92	phiN315		Streptomyces phage phiBT1	
Staphylococcus phage 96	Staphylococcus	prophage	Streptomyces phage phiC31	
Staphylococcus phage CNPH82	phiPV83		Streptomyces phage	
Staphylococcus phage EW	Staphylococcus	prophage	phiSASD1	
Staphylococcus phage G1	PVL		Streptomyces phage VWB	
Staphylococcus phage K	Staphylococcus	prophage	Stx1 converting phage	
Staphylococcus phage P954	tp310-1		Stx2-converting phage 1717	
Staphylococcus phage PH15	Staphylococcus	prophage	Stx2-converting phage 86	
Staphylococcus phage phi2958PVL	tp310-2		Stx2 converting phage-I	
Staphylococcus phage phiETA2	Staphylococcus	prophage	Stx2 converting phage II	
Staphylococcus phage phiETA3	tp310-3		Subterranean clover stunt	
Staphylococcus phage-phiETA	Starling circovirus		virus DNA 1	
Staphylococcus phage phiMR11	Stenotrophomonas	phage	Subterranean clover stunt	
Staphylococcus phage phiMR25	phiSMA9		virus DNA 2	
Staphylococcus phage phiNM1	Stenotrophomonas phage S1		Subterranean clover stunt	
Staphylococcus phage phiNM3	Strawberry vein banding virus		virus DNA 3	
Staphylococcus phage phiP68	Streptococcus phage 2972		Subterranean clover stunt	
Staphylococcus phage phiPVL108	Streptococcus phage 5093		virus DNA 4	
Staphylococcus phage phiPVL-CN125	Streptococcus phage 7201		Subterranean clover stunt	
Staphylococcus phage phiSauS-IPLA35	Streptococcus phage 858		virus DNA 5	
Staphylococcus phage phiSauS-IPLA88	Streptococcus phage Abc2		Subterranean clover stunt	
Staphylococcus phage phiSLT	Streptococcus phage		virus DNA 6	
Staphylococcus phage PT1028	ALQ13.2		Subterranean clover stunt	
Staphylococcus phage ROSA	Streptococcus phage C1		virus DNA 7	
Staphylococcus phage SAP-26	Streptococcus phage Cp-1		Subterranean clover stunt	
Staphylococcus phage SAP2	Streptococcus phage DT1		virus DNA 8	
Staphylococcus phage Twort	Streptococcus phage M102		Sugarcane bacilliform IM virus	
Staphylococcus phage X2	Streptococcus phage O1205		Sugarcane bacilliform Mor virus	
	Streptococcus phage P9		Sugarcane bacilliform virus	
	Streptococcus phage PH10		Sugarcane streak Egypt virus-Giza	
	Streptococcus phage PH15		Sugarcane streak Reunion virus	
	Streptococcus phage phi3396		Sugarcane streak virus-Natal	
	Streptococcus phage Sfi11		Suid herpesvirus 1	
	Streptococcus phage Sfi19		Sulfolobus islandicus	
	Streptococcus phage Sfi21		filamentous virus	
	Streptococcus phage SM1		Sulfolobus islandicus rod-shaped virus 1	
	Streptococcus phage SMP		Sulfolobus islandicus rod-shaped virus 2	
	Streptococcus prophage 315.1		Sulfolobus spindle-shaped virus 4	
	Streptococcus prophage 315.2		Sulfolobus spindle-shaped virus 5	
	Streptococcus prophage 315.5			
	Streptococcus prophage 315.6			
	Streptococcus prophage EJ-1			

SIANN: Strain Identification by Alignment to Near Neighbors

Sulfolobus virus 6	spindle-shaped	Tobacco curly shoot-virus	Tomato leaf curl Cebu virus DNA-A
Sulfolobus virus 7	spindle-shaped	Tobacco leaf curl disease associated sequence virion	Tomato leaf curl China virus-G32
Sulfolobus icosahedral virus 2	turreted	Tobacco leaf curl Japan virus	Tomato leaf curl Cotabato virus DNA-A
Sulfolobus icosahedral-virus	turreted	Tobacco leaf curl Thailand virus	Tomato leaf curl Ghana virus segment A
Sulfolobus virus 1		Tobacco leaf curl virus-associated DNA beta	Tomato leaf curl Guangdong virus DNA-A
Sulfolobus virus 2		Tobacco leaf curl Yunnan virus associated DNA 1	Tomato leaf curl Guangxi virus
Sulfolobus virus Kamchatka 1		Tobacco leaf curl Yunnan virus satellite DNA beta	Tomato leaf curl Gujarat virus-Varanasi segment A
Sulfolobus virus Ragged Hills		Tobacco leaf curl Yunnan virus-Y136	Tomato leaf curl Gujarat virus-Varanasi segment B
Sulfolobus virus STSV1		Tobacco leaf curl Zimbabwe virus	Tomato leaf curl Hainan virus
Sunn hemp leaf distortion virus DNA-A		Tobacco vein clearing virus	Tomato leaf curl Hsinchu virus-TaiwanHsinchu2005 DNA A
Sus scrofa papillomavirus type 1		Tobacco yellow dwarf virus	Tomato leaf curl Iran virus
Sweetpotato badnavirus B		Tomato begomovirus satellite DNA beta	Tomato leaf curl Java virus-Ageratum satellite DNA
Sweet potato leaf curl Bengal virus-IndiaWest Bengal2008 segment A		Tomato chino La Paz virus segment A	Tomato leaf curl Java-virus
Sweet potato leaf curl Canary virus		Tomato chlorotic mottle virus DNA A	Tomato leaf curl Joydebpur beta virus
Sweet potato leaf curl Georgia virus		Tomato chlorotic mottle virus DNA B	Tomato leaf curl Joydebpur virus DNA-A
Sweet potato leaf curl Lanzarote virus		Tomato common mosaic virus DNA-A	Tomato leaf curl Karnataka virus-associated DNA beta DNA-A
Sweet potato leaf curl Spain virus		Tomato common mosaic virus DNA-B	Tomato leaf curl Karnataka-virus
Sweet potato leaf curl virus		Tomato curly stunt virus	Tomato leaf curl Kerala virus
Swinepox virus		Tomato golden mosaic virus DNA A	Tomato leaf curl Kumasi virus segment A
Synechococcus phage P60		Tomato golden mosaic virus DNA B	Tomato leaf curl Laos virus
Synechococcus phage S-PM2		Tomato golden mottle virus DNA A	Tomato leaf curl Malaysia virus
Synechococcus phage S-RSM4		Tomato golden mottle virus DNA B	Tomato leaf curl Mali virus
Synechococcus phage syn9		Tomato golden mottle virus DNA B	Tomato leaf curl Mayotte virus
Tanapox virus		Tomato leaf curl Arusha virus DNA-A	Tomato leaf curl Mindanao virus DNA-A
Taro bacilliform virus		Tomato leaf curl Bangalore virus-Ban5 satellite DNA beta	Tomato leaf curl New Delhi virus-associated DNA beta
Taterapox virus		Tomato leaf curl Bangalore-virus	Tomato leaf curl New Delhi virus DNA A
Thalassomonas phage BA3		Tomato leaf curl Bangladesh virus	Tomato leaf curl New Delhi virus DNA B
Thermoproteus tenax spherical virus 1		Tomato leaf curl Cameroon virus-CameroonBueaOkra2008	Tomato leaf curl Nigeria virus-Nigeria2006
Thermus phage IN93			Tomato leaf curl Pakistan virus associated DNA 1
Thermus phage P23-45			
Thermus phage P23-77			
Thermus phage P74-26			
Thermus phage phiYS40			
Tobacco curly shoot virus associated DNA 1			
Tobacco curly shoot virus-associated DNA beta			

SIANN: Strain Identification by Alignment to Near Neighbors

Tomato leaf curl Pakistan virus segment A	Tomato mottle Taino virus DNA B	Tomato yellow spot virus DNA-B
Tomato leaf curl Palampur virus	Tomato mottle virus DNA A	Tomato yellow vein streak virus DNA-A
Tomato leaf curl Patna virus DNA-A	Tomato mottle virus DNA B	Tomato yellow vein streak virus DNA-B
Tomato leaf curl Philippines virus	Tomato pseudo-curly top virus	Torque teno canis virus
Tomato leaf curl Philippine virus satellite DNA beta	Tomato rugose mosaic virus DNA A	Torque teno douroucouli virus
Tomato leaf curl Pune virus	Tomato rugose mosaic virus DNA B	Torque teno felis virus
Tomato leaf curl Seychelles virus	Tomato severe leaf curl virus	Torque teno midi virus 1
Tomato leaf curl Sinaloa virus DNA A	Tomato severe rugose virus DNA A	Torque teno midi virus 2
Tomato leaf curl Sinaloa virus DNA B	Tomato severe rugose virus DNA B	Torque teno mini virus 1
Tomato leaf curl Sri Lanka virus	Tomato yellow dwarf disease associated satellite DNA beta-Kochi virus	Torque teno mini virus 2
Tomato leaf curl Sudan virus-Gezira	Tomato yellow leaf curl China virus associated DNA 1	Torque teno mini virus 3
Tomato leaf curl Sulawesi virus DNA-A	Tomato yellow leaf curl China-virus	Torque teno mini virus 4
Tomato leaf curl Taiwan virus	Tomato yellow leaf curl Guangdong virus DNA-A	Torque teno mini virus 5
Tomato leaf curl Togo virus-Togo2006	Tomato yellow leaf curl Indonesia virus-Lembang	Torque teno mini virus 6
Tomato leaf curl Vietnam virus DNA A	Tomato yellow leaf curl Kanchanaburi virus DNA A	Torque teno mini virus 7
Tomato leaf curl virus-associated DNA beta	Tomato yellow leaf curl Kanchanaburi virus DNA B	Torque teno mini virus 8
Tomato leaf curl-virus	Tomato yellow leaf curl Mali virus-associated DNA beta	Torque teno mini virus 9
Tomato leaf curl virus-Pune-associated DNA beta DNA-A	Tomato yellow leaf curl Thailand virus associated DNA 1	Torque teno sus virus 1
Tomato mild mosaic virus DNA-A	Tomato yellow leaf curl Thailand virus DNA A	Torque teno tamarin virus
Tomato mild mosaic virus DNA-B	Tomato yellow leaf curl Thailand virus DNA B	Torque teno virus 10
Tomato mild yellow leaf curl Aragua virus DNA A	Tomato yellow leaf curl Vietnam virus DNA-A	Torque teno virus 12
Tomato mild yellow leaf curl Aragua virus DNA B	Tomato yellow leaf curl Vietnam virus satellite DNA beta	Torque teno virus 14
Tomato mosaic Havana virus DNA A	Tomato yellow leaf curl virus-associated DNA beta	Torque teno virus 15
Tomato mosaic Havana virus DNA B	Tomato yellow margin leaf curl virus DNA A	Torque teno virus 16
Tomato mosaic leaf curl virus DNA A	Tomato yellow margin leaf curl virus DNA B	Torque teno virus 19
Tomato mosaic leaf curl virus DNA B	Tomato yellow spot virus DNA-A	Torque teno virus-1
Tomato mottle Taino virus DNA A		Torque teno virus 25
		Torque teno virus 26
		Torque teno virus 27
		Torque teno virus 28
		Torque teno virus 3
		Torque teno virus 4
		Torque teno virus 6
		Torque teno virus 7
		Torque teno virus 8
		Trichodysplasia spinulosa-associated polyomavirus
		Trichoplusia ni ascovirus 2c
		Trichoplusia ni SNPV
		Tupaiaid herpesvirus 1
		Turkey adenovirus A
		Turnip curly top virus
		TYLCCNV-Y322 satellite DNA beta
		Urochloa streak virus
		Vaccinia virus
		Variola virus

SIANN: Strain Identification by Alignment to Near Neighbors

Velvet bean severe mosaic virus DNA A	Vibrio phage VP2	Xanthomonas phage phiL7
Velvet bean severe mosaic virus DNA B	Vibriophage VP4	Xanthomonas phage Xop411
Vernonia yellow vein betasatellite	Vibrio phage VP5	Xanthomonas phage Xp10
Vernonia yellow vein virus DNA-A	Vibrio phage VP882	Xanthomonas phage Xp15
Vibrio phage fs1	Vibrio phage VP93	Xenopus laevis endogenous retrovirus Xen1
Vibrio phage fs2	Vibrio phage VpV262	Xestia c-nigrum granulovirus
Vibrio phage K139	Vibrio phage VSK	Xylella phage Xfas53
Vibrio phage kappa	Watermelon chlorotic stunt virus DNA A	Yaba-like disease virus
Vibrio phage KSF-1phi	Watermelon chlorotic stunt virus DNA B	Yaba monkey tumor virus
Vibrio phage KVP40	Wheat dwarf virus	Yersinia pestis phage phiA1122
Vibrio phage N4	Wissadula golden mosaic St Thomas Virus DNA A	Yersinia phage Berlin
Vibrio phage VEJphi	Wissadula golden mosaic St Thomas Virus DNA B	Yersinia phage L-413C
Vibrio phage Vf12	Woodchuck hepatitis virus	Yersinia phage phiYeO3-12
Vibrio phage VfO3K6	WU Polyomavirus	Yersinia phage PY54
Vibrio phage VfO4K68	Xanthomonas phage Cf1c	Zinnia leaf curl disease associated sequence virion
Vibrio phage VGJphi	Xanthomonas phage OP1	Zinnia leaf curl virus-associated DNA beta
Vibrio phage VHML	Xanthomonas phage OP2	

SIANN: Strain Identification by Alignment to Near Neighbors

Appendix 3: Bacterial Database

Acaryochloris marina MBIC11017	Actinosynnema mirum DSM 43827	Anaerolinea thermophila UNI 1
Acetobacter pasteurianus IFO 3283 01	Aerococcus urinae ACS 120 V Col10a	Anaeromyxobacter dehalogenans 2CP 1
Acetohalobium arabaticum DSM 5501	Aeromonas hydrophila subsp hydrophila ATCC 7966	Anaeromyxobacter sp Fw109 5
Acholeplasma laidlawii PG 8A	Aeromonas salmonicida subsp salmonicida A449	Anaplasma centrale str Israel
Achromobacter xylosoxidans A8	Aeromonas veronii B565	Anaplasma marginale str Florida
Acidaminococcus fermentans DSM 20731	Aeropyrum pernix K1	Anaplasma phagocytophilum HZ
Acidaminococcus intestini RyC MR95	Aggregatibacter actinomycetemcomitans D11S 1	Anoxybacillus flavithermus WK1
Acidianus hospitalis W1	Aggregatibacter aphrophilus NJ8700	Aquifex aeolicus VF5
Acidilobus saccharovorans 345 15	Agrobacterium fabrum str C58	Arcanobacterium haemolyticum DSM 20595
Acidimicrobium ferrooxidans DSM 10331	Agrobacterium radiobacter K84	Archaeoglobus fulgidus DSM 4304
Acidiphilium cryptum JF 5	Agrobacterium sp H13 3	Archaeoglobus profundus DSM 5631
Acidiphilium multivorum AIU301	Agrobacterium vitis S4	Archaeoglobus veneficus SNP6
Acidithiobacillus caldus SM 1	Akkermansia muciniphila ATCC BAA 835	Arcobacter butzleri RM4018
Acidithiobacillus ferrivorans SS3	Alcanivorax borkumensis SK2	Arcobacter nitrofigilis DSM 7299
Acidithiobacillus ferrooxidans ATCC 23270	Alicyclophilus denitrificans BC	Arcobacter sp L
Acidobacterium capsulatum ATCC 51196	Alicyclobacillus acidocaldarius subsp acidocaldarius DSM 446	Aromatoleum aromaticum EbN1
Acidothermus cellulolyticus 11B	Aliivibrio salmonicida LFI1238	Arthrobacter arilaitensis Re117
Acidovorax avenae subsp avenae ATCC 19860	Alkalilimnicola ehrlichii MLHE 1	Arthrobacter aurescens TC1
Acidovorax citrulli AAC00 1	Alkaliphilus metalliredigens QYMF	Arthrobacter chlorophenolicus A6
Acidovorax ebreus TPSY	Alkaliphilus oremlandii OhLAs	Arthrobacter phenanthrenivorans Sphe3
Acidovorax sp JS42	Allochrochromatium vinosum DSM 180	Arthrobacter sp FB24
Aciduliprofundum boonei T469	Alteromonas macleodii str Deep ecotype	Aster yellows witches broom phytoplasma AYWB
Acinetobacter baumannii 1656 2	Alteromonas sp SN2	Asticcacaulis excentricus CB 48
Acinetobacter calcoaceticus PHEA 2	Aminobacterium colombiense DSM 12261	Atopobium parvulum DSM 20469
Acinetobacter oleivorans DR1	Ammonifex degensii KC4	Azoarcus sp BH72
Acinetobacter sp ADP1	Amycolatopsis mediterranei U32	Azorhizobium caulinodans ORS 571
Actinobacillus pleuropneumoniae serovar 5b str L20	Amycolicococcus subflavus DQS3 9A1	Azospirillum sp B510
Actinobacillus succinogenes 130Z	Anabaena variabilis ATCC 29413	Azotobacter vinelandii DJ
Actinoplanes sp SE50 110	Anaerococcus prevotii DSM 20548	Bacillus amyloliquefaciens DSM 7
		Bacillus anthracis str Ames

SIANN: Strain Identification by Alignment to Near Neighbors

Bacillus atrophaeus 1942	Bifidobacterium animalis	Burkholderia gladioli BSR3
Bacillus cellulosilyticus DSM 2522	subsp animalis ATCC 25527	Burkholderia glumae BGR1
Bacillus cereus 03BB102	Bifidobacterium bifidum S17	Burkholderia mallei ATCC 23344
Bacillus clausii KSM K16	Bifidobacterium breve ACS 071 V Sch8b	Burkholderia multivorans ATCC 17616
Bacillus coagulans 2 6	Bifidobacterium dentium Bd1	Burkholderia phymatum STM815
Bacillus cytotoxicus NVH 391 98	Bifidobacterium longum DJO10A	Burkholderia phytofirmans PsJN
Bacillus halodurans C 125	Blattabacterium sp Blattella germanica str Bge	Burkholderia pseudomallei 668
Bacillus licheniformis DSM 13 ATCC 14580	Bordetella avium 197N	Burkholderia rhizoxinica HKI 454
Bacillus megaterium DSM 319	Bordetella bronchiseptica RB50	Burkholderia sp 383
Bacillus mycoides DSM 2048	Bordetella parapertussis 12822	Burkholderia thailandensis E264
Bacillus pseudofirmus OF4	Bordetella pertussis CS	Burkholderia vietnamiensis G4
Bacillus pumilus SAFR 032	Bordetella petrii DSM 12804	Burkholderia xenovorans LB400
Bacillus selenitireducens MLS10	Borrelia afzelii PKo	Butyrivibrio proteoclasticus B316
Bacillus subtilis BSn5	Borrelia bissetii DN127	Caldicellulosiruptor bescii DSM 6725
Bacillus thuringiensis serovar berliner ATCC 10792	Borrelia burgdorferi B31	Caldicellulosiruptor hydrothermalis 108
Bacillus weihenstephanensis KBAB4	Borrelia duttonii Ly	Caldicellulosiruptor kristjanssonii 177R1B
Bacteriovorax marinus SJ	Borrelia garinii PBI	Caldicellulosiruptor kronotskyensis 2002
Bacteroides fragilis YCH46	Borrelia hermsii DAH	Caldicellulosiruptor lactoaceticus 6A
Bacteroides helcogenes P 36 108	Borrelia recurrentis A1	Caldicellulosiruptor obsidiansis OB47
Bacteroides salanitronis DSM 18170	Borrelia turicatae 91E135	Caldicellulosiruptor owensensis OL
Bacteroides thetaiotaomicron VPI 5482	Brachybacterium faecium DSM 4810	Caldicellulosiruptor saccharolyticus DSM 8903
Bacteroides vulgatus ATCC 8482	Brachyspira hyodysenteriae WA1	Calditerrivibrio nitroreducens DSM 19672
Bartonella bacilliformis KC583	Brachyspira intermedia PWS A	Caldivirga maquilingensis IC 167
Bartonella clarridgeiae 73	Brachyspira murdochii DSM 12563	Campylobacter concisus 13826
Bartonella grahamii as4aup	Brachyspira pilosicoli 95 1000	Campylobacter curvus 52592
Bartonella henselae str Houston 1	Bradyrhizobium japonicum USDA 110	Campylobacter fetus subsp fetus 82 40
Bartonella quintana str Toulouse	Bradyrhizobium sp BTAi1	Campylobacter hominis ATCC BAA 381
Bartonella tribocorum CIP 105476	Brevibacillus brevis NBRC 100599	Campylobacter jejuni subsp jejuni 81116
Baumannia cicadellinicola str Hc Homalodisca coagulata	Brevundimonas subvibrioides ATCC 15264	
Bdellovibrio bacteriovorus HD100	Brucella abortus A13334	
Beijerinckia indica subsp indica ATCC 9039	Brucella canis ATCC 23365	
Beutenbergia cavernae DSM 12333	Brucella melitensis bv 1 str 16M	
Bifidobacterium adolescentis ATCC 15703	Brucella microti CCM 4915	
	Brucella ovis ATCC 25840	
	Brucella pinnipedialis B2 94	
	Brucella suis 1330	
	Buchnera aphidicola str APS	
	Acyrtosiphon pisum	
	Burkholderia ambifaria AMMD	
	Burkholderia cenocepacia HI2424	

SIANN: Strain Identification by Alignment to Near Neighbors

Campylobacter lari RM2100	Candidatus Solibacter usitatus Ellin6076	Chlorobium phaeobacteroides DSM 266
Candidatus Accumulibacter phosphatis clade IIA str UW 1	Candidatus Sulcia muelleri GWSS	Chlorobium phaeovibrioides DSM 265
Candidatus Amoebophilus asiaticus 5a2	Candidatus Tremblaya princeps PCIT	Chlorobium tepidum TLS
Candidatus Arthromitus sp SFB mouse Japan	Candidatus Vesicomysocius okutanii HA	Chloroflexus aggregans DSM 9485
Candidatus Azobacteroides pseudotrichonymphae genomovar CFP2	Candidatus Zinderia insecticola CARI	Chloroflexus aurantiacus J 10 fl
Candidatus Blochmannia floridanus	Capnocytophaga canimorsus Cc5	Chloroflexus sp Y 400 fl
Candidatus Carsonella ruddii PV	Capnocytophaga ochracea DSM 7271	Chloroherpeton thalassium ATCC 35110
Candidatus Chloracidobacterium thermophilum B	Carboxydotherrnus hydrogenoformans Z 2901	Chromobacterium violaceum ATCC 12472
Candidatus Desulforudis audaxviator MP104C	Carnobacterium sp 17 4	Chromohalobacter salexigens DSM 3043
Candidatus Hamiltonella defensa 5AT Acyrthosiphon pisum	Catenulispora acidiphila DSM 44928	Citrobacter koseri ATCC BAA 895
Candidatus Hodgkinia cicadicola Dsem	Caulobacter crescentus CB15	Citrobacter rodentium ICC168
Candidatus Korarchaeum cryptofilum OPF8	Caulobacter segnis ATCC 21756	Clavibacter michiganensis subsp michiganensis NCPPB 382
Candidatus Koribacter versatilis Ellin345	Caulobacter sp K31	Clostridium acetobutylicum ATCC 824
Candidatus Liberibacter asiaticus str psy62	Cellulomonas fimi ATCC 484	Clostridium beijerinckii NCIMB 8052
Candidatus Methyloirabilis oxyfera	Cellulomonas flavigena DSM 20109	Clostridium botulinum A str ATCC 3502
Candidatus Midichloria mitochondrii IricVA	Cellulophaga algicola DSM 14237	Clostridium cellulolyticum H10
Candidatus Moranella endobia PCIT	Cellulophaga lytica DSM 7489	Clostridium cellulovorans 743B
Candidatus Nitrospira defluvii	Cellvibrio gilvus ATCC 13127	Clostridium difficile 630
Candidatus Pelagibacter sp IMCC9063	Cellvibrio japonicus Ueda107	Clostridium kluyveri DSM 555
Candidatus Phytoplasma australiense	Cenarchaeum symbiosum A	Clostridium lentocellum DSM 5427
Candidatus Protochlamydia amoebophila UWE25	Chelativorans sp BNC1	Clostridium ljungdahlii DSM 13528
Candidatus Puniceispirillum marinum IMCC1322	Chitinophaga pinensis DSM 2588	Clostridium novyi NT
Candidatus Riesia pediculicola USDA	Chlamydia muridarum Nigg	Clostridium perfringens ATCC 13124
Candidatus Ruthia magnifica str Cm Calyptogena magnifica	Chlamydia trachomatis 434 Bu	Clostridium phytofermentans ISDg
	Chlamydophila abortus S26 3	Clostridium saccharolyticum WM1
	Chlamydophila caviae GPIC	Clostridium sp SY8519
	Chlamydophila felis Fe C 56	Clostridium sticklandii DSM 519
	Chlamydophila pecorum E58	Clostridium tetani E88
	Chlamydophila pneumoniae CWL029	Clostridium thermocellum ATCC 27405
	Chlamydophila psittaci 6BC	Collimonas fungivorans Ter331
	Chlorobaculum parvum NCIB 8327	Colwellia psychrerythraea 34H
	Chlorobium chlorochromatii CaD3	
	Chlorobium limicola DSM 245	
	Chlorobium luteolum DSM 273	

SIANN: Strain Identification by Alignment to Near Neighbors

Comamonas testosteroni CNB 2	Dechloromonas aromatica RCB	Desulfovibrio aespoeensis Aspo 2
Conexibacter woesei DSM 14684	Deferibacter desulfuricans SSM1	Desulfovibrio africanus str Walvis Bay
Coprothermobacter proteolyticus DSM 5265	Dehalococcoides ethenogenes 195	Desulfovibrio alaskensis G20
Coralimargarita akajimensis DSM 45221	Dehalococcoides sp BAV1	Desulfovibrio desulfuricans ND132
Coriobacterium glomerans PW2	Dehalogenimonas lykanthroporepellens BL DC 9	Desulfovibrio magneticus RS 1
Corynebacterium aurimucosum ATCC 700975	Deinococcus deserti VCD115	Desulfovibrio salexigens DSM 2638
Corynebacterium diphtheriae NCTC 13129	Deinococcus geothermalis DSM 11300	Desulfovibrio vulgaris RCH1
Corynebacterium efficiens YS 314	Deinococcus maricopensis DSM 21211	Desulfurispirillum indicum S5
Corynebacterium glutamicum ATCC 13032	Deinococcus proteolyticus MRP	Desulfurivibrio alkaliphilus AHT2
Corynebacterium jeikeium K411	Deinococcus radiodurans R1	Desulfurobacterium thermolithotrophum DSM 11699
Corynebacterium kroppenstedtii DSM 44385	Delftia acidovorans SPH 1	Desulfurococcus kamchatkensis 1221n
Corynebacterium pseudotuberculosis FRC41	Delftia sp Cs1 4	Desulfurococcus mucosus DSM 2162
Corynebacterium resistens DSM 45100	Denitrovibrio acetiphilus DSM 12809	Dichelobacter nodosus VCS1703A
Corynebacterium ulcerans 809	Desulfarculus baarsii DSM 2075	Dickeya dadantii 3937
Corynebacterium urealyticum DSM 7109	Desulfatibacillum alkenivorans AK 01	Dickeya zeae Ech1591
Corynebacterium variabile DSM 44702	Desulfatibacillum hafniense Y51	Dictyoglomus thermophilum H 6 12
Coxiella burnetii RSA 493	Desulfobacca acetoxidans DSM 11109	Dictyoglomus turgidum DSM 6724
Croceibacter atlanticus HTCC2559	Desulfobacterium autotrophicum HRM2	Dinoroseobacter shibae DFL 12
Cronobacter sakazakii ATCC BAA 894	Desulfobulbus propionicus DSM 2032	Dyadobacter fermentans DSM 18053
Cronobacter turicensis z3032	Desulfococcus oleovorans Hxd3	Edwardsiella ictaluri 93 146
Cryptobacterium curtum DSM 15641	Desulfohalobium retbaense DSM 5692	Edwardsiella tarda EIB202
Cupriavidus metallidurans CH34	Desulfomicrobium baculatum DSM 4028	Eggerthella lenta DSM 2243
Cupriavidus necator N 1	Desulfotalea psychrophila LSv54	Eggerthella sp YY7918
Cupriavidus taiwanensis LMG 19424	Desulfotomaculum acetoxidans DSM 771	Ehrlichia canis str Jake
cyanobacterium UCYN A	Desulfotomaculum carboxydovorans CO 1 SRB	Ehrlichia chaffeensis str Arkansas
Cyanothece sp ATCC 51142	Desulfotomaculum kuznetsovii DSM 6115	Ehrlichia ruminantium str Welgevonden
Cyclobacterium marinum DSM 745	Desulfotomaculum reducens MI 1	Elusimicrobium minutum Pei191
Cytophaga hutchinsonii ATCC 33406	Desulfotomaculum ruminis DSM 2154	Enterobacter aerogenes KCTC 2190
		Enterobacter asburiae LF7a
		Enterobacter cloacae subsp cloacae ATCC 13047
		Enterobacter sp 638
		Enterococcus faecalis V583

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Erwinia amylovora ATCC 49946	Francisella tularensis subsp holarctica LVS	Granulicella mallensis MP5ACTX8
Erwinia billingiae Eb661	Frankia alni ACN14a	Granulicella tundricola
Erwinia pyrifoliae DSM 12163	Frankia sp Ccl3	Haemophilus ducreyi 35000HP
Erwinia sp Ejp617	Frankia symbiont of Datisca glomerata	Haemophilus influenzae 10810
Erwinia tasmaniensis Et1 99	Fusobacterium nucleatum subsp nucleatum ATCC 25586	Haemophilus parainfluenzae T3T1
Erysipelothrix rhusiopathiae	Gallibacterium anatis UMN179	Haemophilus parasuis SH0165
Erythrobacter litoralis HTCC2594	Gallionella capsiferiformans ES 2	Haemophilus somnus 129PT
Escherichia coli O157:H7 str Sakai	gamma proteobacterium HdN1	Hahella chejuensis KCTC 2396
Escherichia fergusonii ATCC 35469	Gardnerella vaginalis 409 05	Halalkalicoccus jeotgali B3
Ethanoligenens harbinense YUAN 3	Gemmatimonas aurantiaca T 27	Halanaerobium hydrogeniformans
Eubacterium eligens ATCC 27750	Geobacillus kaustophilus HTA426	Haliangium ochraceum DSM 14365
Eubacterium limosum KIST612	Geobacillus sp C56 T3	Halicomenobacter hydrossis DSM 1100
Eubacterium rectale ATCC 33656	Geobacillus thermodenitrificans NG80 2	Haloarcula hispanica ATCC 33960
Exiguobacterium sibiricum 255 15	Geobacillus thermoglucosidasius C56 YS93	Haloarcula marismortui ATCC 43049
Exiguobacterium sp AT1b	Geobacillus thermoleovorans CCB US3 UF5	Halobacterium sp NRC 1
Ferrimonas balearica DSM 9799	Geobacter bemidjiensis Bem	Haloferax volcanii DS2
Ferroglobus placidus DSM 10642	Geobacter daltonii FRC 32	Halogeometricum borinquense DSM 11551
Fervidobacterium nodosum Rt17 B1	Geobacter lovleyi SZ	Halomicrobium mukohataei DSM 12286
Fibrobacter succinogenes subsp succinogenes S85	Geobacter metallireducens GS 15	Halomonas elongata DSM 2581
Filifactor alocis ATCC 35896	Geobacter sp M18	halophilic archaeon DL31
Finegoldia magna ATCC 29328	Geobacter sulfurreducens PCA	Halopiger xanaduensis SH 6
Flavobacteriaceae bacterium 3519 10	Geobacter uraniireducens Rf4	Haloquadratum walsbyi C23
Flavobacterium branchiophilum FL 15	Geodermatophilus obscurus DSM 43160	Halorhabdus utahensis DSM 12940
Flavobacterium columnare ATCC 49512	Glaciecola nitratireducens FR1064	Halorhodospira halophila SL1
Flavobacterium johnsoniae UW101	Glaciecola sp 4H 3 7YE 5	Halorubrum lacusprofundi ATCC 49239
Flavobacterium psychrophilum JIP02 86	Gloeobacter violaceus PCC 7421	Haloterrigena turkmenica DSM 5511
Flexistipes sinusarabici DSM 4947	Gluconacetobacter diazotrophicus PAI 5	Halothermothrix orenii H 168
Fluviicola taffensis DSM 16823	Gluconacetobacter xylinus NBRC 3288	Halothiobacillus neapolitanus c2
Francisella novicida U112	Gluconobacter oxydans 621H	Helicobacter acinonychis str Sheeba
Francisella philomiragia subsp philomiragia ATCC 25017	Gordonia bronchialis DSM 43247	Helicobacter bizzozeronii CIII 1
Francisella sp TX077308	Gramella forsetii KT0803	Helicobacter felis ATCC 49179
	Granulibacter bethesdensis CGDNIH1	Helicobacter hepaticus ATCC 51449
		Helicobacter mustelae 12198
		Helicobacter pylori 26695

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Heliobacterium modesticaldum Ice1	Kytococcus sedentarius DSM 20547	Legionella pneumophila subsp pneumophila ATCC 43290
Herbaspirillum seropedicae SmR1	Lacinutrix sp 5H 3 7 4	Leifsonia xyli subsp xyli str CTCB07
Hermiimonas arsenicoydans	Lactobacillus acidophilus NCFM	Leptospira biflexa serovar Patoc strain Patoc 1 Ames
Herpetosiphon aurantiacus DSM 785	Lactobacillus amylovorus GRL 1112	Leptospira borgpetersenii serovar Hardjo bovis str L550
Hippea maritima DSM 10411	Lactobacillus buchneri NRRL B 30929	Leptospira interrogans serovar Copenhageni str Fiocruz L1 130
Hirschia baltica ATCC 49814	Lactobacillus casei ATCC 334	Leptothrix cholodnii SP 6
Hydrogenobacter thermophilus TK 6	Lactobacillus crispatus ST1	Leptotrichia buccalis C 1013 b
Hydrogenobaculum sp Y04AAS1	Lactobacillus delbrueckii subsp bulgaricus ATCC 11842	Leuconostoc citreum KM20
Hyperthermus butylicus DSM 5456	Lactobacillus fermentum IFO 3956	Leuconostoc gasicomitatum LMG 18811
Hyphomicrobium denitrificans ATCC 51888	Lactobacillus gasseri ATCC 33323	Leuconostoc kimchii IMSNU 11154
Hyphomicrobium sp	Lactobacillus helveticus DPC 4571	Leuconostoc mesenteroides subsp mesenteroides ATCC 8293
Hyphomonas neptunium ATCC 15444	Lactobacillus johnsonii NCC 533	Leuconostoc sp C2
Idiomarina loihiensis L2TR	Lactobacillus kefirianofaciens ZW3	Listeria innocua Clip1 1262
Ignicoccus hospitalis KIN4 I	Lactobacillus plantarum subsp plantarum ST III	Listeria ivanovii
Ignisphaera aggregans DSM 17230	Lactobacillus reuteri DSM 20016	Listeria monocytogenes EGD e
Ilyobacter polytropus DSM 2926	Lactobacillus rhamnosus ATCC 8530	Listeria seeligeri serovar 1 2b str SLCC3954
Intrasporangium calvum DSM 43043	Lactobacillus ruminis ATCC 27782	Listeria welshimeri serovar 6b str SLCC5334
IsotERICOLA variabilis 225	Lactobacillus sakei subsp sakei 23K	Lysinibacillus sphaericus C3 41
Isosphaera pallida ATCC 43644	Lactobacillus salivarius UCC118	Macroccoccus caseolyticus JCSC5402
Jannaschia sp CCS1	Lactobacillus sanfranciscensis TMW 11304	Magnetococcus marinus MC 1
Janthinobacterium sp Marseille	Lactococcus garvieae ATCC 49156	Magnetospirillum magneticum AMB 1
Jonesia denitrificans DSM 20603	Lactococcus lactis subsp cremoris NZ9000	Mahella australiensis 50 1 BON
Kangiella koreensis DSM 16069	Laribacter hongkongensis HLHK9	Mannheimia succiniciproducens MBEL55E
Ketogulonicigenium vulgare WSH 001	Lawsonia intracellularis PHE MN1 00	Maribacter sp HTCC2170
Kineococcus radiotolerans SRS30216	Leadbetterella byssophila DSM 17132	Maricaulis maris MCS10
Kitasatospora setae KM 6054	Legionella longbeachae NSW150	Marinithermus hydrothermalis DSM 14884
Klebsiella oxytoca KCTC 1686		Marinobacter adhaerens HP15
Klebsiella pneumoniae 342		Marinobacter aquaeolei VT8
Klebsiella variicola At 22		Marinomonas mediterranea MMB 1
Kocuria rhizophila DC2201		
Kosmotoga olearia TBF 1951		
Kribbella flavida DSM 17836		
Krokinobacter sp 4H 3 7 5		
Kyrpidia tusciae DSM 2912		

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Marinomonas posidonica IVIA
Po 181
Marinomonas sp MWYL1
Marivirga tractuosa DSM 4126
Megasphaera elsdenii
Meiothermus ruber DSM 1279
Meiothermus silvanus DSM
9946
Melissococcus plutonius ATCC
35311
Mesoplasma florum L1
Mesorhizobium ciceri biovar
biserrulae WSM1271
Mesorhizobium loti
MAFF303099
Mesorhizobium opportunistum
WSM2075
Metallosphaera cuprina Ar 4
Metallosphaera sedula DSM
5348
Methanobacterium sp AL 21
Methanobrevibacter
ruminantium
M1Methanobrevibacter
smithii ATCC 35061
Methanocaldococcus
fervens AG86
Methanocaldococcus
infernus ME
Methanocaldococcus
jannaschii DSM 2661
Methanocaldococcus sp
FS406 22
Methanocaldococcus
vulcanius M7
Methanocella arvoryzae
MRE50
Methanocella paludicola
SANAE
Methanococcoides burtonii
DSM 6242
Methanococcus aeolicus
Nankai 3
Methanococcus maripaludis
S2
Methanococcus vannielii SB
Methanococcus voltae A3
Methanocorpusculum
labreanum Z
Methanoculleus marisnigri JR1

Methanohalobium
evestigatum Z 7303
Methanohalophilus mahii DSM
5219
Methanoplanus petrolearius
DSM 11571
Methanopyrus kandleri AV19
Methanoregula boonei 6A8
Methanosaeta concilii GP6
Methanosaeta thermophila PT
Methanosalsum zhilinae DSM
4017
Methanosarcina acetivorans
C2A
Methanosarcina barkeri str
Fusaro
Methanosarcina mazei Go1
Methanosphaera
stadtmanae DSM 3091
Methanosphaerula palustris
E1 9c
Methanospirillum hungatei JF
1
Methanothermobacter
marburgensis str Marburg
Methanothermobacter
thermautotrophicus str Delta
H
Methanothermococcus
okinawensis IH1
Methanothermus fervidus
DSM 2088
Methanotorris igneus Kol 5
Methylacidiphilum infernorum
V4
Methylibium petroleiphilum
PM1
Methylobacillus flagellatus KT
Methylobacterium
chloromethanicum CM4
Methylobacterium extorquens
AM1
Methylobacterium nodulans
ORS 2060
Methylobacterium populi
BJ001
Methylobacterium
radiotolerans JCM 2831
Methylobacterium sp 4 46
Methylocella silvestris BL2

Methylococcus capsulatus str
Bath
Methylomicrobium
alcaliphilum
Methylomonas methanica
MC09
Methylotenera mobilis JLW8
Methylotenera versatilis 301
Methylovorus glucosetrophus
SIP3 4
Methylovorus sp MP688
Micavibrio aeruginosavorus
ARL 13
Microbacterium testaceum
StLB037
Micrococcus luteus NCTC
2665
Microcystis aeruginosa NIES
843
Microlunatus phosphovorus
NM 1
Micromonospora aurantiaca
ATCC 27029
Micromonospora sp L5
Mobiluncus curtisii ATCC
43063
Moorella thermoacetica
ATCC 39073
Moraxella catarrhalis RH4
Muricauda ruestringensis DSM
13258
Mycobacterium abscessus
ATCC 19977
Mycobacterium africanum
GM041182
Mycobacterium avium 104
Mycobacterium bovis AF2122
97
Mycobacterium canettii CIPT
140010059
Mycobacterium gilvum PYR
GCK
Mycobacterium leprae TN
Mycobacterium marinum M
Mycobacterium rhodesiae
NBB3
Mycobacterium smegmatis str
MC2 155
Mycobacterium sp JDM601
Mycobacterium tuberculosis
H37Rv

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Mycobacterium ulcerans Ag99	Neisseria lactamica 020 06	Orientia tsutsugamushi str Boryong
Mycobacterium vanbaalenii PYR 1	Neisseria meningitidis M01 240149	Oscillibacter valericigenes
Mycoplasma agalactiae PG2	Neorickettsia risticii str Illinois	Owenweeksia hongkongensis DSM 17368
Mycoplasma arthritidis 158L3 1	Neorickettsia sennetsu str Miyayama	Paenibacillus mucilaginosus KNP414
Mycoplasma bovis PG45	Niastella koreensis GR20 10	Paenibacillus polymyxa E681
Mycoplasma capricolum subsp capricolum ATCC 27343	Nitratifactor salsuginis DSM 16511	Paenibacillus sp JDR 2
Mycoplasma conjunctivae HRC 581	Nitratiruptor sp SB155 2	Paenibacillus terrae HPL 003
Mycoplasma crocodyli MP145	Nitrobacter hamburgensis X14	Paludibacter propionigenes WB4
Mycoplasma gallisepticum str Rlow	Nitrobacter winogradskyi Nb 255	Pantoea ananatis LMG 20103
Mycoplasma genitalium G37	Nitrosococcus halophilus Nc4	Pantoea sp At 9b
Mycoplasma haemocanis str Illinois	Nitrosococcus oceani ATCC 19707	Pantoea vagans C9 1
Mycoplasma haemofelis str Langford 1	Nitrosococcus watsonii C 113	Parabacteroides distasonis ATCC 8503
Mycoplasma hominis	Nitrosomonas europaea ATCC 19718	Parachlamydia acanthamoebae UV 7
Mycoplasma hyopneumoniae 232	Nitrosomonas eutropha C91	Paracoccus denitrificans PD1222
Mycoplasma hyorhinis HUB 1	Nitrosomonas sp AL212	Parvibaculum lavamentivorans DS 1
Mycoplasma leachii 99 014 6	Nitrosopumilus maritimus SCM1	Parvularcula bermudensis HTCC2503
Mycoplasma mobile 163K	Nitrosospira multiformis ATCC 25196	Pasteurella multocida subsp multocida str Pm70
Mycoplasma mycoides subsp mycoides SC str PG1	Nocardia farcinica IFM 10152	Pectobacterium atrosepticum SCRI1043
Mycoplasma penetrans HF 2	Nocardioides sp JS614	Pectobacterium carotovorum subsp carotovorum PC1
Mycoplasma pneumoniae M129	Nocardiopsis dassonvillei subsp dassonvillei DSM 43111	Pectobacterium wasabiae WPP163
Mycoplasma pulmonis UAB CTIP	Nostoc azollae 0708	Pediococcus pentosaceus ATCC 25745
Mycoplasma putrefaciens KS1	Nostoc punctiforme PCC 73102	Pedobacter heparinus DSM 2366
Mycoplasma suis str Illinois	Nostoc sp PCC 7120	Pedobacter saltans DSM 12145
Mycoplasma synoviae 53	Novosphingobium aromaticivorans DSM 12444	Pelagibacterium halotolerans B2
Myxococcus fulvus HW 1	Novosphingobium sp PP1Y	Pelobacter carbinolicus DSM 2380
Myxococcus xanthus DK 1622	Oceanithermus profundus DSM 14977	Pelobacter propionicus DSM 2379
Nakamurella multipartita DSM 44233	Oceanobacillus iheyensis HTE831	Pelodictyon phaeoclathratiforme BU 1
Nanoarchaeum equitans Kin4 M	Ochrobactrum anthropi ATCC 49188	Pelotomaculum thermopropionicum SI
Natranaerobius thermophilus JW NM WN LF	Odoribacter splanchnicus DSM 20712	Persephonella marina EX H1
Natrialba magadii ATCC 43099	Oenococcus oeni PSU 1	Petrogoga mobilis SJ95
Natronomonas pharaonis DSM 2160	Oligotropha carboxidovorans OM5	
Nautilia profundicola AmH	Olsenella uli DSM 7084	
Neisseria gonorrhoeae FA 1090	Onion yellows phytoplasma OY M	
	Opitutus terrae PB90 1	

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Phenylobacterium zucineum
HLK1
Photobacterium profundum
SS9
Photorhabdus asymbiotica
subsp asymbiotica ATCC
43949
Photorhabdus luminescens
subsp laumondii T101
Picrophilus torridus DSM 9790
Pirellula staleyi DSM 6068
Planctomyces brasiliensis DSM
5305
Planctomyces limnophilus
DSM 3776
Polaromonas
naphthalenivorans CJ2
Polaromonas sp JS666
Polymorphum gilvum SL003B
26A1
Polynucleobacter necessarius
subsp asymbioticus QLW
P1DMWA 1
Porphyromonas
asaccharolytica DSM 20707
Porphyromonas gingivalis W83
Prevotella denticola F0289
Prevotella melaninogenica
ATCC 25845
Prevotella ruminicola 23
Prochlorococcus marinus str
MIT 9215
Propionibacterium acnes
6609
Propionibacterium
freudenreichii subsp shermanii
CIRM BIA1
Prosthecochloris aestuarii DSM
271
Proteus mirabilis HI4320
Pseudoalteromonas atlantica
T6c
Pseudoalteromonas
haloplanktis TAC125
Pseudoalteromonas sp
SM9913
Pseudogulbenkiania sp NH8B
Pseudomonas aeruginosa
PAO1

Pseudomonas
brassicacearum subsp
brassicacearum NFM421
Pseudomonas entomophila
L48
Pseudomonas fluorescens
F113
Pseudomonas fulva 12 X
Pseudomonas mendocina
ymp
Pseudomonas protegens Pf 5
Pseudomonas putida F1
Pseudomonas stutzeri A1501
Pseudomonas syringae pv
phaseolicola 1448A
Pseudonocardia
dioxanivorans CB1190
Pseudovibrio sp FO BEG1
Pseudoxanthomonas spadix
BD a59
Pseudoxanthomonas
suwonensis 11 1
Psychrobacter arcticus 273 4
Psychrobacter cryohalolentis
K5
Psychrobacter sp PRwf 1
Psychromonas ingrahamii 37
Pusillimonas sp T7 7
Pyrobaculum aerophilum str
IM2
Pyrobaculum arsenaticum
DSM 13514
Pyrobaculum calidifontis JCM
11548
Pyrobaculum islandicum DSM
4184
Pyrobaculum neutrophilum
V24Sta
Pyrobaculum sp 1860
Pyrococcus abyssi GE5
Pyrococcus furiosus DSM 3638
Pyrococcus horikoshii OT3
Pyrococcus sp NA2
Pyrococcus yayanosii CH1
Pyrolobus fumarii 1A
Rahnella sp Y9602
Ralstonia eutropha JMP134
Ralstonia pickettii 12D
Ralstonia solanacearum
GMI1000

Ramlibacter tataouinensis
TTB310
Renibacterium salmoninarum
ATCC 33209
Rhizobium etli CFN 42
Rhizobium leguminosarum bv
viciae 3841
Rhodobacter capsulatus SB
1003
Rhodobacter sphaeroides 241
Rhodococcus equi 103S
Rhodococcus erythropolis PR4
Rhodococcus jostii RHA1
Rhodococcus opacus B4
Rhodoferax ferrireducens T118
Rhodococcus vanniellii
ATCC 17100
Rhodopirellula baltica SH 1
Rhodopseudomonas palustris
CGA009
Rhodospirillum centenum SW
Rhodospirillum rubrum ATCC
11170
Rhodothermus marinus DSM
4252
Rickettsia africae ESF 5
Rickettsia akari str Hartford
Rickettsia bellii RML369 C
Rickettsia canadensis str
McKiel
Rickettsia conorii str Malish 7
Rickettsia felis URRWXC2
Rickettsia heilongjiangensis
054
Rickettsia japonica YH
Rickettsia massiliae MTU5
Rickettsia peacockii str Rustic
Rickettsia prowazekii str
Madrid E
Rickettsia rickettsii str Iowa
Rickettsia sibirica 246
Rickettsia slovaca 13 B
Rickettsia typhi str Wilmington
Riemerella anatipestifer ATCC
11845 DSM 15868
Robiginitalea biformata
HTCC2501
Roseburia hominis A2 183
Roseiflexus castenholzii DSM
13941
Roseiflexus sp RS 1

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Roseobacter denitrificans OCh 114	Shewanella piezotolerans WP3	Stackebrandtia nassauensis DSM 44728
Roseobacter litoralis Och 149	Shewanella putrefaciens CN 32	Staphylococcus aureus subsp aureus JH1
Rothia dentocariosa ATCC 17931	Shewanella sediminis HAW EB3	Staphylococcus carnosus subsp carnosus TM300
Rothia mucilaginosa DY 18	Shewanella sp ANA 3	Staphylococcus epidermidis ATCC 12228
Rubrobacter xylanophilus DSM 9941	Shewanella violacea DSS12	Staphylococcus haemolyticus JCSC1435
Ruegeria pomeroyi DSS 3	Shewanella woodyi ATCC 51908	Staphylococcus lugdunensis HKU09 01
Ruegeria sp TM1040	Shigella boydii Sb227	Staphylococcus pseudintermedius HKU10 03
Ruminococcus albus 7	Shigella dysenteriae Sd197	Staphylothermus hellenicus DSM 12710
Runella slithyformis DSM 19594	Shigella flexneri 2a str 301	Staphylothermus marinus F1
Saccharomonospora viridis DSM 43017	Shigella sonnei Ss046	Starkeya novella DSM 506
Saccharophagus degradans 2 40	Sideroxydans lithotrophicus ES 1	Stenotrophomonas maltophilia K279a
Saccharopolyspora erythraea NRRL 2338	Simkania negevensis Z	Stigmatella aurantiaca DW4 3 1
Salinibacter ruber DSM 13855	Sinorhizobium fredii NGR234	Streptobacillus moniliformis DSM 12112
Salinispora arenicola CNS 205	Sinorhizobium medicae WSM419	Streptococcus agalactiae 2603V R
Salinispora tropica CNB 440	Sinorhizobium meliloti 1021	Streptococcus dysgalactiae subsp equisimilis ATCC 12394
Salmonella bongori NCTC 12419	Slackia heliotrinireducens DSM 20476	Streptococcus equi subspecies zooepidemicus
Salmonella enterica subsp enterica serovar Enteritidis str P125109	Sodalis glossinidius str morsitans	Streptococcus gallolyticus subsp gallolyticus ATCC BAA 2069
Sanguibacter keddiei DSM 10542	Sorangium cellulosum So ce56	Streptococcus gordonii str Challis substr CH1
Sebaldeia termitidis ATCC 33386	Sphaerobacter thermophilus DSM 20745	Streptococcus macedonicus ACA DC 198
Segniliparus rotundus DSM 44985	Sphaerochaeta coccoides DSM 17374	Streptococcus mitis B6
Selenomonas sputigena ATCC 35185	Sphaerochaeta globus str Buddy	Streptococcus mutans NN2025
Serratia plymuthica AS9	Sphaerochaeta pleomorpha str Grapes	Streptococcus oralis Uo5
Serratia proteamaculans 568	Sphingobacterium sp 21	Streptococcus parasanguinis ATCC 15912
Serratia sp AS12	Sphingobium chlorophenolicum L 1	Streptococcus parauberis KCTC 11537
Serratia symbiotica str Cinara cedri	Sphingobium japonicum UT26S	Streptococcus pasteurianus ATCC 43144
Shewanella amazonensis SB2B	Sphingobium sp SYK 6	Streptococcus pneumoniae ST556
Shewanella baltica OS155	Sphingomonas wittichii RW1	Streptococcus pseudopneumoniae IS7493
Shewanella denitrificans OS217	Sphingopyxis alaskensis RB2256	
Shewanella frigidimarina NCIMB 400	Spirochaeta caldaria DSM 7334	
Shewanella halifaxensis HAW EB4	Spirochaeta smaragdinae DSM 11293	
Shewanella loihica PV 4	Spirochaeta thermophila DSM 6192	
Shewanella oneidensis MR 1	Spirosoma linguale DSM 74	
Shewanella pealeana ATCC 700345		

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Streptococcus pyogenes M1 GAS	Synechocystis sp PCC 6803	Thermococcus gammatolerans EJ3
Streptococcus salivarius JIM8780	Syntrophobacter fumaroxidans MPOB	Thermococcus kodakarensis KOD1
Streptococcus sanguinis SK36	Syntrophobotulus glycolicus DSM 8271	Thermococcus onnurineus NA1
Streptococcus suis 05ZYH33	Syntrophomonas wolfei subsp wolfei str Goettingen	Thermococcus sibiricus MM 739
Streptococcus thermophilus CNRZ1066	Syntrophothermus lipocalidus DSM 12680	Thermococcus sp 4557
Streptococcus uberis 0140J	Syntrophus aciditrophicus SB	Thermocrinis albus DSM 14484
Streptomyces avermitilis MA 4680	Tannerella forsythia ATCC 43037	Thermodesulfatator indicus DSM 15286
Streptomyces bingchenggensis BCW 1	Taylorella equigenitalis MCE9	Thermodesulfobacterium sp OPB45
Streptomyces cattleya NRRL 8057 DSM 46488	Tepidanaerobacter acetatoxydans Re1	Thermodesulfobium narugense DSM 14796
Streptomyces coelicolor A32	Teredinibacter turnerae T7901	Thermodesulfobivrio yellowstonii DSM 11347
Streptomyces flavogriseus ATCC 33331	Terriglobus saanensis SP1PR4	Thermofilum pendens Hrk 5
Streptomyces griseus subsp griseus NBRC 13350	Tetragenococcus halophilus Thauera sp MZ1T	Thermomicrobium roseum DSM 5159
Streptomyces scabiei 8722	Thermaerobacter marianensis DSM 12885	Thermomonospora curvata DSM 43183
Streptomyces sp SirexAA E	Thermanaerovibrio acidaminovorans DSM 6589	Thermoplasma acidophilum DSM 1728
Streptomyces violaceusniger Tu 4113	Thermincola potens JR	Thermoplasma volcanium GSS1
Streptosporangium roseum DSM 43021	Thermoanaerobacter brockii subsp finii Ako 1	Thermoproteus uzoniensis 768 20
Sulfobacillus acidophilus DSM 10332	Thermoanaerobacter italicus Ab9	Thermosediminibacter oceani DSM 16646
Sulfolobus acidocaldarius DSM 639	Thermoanaerobacterium thermosaccharolyticum DSM 571	Thermosiphon africanus TCF52B
Sulfolobus islandicus M1425	Thermoanaerobacterium xylanolyticum LX 11	Thermosiphon melanesiensis BI429
Sulfolobus solfataricus P2	Thermoanaerobacter mathranii subsp mathranii str A3	Thermosphaera aggregans DSM 11486
Sulfolobus tokodaii str 7	Thermoanaerobacter pseudethanolicus ATCC 33223	Thermosynechococcus elongatus BP 1
Sulfuricurvum kujiense DSM 16994	Thermoanaerobacter sp X513	Thermotoga lettingae TMO
Sulfurihydrogenibium azorense Az Fu1	Thermoanaerobacter tengcongensis MB4	Thermotoga maritima MSB8
Sulfurihydrogenibium sp YO3AOP1	Thermoanaerobacter wiegelii R18B1	Thermotoga naphthophila RKU 10
Sulfurimonas autotrophica DSM 16294	Thermobaculum terrenum ATCC BAA 798	Thermotoga neapolitana DSM 4359
Sulfurimonas denitrificans DSM 1251	Thermobifida fusca YX	Thermotoga petrophila RKU 1
Sulfurospirillum deleyianum DSM 6946	Thermobispora bispora DSM 43833	Thermotoga sp RQ2
Sulfurovum sp NBC37 1	Thermococcus barophilus MP	Thermotoga thermarum DSM 5069
Symbiobacterium thermophilum IAM 14863		Thermovibrio ammonificans HB 1
Synechococcus elongatus PCC 6301		Thermovirga lienii DSM 17291
Synechococcus sp CC9605		

SIANN: Strain Identification by Alignment to Near Neighbors

Thermus scotoductus SA 01	Vibrio parahaemolyticus RIMD
Thermus sp CCB US3 UF1	2210633
Thermus thermophilus HB27	Vibrio sp EJY3
Thioalkalimicrobium cyclicum	Vibrio splendidus LGP32
ALM1	Vibrio vulnificus CMCP6
Thioalkalivibrio sp K90mix	Vulcanisaeta distributa DSM
Thioalkalivibrio sulfidophilus HL	14429
EbGr7	Vulcanisaeta moutnovskia
Thiobacillus denitrificans	768 28
ATCC 25259	Waddlia chondrophila WSU
Thiomicrospira crunigena	86 1044
XCL 2	Weeksella virosa DSM 16922
Thiomonas intermedia K12	Weissella koreensis KACC
Tolumonas auensis DSM 9187	15510
Treponema azotonutricium	Wigglesworthia glossinidia
ZAS 9	endosymbiont of Glossina
Treponema brennaborensis	brevipalpis
DSM 12168	Wolbachia endosymbiont of
Treponema denticola ATCC	Culex quinquefasciatus Pel
35405	Wolbachia sp wRi
Treponema pallidum subsp	Wolinella succinogenes DSM
pallidum str Nichols	1740
Treponema paraluis-cuniculi	Xanthobacter autotrophicus
Cuniculi A	Py2
Treponema primitia ZAS 2	Xanthomonas albilineans GPE
Treponema succinifaciens	PC73
DSM 2489	Xanthomonas axonopodis pv
Trichodesmium erythraeum	citri str 306
IMS101	Xanthomonas campestris pv
Tropheryma whippelii str Twist	campestris str 8004
Truepera radiovictrix DSM	Xanthomonas oryzae pv
17093	oryzae KACC 10331
Tsukamurella paurometabola	Xenorhabdus bovienii SS 2004
DSM 20162	Xenorhabdus nematophila
Ureaplasma parvum serovar 3	ATCC 19061
str ATCC 27815	Xylanimonas cellulolytica
Ureaplasma urealyticum	DSM 15894
serovar 10 str ATCC 33699	Xylella fastidiosa 9a5c
Variovorax paradoxus S110	Yersinia enterocolitica subsp
Veillonella parvula DSM 2008	enterocolitica 8081
Verminephrobacter eiseniae	Yersinia pestis CO92
EF01 2	Yersinia pseudotuberculosis IP
Verrucospora maris AB 18	32953
032	Zobellia galactanivorans
Vibrio anguillarum 775	Zunongwangia profunda SM
Vibrio cholerae O1 biovar El	A87
Tor str N16961	Zymomonas mobilis subsp
Vibrio fischeri ES114	mobilis ATCC 10988
Vibrio furnissii NCTC 11218	
Vibrio harveyi ATCC BAA 1116	