

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
MetaPhiAn	Alignment to clade-specific marker genes	Segata, et al., 2012
LMAT	Nucleotide kmer matching	Ames, et al., 2013
Kraken	Nucleotide kmer matching	Wood & Salzberg, in submission
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., in preparation

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.

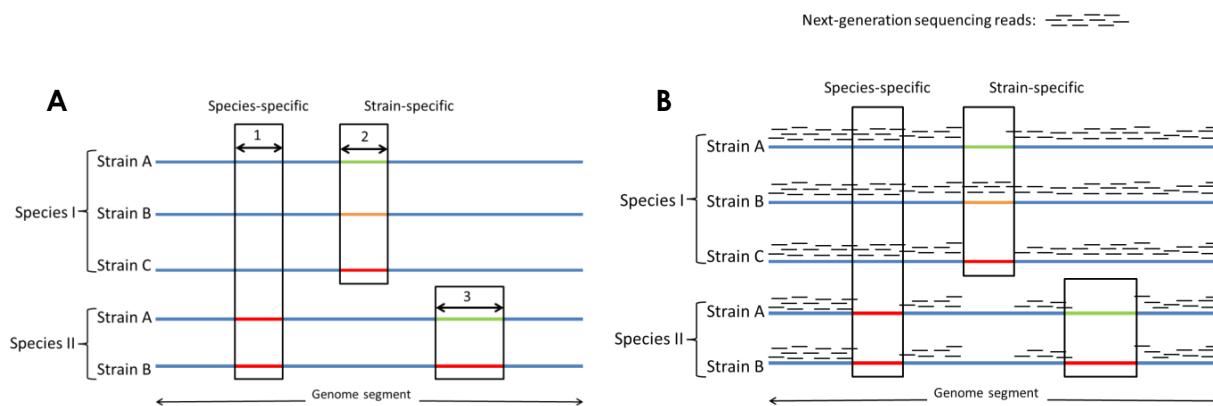


Figure 1. A) For a group of strains belonging to two different species, some regions may be unique to each species (region 1), while other regions may be unique to strains within each species (regions 2 and 3). **B)** A set of reads are aligned to these genomes, and the ones that align in a species- 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%
<i>Hanta virus</i>		1.2%	4.7%	19%	76%	0.074%	0.30%					
<i>Rift valley fever virus</i>	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 fleischmann eii</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%
<i>Monkeypox virus</i>					1.2%	4.7%	19%	76%	0.074%	0.30%		
<i>Vaccinia virus</i>	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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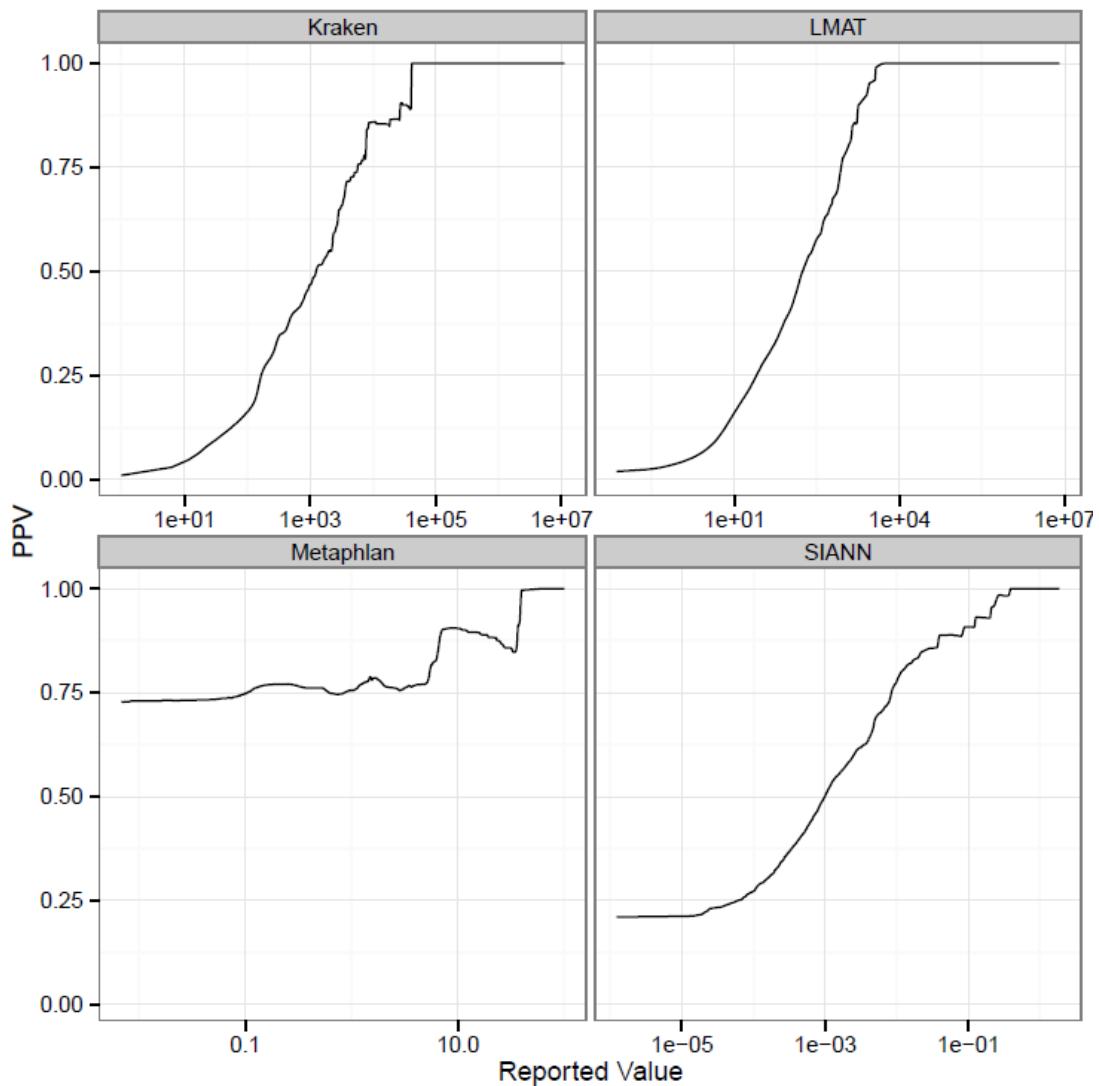


Figure 2. Relationship of reported value for each program (horizontal axis, log scale) to the empirically-determined Positive Predictive Value (PPV), shown on the vertical axis. While the exact values depend on the test data used, the general values at significant cutoff values (0.8, 0.9, 0.95 PPV) remain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

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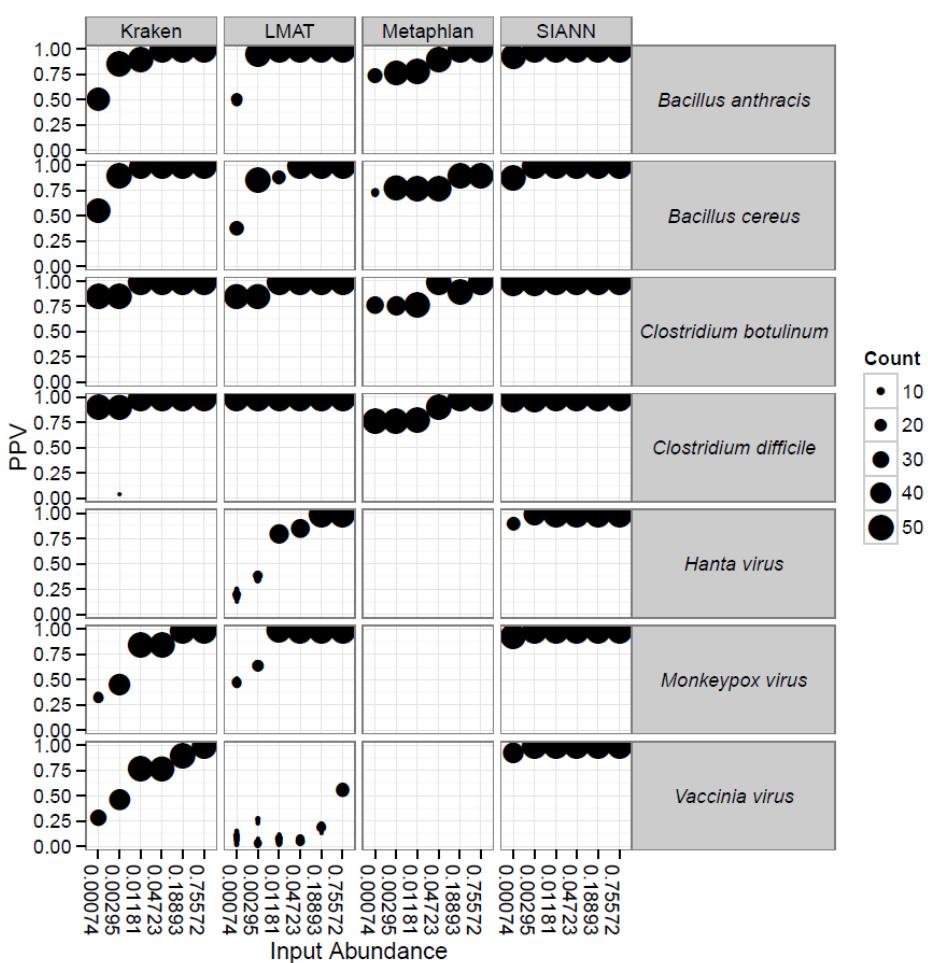


Figure 3. The Positive Predictive Value (PPV, vertical axis) is shown for each organism (boxes on right), at each level of known abundance (horizontal axis, see Table 2), and each program (boxes at top), across a maximum of 50 replicates (indicated by the size of each point). Note that the reference database for MetaPhiAn 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/](http://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/](http://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 Lujo-virus	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 konukian 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 supercont1 22	Burkholderia mallei	mallei
Arenaviridae	New-world-arenaviruses Whitewater-Arroyo-virus	Brucella melitensis ATCC 23457	Burkholderia mallei	ATCC 10399
Arenaviridae	Old-world-arenaviruses Ippy-virus	Brucella melitensis bv 1 str 16M	Burkholderia mallei	SAVP1
Arenaviridae	Old-world-arenaviruses Lassa-virus	Brucella ovis ATCC 25840	Burkholderia multivorans	
Arenaviridae	Old-world-arenaviruses Mopeia-virus-AN20410	Brucella suis 1330	ATCC 17616	
Asfarviridae	African-swine-fever-virus Benin-971-pathogenic-isolate	Brucella suis ATCC 23445	Burkholderia oklahomensis	
Asfarviridae	African-Swine-Fever-Virus	Bunyaviridae Akabane-virus segment-M	C6786	
Bacillus anthracis	A2012 Bant 02 1	Bunyaviridae Hantavirus EO147	Burkholderia oklahomensis	
Bacillus anthracis	Ames Ancestor	Andes-virus	Burkholderia pseudomallei	
Bacillus anthracis	Sterne	Bunyaviridae Hantavirus 1026b	Burkholderia pseudomallei	
Bacillus cereus	03BB102	Dobrava-Belgrade-virus-strain-DOBV-Ano-Poroia-Afl9-1999	Burkholderia pseudomallei	
Bacillus cereus	AH187	Bunyaviridae Hantavirus 1106a	Burkholderia pseudomallei	
Bacillus cereus	AH820	Hantaan-virus	Burkholderia pseudomallei	
Bacillus cereus	ATCC 14579	Bunyaviridae Hantavirus 1710b	Burkholderia pseudomallei	
Bacillus cereus	B4264	Puumala-virus	Burkholderia pseudomallei	
Bacillus cereus	F65185	Bunyaviridae Hantavirus 668	Burkholderia pseudomallei	
		Seoul-virus-strain-Seoul-80-39-clone-1	BPC006	
		Bunyaviridae Hantavirus Sin-Nombre-virus	Burkholderia pseudomallei	
		Bunyaviridae Hantavirus Thottapalayam-virus	K96243	
		Bunyaviridae Hantavirus Tula-virus	Burkholderia pyrrocinia CH-67	
		Bunyaviridae Nairobi-virus Crimean-Congo-hemorrhagic-fever-virus	Burkholderia thailandensis	
		Bunyaviridae Nairobi-virus Dugbe-virus	ATCC 700388	
			Burkholderia thailandensis	
			E264	
			Burkholderia thailandensis	
			MSMB121	
			Campylobacter coli JV20	
			Campylobacter fetus subsp fetus 82-40	
			Campylobacter jejuni RM1221	

SIANN: Strain Identification by Alignment to Near Neighbors

<i>Campylobacter jejuni</i> subsp <i>doylei</i> 26997	<i>Coccidioides posadasii</i> CPA 0020	<i>Coxiella burnetii</i> Dugway 5J108 111
<i>Campylobacter jejuni</i> subsp <i>jejuni</i> 81-176	<i>Coronaviridae</i>	<i>Coxiella burnetii</i> RSA 493
<i>Campylobacter jejuni</i> subsp <i>jejuni</i> NCTC 11168 ATCC 700819	<i>Alphacoronavirus</i> Bat- <i>coronavirus-HKU2</i>	<i>Diphylloctettsia massiliensis</i> 20B CS 1
<i>Campylobacter upsaliensis</i> JV21	<i>Coronaviridae</i>	<i>Ehrlichia canis</i> str Jake
<i>Clostridium acetobutylicum</i> DSM 1731	<i>Alphacoronavirus</i> Feline- infectious-peritonitis-virus	<i>Ehrlichia chaffeensis</i> str Arkansas
<i>Clostridium botulinum</i> A str ATCC 3502	<i>Coronaviridae</i>	<i>Ehrlichia chaffeensis</i> str <i>Sapulpa ctg90</i>
<i>Clostridium botulinum</i>	<i>Alphacoronavirus</i> Human- <i>coronavirus-229E</i>	<i>Ehrlichia ruminantium</i> str Gardel
BKT015925	<i>Coronaviridae</i>	<i>Ehrlichia ruminantium</i> str Welgevonden
<i>Clostridium botulinum</i> B str Eklund 17B	<i>Alphacoronavirus</i> TGEV- Purdue-P115	<i>Escherichia coli</i> APEC O1
<i>Clostridium botulinum</i> E3 str Alaska E43	<i>Coronaviridae</i> Bafinivirus	<i>Escherichia coli</i> BL21 DE3
<i>Clostridium botulinum</i> F str 230613	<i>White-bream-virus</i>	<i>Escherichia coli</i> B str REL606
<i>Clostridium botulinum</i> H04402 065	<i>Coronaviridae</i>	<i>Escherichia coli</i> ETEC H10407
<i>Clostridium difficile</i> 2007855	<i>Betacoronavirus</i> Bovine- coronavirus	<i>Escherichia coli</i> O104H4 str 2011C-3493
<i>Clostridium difficile</i> 630	<i>Coronaviridae</i>	<i>Escherichia coli</i> O157H7 str Escherichia coli O157H7 str EC4115
<i>Clostridium difficile</i> BI1	<i>Betacoronavirus</i> Murine- hepatitis-virus-strain-A59	<i>Escherichia coli</i> O157H7 str Sakai
<i>Clostridium difficile</i> BI9	<i>Coronaviridae</i>	<i>Escherichia coli</i> O7K1 str CE10
<i>Clostridium perfringens</i> ATCC 13124	<i>Betacoronavirus</i> Murine- hepatitis-virus-strain-JHM	<i>Escherichia coli</i> O83H1 str NRG 857C
<i>Clostridium perfringens</i> SM101	<i>Coronaviridae</i>	<i>Escherichia coli</i> str K-12 substr MG1655
<i>Clostridium perfringens</i> str 13	<i>Betacoronavirus</i> SARS- coronavirus	<i>Filoviridae</i> Ebolavirus
<i>Clostridium symbiosum</i> WAL- 14163	<i>Coronaviridae</i> Coronavirinae	<i>Bundibugyo-ebolavirus</i>
<i>Clostridium symbiosum</i> WAL- 14673	<i>Munia-coronavirus-HKU13-</i> 3514	<i>Filoviridae</i> Ebolavirus Cote- d'Ivoire-ebolavirus
<i>Clostridium tetani</i> E88	<i>Coronaviridae</i>	<i>Filoviridae</i> Ebolavirus Ebola- virus-Mayinga-Zaire
<i>Clostridium thermocellum</i> ATCC 27405	<i>Gammacoronavirus</i> Avian- infectious-bronchitis-virus	<i>Filoviridae</i> Ebolavirus Reston- ebolavirus
<i>Clostridium thermocellum</i> DSM 1313	<i>Coronaviridae</i> Turkey- coronavirus	<i>Filoviridae</i> Ebolavirus Sudan- ebolavirus
<i>Clostridium tunisiense</i> TJ C661	<i>Coronaviridae</i> Torovirus	<i>Filoviridae</i> Marburgvirus Lake- Victoria-marburgvirus-Musoke
<i>Clostridium ultunense</i> Esp	<i>Breda-virus</i>	<i>Flaviviridae</i> Alkhurma-virus
<i>Coccidioides immitis</i> H5384	<i>Coronaviridae</i> unclassified- coronaviruses	<i>Flaviviridae</i> Classical-swine- fever-virus
<i>Coccidioides immitis</i> RMSCC 2394	<i>Bat-coronavirus-BM48-31-BGR-</i> 2008	<i>Flaviviridae</i> Dengue-virus 1
<i>Coccidioides immitis</i> RS	<i>Coronaviridae</i> unclassified- coronaviruses	<i>Flaviviridae</i> Dengue-virus 2
<i>Coccidioides posadasii</i> C735 delta SOWgp	<i>Bovine-respiratory-coronavirus-AH187</i>	<i>Flaviviridae</i> Dengue-virus 3
<i>Coccidioides posadasii</i> CPA 0001	<i>Coronaviridae</i> unclassified- coronaviruses Human-enteric- coronavirus-strain-4408	<i>Flaviviridae</i> Dengue-virus 4
	<i>Coxiella burnetii</i> CbuG Q212	<i>Flaviviridae</i> Japanese- encephalitis-virus genome
		<i>Flaviviridae</i> Karshi-virus

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

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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 62z4223- str RSK2980	Staphylococcus carnosus subsp carnosus TM300	Xanthomonas oryzae pv
Salmonella enterica subsp enterica serovar Dublin str CT 02021853	Staphylococcus epidermidis ATCC 12228	oryzae PXO99A
Salmonella enterica subsp enterica serovar Newport str SL254	Staphylococcus epidermidis RP62A	Xanthomonas vasicola pv
Salmonella enterica subsp enterica serovar Paratyphi A str ATCC 9150	Staphylococcus equorum subsp equorum Mu2	vasculorum NCPPB 1326 scf
Salmonella enterica subsp enterica serovar Typhimurium str LT2	Staphylococcus haemolyticus JCSC1435	9767 4580
Salmonella enterica subsp enterica serovar Typhi str Ty2	Staphylococcus hominis SK119	Yersinia aldovae ATCC 35236
Shigella boydii CDC 3083-94	Staphylococcus hominis subsp hominis C80	Yersinia bercovieri ATCC 43970
Shigella boydii Sb227	Staphylococcus lugdunensis HKU09-01	Yersinia enterocolitica IP
Shigella dysenteriae Sd197	Staphylococcus lugdunensis N920143	10393
Shigella flexneri 2002017	Togaviridae Alphavirus	Yersinia enterocolitica IP2222
Shigella flexneri 2a str 2457T	Barmah-Forest-virus	Yersinia enterocolitica subsp
Shigella flexneri 2a str 301	Togaviridae Chikungunya-virus	enterocolitica 8081
Shigella flexneri 5 str 8401	Togaviridae EEEV-complex	Yersinia enterocolitica subsp
Shigella sonnei 53G	Eastern-equine-encephalitis-virus	palearctica 105 5R
Shigella sonnei Ss046	Togaviridae Rubivirus Rubella-virus	Yersinia frederiksenii ATCC
Staphylococcus arletiae CVD059 SARL c230	Togaviridae SFV-complex O-nyong-nyong-virus	33641
Staphylococcus aureus 04-02981	Togaviridae Venezuelan-equine-encephalitis-virus	Yersinia intermedia ATCC
Staphylococcus aureus 08BA02176	Togaviridae WEEV-complex Sindbis-virus	29909
Staphylococcus aureus subsp aureus N315	Togaviridae Western-equine-encephalomyelitis-virus	Yersinia kristensenii ATCC
Staphylococcus aureus subsp aureus NCTC 8325	Xanthomonas albilineans GPE PC73	33638
Staphylococcus aureus subsp aureus TW20	Xanthomonas axonopodis Xac29-1	Yersinia mollaretii ATCC 43969
Staphylococcus capitis QN1 Contig63	Xanthomonas oryzae pv oryzae KACC 10331	Yersinia pestis A1122
		Yersinia pestis Antiqua
		Yersinia pestis KIM 10
		Yersinia pestis Pestoides F
		Yersinia pseudotuberculosis IP
		31758
		Yersinia pseudotuberculosis IP
		32953
		Yersinia pseudotuberculosis
		PB1
		Yersinia pseudotuberculosis
		YPIII
		Yersinia rohdei ATCC 43380
		Yersinia ruckeri ATCC 29473

SIANN: Strain Identification by Alignment to Near Neighbors

Appendix 2: Viral Database

Abaca bunchy top virus DNA-C	Adoxophyes granulovirus	orana	Alternanthera yellow vein virus satellite DNA beta
Abaca bunchy top virus DNA-M	Adoxophyes nucleopolyhedrovirus	orana	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 densonucleosis 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		Archaeol 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		Avian adeno-associated virus
Acanthocystis turfacea	DNA A		ATCC VR-865
Chlorella virus 1	african cassava mosaic virus		Avian adeno-associated virus strain DA-1
Acheta domesticus densovirus	DNA B		Avian endogenous retrovirus EAV-HP
Acholeplasma phage L2	African green monkey polyomavirus		Azospirillum phage Cd
Acholeplasma phage MV-L1	African swine fever virus		Bacillus phage 0305phi8-36
Acidianus bottle-shaped virus	Ageratum enation virus		Bacillus phage AP50
Acidianus filamentous virus 1	Ageratum leaf Cameroon betasatellite		Bacillus phage B103
Acidianus filamentous virus 2	Ageratum leaf curl virus-G52		Bacillus phage Bam35c
Acidianus filamentous virus 3	Ageratum yellow vein China virus-associated DNA beta		Bacillus phage BCJA1c
Acidianus filamentous virus 6	Ageratum yellow vein Chinavirus		Bacillus phage Cherry
Acidianus filamentous virus 7	Ageratum yellow vein Hualian virus-TaiwanHsinchutom2003		Bacillus phage Fah
Acidianus filamentous virus 8	DNA A		Bacillus phage GA-1
Acidianus filamentous virus 9	Ageratum yellow vein Sri Lanka virus segment A		Bacillus phage Gamma
Acidianus rod-shaped virus 1	Ageratum yellow vein Taiwan virus		Bacillus phage GIL16c
Acidianus spindle-shaped virus 1	Ageratum yellow vein virusassociated DNA beta		Bacillus phage IEBH
Acidianus two-tailed virus	Ageratum yellow veinivirus		Bacillus phage phi105
Actinomyces phage Av-1	Agrotis epsilon multiple nucleopolyhedrovirus		Bacillus phage phi29
Actinoplanes phage phiAsp2	Agrotis segetum granulovirus		Bacillus phage SPBc2
Acyrthosiphon pisum bacteriophage APSE-1	Agrotis segetum		Bacillus phage SPO1
Adeno-associated virus-1	nucleopolyhedrovirus		Bacillus phage SPP1
Adeno-associated virus-2	Alcelaphine herpesvirus 1		Bacillus phage TP21-L
Adeno-associated virus-3	Aleutian mink disease virus		Bacillus phage WBeta
Adeno-associated virus-4	Allamanda leaf curl virus		Bacillus prophage phBC6A51
Adeno-associated virus 5	DNA-A		Bacillus prophage phBC6A52
Adeno-associated virus-7	Alternanthera yellow vein virus DNA-A		Bacillus virus 1
Adeno-associated virus-8			Bacteriophage Aaphi23
Adoxophyes honmai NPV			Bacteriophage APSE-2
			Bacteriophage PSA
			Bacteriophage RB32
			Bacteroides phage B40-8

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

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Campoletis sonorensis ichnovirus segment F	Capra hircus papillomavirus type 1	Circovirus-like genome RW-E
Campoletis sonorensis ichnovirus segment G2	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 psoriasis virus RNA1
Campoletis sonorensis ichnovirus segment I2	Caspalia extranea densovirus	Citrus psoriasis virus RNA2
Campoletis sonorensis ichnovirus segment I	Cassava vein mosaic virus	Citrus psoriasis 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	Clerodendron golden mosaic
Campoletis sonorensis ichnovirus segment P	Chaetoceros salsugineum DNA virus	China virus DNA A
Campoletis sonorensis ichnovirus segment Q	Chayote yellow mosaic virus	Clerodendron golden mosaic
Campoletis sonorensis ichnovirus segment T	Chicken anemia virus	China virus DNA B
Campoletis sonorensis ichnovirus segment U	Chickpea chlorotic dwarf virus	Clerodendron golden mosaic
Campoletis sonorensis ichnovirus segment V	Chilli leaf curl disease associated sequence virion	virus DNA-A
Campoletis sonorensis ichnovirus segment Z	Chilli leaf curl Multan alphasatellite	Clerodendrum golden mosaic
Campoletis sonorensis superhelical segment A	Chilli leaf curl virus	virus DNA-B
Campoletis sonorensis superhelical segment aprime	Chino del tomate virus DNA A	Clostridium phage 39-O
Canary circovirus	Chino del tomate virus DNA B	Clostridium phage c-st
Canarypox virus	Chlamydia phage 3	Clostridium phage phi3626
Canine adenovirus	Chlamydia phage 4	Clostridium phage phiC2
Canine minute virus	Chlamydia phage Chp1	Clostridium phage phi CD119
Canine oral papillomavirus	Chlamydia phage Chp2	Clostridium phage phiCD27
Canine papillomavirus 2	Chlamydia phage PhiCPG1	Clostridium phage phiCTP1
Canine papillomavirus 3	Chloris striate mosaic virus	Coconut foliar decay virus
Canine papillomavirus 4	Choristoneura fumiferana DEF MNPV	Columbid circovirus
Canine papillomavirus 6	Choristoneura fumiferana MNPV	Commelina yellow mottle virus
Canine parvovirus	Choristoneura occidentalis granulovirus	Corchorus golden mosaic
	Chrysodeixis chalcites nucleopolyhedrovirus	virus DNA-A
	Circovirus-like genome BBC-A	Corchorus golden mosaic
	Circovirus-like genome CB-A	virus DNA-B
	Circovirus-like genome CB-B	Corchorus yellow spot virus
	Circovirus-like genome RW-A	DNA A
	Circovirus-like genome RW-B	Corchorus yellow spot virus
	Circovirus-like genome RW-C	DNA B
	Circovirus-like genome RW-D	Corchorus yellow vein virus-Hoa Bin DNA A
		Corchorus yellow vein virus-Hoa Bin DNA B
		Corynebacterium phage BFK20
		Corynebacterium phage P1201
		Cotesia congregata bracovirus segment Circle10
		Cotesia congregata bracovirus segment Circle11

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

SIANN: Strain Identification by Alignment to Near Neighbors

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
Emiliania 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
Enterobacteria phage HK022	Enterobacteria phage RTP	DNA-A
Enterobacteria phage HK620	Enterobacteria phage Sf6	Erectites yellow mosaic virus satellite DNA beta
Enterobacteria phage HK97	Enterobacteria phage SfV	Erethizon dorsatum papillomavirus type 1
Enterobacteria phage I2-2	Enterobacteria phage SP6	Erinaceus europaeus papillomavirus
Enterobacteria phage ID18	Enterobacteria phage SSL-2009a	Erwinia amylovora phage Era103
Enterobacteria phage ID2	Enterobacteria phage ST104	Erwinia phage phiEa21-4
MoscowID2001	Enterobacteria phage St-1	Escherichia coli bacteriophage rv5
Enterobacteria phage If1	Enterobacteria phage ST64T	Escherichia phage D108
Enterobacteria phage Ike	Enterobacteria phage T1	Escherichia phage phiV10
Enterobacteria phage IME08	Enterobacteria phage T3	Eupatorium vein clearing virus
Enterobacteria phage JK06	Enterobacteria phage T4	Eupatorium yellow vein associated DNA beta
Enterobacteria phage JS10	Enterobacteria phage T5	Eupatorium yellow vein virus
Enterobacteria phage JS98	Enterobacteria phage T7	Euphorbia leaf curl virus DNA A
Enterobacteria phage JSE	Enterobacteria phage TLS	Euphorbia yellow mosaic virus DNA A
Enterobacteria phage K1-5	Enterobacteria phage VT2-Sakai	Euphorbia yellow mosaic virus DNA B
Enterobacteria phage K1E	Enterobacteria phage WA13	Euproctis pseudoconspersa nucleopolyhedrovirus
Enterobacteria phage K1F	Enterobacteria phage WV8	European elk papillomavirus
Enterobacteria phage lambda	Enterobacteria phage YYZ-2008	
Enterobacteria phage LKA1	Enterococcus faecalis 62 chromosome	
Enterobacteria phage M13	Enterococcus faecalis 62 plasmid EF62pA	

SIANN: Strain Identification by Alignment to Near Neighbors

Faba bean necrotic stunt virus	Frog adenovirus 1	Glypta fumiferanae ichnovirus
DNA C	Frog virus 3	segment B19
Faba bean necrotic stunt virus	Galleria mellonella densovirus	Glypta fumiferanae ichnovirus
DNA M	Gallid herpesvirus 1	segment-B1
Faba bean necrotic stunt virus	Gallid herpesvirus 2	Glypta fumiferanae ichnovirus
DNA N	Gallid herpesvirus 3	segment B20
Faba bean necrotic stunt virus	Gammapapillomavirus	Glypta fumiferanae ichnovirus
DNA R	HPV127	segment B21
Faba bean necrotic stunt virus	Geobacillus phage GBSV1	Glypta fumiferanae ichnovirus
DNA S	Geobacillus virus E2	segment B22
Faba bean necrotic stunt virus	Glossina pallidipes salivary gland hypertrophy virus	Glypta fumiferanae ichnovirus
DNA U1	Glypta fumiferanae ichnovirus segmentA10	segment B23
Faba bean necrotic stunt virus	Glypta fumiferanae ichnovirus segment A1	Glypta fumiferanae ichnovirus
DNA U2	Glypta fumiferanae ichnovirus segment A2	segment B24
Faba bean necrotic stunt virus	Glypta fumiferanae ichnovirus segment A3	Glypta fumiferanae ichnovirus
DNA U4	Glypta fumiferanae ichnovirus segment A4	segment B25
Faba bean necrotic yellows virus DNA 10	Glypta fumiferanae ichnovirus segment A5	Glypta fumiferanae ichnovirus
Faba bean necrotic yellows virus DNA-1	Glypta fumiferanae ichnovirus segment A6	segment B26
Faba bean necrotic yellows virus DNA 2	Glypta fumiferanae ichnovirus segment A7	Glypta fumiferanae ichnovirus
Faba bean necrotic yellows virus DNA 4	Glypta fumiferanae ichnovirus segment A8	segment B27
Faba bean necrotic yellows virus DNA 5	Glypta fumiferanae ichnovirus segment A9	Glypta fumiferanae ichnovirus
Faba bean necrotic yellows virus DNA 7	Glypta fumiferanae ichnovirus segment B10	segment B28
Faba bean necrotic yellows virus DNA 8	Glypta fumiferanae ichnovirus segment B11	Glypta fumiferanae ichnovirus
Faba bean necrotic yellows virus DNA 9	Glypta fumiferanae ichnovirus segment B12	segment B29
Faba bean necrotic yellows Virus	Glypta fumiferanae ichnovirus segment B13	Glypta fumiferanae ichnovirus
Feldmannia species virus	Glypta fumiferanae ichnovirus segment B14	segment-B2
Felid herpesvirus 1	Glypta fumiferanae ichnovirus segment B15	Glypta fumiferanae ichnovirus
Felis domesticus papillomavirus type 1	Glypta fumiferanae ichnovirus segment B16	segment B30
Fenneropenaeus chinensis hepatopancreatic densovirus	Glypta fumiferanae ichnovirus segment B17	Glypta fumiferanae ichnovirus
Figwort mosaic virus	Glypta fumiferanae ichnovirus segment B18	segment B31
Finch circovirus	Glypta fumiferanae ichnovirus segment B19	Glypta fumiferanae ichnovirus
Finch polyomavirus	Glypta fumiferanae ichnovirus segment B20	segment B32
Flavobacterium phage 11b	Glypta fumiferanae ichnovirus segment B21	Glypta fumiferanae ichnovirus
Fowl adenovirus A	Glypta fumiferanae ichnovirus segment B22	segment B33
Fowl adenovirus D	Glypta fumiferanae ichnovirus segment B23	Glypta fumiferanae ichnovirus
Fowlpox virus	Glypta fumiferanae ichnovirus segment B24	segment B34
Francolinus leucoscepus papillomavirus 1	Glypta fumiferanae ichnovirus segment B25	Glypta fumiferanae ichnovirus
Fringilla coelebs papillomavirus	Glypta fumiferanae ichnovirus segment B26	segment B35
	Glypta fumiferanae ichnovirus segment B27	Glypta fumiferanae ichnovirus
	Glypta fumiferanae ichnovirus segment B28	segment B36
	Glypta fumiferanae ichnovirus segment B29	Glypta fumiferanae ichnovirus
	Glypta fumiferanae ichnovirus segment B30	segment B37
	Glypta fumiferanae ichnovirus segment B31	Glypta fumiferanae ichnovirus
	Glypta fumiferanae ichnovirus segment B32	segment B38
	Glypta fumiferanae ichnovirus segment B33	Glypta fumiferanae ichnovirus
	Glypta fumiferanae ichnovirus segment B34	segment B39
	Glypta fumiferanae ichnovirus segment B35	Glypta fumiferanae ichnovirus
	Glypta fumiferanae ichnovirus segment B36	segment-B3
	Glypta fumiferanae ichnovirus segment B37	Glypta fumiferanae ichnovirus
	Glypta fumiferanae ichnovirus segment B38	segment B40

SIANN: Strain Identification by Alignment to Near Neighbors

Glypta fumiferanae ichnovirus segment B41	Glypta fumiferanae ichnovirus segment B64	Glypta fumiferanae ichnovirus segment C7
Glypta fumiferanae ichnovirus segment B42	Glypta fumiferanae ichnovirus segment B65	Glypta fumiferanae ichnovirus segment C8
Glypta fumiferanae ichnovirus segment B43	Glypta fumiferanae ichnovirus segment-B6	Glypta fumiferanae ichnovirus segment C9
Glypta fumiferanae ichnovirus segment B44	Glypta fumiferanae ichnovirus segment B7	Glypta fumiferanae ichnovirus segment D1
Glypta fumiferanae ichnovirus segment B45	Glypta fumiferanae ichnovirus segment B8	Glypta fumiferanae ichnovirus segment D2
Glypta fumiferanae ichnovirus segment B46	Glypta fumiferanae ichnovirus segment B9	Glypta fumiferanae ichnovirus segment D3
Glypta fumiferanae ichnovirus segment B47	Glypta fumiferanae ichnovirus segment C10	Glypta fumiferanae ichnovirus segment D4
Glypta fumiferanae ichnovirus segment B48	Glypta fumiferanae ichnovirus segment C11	Glypta fumiferanae ichnovirus segment D5
Glypta fumiferanae ichnovirus segment B49	Glypta fumiferanae ichnovirus segment C12	Glypta fumiferanae ichnovirus segment D6
Glypta fumiferanae ichnovirus segment-B4	Glypta fumiferanae ichnovirus segment C13	Glypta fumiferanae ichnovirus segment D7
Glypta fumiferanae ichnovirus segment B50	Glypta fumiferanae ichnovirus segment C14	Glypta fumiferanae ichnovirus segment E1
Glypta fumiferanae ichnovirus segment B51	Glypta fumiferanae ichnovirus segment C15	Goatpox virus Pellar
Glypta fumiferanae ichnovirus segment B52	Glypta fumiferanae ichnovirus segment C16	Goose circovirus
Glypta fumiferanae ichnovirus segment B53	Glypta fumiferanae ichnovirus segment C17	Goose hemorrhagic polyomavirus
Glypta fumiferanae ichnovirus segment B54	Glypta fumiferanae ichnovirus segment C18	Goose parvovirus
Glypta fumiferanae ichnovirus segment B55	Glypta fumiferanae ichnovirus segment C19	Gossypium darwini ⁱⁱ alphasatellite
Glypta fumiferanae ichnovirus segment B56	Glypta fumiferanae ichnovirus segment-C1	DNA-alpha
Glypta fumiferanae ichnovirus segment B57	Glypta fumiferanae ichnovirus segment C20	Gossypium darwini ⁱⁱ symptomless virus DNA-A
Glypta fumiferanae ichnovirus segment B58	Glypta fumiferanae ichnovirus segment C21	Gossypium davidsonii alphasatellite
Glypta fumiferanae ichnovirus segment B59	Glypta fumiferanae ichnovirus segment C22	DNA-alpha-B
Glypta fumiferanae ichnovirus segment-B5	Glypta fumiferanae ichnovirus segment-C2	Gossypium mustilinum alphasatellite
Glypta fumiferanae ichnovirus segment B60	Glypta fumiferanae ichnovirus segment C3	DNA-alpha-B
Glypta fumiferanae ichnovirus segment B61	Glypta fumiferanae ichnovirus segment C4	Gossypium punctatum mild leaf curl virus DNA A
Glypta fumiferanae ichnovirus segment B62	Glypta fumiferanae ichnovirus segment C5	Gossypium punctatum mild leaf curl virus DNA B
Glypta fumiferanae ichnovirus segment B63	Glypta fumiferanae ichnovirus segment C6	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

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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 erythroivirus 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
Heliothis 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	Human papillomavirus-5	segment B12
beta-JapanMiyizaki2001	Human papillomavirus type 101	Hyposoter fugitivus ichnovirus
Honeysuckle yellow vein mosaic disease associated satellite DNA beta-Ibaraki	Human papillomavirus type 103	segment B13
Honeysuckle yellow vein mosaic Virus	Human papillomavirus type 108	Hyposoter fugitivus ichnovirus
Honeysuckle yellow vein mosaic virus-Kagoshima	Human papillomavirus type-10	segment B14
Honeysuckle yellow vein mosaic virus satellite DNA beta	Human papillomavirus type 16	Hyposoter fugitivus ichnovirus
Honeysuckle yellow vein virus-UK1	Human papillomavirus type 26	segment B15
Horsegream yellow mosaic Virus DNA B	Human papillomavirus type 32	Hyposoter fugitivus ichnovirus
Horsegream yellow mosaic virus	Human papillomavirus type 34	segment B16
Horseradish curly top virus	Human papillomavirus type 41	Hyposoter fugitivus ichnovirus
Human adenovirus 54	Human papillomavirus type 48	segment B17
Human adenovirus A	Human papillomavirus type 49	Hyposoter fugitivus ichnovirus
Human adenovirus B1	Human papillomavirus type-4	segment B18
Human adenovirus B2	Human papillomavirus type 50	Hyposoter fugitivus ichnovirus
Human adenovirus C	Human papillomavirus type 53	segment-B1
Human adenovirus D	Human papillomavirus type 60	Hyposoter fugitivus ichnovirus
Human adenovirus E	Human papillomavirus type 63	segment B2
	Human papillomavirus type 6b	Hyposoter fugitivus ichnovirus
	Human papillomavirus type 7	segment B3
	Human papillomavirus type 88	Hyposoter fugitivus ichnovirus
	Human papillomavirus type 90	segment B4
	Human papillomavirus type 92	Hyposoter fugitivus ichnovirus
	Human papillomavirus type 96	segment B5
	Human papillomavirus type-9	Hyposoter fugitivus ichnovirus
	Human parvovirus B19	segment B6
	Human T-lymphotropic virus 1	Hyposoter fugitivus ichnovirus
	Human T-lymphotropic virus 4	segment B7
		Hyposoter fugitivus ichnovirus
		segment B8
		Hyposoter fugitivus ichnovirus
		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 asccphi28
Hyposoter fugitivus ichnovirus segment C6	Iodobacteriophage phiPLPE	Lactococcus phage bIBB29
Hyposoter fugitivus ichnovirus segment C7	Ipomoea yellow vein virus	Lactococcus phage bIL170
Hyposoter fugitivus ichnovirus segment C8	Jatropha leaf curl virus DNA A	Lactococcus phage bIL67
Hyposoter fugitivus ichnovirus segment C9	Jatropha yellow mosaic India virus DNA-A	Lactococcus phage BK5-T
Hyposoter fugitivus ichnovirus segment D10	JC polyomavirus	Lactococcus phage c2
Hyposoter fugitivus ichnovirus segment D11	Junonia coenia densovirus	Lactococcus phage jj50
Hyposoter fugitivus ichnovirus segment D12	Kalanchoe top-spotting virus	Lactococcus phage KSY1
Hyposoter fugitivus ichnovirus segment-D1	Kenaf leaf curl virus DNA A	Lactococcus phage P008
Hyposoter fugitivus ichnovirus segment D2	KI polyomavirus Stockholm 60	Lactococcus phage P087
Hyposoter fugitivus ichnovirus segment D3	Klebsiella phage KP15	Lactococcus phage phiLC3
	Klebsiella phage KP32	Lactococcus phage Q54
	Klebsiella phage KP34	Lactococcus phage r1t
	Klebsiella phage phiKO2	Lactococcus phage sk1
	Kluyvera phage Kvp1	Lactococcus phage TP901-1
	Kudzu mosaic virus DNA-A	Lactococcus phage Tuc2009
	Kudzu mosaic virus DNA-B	Lactococcus phage ul36
	Lactobacillus johnsonii prophage Lj771	Lactococcus prophage bIL285
	Lactobacillus phage A2	Lactococcus prophage bIL286
	Lactobacillus phage KC5a	Lactococcus prophage bIL309
	Lactobacillus phage Lb338-1	Lactococcus prophage bIL310
		Lactococcus prophage bIL311
		Lactococcus prophage bIL312
		Lamium leaf distortion associated virus
		Leucania separata nuclear polyhedrosis virus
		Leucas zeylanica yellow vein virus satellite DNA beta

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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 Bahraich virus-IndiaBahraich2007 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
Lulll 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 xyloina MNPV	Mannheimia phage phiMHaA1	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 Konstantine
Milk vetch dwarf virus segment 9	Muscovy duck parvovirus	Mycobacterium phage Jasper
Mimosa yellow leaf curl virus- associated DNA 1	Mus musculus papillomavirus type 1	Mycobacterium phage KBG
Mimosa yellow leaf curl virus DNA-A	Mycobacterium phage 244	Mycobacterium phage Myrna
Mimosa yellow leaf curl virus satellite DNA beta	Mycobacterium phage	Mycobacterium phage Lebron
Minute virus of mice	Adjutor	Mycobacterium phage Lij
Mirabilis mosaic virus	Mycobacterium phage Angel	Mycobacterium phage Lockley
Miscanthus streak virus-91	Mycobacterium phage	Mycobacterium phage Myrna
Molluscum contagiosum virus subtype 1	angelica	Mycobacterium phage Nigel
Monkeypox virus Zaire-96-I-16	Mycobacterium phage	Mycobacterium phage Omega
Morganella phage MmP1	Ardmore	Mycobacterium phage Orion
Mouse mammary tumor virus	Mycobacterium phage	Mycobacterium phage Pacc40
Mouse parvovirus 1	Bethlehem	Mycobacterium phage PB1
Mouse parvovirus 2	Mycobacterium phage	Mycobacterium phage Peaches
Mouse parvovirus 3	Boomer	Mycobacterium phage PG1
Mouse parvovirus 4	Mycobacterium phage	Mycobacterium phage Phaedrus
Mouse parvovirus 5	BPs	Mycobacterium phage Phlyer
Mulard duck circovirus	Mycobacterium phage Brujita	Mycobacterium phage Pipefish
	Mycobacterium phage Cali	Mycobacterium phage PLot
	Mycobacterium phage Butterscotch	Mycobacterium phage PMC
	Mycobacterium phage Bxb1	
	Mycobacterium phage Bxz1	
	Mycobacterium phage Bxz2	
	Mycobacterium phage Catera	
	Mycobacterium phage Chah	
	Mycobacterium phage Che12	
	Mycobacterium phage Che8	

SIANN: Strain Identification by Alignment to Near Neighbors

Mycobacterium phage Porky	Okra yellow mosaic Mexico	Pelargonium vein banding
Mycobacterium phage	virus DNA B	virus
Predator	Okra yellow vein disease	Penaeus merguiensis
Mycobacterium phage	associated sequence virion	densovirus
Pukovnik	Okra yellow vein mosaic virus	Penaeus monodon
Mycobacterium phage	Old World harvest mouse	hepatopancreatic parvovirus
Qyrzula	papillomavirus	Pepper curly top virus
Mycobacterium phage	Orangutan polyomavirus	Pepper golden mosaic virus
Ramsey	Orf virus	DNA A
Mycobacterium phage Rizal	Orgya leucostigma NPV	Pepper golden mosaic virus
Mycobacterium phage	Orgya 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-G8	Pepper leaf curl Yunnan virus-YN323
Mycoplasma phage MAV1	Papaya leaf curl China virus satellite DNA beta	Pepper yellow dwarf virus-New Mexico
Mycoplasma phage P1	Papaya leaf curl Guandong virus-GD2 DNA A	Pepper yellow leaf curl Indonesia virus DNA-A
Mycoplasma phage phiMFV1	Papaya leaf curl virus-associated DNA beta	Pepper yellow leaf curl Indonesia virus DNA-B
Myotis polyomavirus VM-2008	Papaya leaf curl-virus	Pepper yellow vein Mali virus
Mythimna loreyi densovirus	Papiine herpesvirus 2	Periplaneta fuliginosa
Myxococcus phage Mx8	Paramecium bursaria	densovirus
Myxoma virus	Chlorella virus 1	Petunia vein clearing virus
Myzus persicae densovirus	Paramecium bursaria	Phage cd1
Nanovirus-like particle	Chlorella virus AR158	Phage Gifsy-1
Natrialba phage PhiCh1	Paramecium bursaria	Phage Gifsy-2
Neodiprion abietis NPV	Chlorella virus FR483	Phage phiJL001
Neodiprion lecontei NPV	Paramecium bursaria	Phocoena spinipinnis
Neodiprion sertifer NPV	Chlorella virus NY2A	papillomavirus
Oat dwarf virus	Parvovirus H1	Phormidium phage Pf-WMP3
OkLCV satDNA 10	Passionfruit severe leaf	Phormidium phage Pf-WMP4
Okra leaf curl disease	distortion virus DNA-A	Phthorimaea operculella
associated DNA 1	Passionfruit severe leaf	granulovirus
Okra leaf curl Mali virus	distortion virus DNA-B	Pieris rapae granulovirus
satellite DNA beta	Pasteurella phage F108	Planaria asexual strain-specific virus-like element
Okra leaf curl virus-Cameroon	Peanut chlorotic streak virus	type 1 large DNA segment
Okra mottle virus-Brazilokra	Pedilanthus leaf curl virus-	Planaria asexual strain-specific virus-like element
DNA A	Pedilanthus	type 1 small DNA segment
Okra mottle virus-Brazilokra	PakistanMultan2004	
DNA B		
Okra yellow crinkle virus		
segment A		
Okra yellow mosaic Mexico		
virus DNA A		

SIANN: Strain Identification by Alignment to Near Neighbors

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
Porcine parvovirus	Pseudomonas phage MP29	papillomavirus
Potato apical leaf curl disease-associated satellite DNA beta	Pseudomonas phage MP38	Rhizobium phage 16-3
Potato yellow mosaic	Pseudomonas phage PA11	Rhodothermus phage RM378
Panama virus DNA A	Pseudomonas phage PAJU2	Rhynchosia golden mosaic virus DNA A
Potato yellow mosaic	Pseudomonas phage PaP2Pseudomonas phage	Rhynchosia golden mosaic virus DNA B
Panama virus DNA B	PaP3	Rhynchosia golden mosaic Yucatan virus DNA A
Potato yellow mosaic Trinidad virus DNA A	Pseudomonas phage PB1	Rhynchosia golden mosaic Yucatan virus DNA B
Potato yellow mosaic Trinidad virus DNA B	Pseudomonas phage Pf1	Rice tungro bacilliform virus
Potato yellow mosaic virus DNA A	Pseudomonas phage Pf3	Roseobacter phage SIO1
Potato yellow mosaic virus DNA B	Pseudomonas phage phi-2	Roseophage DSS3P2
Prochlorococcus phage P-SSM4	Pseudomonas phage phiCTX	Roseophage EE36P1
Propionibacterium phage B5	Pseudomonas phage phikF77	Rossi goose hepatitis B virus
Propionibacterium phage PA6	Pseudomonas phage phiKMV	Rousettus aegyptiacus
Pseudaletia unipuncta granulovirus	Pseudomonas phage phiKZ	papillomavirus type 1
Pseudoalteromonas phage PM2	Pseudomonas phage PT2	Rudbeckia flower distortion virus
Pseudocowpox virus	Pseudomonas phage PT5	Saccharum streak virus
Pseudomonas phage 119X	Pseudomonas phage SN	Saimiriine herpesvirus 2
Pseudomonas phage 14-1	Pseudomonas phage YuA	Salmonella enterica
Pseudomonas phage 201phi2-1	Psittacid herpesvirus 1	bacteriophage SE1
Pseudomonas phage 73	Psittacus erithacus timneh	Salmonella phage c341
Pseudomonas phage B3	papillomavirus	Salmonella phage E1
Pseudomonas phage D3112	Pumpkin yellow mosaic	Salmonella phage epsilon34
Pseudomonas phage-D3	Malaysia virus DNA A	Salmonella phage Fels-1
Pseudomonas phage DMS3	Pyrobaculum spherical virus	Salmonella phage phiSG-JL2
Pseudomonas phage EL	Pyrococcus abyssi virus 1	Salmonella phage SETP3
Pseudomonas phage F10	Rabbit fibroma virus	Salmonella phage ST64B
Pseudomonas phage F116	Rabbit oral papillomavirus	Sclerotinia sclerotiorum
Pseudomonas phage F8	Rachiplusia ou MNPV	hypovirulence associated
Pseudomonas phage gh-1	Radish leaf curl virus satellite	DNA virus 1
	DNA beta	Sea turtle tornovirus 1
	Radish leaf curl virus segment A	Senecio yellow mosaic virus
	Ralstonia phage p12J	Sheeppox virus 17077-99
	Ralstonia phage phiRSA1	Sheldgoose hepatitis B virus
	Ralstonia phage RSB1	Shigella phage phiSbom-AG3
	Ralstonia phage RSL1	Shrimp white spot syndrome virus
	Ralstonia phage RSM1	
	Ralstonia phage RSM3	
	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 leaf curl virus-associated DNA 1	Simian immunodeficiency virus SIV-mnd 2	Squash leaf curl Philippines virus segment A
Sida leaf curl virus-associated DNA beta	Simian retrovirus 4	Squash leaf curl Philippines virus segment B
Sida leaf curl-virus	Simian T-cell lymphotropic virus 6	Squash leaf curl virus A component DNA
Sida leaf curl virus satellite DNA beta	Simian T-lymphotropic virus 1	Squash leaf curl virus B component DNA
Sida micrantha mosaic virus segment A	Simian T-lymphotropic virus 3	Squash leaf curl Yunnan virus
Sida micrantha mosaic virus segment B	Simian virus 40	Squash mild leaf curl virus-Imperial Valley DNA A
Sida mosaic Sinaloa virus DNA A	Singapore grouper iridovirus	Squash mild leaf curl virus-Imperial Valley DNA B
Sida mosaic Sinaloa virus DNA B	Sinorhizobium phage PBC5	Squash yellow mild mottle virus DNA B
Sida mottle virus	Small anellovirus 1	Squirrel monkey polyomavirus
Sida yellow mosaic virus-China-associated DNA beta	Small anellovirus 2	Sri Lankan cassava mosaic virus DNA A
Sida yellow mosaic-virus	Snake parvovirus 1	Sri Lankan cassava mosaic virus DNA B
Sida yellow mosaic Yucatan virus DNA A	Snow goose hepatitis B virus	Stachytarpheta leaf curl virus
Sida yellow mosaic Yucatan virus DNA B	Sodalis phage phiSG1	Staphylococcus phage 11
Sida yellow vein disease associated DNA 1	Sodalis phage SO-1	Staphylococcus phage 187
Sida yellow vein Madurai virus	South African cassava mosaic virus DNA A	Staphylococcus phage 2638A
Sida yellow vein Vietnam virus-associated DNA 1	South African cassava mosaic virus DNA B	Staphylococcus phage 29
Sida yellow vein Vietnam virus DNA-A	Soybean chlorotic blotch virus DNA A	Staphylococcus phage 37
	Soybean chlorotic blotch virus DNA B	Staphylococcus phage 3A
	Soybean chlorotic mottle virus	Staphylococcus phage 42e
	Soybean crinkle leaf virus	Staphylococcus phage 44AHJD
	Soybean mild mottle virus	Staphylococcus phage 47
	Spilanthes yellow vein virus DNA-A	Staphylococcus phage 52A
	Spinach curly top virus	Staphylococcus phage 53
	Spiroplasma kunkelii virus SkV1 CR2-3x	Staphylococcus phage 55
	Spiroplasma phage 1-C74	Staphylococcus phage 66
	Spiroplasma phage 1-R8A2B	Staphylococcus phage 69
	Spiroplasma phage 4	

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

SIANN: Strain Identification by Alignment to Near Neighbors

Sulfolobus virus 6	spindle-shaped	Tobacco curly shoot-virus	Tomato leaf curl Cebu virus
Sulfolobus virus 7	spindle-shaped	Tobacco leaf curl disease associated sequence virion	DNA-A
Sulfolobus icosahedral virus 2	tureted	Tobacco leaf curl Japan virus	Tomato leaf curl China virus-G32
Sulfolobus icosahederal-virus	tureted	Tobacco leaf curl Kochi virus	Tomato leaf curl Cotabato virus DNA-A
Sulfolobus virus 1		Tobacco leaf curl Thailand virus	Tomato leaf curl Ghana virus segment A
Sulfolobus virus 2		Tobacco leaf curl virus-associated DNA beta	Tomato leaf curl Guangdong virus DNA-A
Sulfolobus virus Kamchatka 1		Tobacco leaf curl Yunnan virus associated DNA 1	Tomato leaf curl Guangxi virus
Sulfolobus virus Ragged Hills		Tobacco leaf curl Yunnan virus satellite DNA beta	Tomato leaf curl Gujarat virus-Varanasi segment A
Sulfolobus virus STSV1		Tobacco leaf curl Yunnan virus-Y136	Tomato leaf curl Gujarat virus-Varanasi segment B
Sunn hemp leaf distortion virus DNA-A		Tobacco leaf curl Zimbabwe virus	Tomato leaf curl Hainan virus
Sus scrofa papillomavirus type 1		Tobacco vein clearing virus	Tomato leaf curl Hsinchu virus-TaiwanHsinchu2005 DNA A
Sweetpotato badnavirus B		Tobacco yellow dwarf virus	Tomato leaf curl Iran virus
Sweet potato leaf curl Bengal virus-IndiaWest	Bengal2008 segment A	Tomato begomovirus satellite DNA beta	Tomato leaf curl Java virus-Ageratum satellite DNA
Sweet potato leaf curl Canary virus		Tomato chino La Paz virus segment A	Tomato leaf curl Java-virus
Sweet potato leaf curl Georgia virus		Tomato chlorotic mottle virus DNA A	Tomato leaf curl Joydebpur beta virus
Sweet potato leaf curl Lanzarote virus		Tomato chlorotic mottle virus DNA B	Tomato leaf curl Joydebpur virus DNA-A
Sweet potato leaf curl Spain virus		Tomato common mosaic virus DNA-A	Tomato leaf curl Karnataka virus-associated DNA beta
Sweet potato leaf curl virus		Tomato common mosaic virus DNA-B	Tomato leaf curl Karnataka-virus
Swinepox virus		Tomato curly stunt virus	Tomato leaf curl Kerala virus
Synechococcus phage P60		Tomato golden mosaic virus DNA A	Tomato leaf curl Kumasi virus segment A
Synechococcus phage S-PM2		Tomato golden mosaic virus DNA B	Tomato leaf curl Laos virus
Synechococcus phage S-RSM4		Tomato golden mottle virus DNA A	Tomato leaf curl Malaysia virus
Synechococcus phage syn9		Tomato golden mottle virus DNA B	Tomato leaf curl Mali virus
Tanapox virus		Tomato leaf curl Arusha virus DNA-A	Tomato leaf curl Mayotte virus
Taro bacilliform virus		Tomato leaf curl Bangalore virus-Ban5 satellite DNA beta	Tomato leaf curl Mindanao virus DNA-A
Taterapox virus		Tomato leaf curl Bangalore-virus	Tomato leaf curl New Delhi virus-associated DNA beta
Thalassomonas phage BA3		Tomato leaf curl Bangladesh virus	Tomato leaf curl New Delhi virus DNA A
Thermoproteus tenax spherical virus 1		Tomato leaf curl Cameroon virus-	Tomato leaf curl New Delhi virus DNA B
Thermus phage IN93		CameroonBueaOkra2008	Tomato leaf curl Nigeria virus-Nigeria2006
Thermus phage P23-45			Tomato leaf curl Pakistan virus associated DNA 1
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-curl 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
		Tupaiid 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	Yersinia phage Berlin
Vibrio phage VEJphi	Thomas Virus DNA A	Yersinia phage L-413C
Vibrio phage Vf12	Wissadula golden mosaic St	Yersinia phage phiYeO3-12
Vibrio phage VfO3K6	Thomas Virus DNA B	Yersinia phage PY54
Vibrio phage VfO4K68	Woodchuck hepatitis virus	Zinnia leaf curl disease associated sequence virion
Vibrio phage VGJphi	WU Polyomavirus	Zinnia leaf curl virus-associated DNA beta
Vibrio phage VHML	Xanthomonas phage Cf1c	
	Xanthomonas phage OP1	
	Xanthomonas phage OP2	

SIANN: Strain Identification by Alignment to Near Neighbors

Appendix 3: Bacterial Database

Acaryochloris marina	Actinosynnema mirum DSM 43827	Anaerolinea thermophila UNI 1
MBIC11017	Aerococcus urinae ACS 120 V Col10a	Anaeromyxobacter dehalogenans 2CP 1
Acetobacter pasteurianus IFO 3283 01	Aeromonas hydrophila subsp hydrophila ATCC 7966	Anaeromyxobacter sp Fw109 5
Acetohalobium arabaticum DSM 5501	Aeromonas salmonicida subsp salmonicida A449	Anaplasma centrale str Israel
Acholeplasma laidlawii PG 8A	Aeromonas veronii B565	Anaplasma marginale str Florida
Achromobacter xylosoxidans A8	Aeropyrum pernix K1	Anaplasma phagocytophilum HZ
Acidaminococcus fermentans DSM 20731	Aggregatibacter actinomycetemcomitans D11S 1	Anoxybacillus flavithermus WK1
Acidaminococcus intestini RYC MR95	Aggregatibacter aphrophilus NJ8700	Aquifex aeolicus VF5
Acidianus hospitalis W1	Agrobacterium fabrum str C58	Arcanobacterium haemolyticum DSM 20595
Acidilobus saccharovorans 345 15	Agrobacterium radiobacter K84	Archaeoglobus fulgidus DSM 4304
Acidimicrobium ferrooxidans DSM 10331	Agrobacterium sp H13 3	Archaeoglobus profundus DSM 5631
Acidiphilum cryptum JF 5	Agrobacterium vitis S4	Archaeoglobus veneficus SNP6
Acidiphilum multivorum AIU301	Akkermansia muciniphila ATCC BAA 835	Arcobacter butzleri RM4018
Acidithiobacillus caldus SM 1	Alcanivorax borkumensis SK2	Arcobacter nitrofigilis DSM 7299
Acidithiobacillus ferrivorans SS3	Alicycliphilus denitrificans BC	Arcobacter sp L
Acidithiobacillus ferrooxidans ATCC 23270	Alicyclobacillus acidocaldarius subsp acidocaldarius DSM 446	Aromatoleum aromaticum EbN1
Acidobacterium capsulatum ATCC 51196	Aliivibrio salmonicida LFI1238	Arthrobacter arilaitensis Re117
Acidothrmus cellulolyticus 11B	Alkalilimnicola ehrlichii MLHE 1	Arthrobacter aurescens TC1
Acidovorax avenae subsp avenae ATCC 19860	Alkaliphilus metallireducens QYMF	Arthrobacter chlorophenolicus A6
Acidovorax citrulli AAC00 1	Alkaliphilus oremlandii OhILAs	Arthrobacter phenanthrenivorans Sphe3
Acidovorax ebreus TPSY	Allochromatium vinosum DSM 180	Arthrobacter sp FB24
Acidovorax sp JS42	Alteromonas macleodii str Deep ecotype	Aster yellows witches broom phytoplasma AYWb
Aciduliprofundum boonei T469	Alteromonas sp SN2	Asticcacaulis excentricus CB 48
Acinetobacter baumannii 1656 2	Aminobacterium colombiense DSM 12261	Atopobium parvulum DSM 20469
Acinetobacter calcoaceticus PHEA 2	Ammonifex degensii KC4	Azoarcus sp BH72
Acinetobacter oleivorans DR1	Amycolatopsis mediterranei U32	Azorhizobium caulinodans ORS 571
Acinetobacter sp ADP1	Amycolicicoccus subflavus DQS3 9A1	Azospirillum sp B510
Actinobacillus pleuropneumoniae serovar 5b str L20	Anabaena variabilis ATCC 29413	Azotobacter vinelandii DJ
Actinobacillus succinogenes 130Z	Anaerococcus prevotii DSM 20548	Bacillus amyloliquefaciens DSM 7
Actinoplanes sp SE50 110		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
Bacillus coagulans 2 6	Bifidobacterium dentium Bd1	ATCC 17616
Bacillus cytotoxicus NVH 391 98	Bifidobacterium longum DJO10A	Burkholderia phymatum STM815
Bacillus halodurans C 125	Blattabacterium sp Blattella germanica str Bge	Burkholderia phytofirmans PsJN
Bacillus licheniformis DSM 13 ATCC 14580	Bordetella avium 197N	Burkholderia pseudomallei 668
Bacillus megaterium DSM 319	Bordetella bronchiseptica RB50	Burkholderia rhizoxinica HKI 454
Bacillus mycoides DSM 2048	Bordetella parapertussis 12822	Burkholderia sp 383
Bacillus pseudofirmus OF4	Bordetella pertussis CS	Burkholderia thailandensis E264
Bacillus pumilus SAFR 032	Bordetella petrii DSM 12804	Burkholderia vietnamiensis G4
Bacillus selenitireducens MLS10	Borrelia afzelii PKo	Burkholderia xenovorans LB400
Bacillus subtilis BSn5	Borrelia bissettii DN127	Butyrivibrio proteoclasticus B316
Bacillus thuringiensis serovar berliner ATCC 10792	Borrelia burgdorferi B31	Caldicellulosiruptor bescii DSM 6725
Bacillus weihenstephanensis KBAB4	Borrelia duttonii Ly	Caldicellulosiruptor hydrothermalis 108
Bacteriovorax marinus SJ	Borrelia garinii PBi	Caldicellulosiruptor kristjanssonii 177R1B
Bacteroides fragilis YCH46	Borrelia hermsii DAH	Caldicellulosiruptor kronotskyensis 2002
Bacteroides helcogenes P 36 108	Borrelia recurrentis A1	Caldicellulosiruptor lactoaceticus 6A
Bacteroides salanitronis DSM 18170	Borrelia turicatae 91E135	Caldicellulosiruptor obsidiansis OB47
Bacteroides thetaiotaomicron VPI 5482	Brachybacterium faecium DSM 4810	Caldicellulosiruptor owensensis OL
Bacteroides vulgatus ATCC 8482	Brachyspira hyodysenteriae WA1	Caldicellulosiruptor saccharolyticus DSM 8903
Bartonella bacilliformis KC583	Brachyspira intermedia PWS A	Calditerrivibrio nitroreducens DSM 19672
Bartonella clarridgeiae 73	Brachyspira murdochii DSM 12563	Caldivirga maquilingensis IC 167
Bartonella grahamii as4aup	Brachyspira piloscoli 95 1000	Campylobacter concisus 13826
Bartonella henselae str Houston 1	Bradyrhizobium japonicum USDA 110	Campylobacter curvus 52592
Bartonella quintana str Toulouse	Bradyrhizobium sp BTA11	Campylobacter fetus subsp fetus 82 40
Bartonella tribocorum CIP 105476	Brevibacillus brevis NBRC 100599	Campylobacter hominis ATCC BAA 381
Baumannia cicadellinicola str Hc Homalodisca coagulata	Brevundimonas subvibrioides ATCC 15264	Campylobacter jejuni subsp jejuni 81116
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	
	Acyrhosiphon pisum	
	Burkholderia ambifaria AMMD	
	Burkholderia cenocepacia HI2424	

SIANN: Strain Identification by Alignment to Near Neighbors

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

SIANN: Strain Identification by Alignment to Near Neighbors

Comamonas testosteroni CNB 2	Dechloromonas aromaticum RCB	Desulfovibrio aespoeensis Aspo 2
Conexibacter woeselii DSM 14684	Defribacter desulfuricans SSM1	Desulfovibrio africanus str Walvis Bay
Coprothermobacter proteolyticus DSM 5265	Dehalococcoides ethenogenes 195	Desulfovibrio alaskensis G20
Coraliomargarita 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	Desulfobacterium 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 baculum 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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<i>Erwinia amylovora</i> ATCC 49946	<i>Francisella tularensis</i> subsp <i>holarctica</i> LVS	<i>Granulicella mallensis</i>
<i>Erwinia billingiae</i> Eb661	<i>Frankia alni</i> ACN14a	<i>MP5ACTX8</i>
<i>Erwinia pyrifoliae</i> DSM 12163	<i>Frankia</i> sp Ccl3	<i>Granulicella tundricola</i>
<i>Erwinia</i> sp Ejp617	<i>Frankia symbiont of Datisca glomerata</i>	<i>Haemophilus ducreyi</i> 35000HP
<i>Erwinia tasmaniensis</i> Et1 99	<i>Fusobacterium nucleatum</i>	<i>Haemophilus influenzae</i> 10810
<i>Erysipelothrix rhusiopathiae</i>	subsp <i>nucleatum</i> ATCC 25586	<i>Haemophilus parainfluenzae</i>
<i>Erythrobacter litoralis</i>	<i>Gallibacterium anatis</i> UMN179	T3T1
HTCC2594	<i>Gallionella capsiferriformans</i>	<i>Haemophilus parasuis</i> SH0165
<i>Escherichia coli</i> O157:H7 str Sakai	ES 2	<i>Haemophilus somnus</i> 129PT
<i>Escherichia fergusonii</i> ATCC 35469	gamma proteobacterium Hdn1	<i>Hahella chejuensis</i> KCTC 2396
<i>Ethanoligenens harbinense</i> YUAN 3	<i>Gardnerella vaginalis</i> 409 05	<i>Halalkalicoccus jeotgali</i> B3
<i>Eubacterium eligens</i> ATCC 27750	<i>Gemmamimonas aurantiaca</i> T 27	<i>Halanaerobium hydrogeniformans</i>
<i>Eubacterium limosum</i> KIST612	<i>Geobacillus kaustophilus</i>	<i>Haliangium ochraceum</i> DSM 14365
<i>Eubacterium rectale</i> ATCC 33656	HTA426	<i>Haliscomenobacter hydrossis</i>
<i>Exiguobacterium sibiricum</i> 255 15	<i>Geobacillus</i> sp C56 T3	DSM 1100
<i>Exiguobacterium</i> sp AT1b	<i>Geobacillus</i> thermodenitrificans NG80 2	<i>Haloarcula hispanica</i> ATCC 33960
<i>Ferrimonas balearica</i> DSM 9799	<i>Geobacillus</i> thermoglucosidasius C56 YS93	<i>Haloarcula marismortui</i> ATCC 43049
<i>Ferroglobus placidus</i> DSM 10642	<i>Geobacillus</i> thermoleovorans CCB US3 UF5	<i>Halobacterium</i> sp NRC 1
<i>Fervidobacterium nodosum</i> Rt17 B1	<i>Geobacter bemandjiensis</i> Bem	<i>Haloferax volcanii</i> DS2
<i>Fibrobacter succinogenes</i> subsp <i>succinogenes</i> S85	<i>Geobacter daltonii</i> FRC 32	<i>Halogeometricum borinquense</i> DSM 11551
<i>Filifactor alocis</i> ATCC 35896	<i>Geobacter lovleyi</i> SZ	<i>Halomicromonium mukohataei</i>
<i>Finegoldia magna</i> ATCC 29328	<i>Geobacter metallireducens</i>	DSM 12286
<i>Flavobacteriaceae</i> bacterium 3519 10	GS 15	<i>Halomonas elongata</i> DSM 2581
<i>Flavobacterium</i> branchiophilum FL 15	<i>Geobacter</i> sp M18	halophilic archaeon DL31
<i>Flavobacterium columnare</i> ATCC 49512	<i>Geobacter sulfurreducens</i>	<i>Halopiger xanaduensis</i> SH 6
<i>Flavobacterium johnsoniae</i> UW101	PCA	<i>Haloquadratum walsbyi</i> C23
<i>Flavobacterium psychrophilum</i> JIP02 86	<i>Geobacter uraniireducens</i> Rf4	<i>Halarhabdus utahensis</i> DSM 12940
<i>Flexistipes sinusarabici</i> DSM 4947	<i>Geodermatophilus obscurus</i>	<i>Halarhodospira halophila</i> SL1
<i>Fluviicola taaffensis</i> DSM 16823	DSM 43160	<i>Halorubrum lacusprofundi</i>
<i>Francisella novicida</i> U112	<i>Glaciecola nitratireducens</i>	ATCC 49239
<i>Francisella philomiragia</i> subsp <i>philomiragia</i> ATCC 25017	FR1064	<i>Haloterrigena turkmenica</i>
<i>Francisella</i> sp TX077308	<i>Glaciecola</i> sp 4H 3 7YE 5	DSM 5511
	<i>Gloeobacter violaceus</i> PCC 7421	<i>Halothermothrix orenii</i> H 168
	<i>Gluconacetobacter diazotrophicus</i> PAI 5	<i>Halothiobacillus neapolitanus</i> c2
	<i>Gluconacetobacter xylinus</i> NBRC 3288	<i>Helicobacter acinonychis</i> str Sheeba
	<i>Gluconobacter oxydans</i> 621H	<i>Helicobacter bizzozeronii</i> CIII 1
	<i>Gordonia bronchialis</i> DSM 43247	<i>Helicobacter felis</i> ATCC 49179
	<i>Gramella forsetii</i> KT0803	<i>Helicobacter hepaticus</i> ATCC 51449
	<i>Granulibacter bethesdensis</i> CGDNIH1	<i>Helicobacter mustelae</i> 12198
		<i>Helicobacter pylori</i> 26695

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<i>Heliobacterium modesticaldum</i> Ic1	<i>Kytococcus sedentarius</i> DSM 20547	<i>Legionella pneumophila</i> subsp <i>pneumophila</i> ATCC 43290
<i>Herbaspirillum seropedicae</i> Smr1	<i>Lacinutrix</i> sp 5H 3 7 4	<i>Leifsonia xyli</i> subsp <i>xyli</i> str CTCB07
<i>Herminiimonas arsenicoxydans</i>	<i>Lactobacillus acidophilus</i> NCFM	<i>Leptospira biflexa</i> serovar Patoc strain Patoc 1 Ames
<i>Herpetosiphon aurantiacus</i> DSM 785	<i>Lactobacillus amylovorus</i> GRL 1112	<i>Leptospira borgpetersenii</i> serovar Hardjo bovis str L550
<i>Hippea maritima</i> DSM 10411	<i>Lactobacillus brevis</i> ATCC 367	<i>Leptospira interrogans</i> serovar Copenhageni str Fiocruz L1 130
<i>Hirschia baltica</i> ATCC 49814	<i>Lactobacillus buchneri</i> NRRL B 30929	<i>Leptothrix cholodnii</i> SP 6
<i>Hydrogenobacter thermophilus</i> TK 6	<i>Lactobacillus casei</i> ATCC 334	<i>Leptotrichia buccalis</i> C 1013 b
<i>Hydrogenobaculum</i> sp Y04AAS1	<i>Lactobacillus crispatus</i> ST1	<i>Leuconostoc citreum</i> KM20
<i>Hyperthermus butylicus</i> DSM 5456	<i>Lactobacillus delbrueckii</i> subsp <i>bulgaricus</i> ATCC 11842	<i>Leuconostoc gasicomitatum</i> LMG 18811
<i>Hyphomicrobium denitrificans</i> ATCC 51888	<i>Lactobacillus fermentum</i> IFO 3956	<i>Leuconostoc kimchii</i> IMSNU 11154
<i>Hyphomicrobium</i> sp	<i>Lactobacillus gasseri</i> ATCC 33323	<i>Leuconostoc mesenteroides</i> subsp <i>mesenteroides</i> ATCC 8293
<i>Hyphomonas neptunium</i> ATCC 15444	<i>Lactobacillus helveticus</i> DPC 4571	<i>Leuconostoc</i> sp C2
<i>Idiomarina loihiensis</i> L2TR	<i>Lactobacillus johnsonii</i> NCC 533	<i>Listeria innocua</i> Clip11262
<i>Ignicoccus hospitalis</i> KIN4 I	<i>Lactobacillus kefiranofaciens</i> ZW3	<i>Listeria ivanovii</i>
<i>Ignisphaera aggregans</i> DSM 17230	<i>Lactobacillus plantarum</i> subsp <i>plantarum</i> ST III	<i>Listeria monocytogenes</i> EGD e
<i>Ilyobacter polytropus</i> DSM 2926	<i>Lactobacillus reuteri</i> DSM 20016	<i>Listeria seeligeri</i> serovar 1 2b str SLCC3954
<i>Intrasporangium calvum</i> DSM 43043	<i>Lactobacillus rhamnosus</i> ATCC 8530	<i>Listeria welshimeri</i> serovar 6b str SLCC5334
<i>Isoptericola variabilis</i> 225	<i>Lactobacillus ruminis</i> ATCC 27782	<i>Lysinibacillus sphaericus</i> C3 41
<i>Isosphaera pallida</i> ATCC 43644	<i>Lactobacillus sakei</i> subsp <i>sakei</i> 23K	<i>Macrococcus caseolyticus</i> JCSC5402
<i>Jannaschia</i> sp CCS1	<i>Lactobacillus salivarius</i> UCC118	<i>Magnetococcus marinus</i> MC 1
<i>Janthinobacterium</i> sp Marseille	<i>Lactobacillus sanfranciscensis</i> TMW 11304	<i>Magnetospirillum magneticum</i> AMB 1
<i>Jonesia denitrificans</i> DSM 20603	<i>Lactococcus garvieae</i> ATCC 49156	<i>Mahella australiensis</i> 50 1 BON
<i>Kangiella koreensis</i> DSM 16069	<i>Lactococcus lactis</i> subsp <i>cremoris</i> NZ9000	<i>Mannheimia succiniciproducens</i> MBEL55E
<i>Ketogulonicigenium vulgare</i> WSH 001	<i>Lariabacter hongkongensis</i> HLHK9	<i>Maribacter</i> sp HTCC2170
<i>Kineococcus radiotolerans</i> SRS30216	<i>Lawsonia intracellularis</i> PHE MN100	<i>Maricaulis maris</i> MCS10
<i>Kitasatospora setae</i> KM 6054	<i>Leadbetterella byssophila</i> DSM 17132	<i>Marinithermus hydrothermalis</i> DSM 14884
<i>Klebsiella oxytoca</i> KCTC 1686	<i>Legionella longbeachae</i> NSW150	<i>Marinobacter adhaerens</i> HP15
<i>Klebsiella pneumoniae</i> 342		<i>Marinobacter aquaeolei</i> VT8
<i>Klebsiella variicola</i> At 22		<i>Marinomonas mediterranea</i> MMB 1
<i>Kocuria rhizophila</i> DC2201		
<i>Kosmotoga olearia</i> TBF 1951		
<i>Kribbella flava</i> DSM 17836		
<i>Krokinobacter</i> sp 4H 3 7 5		
<i>Kyriopidia tusciae</i> DSM 2912		

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Marinomonas posidonica IVIA Po 181	Methanohalobium evestigatum Z 7303	Methylococcus capsulatus str Bath
Marinomonas sp MWYL1	Methanohalophilus mahii DSM 5219	Methylomicrobium alcaliphilum
Marivirga tractuosa DSM 4126	Methanoplanus petrolearius DSM 11571	Methylomonas methanica MC09
Megasphaera elsdenii	Methanopyrus kandleri AV19	Methylotenera mobilis JLW8
Meiothermus ruber DSM 1279	Methanoregula boonei 6A8	Methylotenera versatilis 301
Meiothermus silvanus DSM 9946	Methanosaeta concilii GP6	Methylovorus glucosetrophus SIP3 4
Melissococcus plutonius ATCC 35311	Methanosaeta thermophila PT	Methylovorus sp MP688
Mesoplasma florum L1	Methanosalsum zhilinae DSM 4017	Micavibrio aeruginosavorus ARL 13
Mesorhizobium ciceri biovar biserrulae WSM1271	Methanosarcina acetivorans C2A	Microbacterium testaceum StLB037
Mesorhizobium loti MAFF303099	Methanosarcina barkeri str Fusaro	Micrococcus luteus NCTC 2665
Mesorhizobium opportunistum WSM2075	Methanosarcina mazae Go1	Microcystis aeruginosa NIES 843
Metallosphaera cuprina Ar 4	Methanospaera stadtmanae DSM 3091	Microlunatus phosphovorus NM 1
Metallosphaera sedula DSM 5348	Methanospaerula palustris E1 9c	Micromonospora aurantiaca ATCC 27029
Methanobacterium sp AL 21	Methanospirillum hungatei JF 1	Micromonospora sp L5
Methanobrevibacter ruminantium	Methanothermobacter marburgensis str Marburg	Mobiluncus curtisi ATCC 43063
M1Methanobrevibacter smithii ATCC 35061	Methanothermobacter thermautrophicus str Delta H	Moorella thermoacetica ATCC 39073
Methanocaldococcus fervens AG86	Methanothermococcus okinawensis IH1	Moraxella catarrhalis RH4
Methanocaldococcus infernus ME	Methanothermus fervidus DSM 2088	Muricauda ruestringensis DSM 13258
Methanocaldococcus jannaschii DSM 2661	Methanotorris igneus Kol 5	Mycobacterium abscessus ATCC 19977
Methanocaldococcus sp FS406 22	Methylacidiphilum infernorum V4	Mycobacterium africanum GM041182
Methanocaldococcus vulcanius M7	Methylibium petroleiphilum PM1	Mycobacterium avium 104
Methanocella arvoryzae MRE50	Methylobacillus flagellatus KT	Mycobacterium bovis AF2122 97
Methanocella paludicola SANAE	Methylobacterium chloromethanicum CM4	Mycobacterium canettii CIPT 140010059
Methanococcoides burtonii DSM 6242	Methylobacterium extorquens AM1	Mycobacterium gilvum PYR GCK
Methanococcus aeolicus Nankai 3	Methylobacterium nodulans ORS 2060	Mycobacterium leprae TN
Methanococcus maripaludis S2	Methylobacterium populi BJ001	Mycobacterium marinum M
Methanococcus vannielii SB	Methylobacterium radiotolerans JCM 2831	Mycobacterium rhodesiae NBB3
Methanococcus voltae A3	Methylobacterium sp 4 46	Mycobacterium smegmatis str MC2 155
Methanocorpusculum labreanum Z	Methylocella silvestris BL2	Mycobacterium sp JDM601
Methanoculleus marismigri JR1		Mycobacterium tuberculosis H37Rv

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Mycobacterium ulcerans	Neisseria lactamica 020 06	Orientia tsutsugamushi str
Agy99	Neisseria meningitidis M01	Boryong
Mycobacterium vanbaalenii	240149	Oscillibacter valericigenes
PYR 1	Neorickettsia risticii str Illinois	Owenweeksia hongkongensis
Mycoplasma agalactiae PG2	Neorickettsia sennetsu str	DSM 17368
Mycoplasma arthritidis 158L3 1	Miyayama	Paenibacillus mucilaginosus
Mycoplasma bovis PG45	Niastella koreensis GR20 10	KNP414
Mycoplasma capricolum subsp capricolum ATCC 27343	Nitratirfractor salsuginis DSM 16511	Paenibacillus polymyxia E681
Mycoplasma conjunctivae HRC 581	Nitratiruptor sp SB155 2	Paenibacillus sp JDR 2
Mycoplasma crocodyli MP145	Nitrobacter hamburgensis X14	Paenibacillus terrae HPL 003
Mycoplasma gallisepticum str Rlow	Nitrobacter winogradskyi Nb 255	Paludibacter propionicigenes WB4
Mycoplasma genitalium G37	Nitrosococcus halophilus Nc4	Pantoea ananatis LMG 20103
Mycoplasma haemocanis str Illinois	Nitrosococcus oceanii ATCC 19707	Pantoea sp At 9b
Mycoplasma haemofelis str Langford 1	Nitrosococcus watsonii C 113	Pantoea vagans C9 1
Mycoplasma hominis	Nitrosomonas europaea ATCC 19718	Parabacteroides distasonis
Mycoplasma hyopneumoniae 232	Nitrosomonas eutropha C91	ATCC 8503
Mycoplasma hyorhinis HUB 1	Nitrosomonas sp AL212	Parachlamydia acanthamoebiae UV 7
Mycoplasma leachii 99 014 6	Nitrosopumilus maritimus SCM1	Paracoccus denitrificans
Mycoplasma mobile 163K	Nitrosospira multiformis ATCC 25196	PD1222
Mycoplasma mycoides subsp mycoides SC str PG1	Nocardia farcinica IFM 10152	Parvibaculum lavamentivorans DS 1
Mycoplasma penetrans HF 2	Nocardoides sp JS614	Parvularcula bermudensis
Mycoplasma pneumoniae M129	Nocardiopsis dassonvillei subsp dassonvillei DSM 43111	HTCC2503
Mycoplasma pulmonis UAB CTIP	Nostoc azollae 0708	Pasteurella multocida subsp multocida str Pm70
Mycoplasma putrefaciens KS1	Nostoc punctiforme PCC 73102	Pectobacterium atrosepticum
Mycoplasma suis str Illinois	Nostoc sp PCC 7120	SCRI1043
Mycoplasma synoviae 53	Novosphingobium aromaticivorans DSM 12444	Pectobacterium carotovorum
Myxococcus fulvus HW 1	Novosphingobium sp PP1Y	subsp carotovorum PC1
Myxococcus xanthus DK 1622	Oceanithermus profundus DSM 14977	Pectobacterium wasabiae
Nakamurella multipartita DSM 44233	Oceanobacillus iheyensis HTE831	WPP163
Nanoarchaeum equitans Kin4 M	Ochrobactrum anthropi ATCC 49188	Pediococcus pentosaceus
Natranaerobius thermophilus JW NM WN LF	Odoribacter splanchnicus DSM 20712	ATCC 25745
Natrialba magadii ATCC 43099	Oenococcus oeni PSU 1	Pedobacter heparinus DSM 2366
Natronomonas pharaonis DSM 2160	Oligotropha carboxidovorans OM5	Pedobacter saltans DSM 12145
Nautilia profundicola AmH	Olsenella uli DSM 7084	Pelagibacter halotolerans
Neisseria gonorrhoeae FA 1090	Onion yellows phytoplasma OY M	B2
	Opitutus terrae PB90 1	Pelobacter carbinolicus DSM 2380
		Pelobacter propionicus DSM 2379
		Pelodictyon phaeoclathratiforme BU 1
		Pelotomaculum thermopropionicum SI
		Persephonella marina EX H1
		Petrotoga mobilis SJ95

SIANN: Strain Identification by Alignment to Near Neighbors

<i>Phenylobacterium zucineum</i> HLK1	<i>Pseudomonas brassicacearum</i> subsp <i>brassicacearum</i> NFM421	<i>Ramlibacter tataouinensis</i> TTB310
<i>Photobacterium profundum</i> SS9	<i>Pseudomonas entomophila</i> L48	<i>Renibacterium salmoninarum</i> ATCC 33209
<i>Photorhabdus asymbiotica</i> subsp <i>asymbiotica</i> ATCC 43949	<i>Pseudomonas fluorescens</i> F113	<i>Rhizobium etli</i> CFN 42
<i>Photorhabdus luminescens</i> subsp <i>laumontii</i> TTO1	<i>Pseudomonas fulva</i> 12 X	<i>Rhizobium leguminosarum</i> bv <i>viciae</i> 3841
<i>Picrophilus torridus</i> DSM 9790	<i>Pseudomonas mendocina</i> ymp	<i>Rhodobacter capsulatus</i> SB 1003
<i>Pirellula staleyi</i> DSM 6068	<i>Pseudomonas protegens</i> Pf 5	<i>Rhodobacter sphaeroides</i> 241
<i>Planctomyces brasiliensis</i> DSM 5305	<i>Pseudomonas putida</i> F1	<i>Rhodococcus equi</i> 103S
<i>Planctomyces limnophilus</i> DSM 3776	<i>Pseudomonas stutzeri</i> A1501	<i>Rhodococcus erythropolis</i> PR4
<i>Polaromonas</i> <i>naphthalenivorans</i> CJ2	<i>Pseudomonas syringae</i> pv <i>phaseolicola</i> 1448A	<i>Rhodococcus jostii</i> RHA1
<i>Polaromonas</i> sp JS666	<i>Pseudonocardia</i> <i>dioxanivorans</i> CB1190	<i>Rhodococcus opacus</i> B4
<i>Polymorphum gilvum</i> SL003B 26A1	<i>Pseudovibrio</i> sp FO BEG1	<i>Rhodoferax ferrireducens</i> T118
<i>Polynucleobacter necessarius</i> subsp <i>asymbioticus</i> QLW P1DMWA 1	<i>Pseudoxanthomonas</i> spadix BD a59	<i>Rhodomicrobium vannielii</i> ATCC 17100
<i>Porphyromonas</i> <i>asaccharolytica</i> DSM 20707	<i>Pseudoxanthomonas</i> <i>suwonensis</i> 11 1	<i>Rhodopirellula baltica</i> SH 1
<i>Porphyromonas gingivalis</i> W83	<i>Psychrobacter arcticus</i> 273 4	<i>Rhodopseudomonas palustris</i> CGA009
<i>Prevotella denticola</i> F0289	<i>Psychrobacter cryohalolentis</i> K5	<i>Rhodospirillum centenum</i> SW
<i>Prevotella melaninogenica</i> ATCC 25845	<i>Psychrobacter</i> sp PRwf 1	<i>Rhodospirillum rubrum</i> ATCC 11170
<i>Prevotella ruminicola</i> 23	<i>Psychromonas ingrahamii</i> 37	<i>Rhodothermus marinus</i> DSM 4252
<i>Prochlorococcus marinus</i> str MIT 9215	<i>Pusillimonas</i> sp T7 7	<i>Rickettsia africae</i> ESF 5
<i>Propionibacterium acnes</i> 6609	<i>Pyrobaculum aerophilum</i> str IM2	<i>Rickettsia akari</i> str Hartford
<i>Propionibacterium</i> <i>freudenreichii</i> subsp <i>shermanii</i> CIRM BIA1	<i>Pyrobaculum arsenaticum</i> DSM 13514	<i>Rickettsia bellii</i> RML369 C
<i>Prosthecochloris aestuarii</i> DSM 271	<i>Pyrobaculum calidifontis</i> JCM 11548	<i>Rickettsia canadensis</i> str McKiel
<i>Proteus mirabilis</i> HI4320	<i>Pyrobaculum islandicum</i> DSM 4184	<i>Rickettsia conorii</i> str Malish 7
<i>Pseudoalteromonas atlantica</i> T6c	<i>Pyrobaculum neutrophilum</i> V24Sta	<i>Rickettsia felis</i> URRWXCal2
<i>Pseudoalteromonas</i> <i>haloplanktis</i> TAC125	<i>Pyrobaculum</i> sp 1860	<i>Rickettsia heilongjiangensis</i> 054
<i>Pseudoalteromonas</i> sp SM9913	<i>Pyrococcus abyssi</i> GE5	<i>Rickettsia japonica</i> YH
<i>Pseudogulbenkiania</i> sp NH8B	<i>Pyrococcus furiosus</i> DSM 3638	<i>Rickettsia massiliae</i> MTU5
<i>Pseudomonas aeruginosa</i> PAO1	<i>Pyrococcus horikoshii</i> OT3	<i>Rickettsia peacockii</i> str Rustic
	<i>Pyrococcus</i> sp NA2	<i>Rickettsia prowazekii</i> str Madrid E
	<i>Pyrococcus yayanosii</i> CH1	<i>Rickettsia rickettsii</i> str Iowa
	<i>Pyrolobus fumarii</i> 1A	<i>Rickettsia sibirica</i> 246
	<i>Rahnella</i> sp Y9602	<i>Rickettsia slovaca</i> 13 B
	<i>Ralstonia eutropha</i> JMP134	<i>Rickettsia typhi</i> str Wilmington
	<i>Ralstonia pickettii</i> 12D	<i>Riemerella anatipestifer</i> ATCC 11845 DSM 15868
	<i>Ralstonia solanacearum</i> GMI1000	<i>Robiginitalea</i> biformata HTCC2501
		<i>Roseburia hominis</i> A2 183
		<i>Roseiflexus castenholzii</i> DSM 13941
		<i>Roseiflexus</i> 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
Salinibacter ruber DSM 13855	Sinorhizobium fredii NGR234	1
Salinispora arenicola CNS 205	Sinorhizobium medicae WSM419	Streptobacillus moniliformis DSM 12112
Salinispora tropica CNB 440	Sinorhizobium meliloti 1021	Streptococcus agalactiae 2603V R
Salmonella bongori NCTC 12419	Slackia heliotrinireducens DSM 20476	Streptococcus dysgalactiae subsp equisimilis ATCC 12394
Salmonella enterica subsp enterica serovar Enteritidis str P125109	Sodalis glossinidius str morsitans	Streptococcus equi subspecies zooepidemicus
Sanguibacter keddieii DSM 10542	Sorangium cellulosum So ce56	Streptococcus gallolyticus subsp gallolyticus ATCC BAA 2069
Sebaldella termitidis ATCC 33386	Sphaerobacter thermophilus DSM 20745	Streptococcus gordoni str Challis substr CH1
Segniliparus rotundus DSM 44985	Sphaerochaeta coccoides DSM 17374	Streptococcus macedonicus ACA DC 198
Selenomonas sputigena ATCC 35185	Sphaerochaeta globus str Buddy	Streptococcus mitis B6
Serratia plymuthica AS9	Sphaerochaeta pleomorpha str Grapes	Streptococcus mutans NN2025
Serratia proteamaculans 568	Sphingobacterium sp 21	Streptococcus oralis Uo5
Serratia sp AS12	Sphingobium chlorophenolicum L 1	Streptococcus parasanguinis ATCC 15912
Serratia symbiotica str Cinara cedri	Sphingobium japonicum UT26S	Streptococcus parauberis KCTC 11537
Shewanella amazonensis SB2B	Sphingobium sp SYK 6	Streptococcus pasteurianus ATCC 43144
Shewanella baltica OS155	Sphingomonas wittichii RW1	Streptococcus pneumoniae ST556
Shewanella denitrificans OS217	Sphingopyxis alaskensis RB2256	Streptococcus pseudopneumoniae IS7493
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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<i>Streptococcus pyogenes</i> M1	<i>Synechocystis</i> sp PCC 6803	<i>Thermococcus</i>
GAS	<i>Syntrophobacter</i>	<i>gammatolerans</i> EJ3
<i>Streptococcus salivarius</i>	<i>fumaroxidans</i> MPOB	<i>Thermococcus kodakarensis</i>
JIM8780	<i>Syntrophobutulus glycolicus</i>	KOD1
<i>Streptococcus sanguinis</i> SK36	DSM 8271	<i>Thermococcus onnurineus</i>
<i>Streptococcus suis</i> 05ZYH33	<i>Syntrophomonas wolfei</i> subsp	NA1
<i>Streptococcus thermophilus</i>	wolfei str Goettingen	<i>Thermococcus sibiricus</i> MM
CNRZ1066	<i>Syntrophothermus lipocalidus</i>	739
<i>Streptococcus uberis</i> 0140J	DSM 12680	<i>Thermococcus</i> sp 4557
<i>Streptomyces avermitilis</i> MA	<i>Syntrophus aciditrophicus</i> SB	<i>Thermocrinis albus</i> DSM 14484
4680	<i>Tannerella forsythia</i> ATCC	<i>Thermodesulfatator indicus</i>
<i>Streptomyces bingchengensis</i> BCW 1	43037	DSM 15286
<i>Streptomyces cattleya</i> NRRL	<i>Taylorella equigenitalis</i> MCE9	<i>Thermodesulfobacterium</i> sp
8057 DSM 46488	<i>Tepidanaerobacter acetatoxydans</i> Re1	OPB45
<i>Streptomyces coelicolor</i> A32	<i>Teredinibacter turnerae</i> T7901	<i>Thermodesulfobium</i>
<i>Streptomyces flavogriseus</i>	<i>Terriglobus saanensis</i> SP1PR4	<i>narugense</i> DSM 14796
ATCC 33331	<i>Tetragenococcus halophilus</i>	<i>Thermodesulfovibrio</i>
<i>Streptomyces griseus</i> subsp	<i>Thauera</i> sp MZ1T	<i>yellowstonii</i> DSM 11347
griseus NBRC 13350	<i>Thermaerobacter marianensis</i>	<i>Thermofilum pendens</i> Hrk 5
<i>Streptomyces scabiei</i> 8722	DSM 12885	<i>Thermomicrombium roseum</i>
<i>Streptomyces</i> sp SirexAA E	<i>Thermanaerovibrio</i>	DSM 5159
<i>Streptomyces violaceusniger</i>	<i>acidaminovorans</i> DSM 6589	<i>Thermomonospora curvata</i>
Tu 4113	<i>Thermincola potens</i> JR	DSM 43183
<i>Streptosporangium roseum</i>	<i>Thermoanaerobacter brockii</i>	<i>Thermoplasma acidophilum</i>
DSM 43021	subsp finnii Ako 1	DSM 1728
<i>Sulfobacillus acidophilus</i> DSM	<i>Thermoanaerobacter italicus</i>	<i>Thermoplasma volcanium</i>
10332	Ab9	GSS1
<i>Sulfolobus acidocaldarius</i>	<i>Thermoanaerobacterium</i>	<i>Thermoproteus uzoniensis</i> 768
DSM 639	<i>thermosaccharolyticum</i> DSM	20
<i>Sulfolobus islandicus</i> M1425	571	<i>Thermosediminibacter oceanii</i>
<i>Sulfolobus solfataricus</i> P2	<i>Thermoanaerobacterium</i>	DSM 16646
<i>Sulfolobus tokodaii</i> str 7	<i>xylanolyticum</i> LX 11	<i>Thermosiphon africanus</i> TCF52B
<i>Sulfuricurvum kuijense</i> DSM	<i>Thermoanaerobacter</i>	<i>Thermosiphon melanesiensis</i>
16994	<i>mathranii</i> subsp <i>mathranii</i> str	BI429
<i>Sulfurihydrogenibium azorense</i> Az Fu1	A3	<i>Thermosphaera aggregans</i>
<i>Sulfurihydrogenibium</i> sp	<i>Thermoanaerobacter</i>	DSM 11486
YO3AOP1	<i>pseudethanolicus</i> ATCC	<i>Thermosynechococcus elongatus</i>
<i>Sulfurimonas autotrophica</i>	33223	BP 1
DSM 16294	<i>Thermoanaerobacter</i> sp X513	<i>Thermotoga lettingae</i> TMO
<i>Sulfurimonas denitrificans</i> DSM	<i>Thermoanaerobacter</i>	<i>Thermotoga maritima</i> MSB8
1251	<i>tengcongensis</i> MB4	<i>Thermotoga naphthophila</i>
<i>Sulfurospirillum deleyianum</i>	<i>Thermoanaerobacter wiegelii</i>	RKU 10
DSM 6946	Rt8B1	<i>Thermotoga neapolitana</i> DSM
<i>Sulfurovum</i> sp NBC37 1	<i>Thermobaculum terrenum</i>	4359
<i>Symbiobacterium</i>	ATCC BAA 798	<i>Thermotoga petrophila</i> RKU 1
<i>thermophilum</i> IAM 14863	<i>Thermobifida fusca</i> YX	<i>Thermotoga</i> sp RQ2
<i>Synechococcus elongatus</i>	<i>Thermobispora bispora</i> DSM	<i>Thermotoga thermarum</i> DSM
PCC 6301	43833	5069
<i>Synechococcus</i> sp CC9605	<i>Thermococcus barophilus</i> MP	<i>Thermovibrio ammonificans</i>
		HB 1
		<i>Thermovirga lienii</i> DSM 17291

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