Bacterial benchmark datasets for comparison and validation of phylogenomic pipelines

Standards for Pathogen Detection Workshop

NIST, 14 August 2017

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Working Group: WGS Standards and Analysis

- Participants: FDA, CDC, NCBI and FSIS, APHL

Benchmarks allow:

- Evaluation of method performance
- Guidance on improvement of methods
- Standards for assessing reproducibility of results
- Bolster use of results for regulatory action

Benchmark datasets

Dataset	Organism	Number of Isolates [a]	Epidemiologically linked Isolates [b]	reference genome[c]	Type of dataset	Reference/Comment
Stone Fruit recall	*L. monocytogenes*	31	28	CFSAN023463	Empirical	PMID: 27694232
Spicy Tuna outbreak	*S. enterica*	23	18	CFSAN000189	Empirical	PMID: 25995194
Raw Milk Outbreak	*C. jejuni*	22	14	D7331	Empirical	http://www.outbreakdatabase.com/details/endricks-farm-and-dairy-raw-milk-2008/
Sprouts Outbreak	*E. coli*	10	3	2011C-3609	Empirical	http://www.cdc.gov/ecoli/2014/o121-05-14/index.html
Simulated outbreak	*S. enterica*	23	18	CFSAN000189	Synthetic	Simulated dataset based off the *S. enterica* spicy tuna outbreak tree and reference genome.

Standard template for datasets

header

Organism	Salmonella enterica subspecies enterica Serovar Bareilly
Outbreak	1203NYJAP-1 - Tuna Scrape Outbreak
pmid	25995194
tree	http://api.opentreeoflife.org/v2/study/ot_301/tree/tree1.tre
source	Ruth Timme
dataType	empirical

body

biosample_acc	strain	genBankAssembly	SRArun_acc	outbreak	dataSetName	suggestedReference	sha256sumAssembly	sha256sumRead1	sha256sumRead2	voucherContact
SAMN01823701	CFSAN000189	CP006053, CP006054	SRR498276	outgroup	1203NYJAP-1 - Tuna Scrape Outbreak	TRUE	checksums			Dwayne Roberson, FDA
SAMN00860590	CFSAN000191	JMMH00000000	SRR498369	outgroup	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00989085	CFSAN000211	JMMM00000000	SRR498373	outgroup	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00862341	CFSAN000212	JRDM00000000	SRR500494	outgroup	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00862340	CFSAN000228	JRCY00000000	SRR500493	outgroup	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991042	CFSAN000661	JMMG00000000	SRR498397	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991044	CFSAN000669	JRCQ00000000	SRR498399	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991046	CFSAN000700	JRCO00000000	SRR498402	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991047	CFSAN000752	JRCN00000000	SRR498403	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991048	CFSAN000753	JRCM00000000	SRR498404	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991050	CFSAN000951	JRCJ00000000	SRR498422	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991051	CFSAN000952	JRCI00000000	SRR498423	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991053	CFSAN000954	JRCG00000000	SRR498425	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991081	CFSAN000958	JRCD00000000	SRR498431	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991087	CFSAN000960	JRCB00000000	SRR498433	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00991100	CFSAN000961	JRCA00000000	SRR498434	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN01942246	CFSAN000963	JRBZ00000000	SRR498436	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN01942268	CFSAN000968	JMMF00000000	SRR498442	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN00996629	CFSAN000970	JRBT00000000	SRR498444	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN01816358	CFSAN001112	JRBL00000000	SRR1258439	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN01816359	CFSAN001115	JRBK00000000	SRR1258442	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN01816351	CFSAN001118	JRBJ00000000	SRR1258443	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA
SAMN01816352	CFSAN001140	JRBI00000000	SRR1258440	1203NYJAP-1	1203NYJAP-1 - Tuna Scrape Outbreak	FALSE				Dwayne Roberson, FDA

Data Archiving

GitHub:

https://github.com/WGS-standards-and-analysis/datasets

Gen-FS Gopher download script

dataset table files

NCBI:

https://www.ncbi.nlm.nih.gov/pathogens

Metadata: BioSample Database

Raw sequence data: SRA database

Assembled genomes: Assembly database

OpenTreeOfLife:

https://tree.opentreeoflife.org

newick formated tree files

Working with the Datasets

visit WGS standards GitHub site

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"git clone" to download tables and script (or zip file)

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downloadDataset.pl -o outdir spreadsheet.dataset.tsv

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Downloaded files, verify integrity with checksums:
- fastq files
- fasta assemblies
- tree file (newick format)

↓

Perform your own clustering pipeline(s)
(FDA: SNP pipeline, CDC: LyveSet, NCBI: Pathogen Detection, …)

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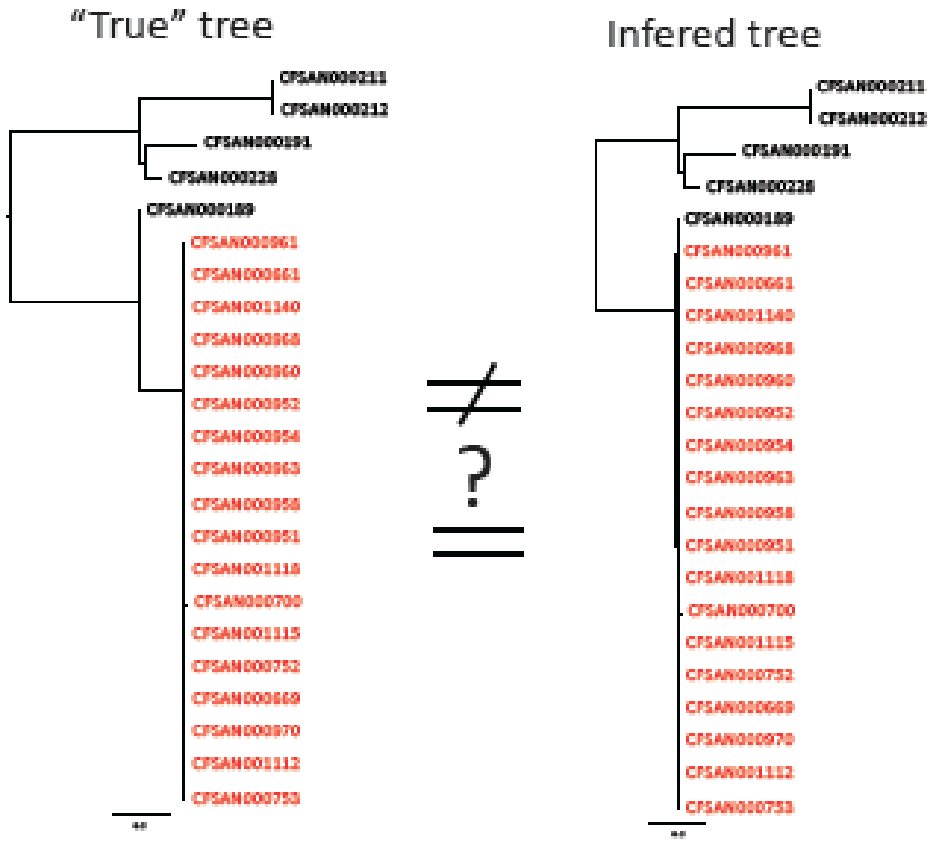
Compare results!

Compare results!



Manuscript accepted at PeerJ.