



NCBI Pathogen Detection, SEDRIC, & Recent Case Study

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Introductions

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Agenda

- NCBI Pathogen Detection
 - Cluster detection
 - Notification set-up
- SEDRIC
 - Historical outbreaks and serotypes/species
 - NORS

BREAK

- Case study
 - Breakfast chain restaurant
- PulseNet2.0

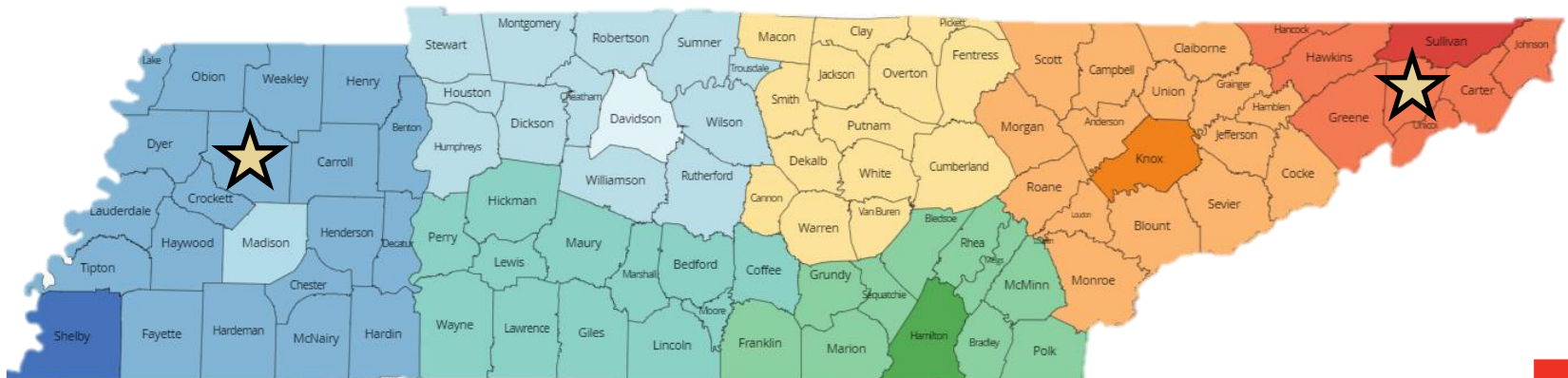


TM

NCBI Pathogen Detection Tool with *Salmonella* Stanley Example

Cluster Identification

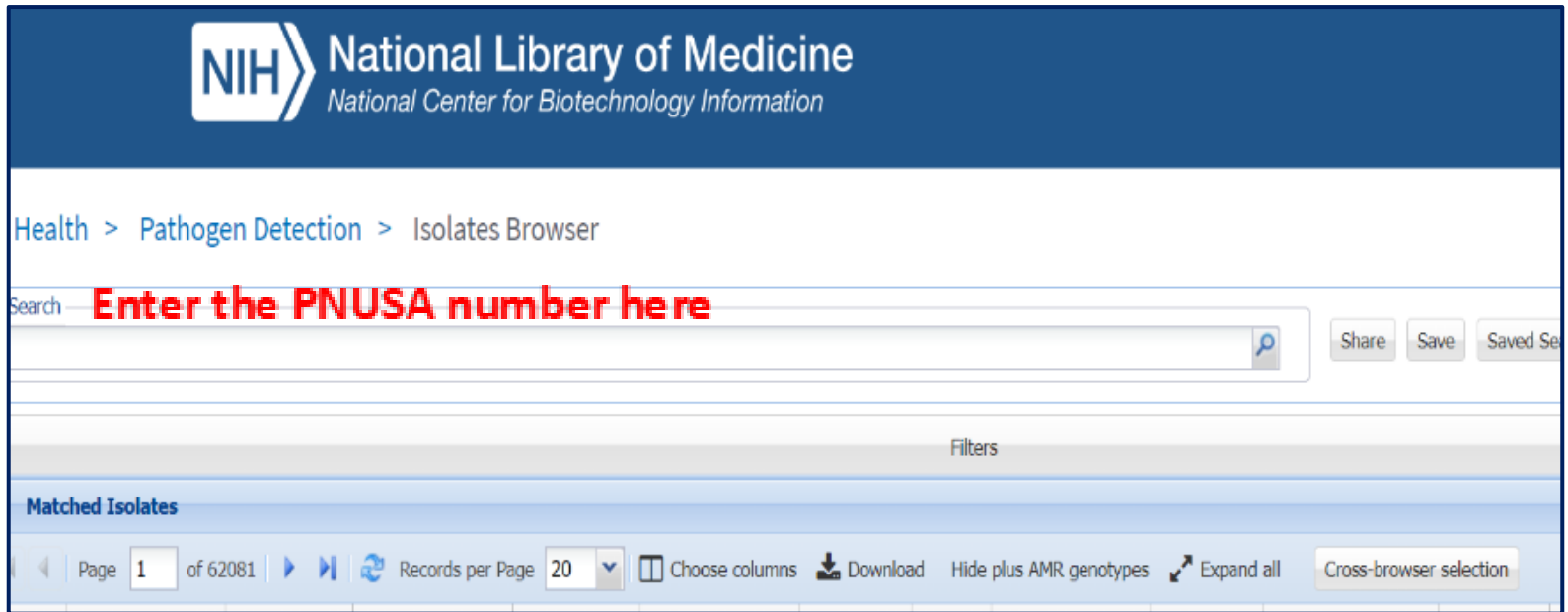
- *Salmonella* Stanley cluster, 0 alleles apart
 - Case A: 4-year-old boy in Northeast Tennessee
 - Case B: 58-year-old woman in West Tennessee
- Common exposure to small turtles
- NCBI and SEDRIC used to find more cases
 - Pulled cases within 20 SNPs in last year
 - One WA case with turtle exposure



Using NCBI Pathogen Detection Isolates Browser

Search for cases in the National Center for Biotechnology Information (NCBI) Isolates Browser by using the **WGS ID** or **PNUSA #** into search bar to determine if there are any current or historical human, animal, or environmental on a national level are closely related to the cases in the cluster being investigated.

Lookup: PNUSAS266798, PNUSAS266800



The screenshot shows the NCBI Pathogen Detection Isolates Browser interface. At the top, the NIH logo and "National Library of Medicine National Center for Biotechnology Information" are displayed. Below this, the breadcrumb "Health > Pathogen Detection > Isolates Browser" is visible. A search bar is present with the text "Enter the PNUSA number here" in red. To the right of the search bar are buttons for "Share", "Save", and "Saved Se". Below the search bar is a "Filters" section. The main content area is titled "Matched Isolates". At the bottom, there is a pagination and controls bar showing "Page 1 of 62081", "Records per Page 20", and various icons for "Choose columns", "Download", "Hide plus AMR genotypes", "Expand all", and "Cross-browser selection".

Using NCBI Pathogen Detection Isolates Browser

Health > Pathogen Detection > Isolates Browser

Search
PNUSAS306567

Share Save

Filters

Matched Clusters

#	Organism groups	SNP cluster	Matched Isolates	Matched clinical Isolates	Matched environmental Isolates	Total Isolates
1	Salmonella enterica	PDS000029636.628	1	1	0	3013

Click on the blue hyperlink to view the SNP tree

Matched Isolates

Page 1 of 1 Records per Page 20 Choose columns Download Hide plus AMR genotypes Expand all Cross-browser selection

#	Organism group	Strain	Isolate identifiers	Serovar	Isolate	Create date	Locat...	Isolation source	Isolation ...	SNP cluster
1	Salmonella ente...	PNUSAS306...	PNUSAS306567 SRS15338680	Newport	PDT001444502.1	2022-10-06	USA		clinical	PDS000029636.628

NCBI – Finding Neighbors

Salmonella - 180 isolates
📌 PDG000000002.4080 / PDS000022939.149

2 Isolates Selected ✖ Clear

Distance between selected isolates :
**minimum = 1 SNPs, maximum = 1 SNPs,
average = 1 SNPs**

Target creation date range :
2022-04-19 to 2022-04-19

Group by: Creation date

Isolation type	Location	Cre...	Min...	Min...	Actions
📅 Year: 2022					
clinical	USA	202...	1	1	✖ ⓘ ↗
clinical	USA	202...	0	0	✖ ⓘ ↗

- Make a note of the PNUSA numbers of any isolates that are closely related in time and in SNP distance.
- The information in NCBI does not tell you what state an isolate (may say for environmental or animal isolates) is from.

**SNP distances between
selected isolates shown here**

NCBI – Finding Neighbors

The **neighbors** button can automatically select closely related isolates.

The screenshot displays the NCBI PhyML viewer interface. At the top, a toolbar contains buttons for 'Share', 'Hide Table', 'Labels', 'Load Labels', 'Neighbors', 'Common subtree', 'Watch', and 'Watched isolates'. The 'Neighbors' button is highlighted with a red box. Below the toolbar, a phylogenetic tree is shown with a scale bar at the top left indicating distances of 2, 4, 6, and 8. A 'Neighbors' dialog box is open, showing '2 isolates selected' and an 'SNP distance' of 10. The dialog box has 'Add' and 'Undo' buttons. The tree lists various isolates with their clinical or environmental status, date, location, and accession numbers. Two isolates are highlighted in red: 'clinical, 2022-04-19, USA, PNUSAS2661' and 'clinical, 2022-04-19, USA, PNUSAS266800, PDT001290459.1'.

clinical, 2024-09-11, stool, PNUSAS450521, PDT002378098.1
clinical, 2024-09-11, blood, PNUSAS457242, PDT002378710.1
clinical, 2026-02-23, USA, PNUSAS565204, PDT003111086.1
clinical, 2025-05-12, USA, PNUSAS511357, PDT002766672.1
clinical, 2025-05-18, USA, PNUSAS512178, PDT002772807.1
clinical, 2025-06-30, USA, PNUSAS511357, PDT002766672.1
clinical, 2025-08-10, USA, PNUSAS511357, PDT002766672.1
clinical, 2024-11-18, USA, PNUSAS4871, PDT002766672.1
clinical, 2025-05-13, USA, PNUSAS511357, PDT002766672.1
clinical, 2022-04-22, USA, PNUSAS2671, PDT002766672.1
clinical, 2022-04-19, USA, PNUSAS2661, PDT002766672.1
clinical, 2022-06-13, USA, PNUSAS2761, PDT002766672.1
environmental/other, 2022-05-26, USA:TN, Underside, PNUSAS273359, PDT001315524.1
clinical, 2022-08-02, USA, PNUSAS287682, PDT001377383.1
clinical, 2022-05-02, USA, PNUSAS268802, PDT001297993.1
clinical, 2022-05-13, USA, PNUSAS270824, PDT001307722.1
environmental/other, 2022-05-26, USA:TN, swab, PNUSAS273354, PDT001315522.1
environmental/other, 2022-05-26, USA:TN, feces, PNUSAS273358, PDT001315539.1
environmental/other, 2022-05-26, USA:TN, swab, PNUSAS273355, PDT001315560.1
environmental/other, 2022-05-26, USA:TN, swab, PNUSAS273356, PDT001315544.1
clinical, 2022-07-09, USA, PNUSAS281835, PDT001356182.1
environmental/other, 2022-05-26, USA:TN, Underside, PNUSAS273357, PDT001315543.1
clinical, 2022-04-19, USA, PNUSAS266800, PDT001290459.1
clinical, 2022-05-23, USA, PNUSAS272495, PDT001314126.1
environmental/other, 2023-07-26, USA:TN, swab, PNUSAS366748, PDT001829524.1
clinical, 2023-07-26, USA, PNUSAS366605, PDT001829313.1
environmental/other, 2023-07-26, USA:TN, swab, PNUSAS366747, PDT001829520.1
clinical, 2023-07-24, USA, PNUSAS365466, PDT001826163.1
environmental/other, 2023-07-26, USA:TN, swab, PNUSAS366745, PDT001829523.2
environmental/other, 2023-07-26, USA:TN, turtle, PNUSAS366604, PDT001829316.1
clinical, 2024-02-09, stool, PNUSAS419974, PDT002074682.1

Neighbors

2 isolates selected

SNP distance: 10 Add Undo

NCBI – Download Data

The screenshot displays the NCBI interface for downloading data. A table of Salmonella isolates is shown, with columns for #, Organism group, Strain, Isolate identifiers, Serovar, Isolate, Create date, Location, Isolation source, and Isolation The table contains 5 records. A 'Download' button is highlighted in the top right of the table. A 'Download' dialog box is open, showing options for 'Selected only', 'Data type' (Table), 'Type' (Excel (.csv)), and 'Name' (isolates.csv). The dialog also indicates '2 isolate record(s)' and has 'Download' and 'Cancel' buttons.

#	Organism group	Strain	Isolate identifiers	Serovar	Isolate	Create date	Location	Isolation source	Isolation ...
1	Salmonella ente...	PNUSAS266...	PNUSAS266798 SRS12658296	Stanley	PDT001290457.1	2022-04-19	USA		clinical
2	Salmonella ente...	PNUSAS266...	PNUSAS266800 SRS12658294	St...					clinical
3	Salmonella ente...	PNUSAS033...	PNUSAS033797 SRS3022036						clinical
4	Salmonella ente...	534775	534775 534775.biosample SRS3392885	St...				human	clinical
5	Salmonella ente...	531229	531229 531229.biosample SRS3547989	St...				human	clinical

Download dialog box options:

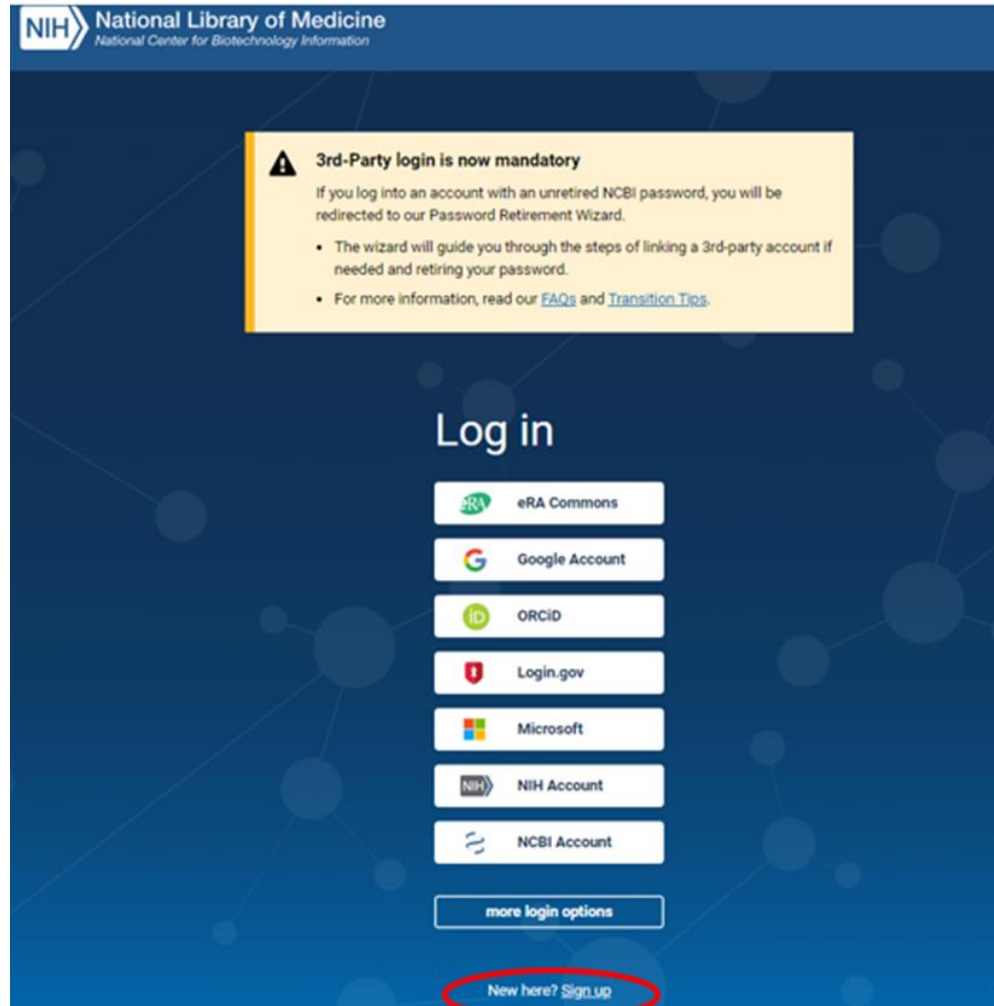
- ☒ Selected only
- Data type: Table
- Type: Excel (.csv)
- Name: isolates.csv
- 2 isolate record(s)
- Download
- Cancel

Bottom navigation bar:

- Share
- Hide Table
- Labels
- Load Labels
- Neighbors
- Common subtree
- Watch
- Watched isolates

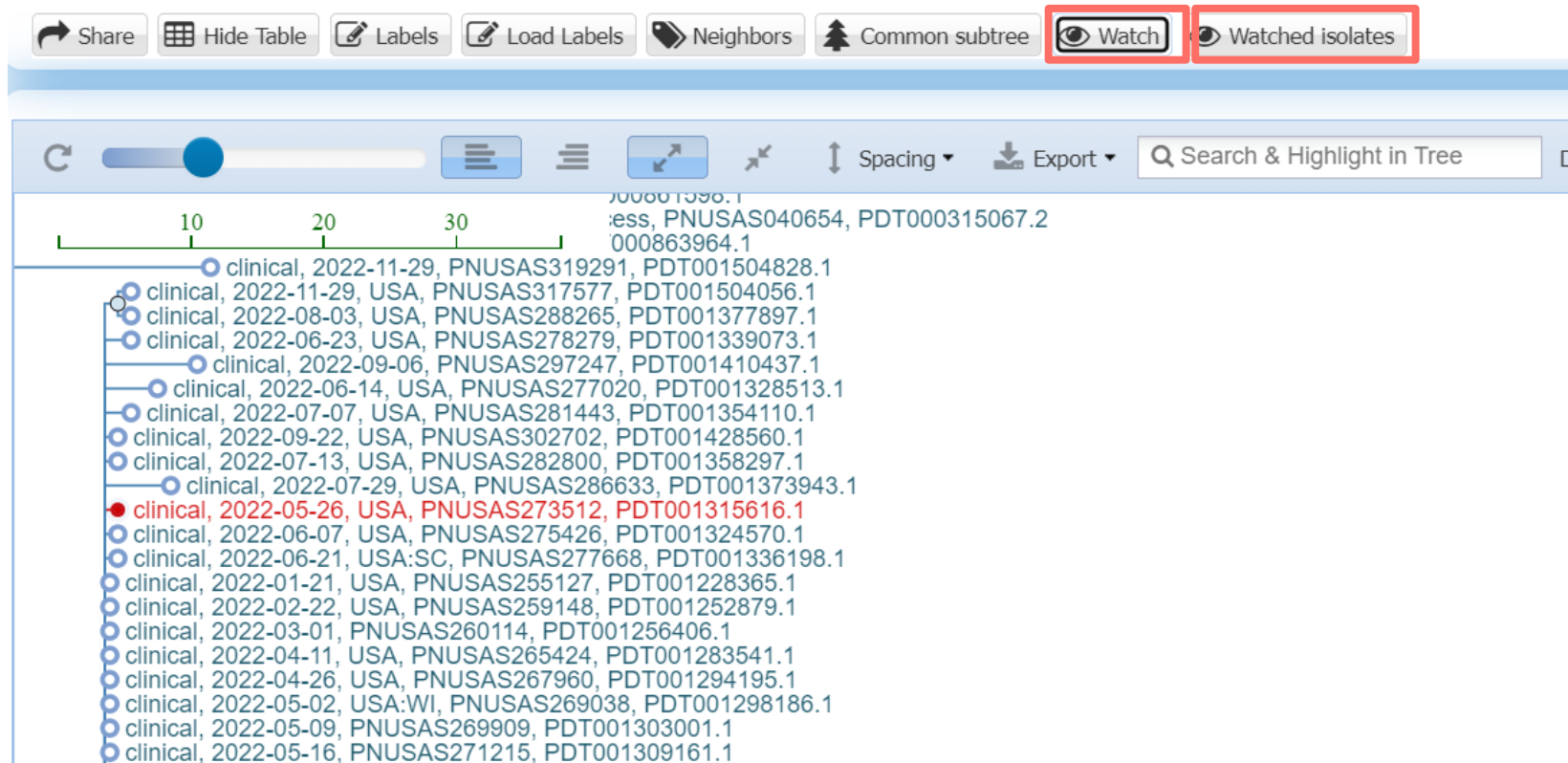
Using NCBI Pathogen Detection Isolates Browser

To get notified of new isolates added to a cluster in NCBI, please create an account first or sign in if you have an account.



Using NCBI Pathogen Detection Isolates Browser

- Above the tree there is an icon that looks like an eye and is labeled “**Watch**”.
- Click it and then name the isolate/cluster a unique name so you’re able to identify what cluster it is in reference to (ex. S. Liverpool cluster).
- Adjust the SNP distance to get notified of any isolates related to the one being watched within the threshold. Click “Save”.



Knowledge Check

Isolates can be searched
for in NCBI with:

- A. PNUSA or WGS IDs
- B. Lab accession number
- C. Investigation ID
- D. None of the above

Knowledge Check

True or False: Only one isolate can be searched for at a time in NCBI.

False!

Knowledge Check

What button does NOT appear in NCBI?

- A. Neighbors
- B. Watch
- C. Watched Isolates
- D. Show State Origin
- E. Labels



**SEDRIC – Contacts,
Cluster Detection,
NORS**

SEDRIC PH Contacts

PUBLIC HEALTH CONTACTS

FILTERS

First Name

contains search

Last Name

contains search

Email Address

contains search

Contact Type

any of these contact types

Government Level

any of these levels

State

IL X

Copy Emails

Draft Email

New

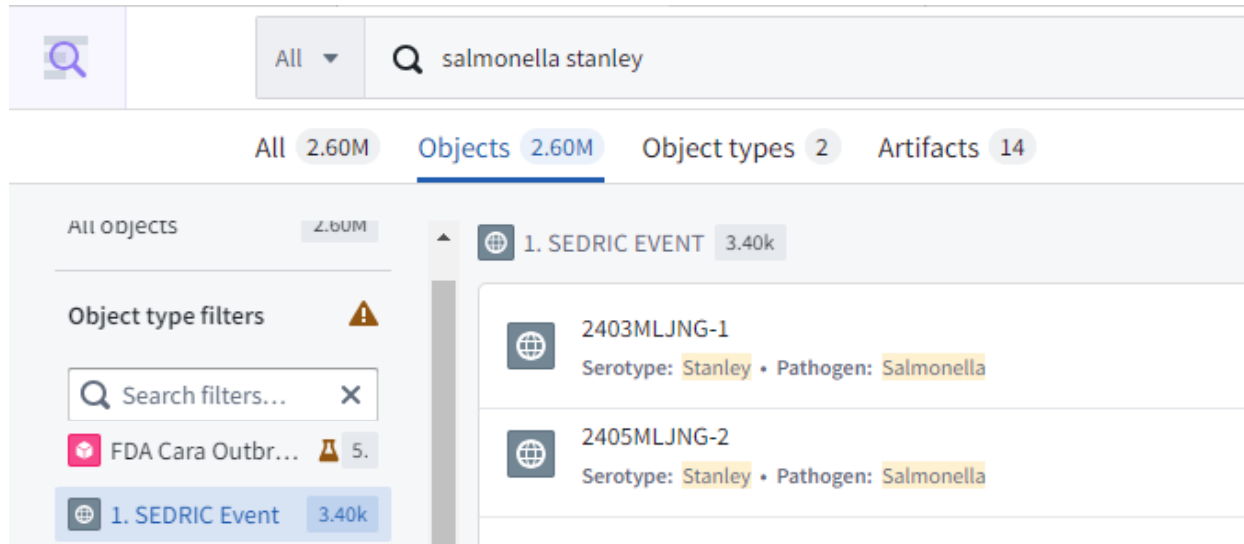
Edit

Delete

	First Name	Last Name	Email Address	Primary Phone	State	Level	Contact Type	Position	Comments	Updated
☐	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	IL	State	VET; Outbreaks; List Outbreaks; Zoonoti Outbreaks; Water Outbreaks	NORS Admin/SPHV	VET; Listeria contact	2024-04-29

SEDRIC

- How to find
 - Historical information, rare serotypes
 - Can search for a serotype or species with SEDRIC event filter to find historical outbreaks



- Other cases: use cluster detection tool!

SEDRIC

Q

Objects × SALM1.1-8.8x.8.996x.12599.338166

Clear

×

Top

Apps 640

Objects 577K

Datasets 5.6K

Files 41K

More ▾

Object type

☐ Augmente... 474K

☐ SEDRIC All... 103K

☐ SEDRIC Preve... 61

☐ NESSI Typhi C... 2

OBJECT TYPES 0

<

No results for "SALM1.1-8.8x.8.996x.12599.338166". Try again with broader search terms.

OBJECTS 57+

☐ [SALM1.1-8.8x.8.996x.12599.338166](#)

SEDRIC Allele Code

Object type: SEDRIC Allele Code

Allelecode: [SALM1.1-8.8x.8.996x.12599.338166](#)

☐ [TN___N26E090274-01](#)

Augmented SEDRIC Isolate

Object type: Augmented SEDRIC Isolate

Allelecode: [SALM1.1-8.8x.8.996x.12599.338166](#)

☐ [TN___N26E057602-01](#)

Augmented SEDRIC Isolate

Object type: Augmented SEDRIC Isolate

Allelecode: [SALM1.1-8.8x.8.996x.12599.338166](#)

HOTKEYS ctrl + J Open Quicksearch

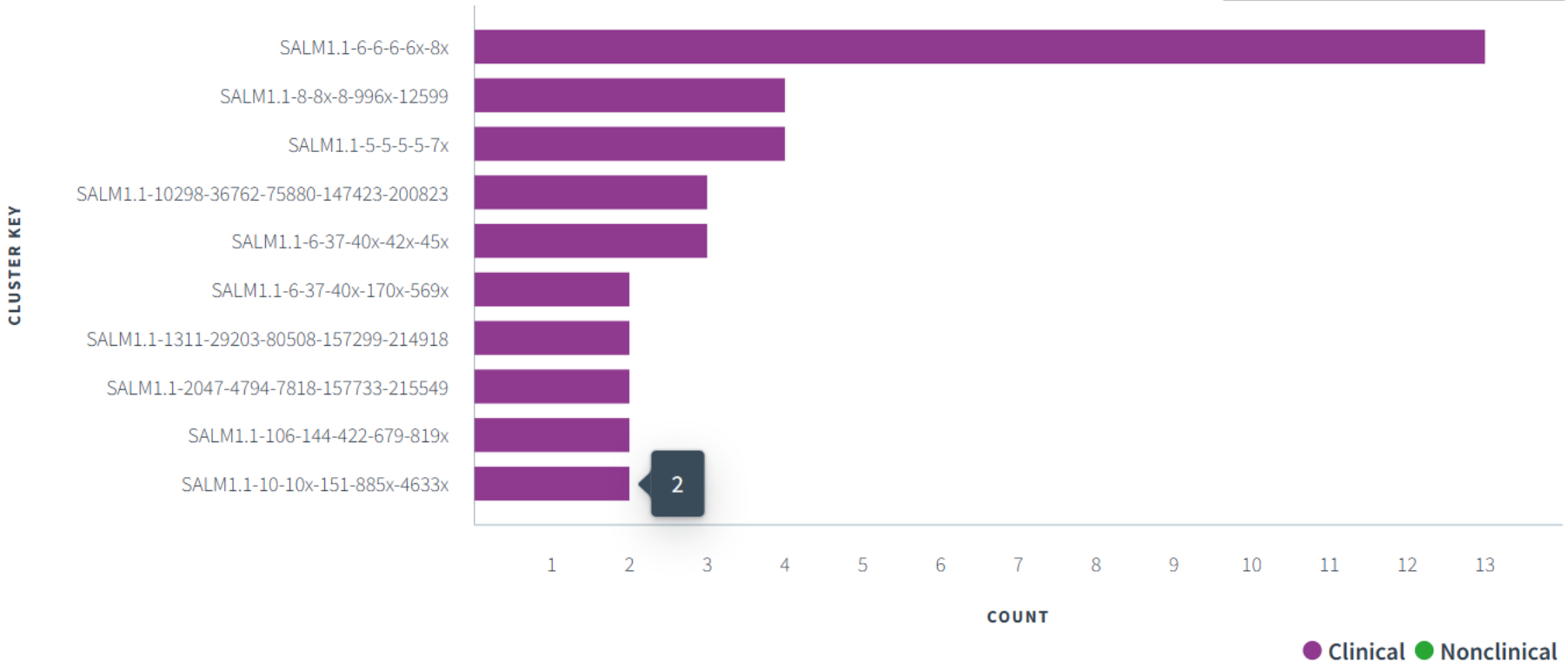
SEDRIC Cluster Detection

- On main page, select SEDRIC, then Cluster Detection
- Settings
 - 3 month window with two isolates minimum
 - Min. of 4 allele digits for Salmonella, STEC
 - Min. of 5 allele digits for Salmonella for Enteriditis, Javiana, Newport, Typhimurium, I4i-, Campylobacter
 - X codes – Checking NCBI for these to identify sub-clusters, SNP threshold for x code clusters
- Threshold for investigation may increase/decrease based on season and capacity
 - Highly clonal serotypes/species = higher threshold

SEDRIC Cluster Detection

Detected Clusters

Stratify by: Clinical/Nonclinical



SEDRIC Cluster Detection

Selected Isolates

☐	Key	Outbreak	Allele Code	Serotype	WGS ID	Isolation Date	Organism ID	Sex	Age	Source Type	County
☐	TN__N26E103955-01		SALM1.1-5.5.5.5.7x.138508	Newport	PNUSAS575087	2026-04-26		M	67	Human	Hamblen
☐	TN__N26E105483-01		SALM1.1-5.5.5.5.7x.138508	Newport	PNUSAS575262	2026-04-29		F	50	Human	Hamblen
☐	TN__N26E105490-01		SALM1.1-5.5.5.5.7x.138508	Newport	PNUSAS575263	2026-04-27		F	74	Human	Hamblen
☐	TN__N26E108165-01		SALM1.1-5.5.5.5.7x	Newport	PNUSAS576235	2026-04-30		M	65	Human	Sevier

Pros and cons

- Cons
 - Fewer clusters detected compared to PN 2.0
 - Typically highly clonal species/serotypes e.g. Enteriditis
 - Some shorter allele codes can be missed
 - Cannot detect *Shigella*, non-jejuni *Campylobacter* clusters
- Pros
 - Easier access than PN 2.0!
 - Higher threshold, lower number of clusters to investigate
 - Can include additional states, demographic filters

NCBI and SEDRIC Investigation Summary

NCBI

- Search using PNUSA #s/WGS ID
- SNP-based dendrogram trees
- Used to find related national and environmental isolates (“neighbors”)
- Can “watch” isolate and get emails when new related isolates are added
- No state or demographic information, public access

SEDRIC

- Limited access
- Search using PNUSA numbers found in NCBI, serotype, or allele code
- No dendrogram trees; use cluster detection application with allele distance
- Great for finding related national, historical, and environmental isolates by allele code/serotype (if uncommon)
- Demographic, state and sometimes exposure information are available
- Find state or national contacts to find for additional data

Knowledge Check

What information can you find in SEDRIC?

- A. Basic demographic data of isolates
- B. Contact information
- C. Isolates with a specific allele code
- D. All of the above
- E. None of the above

Knowledge Check

Connect the data system with units of genetic difference.

PulseNet — Alleles

NCBI Allele Codes

SEDRIC SNPs

NORS in SEDRIC

View As ▾



SEDRIC

SYSTEM FOR ENTERIC DISEASE RESPONSE,
INVESTIGATION, AND COORDINATION

Contact ▾

As a reminder, it is not permissible to publish, present, or share data from SEDRIC with persons outside public health and food regulatory agencies (people who are not SEDRIC users).
If you would like to share data, please contact sedric@cdc.gov.

National Outbreak Reporting System (NORS)



NORS Home

View Existing Reports, Create New Reports



NORS Bulk Upload

Upload or Edit Reports in Bulk



NORS Administrator Dashboard

Query NORS Administration Data



NORS Export Dashboard

Query or Export NORS Data



NORS Training and Guidance Documents

NORS Training and Guidance



Need help with NORS specific questions?

Contact NORSAdmin@cdc.gov

USER RESOURCES



Return to SEDRIC Home



Public Health Contacts



External Partners Database



Email sedric@cdc.gov

PUBLIC FACING PRODUCTS



BEAM Dashboard

National Environmental Assessment Reporting
System

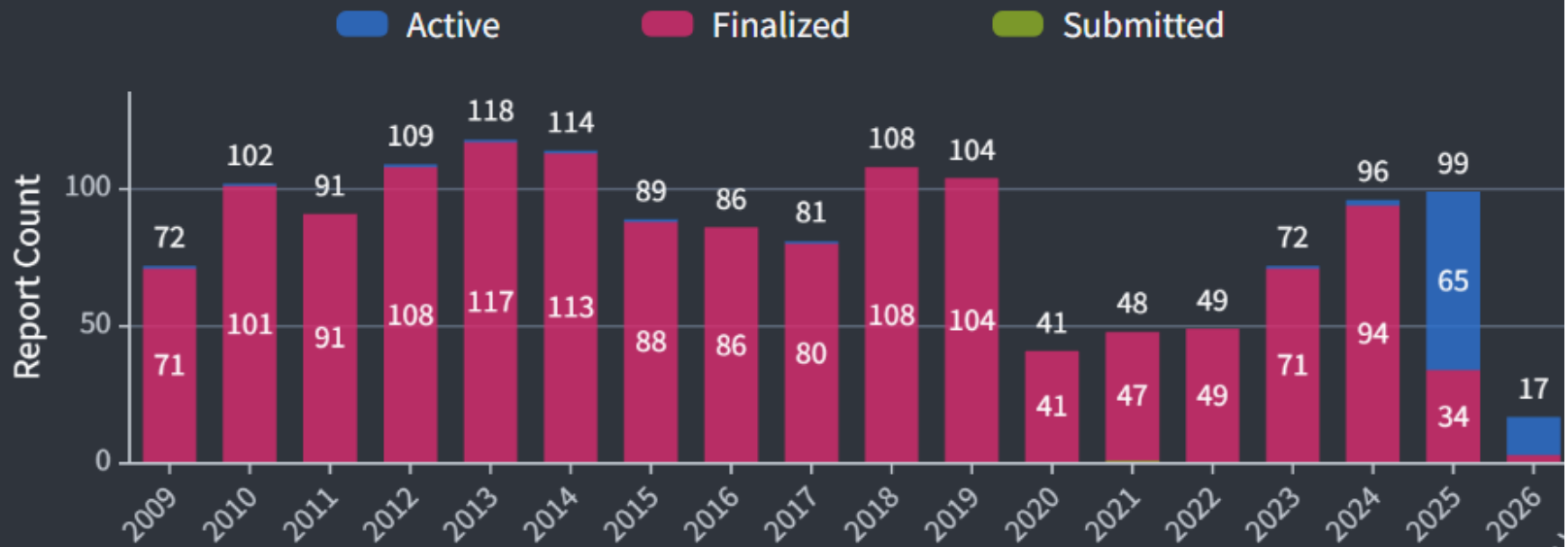
Algal Bloom System

HABS
ALTHarmful Algal Bloom System

NORS in SEDRIC

NORS Home

Agency Name





2026 Breakfast Chain Outbreak of *Salmonella* Thompson

TM

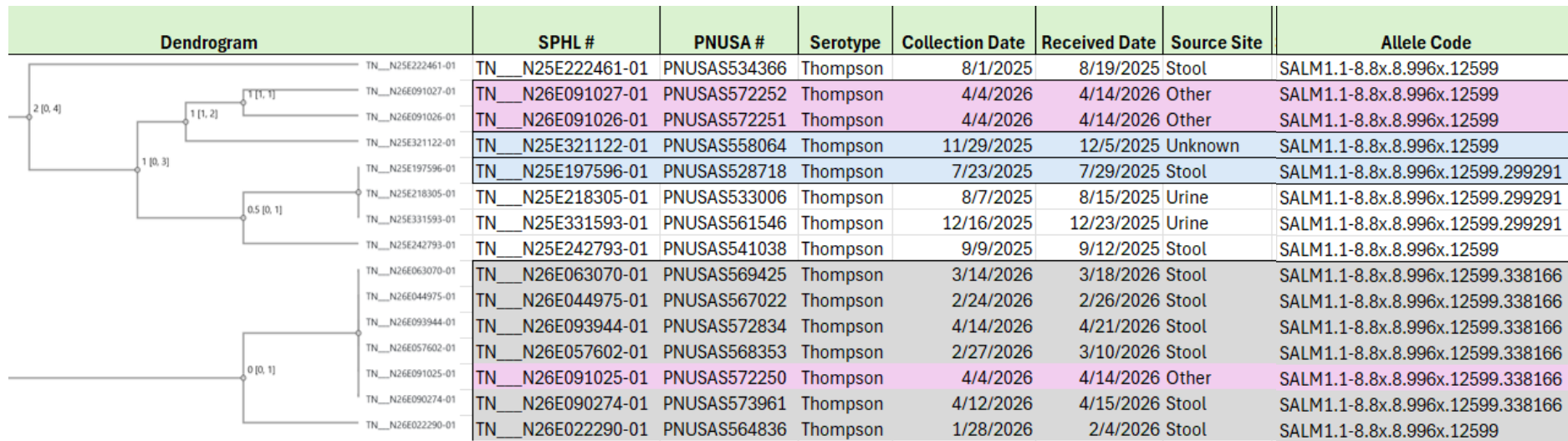
Salmonella Thompson

Dendrogram	SPHL #	PNUSA #	Serotype	Collection Date	Received Date	Source Site	Allele Code
	TN_N26E063070-01	PNUSAS569425	Thompson	3/14/2026	3/18/2026	Stool	SALM1.1-8.8x.8.996x.12599.338166
	TN_N26E044975-01	PNUSAS567022	Thompson	2/24/2026	2/26/2026	Stool	SALM1.1-8.8x.8.996x.12599.338166
	TN_N26E093944-01	PNUSAS572834	Thompson	4/14/2026	4/21/2026	Stool	SALM1.1-8.8x.8.996x.12599.338166
	TN_N26E057602-01	PNUSAS568353	Thompson	2/27/2026	3/10/2026	Stool	SALM1.1-8.8x.8.996x.12599.338166
	TN_N26E091025-01	TN_N26E091025-01	Thompson	4/4/2026	4/14/2026	Other	SALM1.1-8.8x.8.996x.12599.338166
	TN_N26E090274-01	PNUSAS573961	Thompson	4/12/2026	4/15/2026	Stool	SALM1.1-8.8x.8.996x.12599.338166
	TN_N26E022290-01	PNUSAS564836	Thompson	1/28/2026	2/4/2026	Stool	SALM1.1-8.8x.8.996x.12599
	TN_N26E022290-01	PNUSAS564836	Thompson	1/28/2026	2/4/2026	Stool	SALM1.1-8.8x.8.996x.12599

Salmonella Thompson



Salmonella Thompson



- Neighbors within 32 SNPS since 2025
 - Lots of Mattoon IL...



by: Molly Sweeney.

Posted: May 27, 2025 / 01:11 PM CDT
Updated: May 27, 2025 / 09:22 PM CDT

Advertisement

SHARE

The Coles County Health Department and the Illinois Department of Public Health are investigating the outbreak, dating back to May 23. The health department said five of the individuals reported eating at the [REDACTED] in Mattoon.



PulseNet 2.0

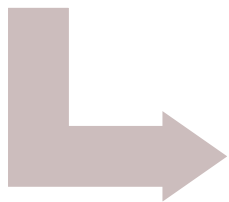
Benefits of Using PN2.0

Cluster Detection and Monitoring	Epidemiologists Review
Create dendrograms and matrices for cluster visualization	Integrate genomic + epidemiological + clinical data
View isolates and clusters all at once	Can identify and exclude likely household clusters
Real-time isolate additions to clusters	Track recurring/reopening clusters
Detects <i>Shigella</i> and non- <i>Campylobacter jejuni</i> clusters	May help with standardized cluster review
Improve situational awareness	Supports workload sharing with lab

Steps to Access PN2.0 for Epidemiologists

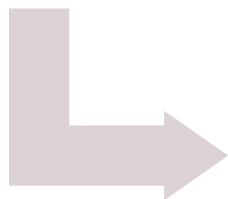
Request Access

- Ask a laboratorian to email pulsenet@cdc.gov
- Request Read Only Certification



Complete Agreements

- Need SAMS access
- Need PulseNet Sharepoint Access
- Data Use Agreement



Pass Quiz

- Review user guide and practice in test environment
- Complete open book quiz

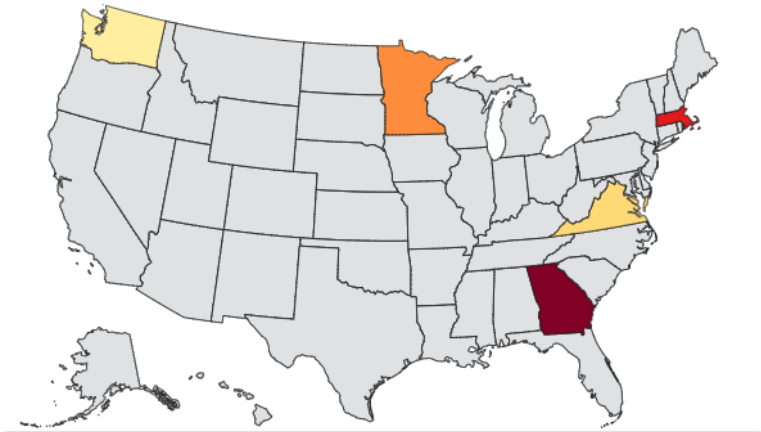


Consult SPHL

- Laboratorians can train on current process
- Can create new or share existing views

Other AMD Resources

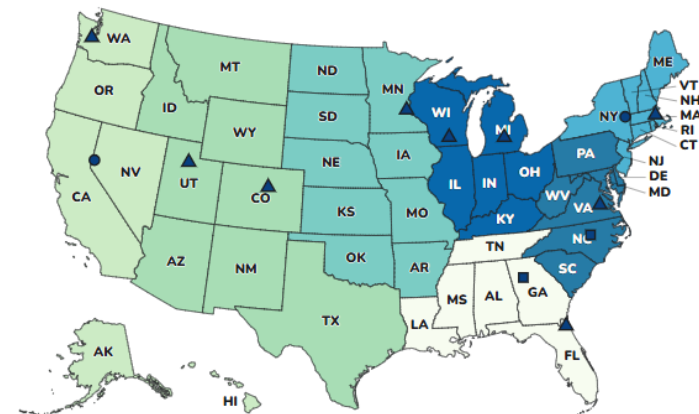
Pathogen Genomics Centers of Excellence



Principal Investigators

- Georgia Department of Public Health
- Massachusetts Department of Health
- Minnesota Department of Health
- Virginia Division of Consolidated Laboratory
- Washington State Department of Health

Bioinformatics Regional Resource Centers (BRRs)



U.S. territories

AS GU MP PR VI

Freely associated states

FM MH PW

Knowledge Check

Epis must have SAMS access and pay for a software license to access PulseNet 2.0

A. TRUE

B. FALSE

Final Session

- Friday June 12 12-1:30PM EST
- Please complete survey!
- Topics
 - Hot Topics
 - SatScan
 - Changes to CIDTs, funding
 - Communication
 - Communicating WGS results
 - Standard phrasing

Questions?