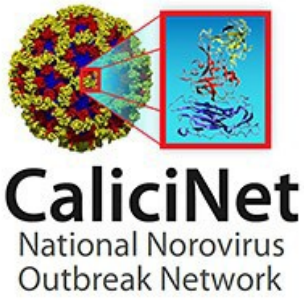
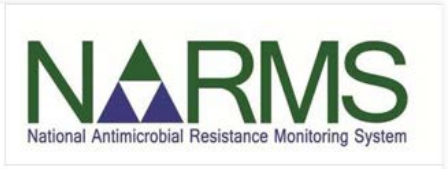
National Outbreak Reporting System

(NORS)

User Training Document:

Integrated CDC Lab Systems





National Outbreak Reporting System (NORS)

User Training Document: Integrated CDC Lab Systems

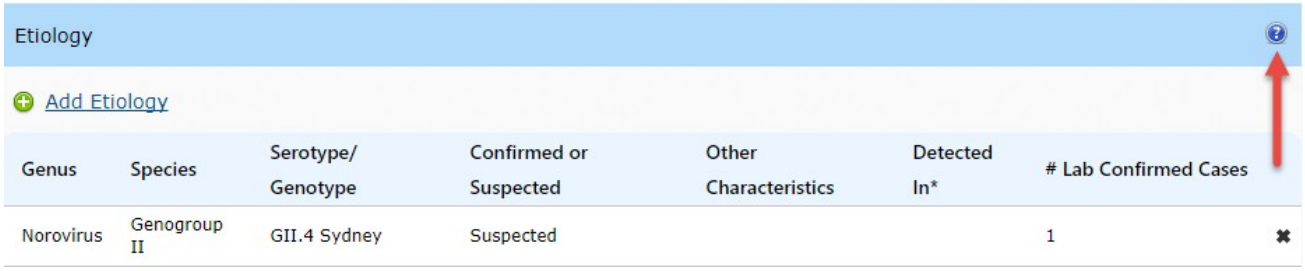
CONTENTS

INTRODUCTION

This training document provides instructions on adding laboratory data into NORS from two integrated CDC laboratory systems:

1) CaliciNet
2) PulseNet

The document assumes you have already read the NORS User Training Document – General Section, Etiology, and Attachments Tabs. Additional information on specific questions can also be found by clicking the blue button with the question mark near the top of each question box within the NORS interface.



OVERVIEW OF FEATURES

CaliciNet Data Integration:

CaliciNet etiology data are *imported* into a NORS report, meaning CaliciNet data that are added to the etiology section of a NORS report are a copy of the data in CaliciNet and will be editable by a NORS user.

CaliciNet strain data are *linked* to the NORS isolate table, meaning CaliciNet strain data that are added to the isolate section of a NORS report are linked directly to the CaliciNet database and will *not* be editable by a NORS user.

PulseNet Data Integration:

PulseNet isolate data are *linked* to a NORS report, meaning PulseNet data that are added to a NORS report will have a direct link established with the PulseNet database and will *not* be editable by a NORS user.

	CaliciNet Integration Features	**PulseNet Integration Features**
Matching etiology data are automatically available for review and import within a NORS report	✓	**Not applicable**
Matching etiology data are editable once added to NORS report	✓	**Not applicable**
Matching isolate data are automatically available for review and linking within a NORS report	✓	✗
Isolate data must be manually searched for review and linking within a NORS report	✗	✓
Isolate table data are automatically updated when CDC lab system data are updated	✓	✓
Automated nightly pull of new and updated data from CDC lab systems into NORS	✓	✓
NORS Home page notifications of new and updated matched data from CDC lab systems	✓	✗
NORS Reports page search option for status of CDC lab system data	✓	✗
CDC lab system data can be imported using NORSDirect	✓	✓

SECTION I

The NORS/CaliciNet integration allows users to add or link norovirus strain data from a CaliciNet record to a matching NORS record. CaliciNet reports are automatically matched to NORS records in which all of the following apply:

- NORS Reporting Site matches the CaliciNet Outbreak State,
- NORS State ID or CDC ID matches the CaliciNet NORS Number or State Outbreak Code, and
- First ill date in NORS is within 90 days of the Outbreak Date reported to CaliciNet.

Once linked to a NORS report by a NORS user, norovirus strain data in the Isolates table will be automatically updated on a nightly basis to reflect any changes made to the CaliciNet record. Etiology data from CaliciNet may also be added to a NORS report, but unlike isolate data, etiology data are not linked and can be edited within the NORS report.

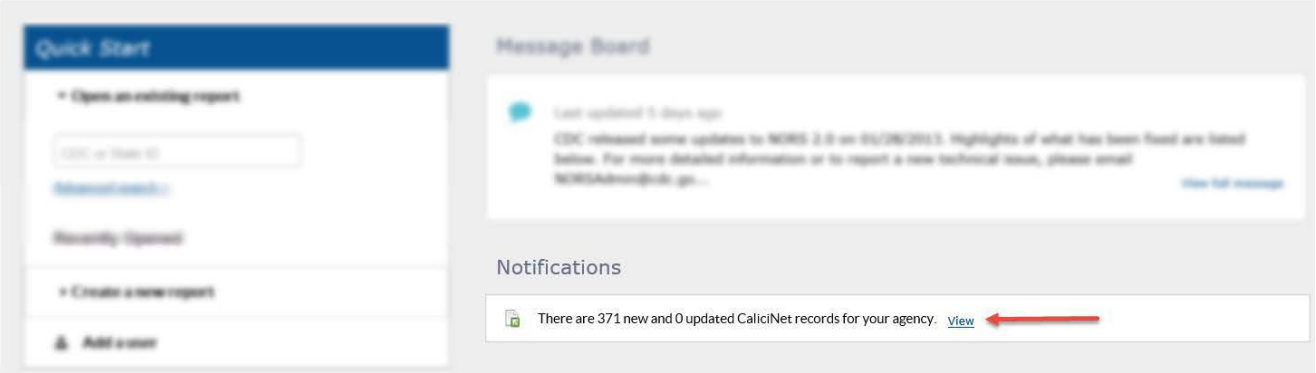
CaliciNet

CaliciNet is a national surveillance network of federal, state, and local public health laboratories that perform norovirus diagnostic testing for outbreaks. CDC launched CaliciNet in 2009 to collect information on norovirus strains associated with gastroenteritis outbreaks in the United States. This network plays an important role in monitoring circulating norovirus strains, identifying newly emerging norovirus strains, and using these data to potentially link norovirus outbreaks to a common source. More information on CaliciNet can be found on the website https://www.cdc.gov/norovirus/reporting/calicinet/index.html.

SEARCHING FOR MATCHED RECORDS

Users can search for matched records in NORS and will have the option to import the etiology and link norovirus strain data from CaliciNet into an existing NORS record. The “Notifications” section of the NORS homepage will display the number of NORS records that have newly matched CaliciNet data available. Clicking on the “View” link in this section will direct users to the Reports page, where new and updated CaliciNet records within the user’s agency will be listed by default.

NORS Home



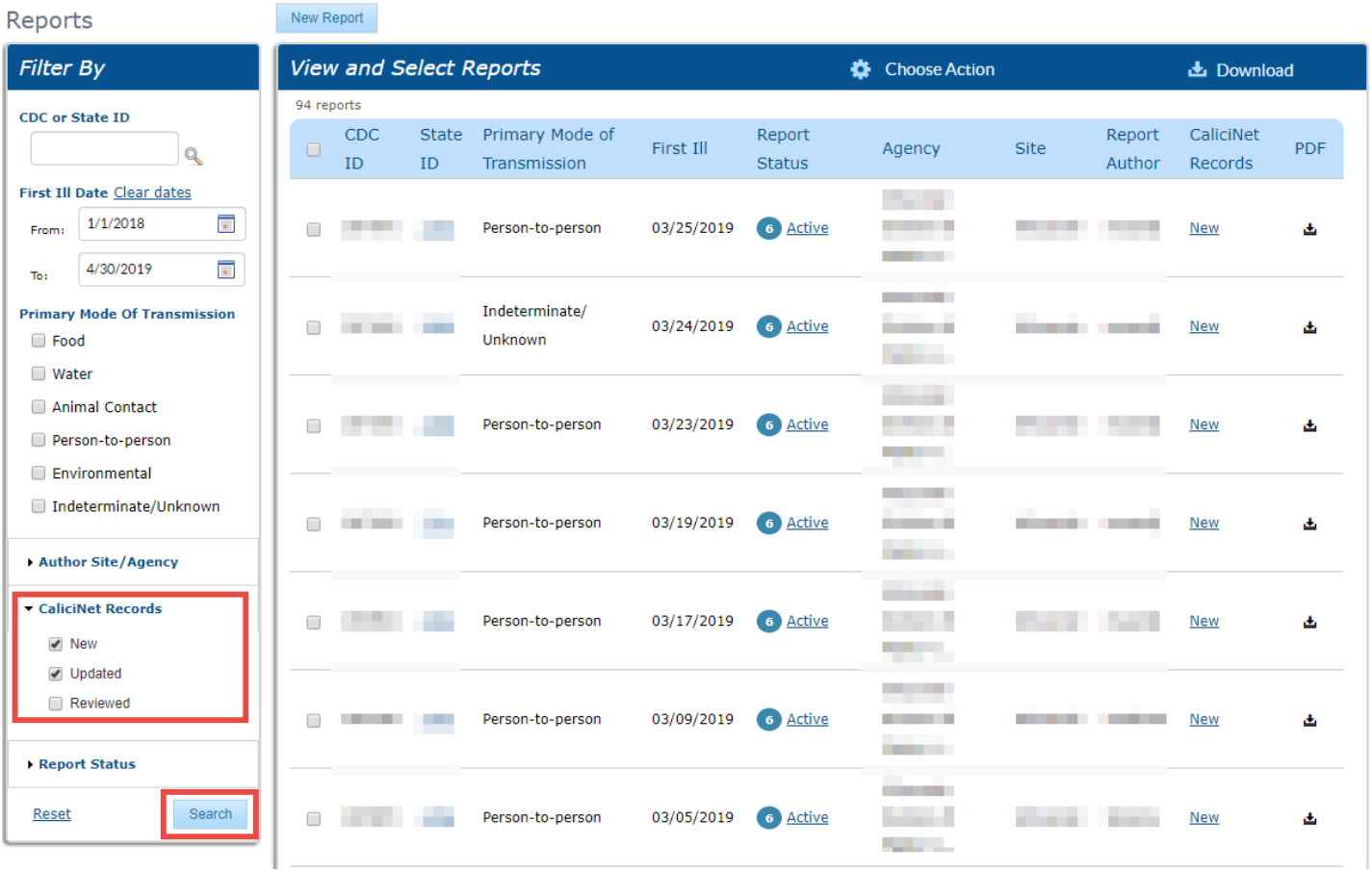
If a user navigates directly to the Reports page or by clicking on the "Advanced search" link in the Quick Start menu on the home page, matching CaliciNet records will not be listed by default. Users must select the checkboxes in the CaliciNet Records section of the "Filter By" navigation bar and click "Search."

Filtering by CaliciNet Records will return NORS reports that fall into the following three categories:

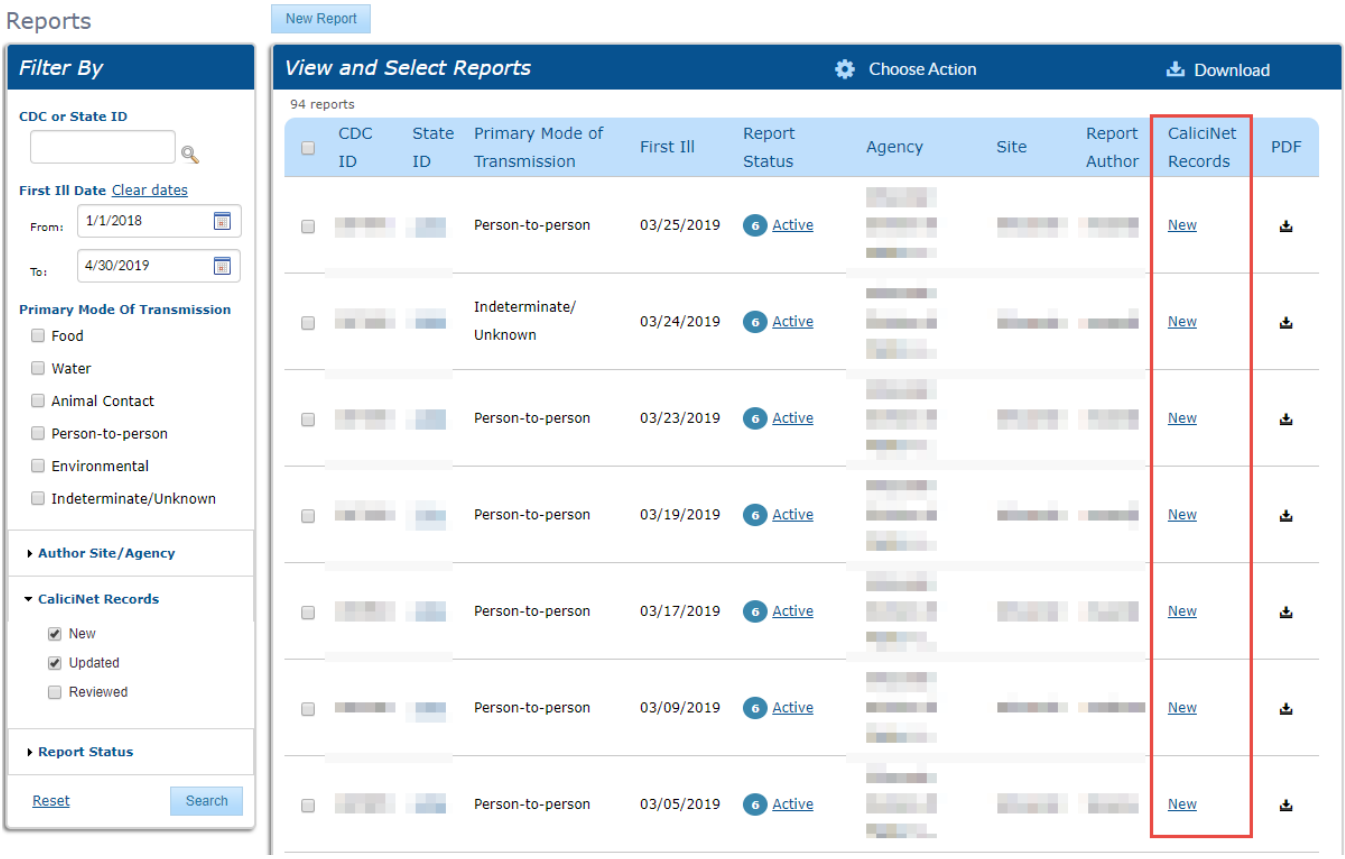
1) *New CaliciNet Records*: NORS reports that have been newly matched to a CaliciNet record, for which no action has yet been taken (i.e., the user has not reviewed, added, or linked the CaliciNet data).

2) *Updated CaliciNet Records*: NORS reports with matched CaliciNet data, for which updates to the corresponding CaliciNet records have occurred since the data was reviewed, added, or linked (e.g., additional sequences were uploaded to CaliciNet).

3) *Reviewed CaliciNet Records*: NORS reports with matched CaliciNet data that have already been reviewed, added, or linked to the NORS record.



The search results will display all records that fit the desired search parameters. In the “CaliciNet Records” column, the search results will indicate whether a NORS record has newly matched CaliciNet data for review (New), updated CaliciNet data for review (Updated), or if matched CaliciNet data have already been reviewed, added, or linked (Reviewed). Users can click on any of the column headers in the results box (e.g., Primary Mode of Transmission, First Ill) to sort on that column.



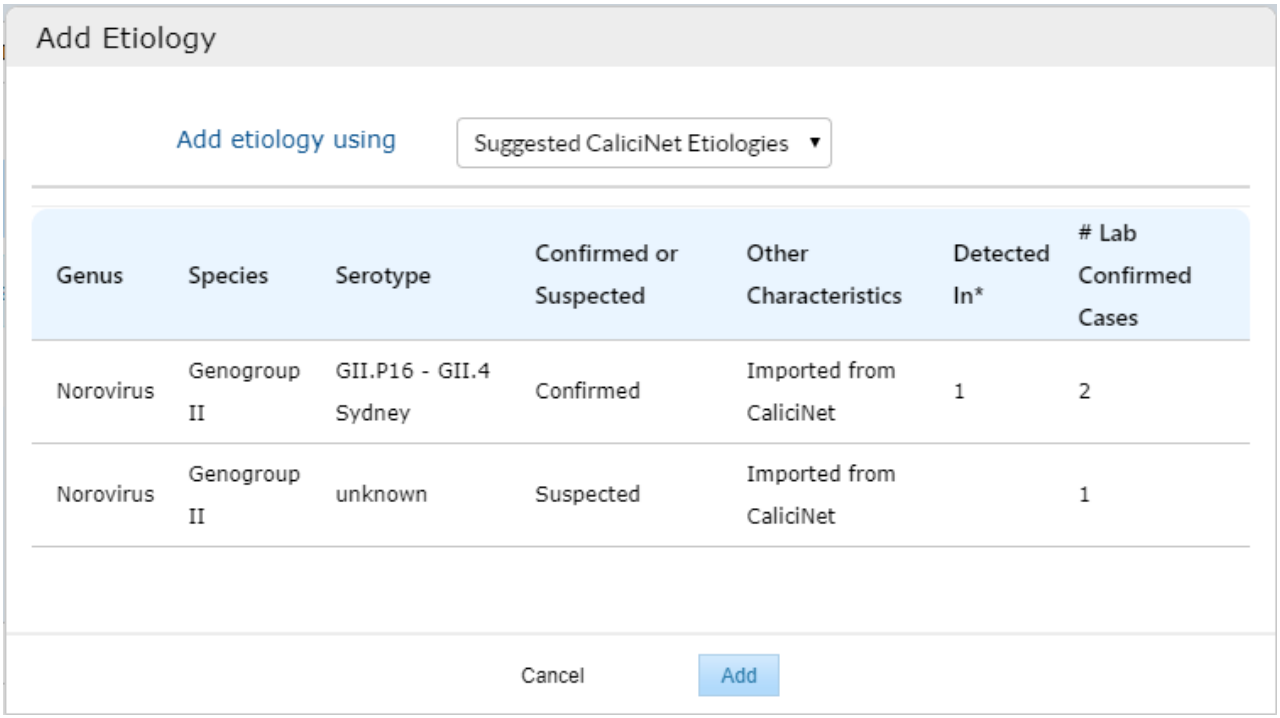
To open the NORS record to review matched CaliciNet data, click on the “New”, “Updated”, or “Reviewed” link in the CaliciNet Records column that corresponds to the NORS report for which the user would like to review the data. This will open the report directly to the Etiology section. Alternatively, users may click on the State ID of the desired report; this will open to the General section of the report, from which users can navigate to the Etiology section.

REVIEWING NORS ETIOLOGY DATA

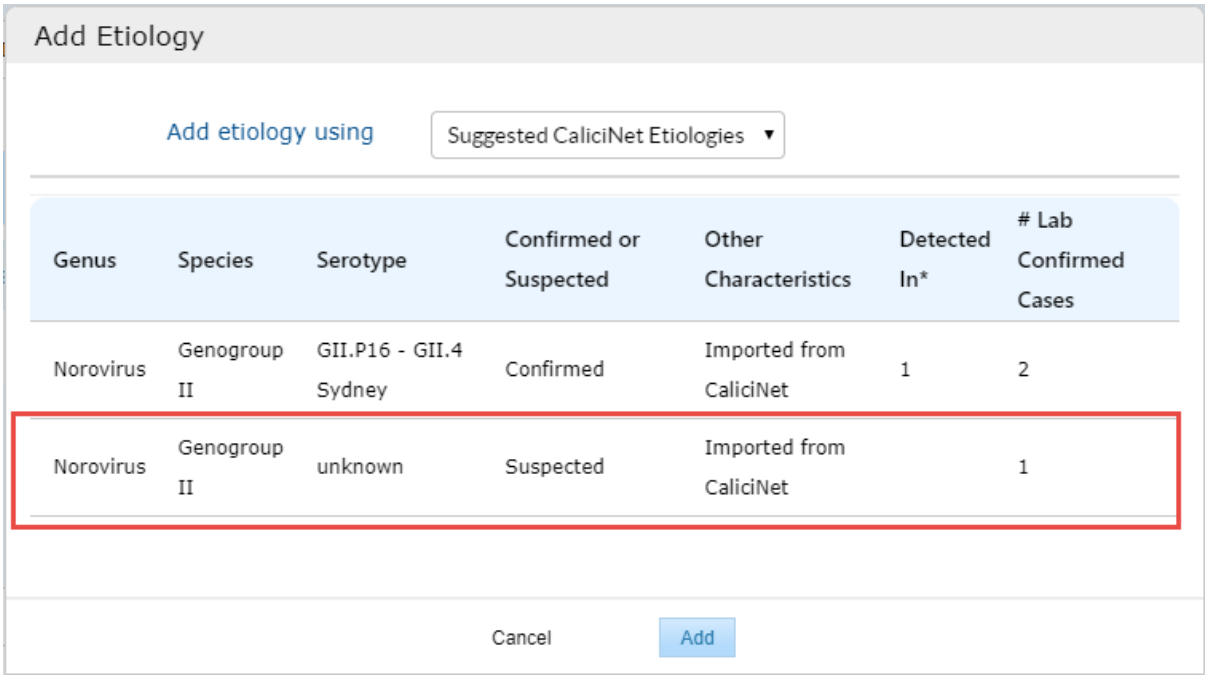
If the NORS record has been newly matched to data from CaliciNet, a notification will appear above the "Add Etiology" button indicating that suggested CaliciNet etiologies exist. To view the suggested CaliciNet etiologies, click the "Review" link.

The Add Etiology pop-up will open showing the suggested CaliciNet etiologies that have been formatted to match the NORS Etiology table. All etiology data imported from CaliciNet will include "Imported from CaliciNet" under the "Other Characteristics" field by default for foodborne, animal contact, person-to-person, environmental and unknown modes of transmission.

The suggested CaliciNet etiologies will list each genotype as confirmed or suspected based on the number of positive stool specimens in CaliciNet that match the listed norovirus genotype. In the example below, the number of lab confirmed cases in the first suggested CaliciNet etiology is two, so the first genotype (GII.P16 – GII.4 Sydney) is listed as "Confirmed." If the number of lab confirmed cases as reported to CaliciNet is less than two, the genotype will be listed as "Suspected." If norovirus strain data from food, water, or other environmental samples has been entered into CaliciNet, the Detected In field will be updated to reflect the appropriate sample type, and the number of lab confirmed cases will not include those samples.



If the number of real-time positive specimens entered into CaliciNet is greater than the number of sequenced specimens, the suggested CaliciNet etiologies will display an additional row containing information on positive but not sequenced specimens. These specimens will include the Genus (Norovirus) and the Species (e.g., Genogroup II), and will list the serotype as "unknown." In the example below, 3 total specimens were obtained, tested positive by RT-PCR for norovirus GII, and had information entered into CaliciNet. Two of the specimens were sequenced as GII.P16 – GII.4 Sydney. The remaining specimen was positive for norovirus GII but could not be sequenced.



The data shown in the suggested CaliciNet etiologies cannot be edited or deleted before being added to the NORS record. If there is an error in the CaliciNet data, please contact NORSAdmin@cdc.gov.

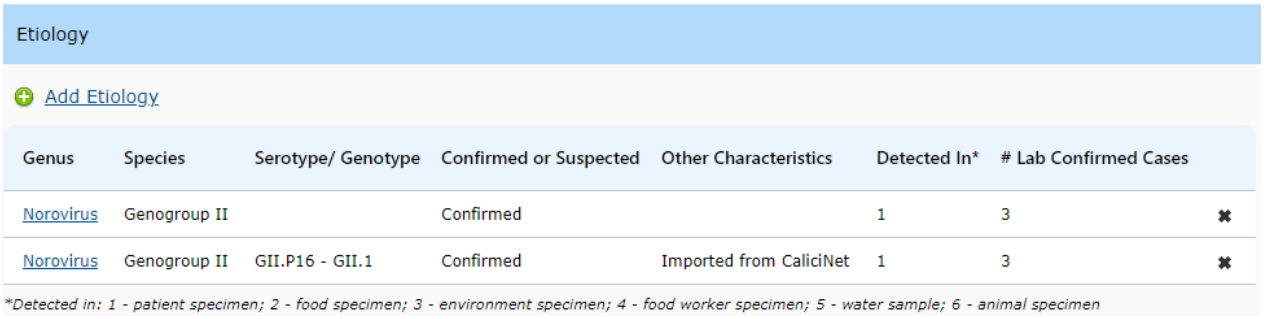
Once the CaliciNet data have been reviewed, users can choose to either add or ignore the CaliciNet etiologies.

ADD CALICINET ETIOLOGIES

Selecting the option to "Add" will append the suggested CaliciNet etiologies to the NORS Etiology table without affecting the existing data in the NORS Etiology table. The CaliciNet data will appear as a new row in the NORS Etiology table. The imported CaliciNet etiology data can be edited by clicking on the row, as one would with any other NORS etiology data.

When adding CaliciNet data to a NORS record, care should be taken to avoid data duplication. In the example shown, the user previously entered Norovirus Genogroup II as an etiology in NORS. The appended CaliciNet data provide further detail, showing that the genotype was GII.P16 – GII.1.

If these results refer to the same three specimens, the user should delete the previously entered etiology information in order to avoid duplication. However, if three specimens were genotyped as GII.P16 – GII.1 and three additional specimens were RT-PCR positive for Genogroup II but not sequenced, the user should keep both entries**.**



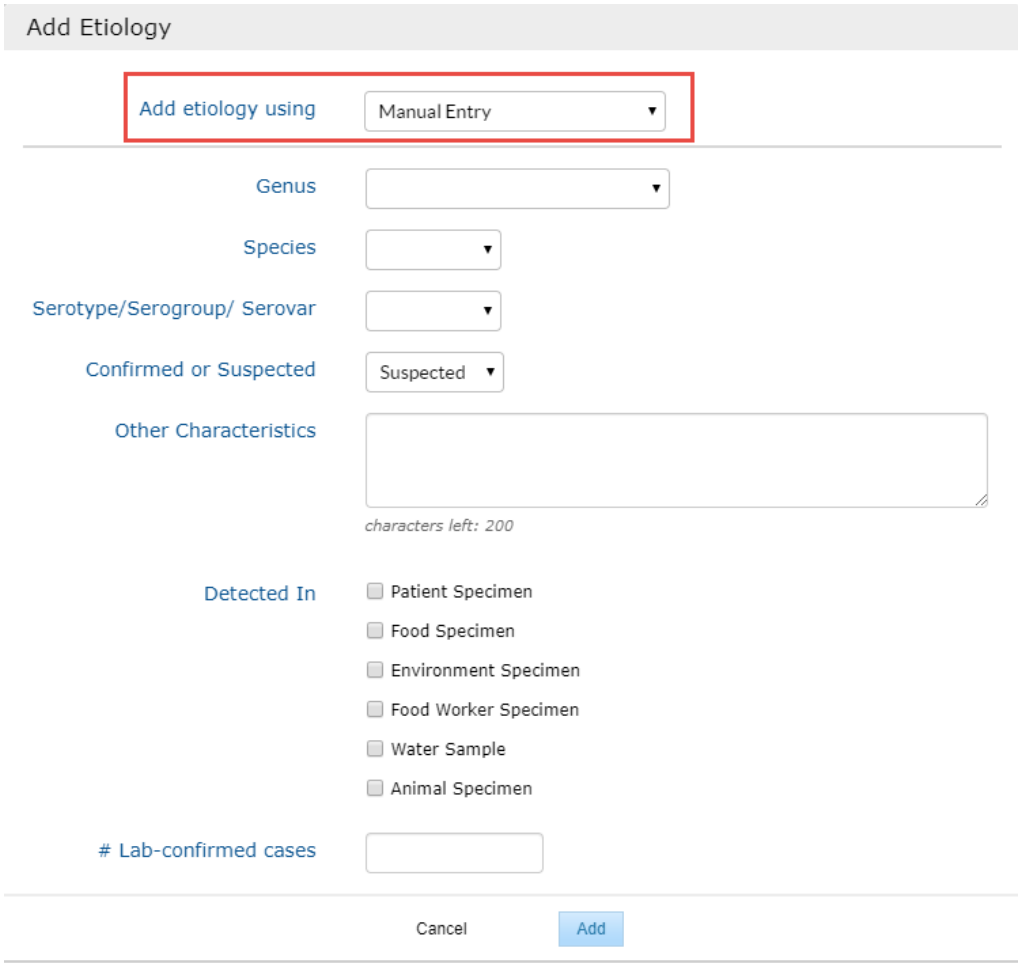
IGNORE CALICINET ETIOLOGIES

After reviewing the matched CaliciNet data, a user may decide not to include the information in the NORS report. In this case, clicking on the "Cancel" button will close the Add Etiology pop-up, and the NORS Etiology table will remain unchanged. The CaliciNet record will be marked as "Reviewed" and the message "There are # suggested CaliciNet etiologies available to add" will appear under the etiology section, indicating the number of suggested CaliciNet etiologies that still exist if no other etiologies have been entered.

To view the suggested CaliciNet etiologies again, select the "Add Etiology" button and select "Suggested CaliciNet Etiologies" from the "Add etiology using" drop down menu. The user may again elect to add or ignore the CaliciNet data shown.

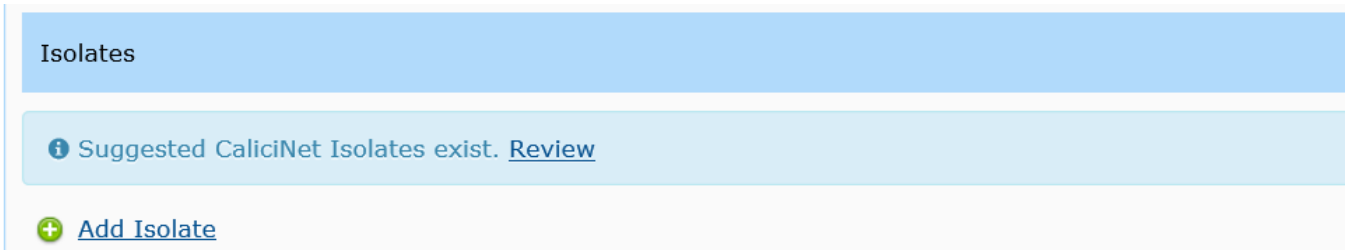
Once a user has clicked one of the above options, the Add Etiology pop-up will close. The NORS Etiology table will include the CaliciNet data as part of the NORS report; these data can be edited as well as downloaded as part of the NORS record. The CaliciNet record will be marked as "Reviewed" in the NORS Reports page.

If additional specimens tested positive for norovirus by RT-PCR but the information was not submitted to CaliciNet, the user may wish to manually add additional rows to the NORS Etiology table to note the additional laboratory testing information, after reviewing the suggested CaliciNet etiologies. This can be done by clicking on “Add Etiology” and selecting “Manual Entry” from the dropdown, then entering any additional etiology data.

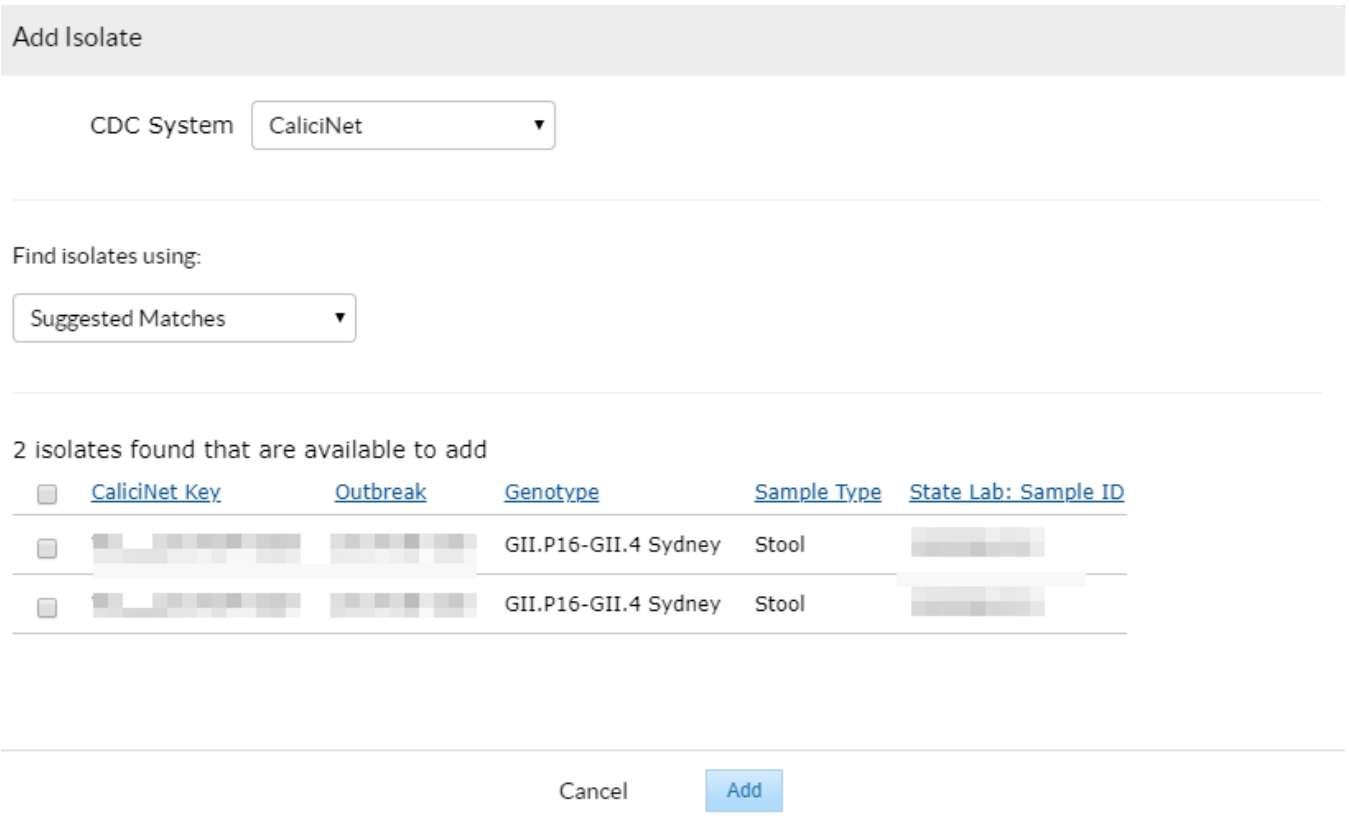


REVIEWING NORS ISOLATES DATA

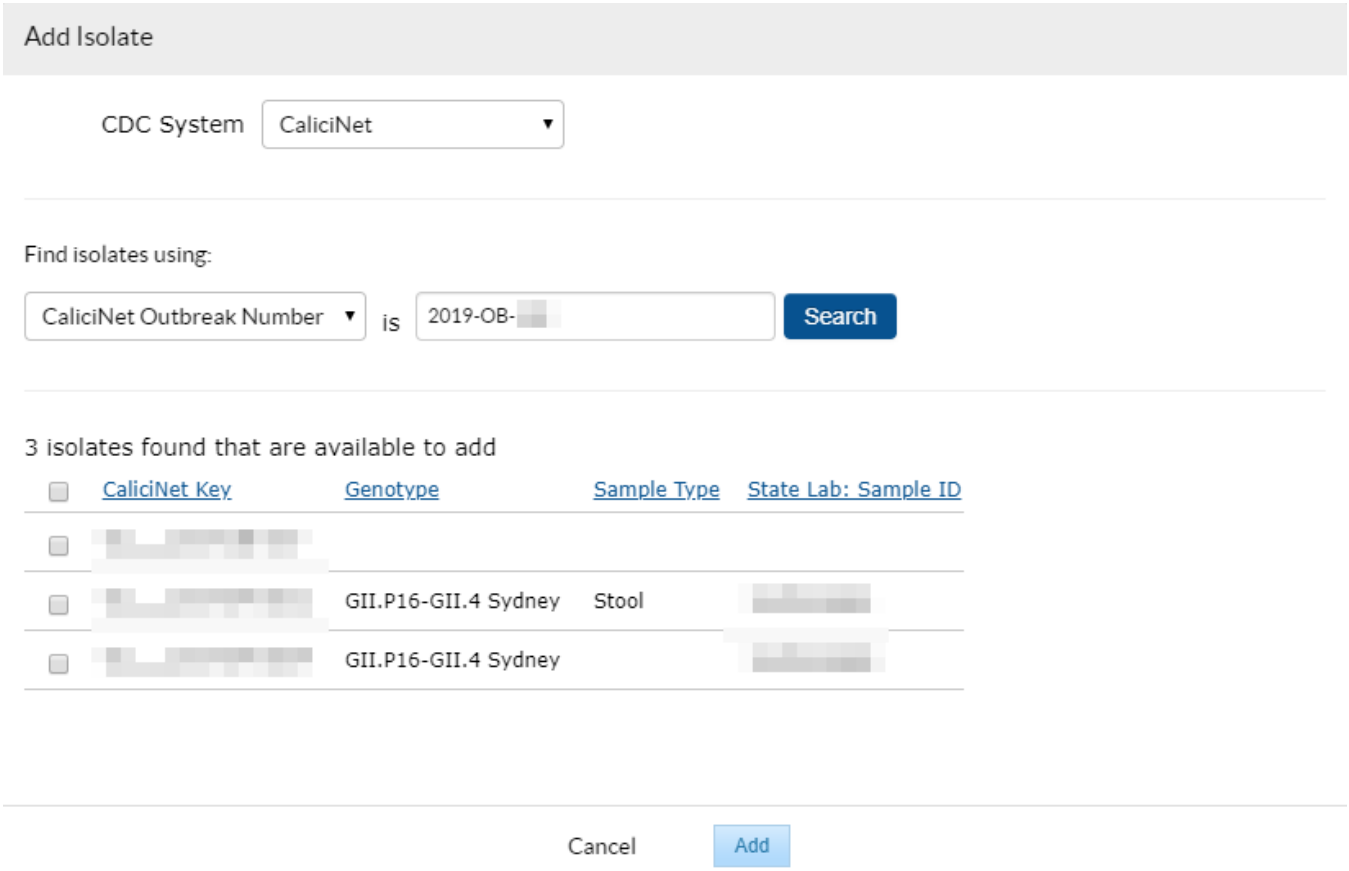
The Isolates table in the General Etiology section of a NORS report can also be linked to matching CaliciNet data. If the NORS record has been matched to data from CaliciNet, a message will appear indicating that suggested CaliciNet isolates exist.



To view the matched data from CaliciNet, click the "Review" button to open up the Add Isolate pop-up.



Users may also search for matched CaliciNet records by the CaliciNet Outbreak Number by selecting "CaliciNet Outbreak Number" under the "Find isolates using" drop down menu. Users can then type in a CaliciNet outbreak number and clicking "Search". Only CaliciNet data that are associated with the user's reporting site and with a CaliciNet outbreak date within 90 days of the NORS first ill date will appear in the search results.



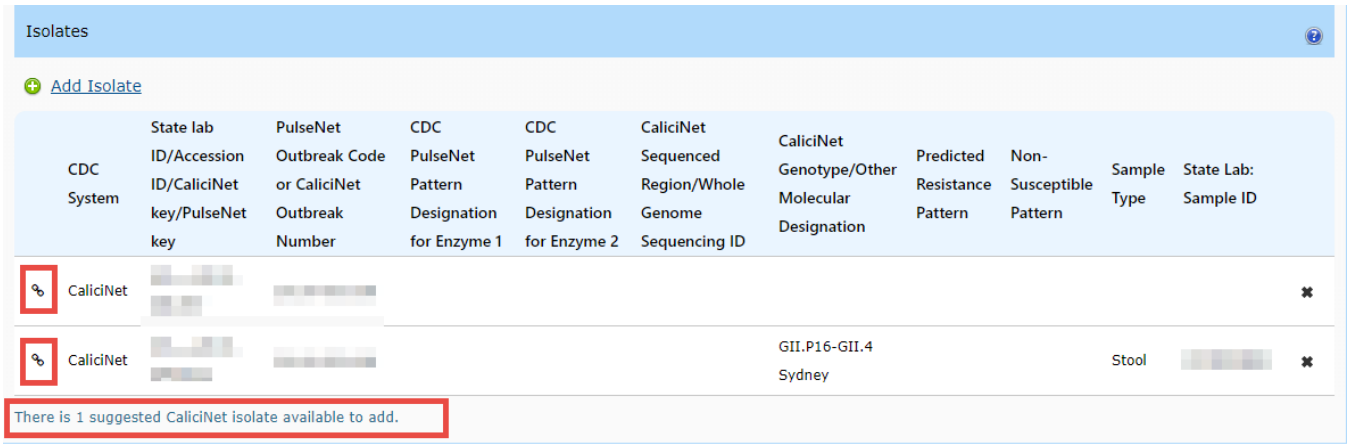
The suggested isolates table will contain norovirus strain data from CaliciNet that have been formatted to match the NORS Isolates table, including the fields Sample Type and State Lab: Sample ID.

Data in the Add Isolates table cannot be edited or deleted. If there is an error in the CaliciNet data, please contact NORSAdmin@cdc.gov.

Users can add or ignore the CaliciNet strain data shown in the Add Isolate pop-up:

- *Add* – Clicking this option will add the selected CaliciNet strain data to the NORS isolates table. Users can select individual rows to add using the checkboxes for each row or all rows by selecting the top checkbox.
- *Cancel* – Clicking this option will close the Add Isolate pop-up without adding any information to the NORS Isolates table.

Once the user has clicked one of the above options, the Add Isolate pop-up will close, and the linked isolates will appear in the NORS Isolates table. Similar to the PulseNet integration, explained in Section II below, CaliciNet strain data cannot be manually entered into the isolates table nor can they be edited after being added to the NORS record. All changes made in the CaliciNet record will be automatically updated nightly in the NORS record. This link is indicated by the link symbol in the isolates table.



If there are remaining suggested CaliciNet strains that have not been linked to the NORS record, a message will appear underneath the isolates table with the number of isolates still available to add. These records can be viewed by clicking the “Add Isolate” button and selecting “CaliciNet” as the CDC system.

SECTION II

The NORS/PulseNet integration allows users to link isolate information to their NORS report directly from the PulseNet national databases. Additionally, resistance data from CDC's National Antimicrobial Resistance Monitoring System (NARMS) will be linked to a NORS report if that isolate matches based on the PulseNet Key. Once linked to a NORS report, isolate information will be automatically updated on a nightly basis if any changes are made to that isolate by either PulseNet or NARMS. Resistance data displayed will include the predicted resistance pattern and any antimicrobial susceptibility testing (AST) results if the isolate was found to be intermediate or resistant to a particular drug.

PulseNet

PulseNet is a network of local, state, and federal public health labs that began in 1996. PulseNet detects cases of related illnesses through pulsed-field gel electrophoresis (PFGE) and whole genome sequencing (WGS) to rapidly identify potential foodborne, animal contact, and some waterborne outbreaks. More information on PulseNet can be found on their website: https://www.cdc.gov/pulsenet/

NARMS

NARMS is a collaboration among state and local public health departments, CDC, the U.S. Food and Drug Administration (FDA), and the U.S. Department of Agriculture (USDA) that was established in 1996. NARMS tracks changes in the antimicrobial susceptibility of certain enteric bacteria found in ill people (CDC), retail meats (FDA), and food animals (USDA) in the United States. More information on NARMS can be found on their website: https://www.cdc.gov/narms/

LINKING PULSENET ISOLATE DATA TO NORS

NORS users can search for isolates within the PulseNet database in real-time based on:

I. **PulseNet Key**
   OR
II. **PulseNet Outbreak Code**

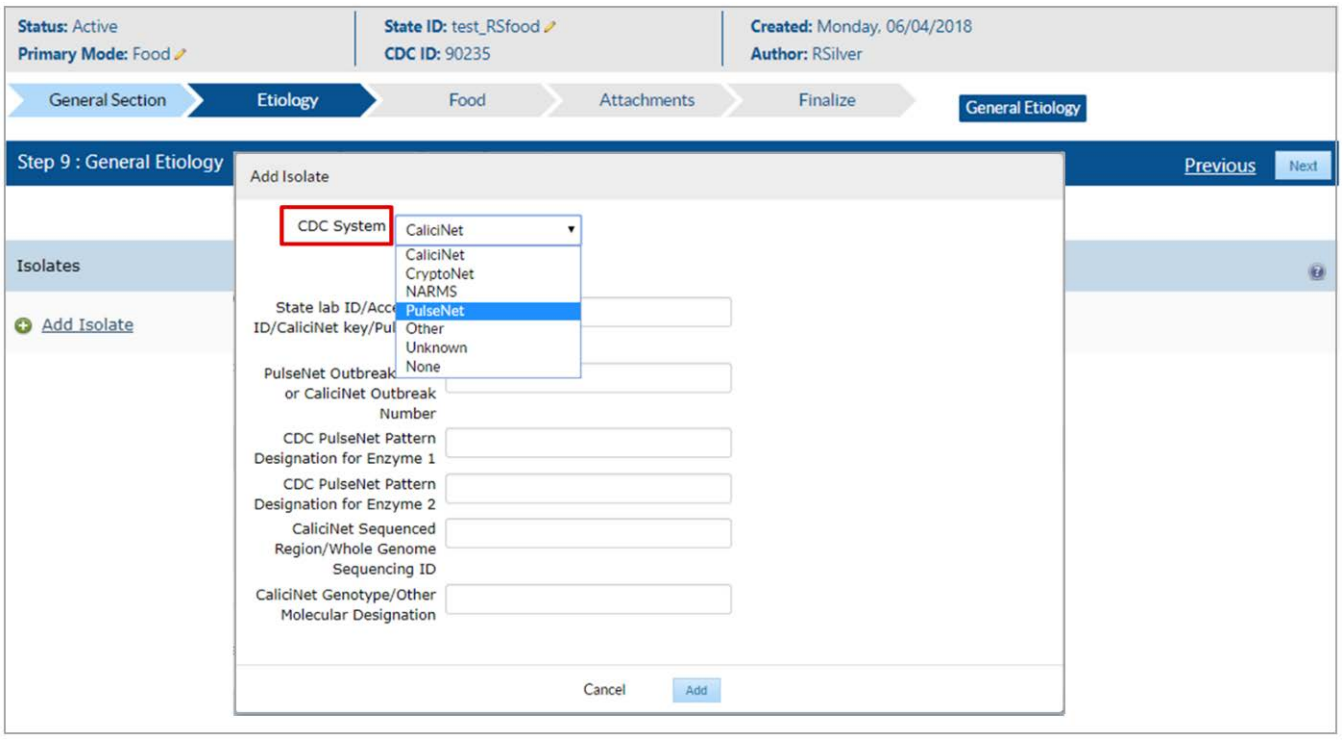
It is important to note that PulseNet isolates that only undergo whole-genome sequencing (WGS), without pulsed-field gel electrophoresis (PFGE) run, are not yet accessible to link to a NORS report using this feature. If this is the case for your isolates, please add your isolates normally, citing "Other" as your CDC System.

ADDING AN ISOLATE

Users can find the Isolates table within the Etiology section (52.13 form) or Etiology & Lab section (52.12 form) of their NORS report.

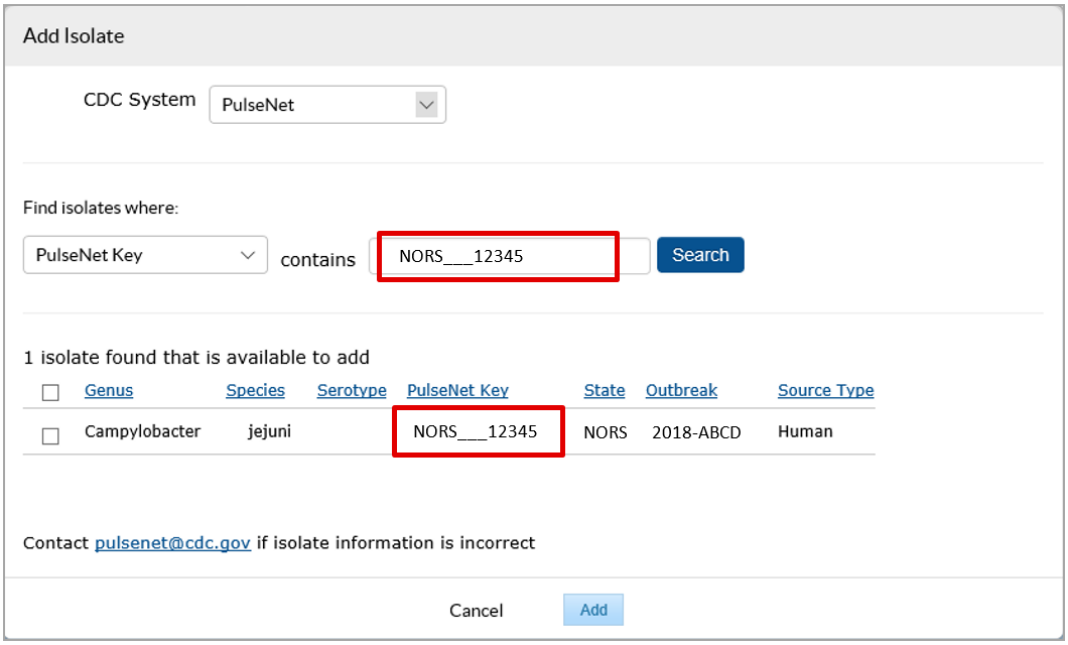
Step 1: **Click to add isolate** to NORS report

Step 2: Choose **PulseNet** as your CDC System

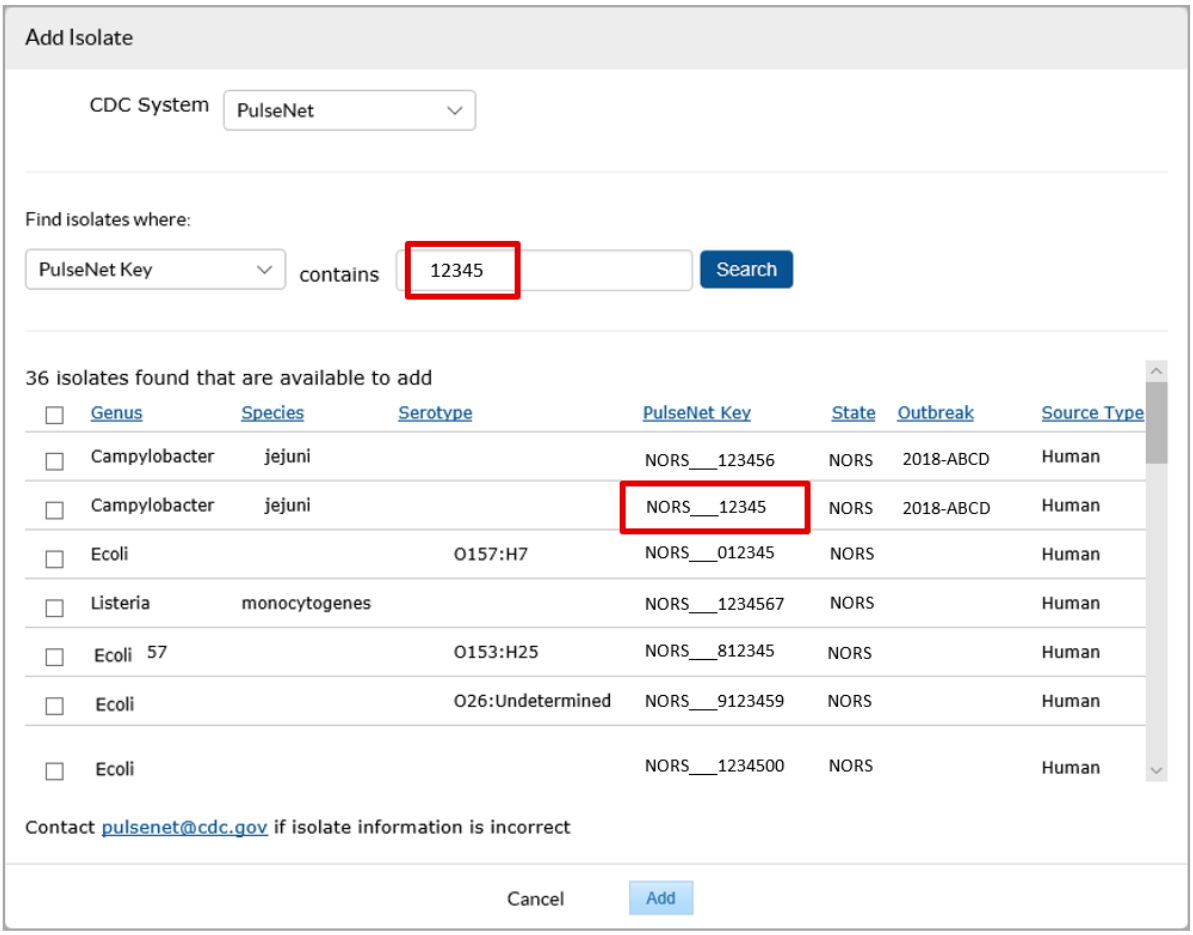


OPTION I — SEARCH AND ADD ISOLATES BY PULSENET KEY

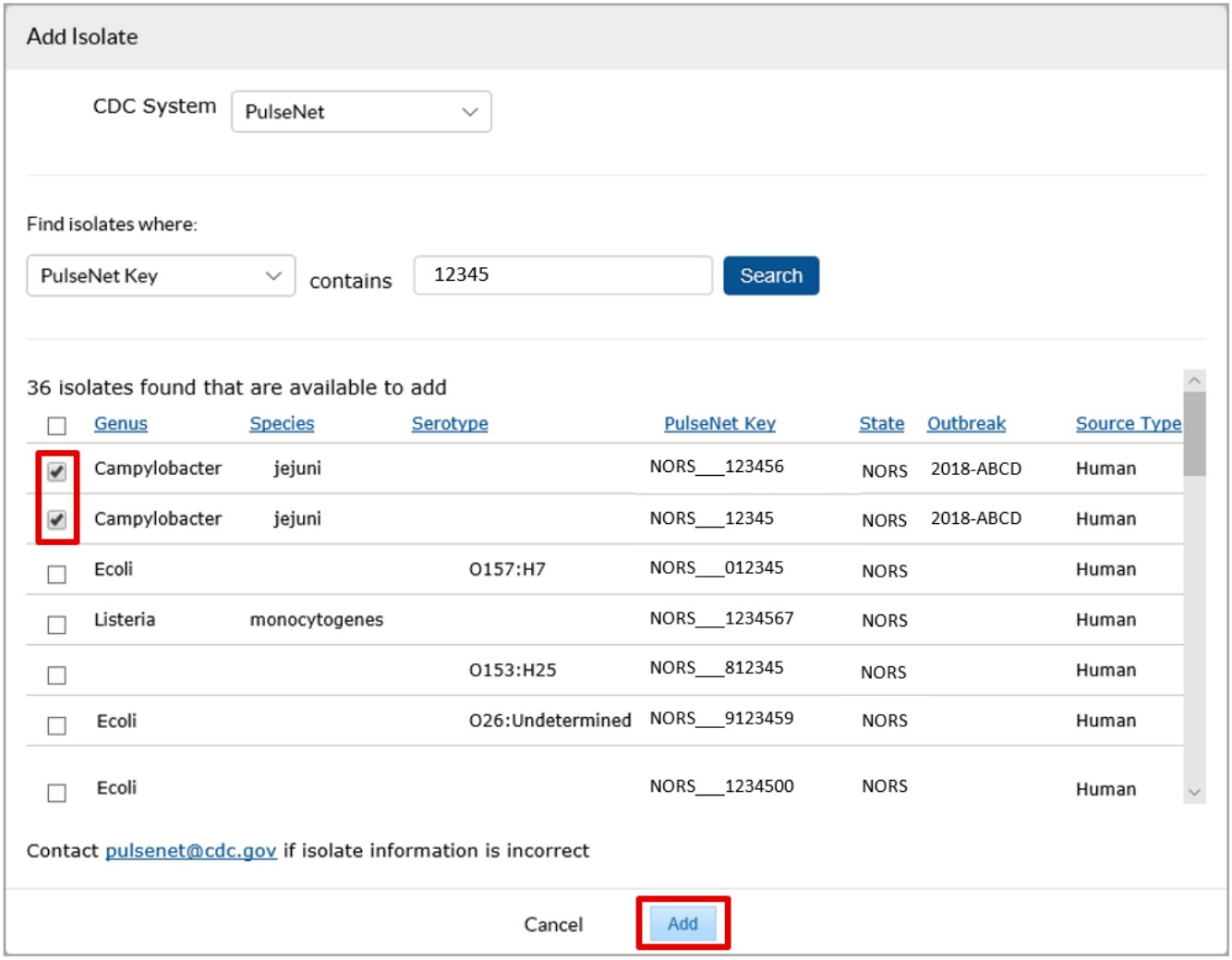
Step 3A: Search isolates by **PulseNet Key** where the PulseNet Key is an **exact match**



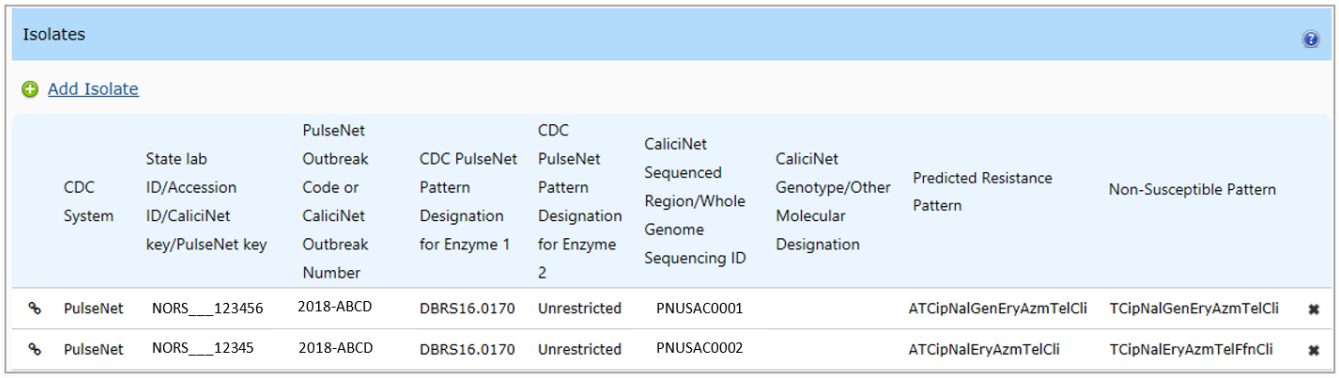
Step 3B: OR Search isolates by **PulseNet Key** where the PulseNet Key is a **partial match**



Step 4: Add **selected** isolate(s) to NORS report

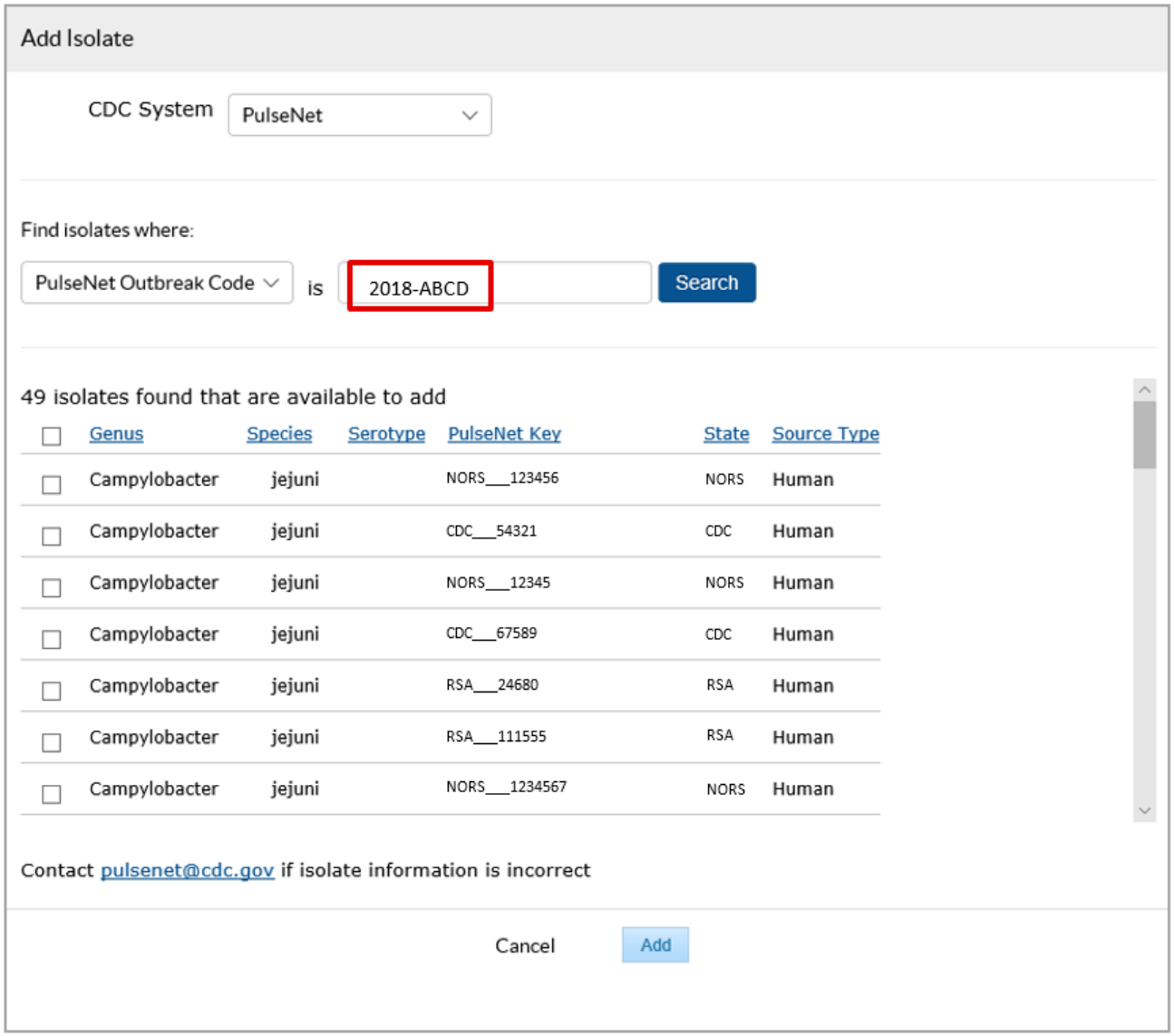


Step 5: Selected isolate(s) will appear in the Isolates table

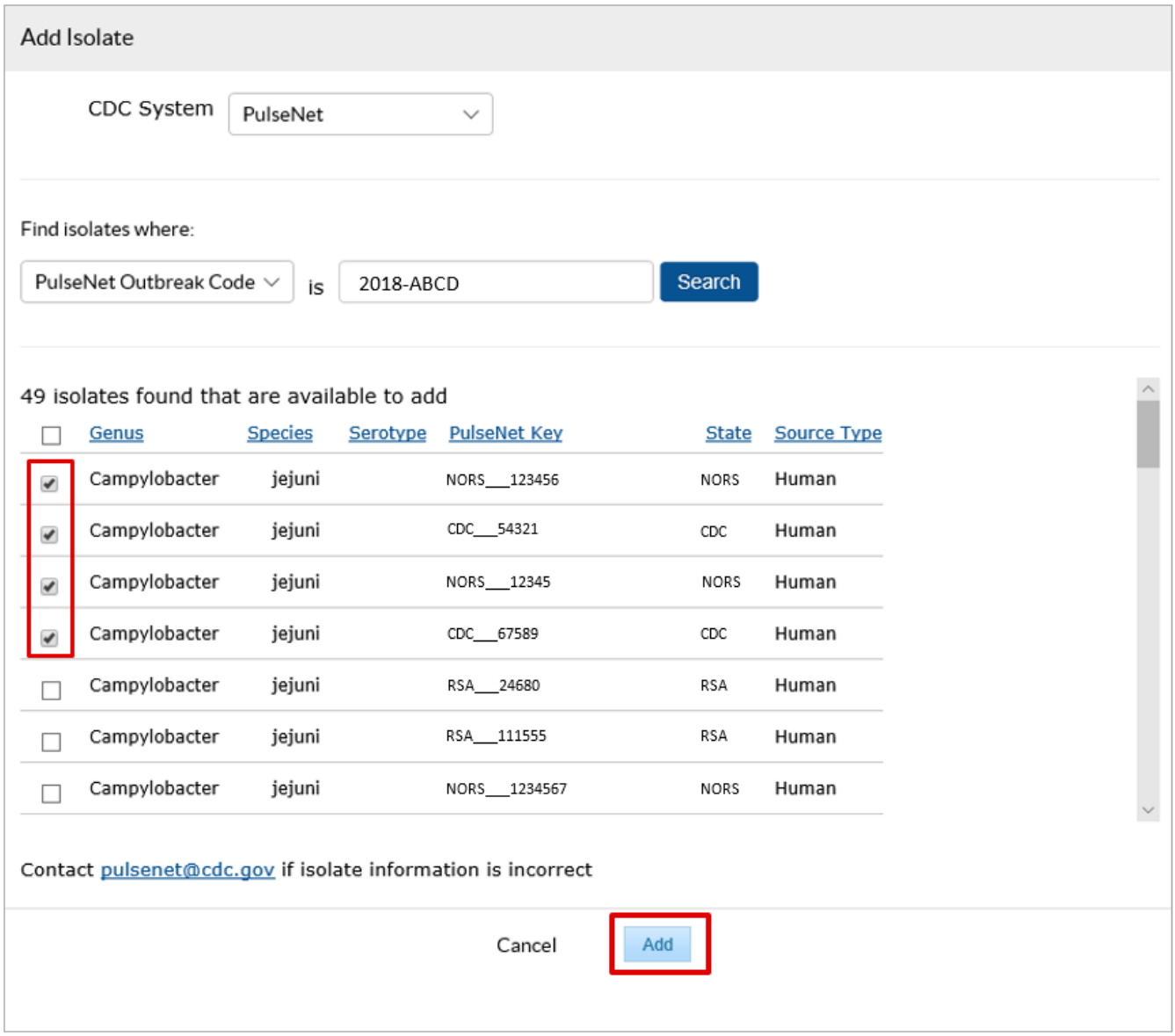


OPTION II — SEARCH AND ADD ISOLATES BY PULSENET OUTBREAK CODE

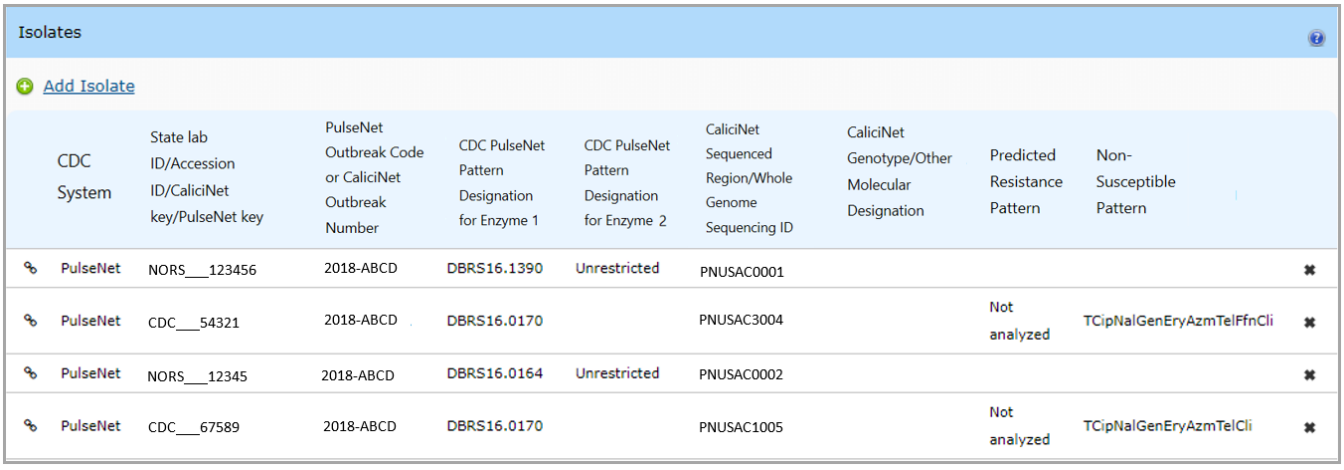
Step 3: Search isolates by **PulseNet Outbreak Code**



Step 4: Add **selected** isolate(s) to NORS report

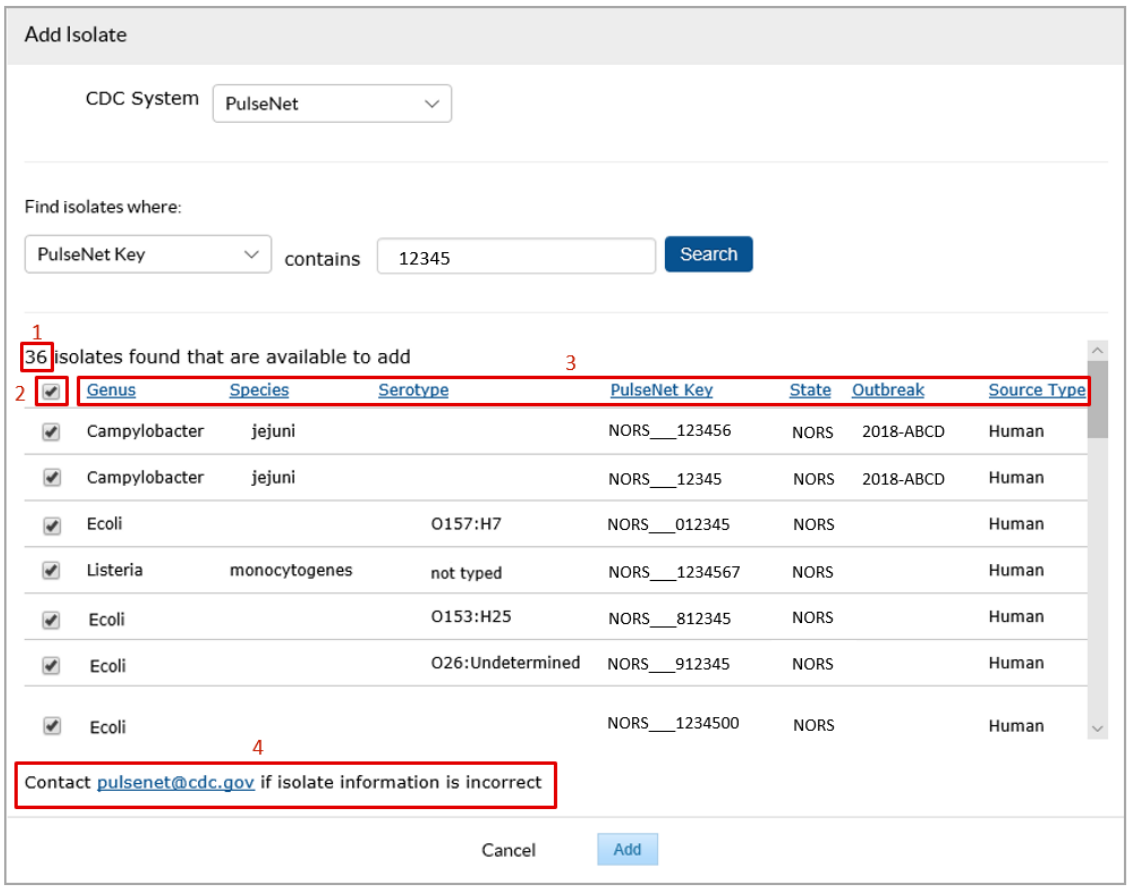


Step 5: Selected isolate(s) will appear in the Isolates table

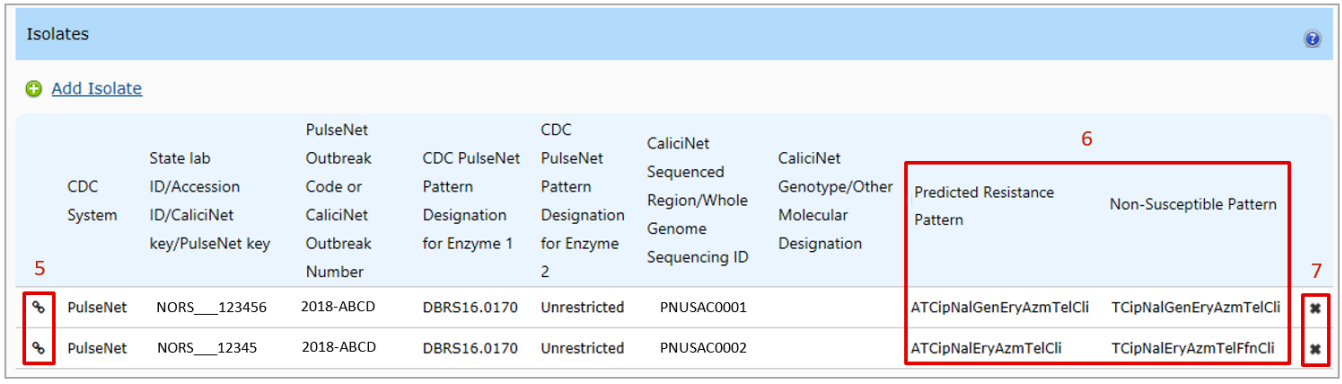


FEATURES TO NOTE

1) The number of isolates found matching the search criteria are displayed at the top of the search.
2) Users can select all isolates from an outbreak code if desired by selecting the top check box.
3) Users can sort all columns by clicking on the headers.
4) All information displayed reflects the most current data stored in PulseNet. If information is incorrect, please contact PulseNet directly at pulsenet@cdc.gov to have isolate information updated.



5) The link symbol indicates the isolate information in that row is linked to the PulseNet database and therefore cannot be edited.
6) Any NARMS data linked by PulseNet Key to added isolates is displayed in the Isolates table.
7) Users have the ability to remove isolates from their NORS report by clicking the "x" on the right side.



DATA VALIDATION CHECKS

NORS/PulseNet integration has three types of built-in data validation checks to ensure data consistency across CDC systems, and data accuracy with state level data.

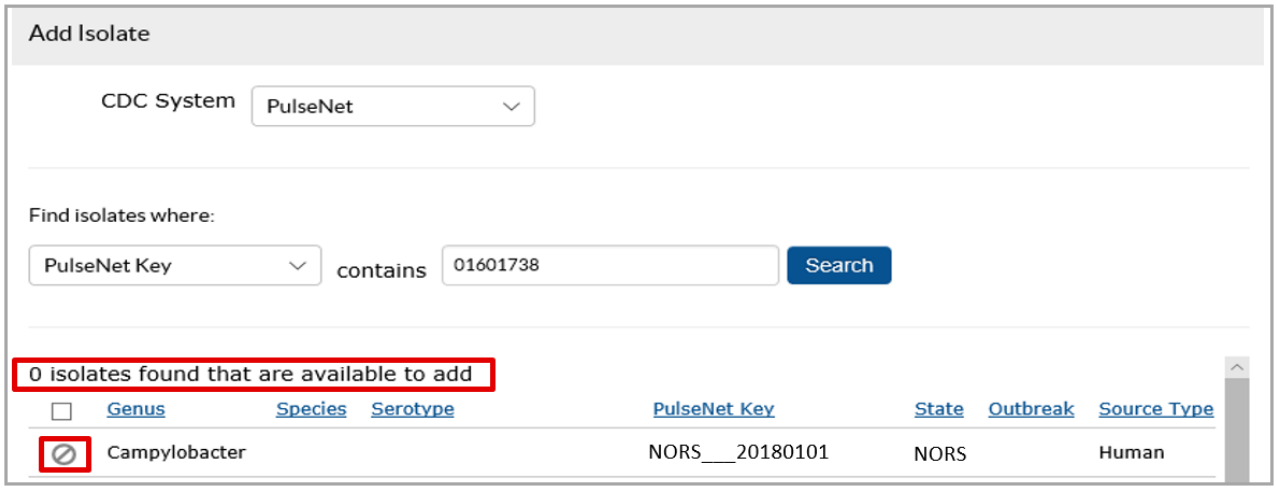
1) NORS users cannot edit an isolate once added to a NORS report.

This is to ensure data consistency. If there is a discrepancy between the PulseNet isolate information displayed and state lab data, please contact PulseNet directly at pulsenet@cdc.gov.

2) NORS users cannot add isolates from more than one PulseNet outbreak code to a NORS report.

a) If a user tries to add two isolates with different PulseNet outbreak codes at once, they will receive the following message:

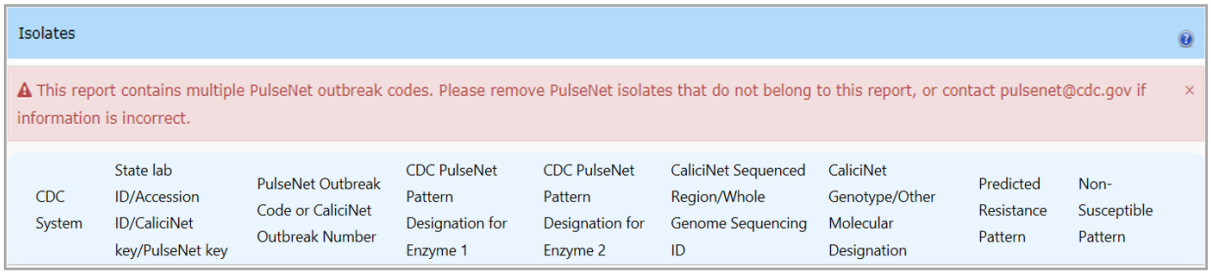
b) If a user tries to add an isolate with an outbreak code that differs from the outbreak code of any isolates already added to the NORS report, the user will not be able to select and add those isolates. Please note that this includes missing outbreak codes. For example, a user will not be able to add an isolate where the outbreak code is blank to a report with PulseNet isolates where an outbreak code exists.



3) NORS reports with altered isolate data resulting in differing outbreak codes must be addressed.

If PulseNet isolates that have been added to a NORS report have their outbreak code information updated in the PulseNet database, and the update results in those isolates differing by outbreak code, users are asked to remove the isolate(s) that no longer belong(s) before adding any additional isolates.

If changes made to isolates in the PulseNet database are incorrect, please contact PulseNet directly.



NORSDIRECT USERS

This section assumes you have already read the NORSDirect Training Document (https://wwwn.cdc.gov/NorsDirect/Resources/NORSDirect%20Training%20Document.pdf) or reviewed the NORSDirect help page (https://wwwn.cdc.gov/NorsDirect/UserPages/Instructions.aspx). NORSDirect users should note that any isolates added to the NORS Isolates table using the CaliciNet or PulseNet integration tools must also be added to respective state databases. Any changes that are made using the CaliciNet or PulseNet integration tools will be overwritten by any subsequent NORSDirect uploads that do not include the imported CaliciNet or linked PulseNet data. This similarly applies to any changes made to the NORS Etiology table using CaliciNet integration.

NORSDirect users will have full capabilities to add CaliciNet and PulseNet isolates using NORSDirect but will only be able to do so by providing an exact match to an existing CaliciNet or PulseNet Key in the NORSDirect fields StateLabID1–StateLabID99. Users will not be able to add a CaliciNet or PulseNet isolate based on a partial match to a CaliciNet or PulseNet Key or by only providing a CaliciNet or PulseNet Outbreak Code. All checks described in the "Data Validation Checks" section above apply to reports uploaded through NORSDirect. Users will also not be able to add CaliciNet or PulseNet Keys with different outbreak codes to one NORS report.

All isolate data imported using NORSDirect with a selection of "PulseNet" in the variables CDCSystem1–CDCSystem99 must match an existing key in PulseNet. Similarly, all isolate data imported using NORSDirect with a selection of "CaliciNet" in the variables CDCSystem1– CDCSystem99 must match an existing key in CaliciNet. If the CaliciNet or PulseNet Key submitted using NORSDirect does not match an existing key in the CaliciNet or PulseNet, respectively, an error will indicate that no match can be found. The user should verify the CaliciNet or PulseNet Key information or enter the isolate information using a different selection for the CDC System variable.

NORSDirect Isolate Table Variables:

CaliciNet Integration

NORSDirect Import Field Name	**Field Description: Isolates**	**Variable Requirements**	**Data Validation Checks**
CDCLabSystem1–CDCLabSystem99	CaliciNet	Required	
StateLabID1–StateLabID99	CaliciNet Key	Required	Exact CaliciNet Key(s) required
CDCLabOutbreakID1–CDCLabOutbreak99	CaliciNet outbreak number	Optional*	1 outbreak number permitted per NORS report
OtherMolecularDesignation1–OtherMolecularDesignation99	CaliciNet Genotype	Optional*	

**Variables listed as "Optional" in the Variable Requirements column will automatically populate with CaliciNet data once the NORS report is uploaded, if the isolate is able to be linked to the CaliciNet system.*

PulseNet Integration

NORSDirect Import Field Name	Field Description: Isolates	Variable Requirements	Data Validation Checks
CDCLabSystem1–CDCLabSystem99	PulseNet	Required	
StateLabID1–StateLabID99	PulseNet Key	Required	Exact PulseNet Key(s) required
CDCLabOutbreakID1–CDCLabOutbreak99	PulseNet outbreak code	Optional*	1 outbreak code permitted per NORS report
Enzyme1_1–Enzyme1_99	Enzyme 1	Optional*	
Enzyme2_1–Enzyme2_99	Enzyme 2	Optional*	
SequenceID1–SequenceID99	Whole Genome Sequencing ID	Optional*	
OtherMolecularDesignation1–OtherMolecularDesignation99	Other Molecular Designation	Optional*	

**Variables listed as "Optional" in the Variable Requirements column will automatically populate with PulseNet data once the NORS report is uploaded, if the isolate is able to be linked to PulseNet.*

Error Messaging Guide:

CaliciNet Integration

Scenario	Error Message	Field Highlighted in NORSDirect
CDC System is *CaliciNet* but CaliciNet Key is blank.	"A CaliciNet Key must be provided if CaliciNet is chosen for CDCSystem in order for isolates to link to CaliciNet database."	StateLabID
No CaliciNet match is found for CaliciNet Key entered.	"The CaliciNet State Lab ID provided was not found or did not match the report."	StateLabID
Multiple CaliciNet isolates are being imported with different outbreak codes for one NORS report.	"Cannot save isolates from more than one outbreak code to a report. CaliciNet Keys must be changed to match a single outbreak code. Contact calicinet1@cdc.gov if outbreak code information is incorrect."	All StateLabIDs
Identical CaliciNet Keys added to the same NORS report.	"Cannot save isolates with identical State lab IDs. Duplicate IDs must be revised."	Duplicate StateLabIDs

PulseNet Integration

Scenario	Error Message	Field Highlighted in NORSDirect
CDC System is *PulseNet* but PulseNet Key is blank.	"A PulseNet Key must be provided if PulseNet is chosen for CDCSystem in order for isolates to link to PulseNet database."	StateLabID
No PulseNet match is found for PulseNet Key entered.	"PulseNet Key provided was not found in PulseNet database and is unable to be linked. The PulseNet Key provided must be edited, or a different CDC System must be specified."	StateLabID
Multiple PulseNet isolates are being imported with different outbreak codes for one NORS report.	"Cannot save isolates from more than one outbreak code to a report. PulseNet Keys must be revised to match a single outbreak code. Contact pulsenet@cdc.gov if outbreak code information is incorrect."	All StateLabIDs
Identical PulseNet Keys added to the same NORS report.	"Cannot save isolates with identical PulseNet Keys. Duplicate PulseNet Keys must be revised."	Duplicate StateLabIDs

NORSDirect files with errors will *not* be uploaded to NORS until errors are addressed.

ADDITIONAL INFORMATION

If you need assistance in completing other sections of NORS, please refer to the online technical and guidance documents located at https://www.cdc.gov/nors/forms.html.

For further assistance or for questions or comments, please email us at NORSAdmin@cdc.gov.

APPENDIX: NARMS METHODS & DRUG KEY

Predicted Resistance Pattern: CDC NARMS predicted resistance pattern based on resistance determinants

CDC NARMS screens sequenced isolates, using ResFinder, for the presence of resistance genes. This listing of genes is then used to determine a predicted resistance pattern. If no determinants were found, the Predicted Resistance Pattern field in NORS will read "No determinants detected". If whole genome sequencing was not performed on the isolate, the Predicted Resistance Pattern field in NORS will read "Not sequenced." If whole genome sequencing was performed on the isolate, but it has not yet been analyzed for the presence of resistance genes, the Predicted Resistance Pattern field in NORS will read "Not analyzed".

Non-Susceptible Pattern: CDC NARMS antimicrobial susceptibility testing (AST) results

Antibiotics that had either an intermediate or resistant (i.e. not susceptible) interpretation for the isolate based on results of phenotypic susceptibility testing are listed. Otherwise, the Non-Susceptible Pattern field in NORS will read “No non-susceptibility detected”. If there are no breakpoints for the isolate, the Non-Susceptible Pattern field in NORS will read "N/A".

CDC NARMS phenotypic testing is performed via broth microdilution to obtain a minimum inhibitory concentration (in micrograms per milliliter). That value is then used to determine if an isolate is susceptible, intermediate, or resistant to that particular drug, based on current breakpoints provided by the Clinical and Laboratory Standards Institute (CLSI), epidemiological cutoff values established by the European Committee on Antimicrobial Susceptibility Testing (EUCAST), or MIC distribution data collected by NARMS. Please see https://www.cdc.gov/narms/antibiotics-tested.html for more information.

NARMS Pattern Abbreviation Key:

Pattern Abbreviation	Agent Name
Ami	Amikacin
Au	Amoxicillin-Clavulanic Acid
A	Ampicillin
Azm	Azithromycin
Car	Carbomycin
Fox	Cefoxitin
Tio	Ceftiofur
Cx	Ceftriaxone
Cep	Cephalothin
C	Chloramphenicol
Cip	Ciprofloxacin (abbreviation used in the Non-Susceptible Pattern field)
Cip(I/R)	Ciprofloxacin (abbreviation used in the Predicted Resistance Pattern field to indicate when the genetic determinants can only predict decreased susceptibility to ciprofloxacin (intermediate or resistant MIC).)
Cli	Clindamycin
Col	Colistin
Ery	Erythromycin
Ffn	Florfenicol
Fos	Fosfomycin
Fus	Fuscidic acid

Gen	Gentamicin
Hyg	Hygromycin
Imd	Imidazole
Kan	Kanamycin
Lin	Lincomycin
Lzd	Linezolid
Mer	Meropenem
Nal	Nalidixic Acid
Ole	Oleandomycin
Pen	Penicillin
Rif	Rifampin
Spe	Spectinomycin
Spi	Spiramycin
S	Streptomycin
Su	Sulfamethoxazole/Sulfisoxazole
Tel	Telithromycin
T	Tetracycline
Tia	Tiamulin
Tmp	Trimethoprim
Cot	Trimethoprim-Sulfamethoxazole
Tyl	Tylosin
Van	Vancomycin
Vir	Virginiamycin