

VERSION 8

APR 11, 2023

OPEN BACCESS

DOI:

dx.doi.org/10.17504/protocol s.io.4r3l284pql1y/v8

Protocol Citation: Ruth Timme, Julie Haendiges, Tina. Pfefer, Errol Strain, Maria Balkey 2023. NCBI submission protocol for microbial pathogen surveillance. protocols.io

https://dx.doi.org/10.17504/p rotocols.io.4r3l284pql1y/v8Ve rsion created by Ruth Timme

MANUSCRIPT CITATION:

Timme, Ruth E., William J. Wolfgang, Maria Balkey, Sai Laxmi Gubbala Venkata, Robyn Randolph, Marc Allard, and Errol Strain. "Optimizing Open Data to Support One Health: Best Practices to Ensure Interoperability of Genomic Data from Bacterial Pathogens." One Health Outlook 2, no. 1 (October 19, 2020): 20. https://doi.org/10.1186/s425 22-020-00026-3.

License: This is an open access protocol distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

Protocol status: Working We use this protocol and it's working

Created: Apr 11, 2023

Last Modified: Apr 11, 2023

PROTOCOL integer ID: 80323

Keywords: NCBI submission, WGS, pathogen surveillance, GenomeTrakr

NCBI submission protocol for microbial pathogen surveillance V.8

In 3 collections

Ruth Timme¹, Julie Haendiges¹, Tina.Pfefer², Errol Strain², Maria Balkey³

¹US Food and Drug Administration; ²Center for Veterinary Medicine, U.S. Food and Drug Administration, College Park, Maryland, USA; ³Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration, College Park, Maryland, USA

GenomeTrakr

Tech. support email: genomeTrakr@fda.hhs.gov



Ruth Timme

US Food and Drug Administration

DISCLAIMER

Please note that this protocol is public domain, which supersedes the CC-BY license default used by protocols.io.

ABSTRACT

PURPOSE: Step-by-step instructions for submitting pathogen whole genome sequence data to NCBI and to the NCBI Pathogen Detection portal. This protocol covers the steps needed to establish a new NCBI submission environment for your laboratory, including the creation of new BioProject(s) and submission groups. Once these are step up, the protocol then walks through the process for submitting raw reads to SRA and sample metadata to BioSample through the Submission portal.

SCOPE: for use by any laboratory submitting WGS data for bacterial pathogens, including pathogens under surveillance at NCBI Pathogen Detection. (This includes US laboratories in GenomeTrakr, NARMS, Vet-LIRN, PulseNet, and other non-US networks and submitters).

For new submitters, there's quite a bit of groundwork that needs to be established before a laboratory can start its first data submission. We recommend that one person in the laboratory take a few days to get everything set up in advance of when you expect to do your first data submission.

If you need a pipeline for frequent or large volume submissions, follow Step 1 to get your NCBI submission environment established, then contact <u>gb-admin@ncbi.nlm.nih.gov</u> to set up an account for submitting through the API.

This protocol covers submission using NCBI's Submission Portal web-interface.

Version history:

V4: updated screenshots to reflect NCBI submission portal changes. Updated custom BioSample template.

V5: Linking directly to the metadata template guidance instead of including duplicate copies of the files in this protocol. Updated screenshot for choosing the pathogen template to reflect changes at NCBI.

V6: minor edits including updating links out to other protocols.

V7: Updated guidance for creating new BioProjects, including projects for non-targeted species

V8: Corrected the multi-species umbrella project accession in Step 1.5

BEFORE START INSTRUCTIONS

This protocol has three sections:

- Section 1: Setting up NCBI accounts (for new users)
- Section 2: Single-step data submission to SRA for raw reads and associated sequence metadata and to BioSample for sample metadata
- Section 3: Detailed steps for creating a BioProject (usually done once during the account set-up)

Associated protocols:

- Guidance for populating GenomeTrakr metadata templates (BioSample and SRA)
- NCBI Data Curation protocol for making updates, corrections, or retractions to your data.

Establish submission environmnet at NCBI

- 1 Set up a new NCBI submission environment for your lab:
 - 1.1: Create an NCBI user account
 - 1.2: Set up an NCBI submission user group for your lab
 - 1.4: Bookmark the link to your submission portal
 - $\textbf{1.5}. \ \text{Identify or establish new BioProjects (detailed in \textbf{Step 3})}$

Ready for data submission:

1.1 Create an NCBI user account at NCBI: https://www.ncbi.nlm.nih.gov/account. This will be your own individual user account at NCBI.



***NCBI login changes updated in June, 2021. Read more here.

1.2 Establish an NCBI submission user group for your laboratory.

We recommend using this user group for all NCBI submissions related to microbial genome surveillance. This will link your laboratory's NCBI data ownership to the *user group* and not to individuals, allowing anyone in the current group to perform updates or retractions and answer inquiries from the NCBI staff, even if there's been a complete turnover of staff since the original data submission.

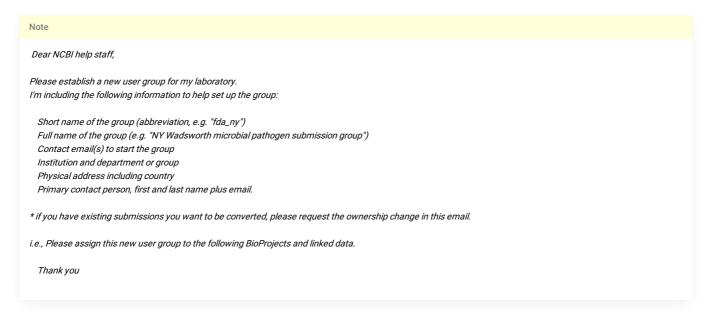
User groups also ensure consistent data ownership across BioProjects, BioSamples, and sequence data. If your laboratory has non-overlapping research groups submitting and managing data at NCBI, multiple user groups can be established to track these efforts separately.

Your laboratory might already have a submission group established! Check the "Group" tab in the submission portal, https://submit.ncbi.nlm.nih.gov/groups/. Ask your colleagues to do the same thing, to ensure your laboratory doesn't already have one in place.



Creating a new submission group:

 $\textbf{1}. \ \textbf{Submit an email request to} \ \textbf{submit-help@ncbi.nlm.nih.gov} \ \ \textbf{containing the following information:}$

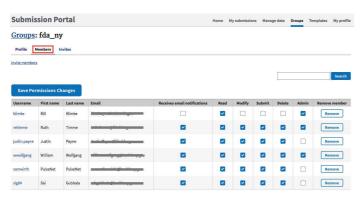


2. Look for an email reply entitled "NCBI Submission Portal Group invitation" and click on the enclosed link to accept the invitation.

1.3 Managing your NCBI submission user group.

After a user group has been established it can be edited for membership and permissions by clicking in the "group" tab of the submission portal (https://submit.ncbi.nlm.nih.gov/groups/), then on the Group Id hyperlink, e.g 'fda_ny' in the above example.

Users with admin privileges can update contact information in the "profile" tab and membership in the "Members" tab. New members can be invited by clicking on the "Invite members" link.

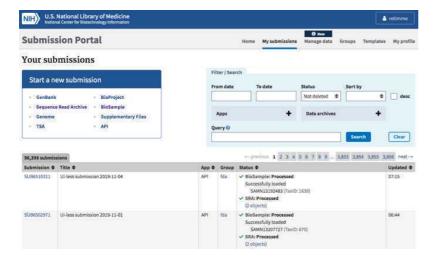


This user group should be kept up-to-date as members enter and leave the laboratory.

Permissions levels:

- READ: primarily for collaborators who can see the submissions, but not edit them.
- MODIFY, SUBMIT, DELETE: Permissions to submit, modify, or retract data (members usually have all or none of these permissions)
- ADMIN: Can invite or remove members of the submission group. Ensure that at least one (or more) members of your group have ADMIN privileges.
- 1.4 Bookmark "my submissions" at NCBI: https://submit.ncbi.nlm.nih.gov/subs/. This is the page where you view and track all of your past submissions.

If you see a blank page with a yellow box in the upper right corner saying "please login", click this link and login using the credentials created in Step 1.1.



1.5 Identify or establish new BioProjects (Umbrella and/or Data BioProjects)

Umbrella BioProjects. If you are already part of a surveillance network, (e.g. GenomeTrakr, NARMS, Vet-LIRN, or PulseNet) you will create a new data project linked to an established umbrella BioProject. For reference, here is a list of the major Umbrella projects for GenomeTrakr and Vet-LIRN, organized by taxonomic classification. For species not included in this list, create a general non-targeted data BioProject for your lab linked to PRJNA593772 (our multi-species BioProject).

GenomeTrakr Umbrella projects (https://www.ncbi.nlm.nih.gov/bioproject/PRJNA593772):

Salmonella sp. PRJNA183844
 Listeria sp. PRJNA514048
 Escherichia coli / Shigella PRJNA230919
 Vibrio parahaemolyticus PRJNA245885
 Campylobacter sp. PRJNA258021
 Clostridium botulinum PRJNA290488
 Cronobacter sp. PRJNA258402
 All other species PRJNA706684

Vet-LIRN Umbrella projects:

■ Salmonella enterica PRJNA314607

Escherichia coli and Shigella PRJNA316449 Staphylococcus PRJNA316451

If you need to establish a new umbrella BioProject, follow instructions in Step 3 with modifications for creating a new Umbrella BioProject (Step 3.12).

Data BioProjects. Does your laboratory have an established data BioProject for this effort? If not please follow the instructions in Step 3 for creating a new one.

More information:

Learn more about data vs umbrella BioProjects in Step 3

Data submission (BioSample and SRA)

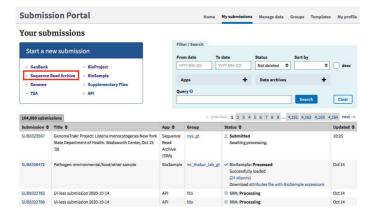
2 Data submission (source metadata and sequence data):

This protocol follows a one-step data submission process where the source metadata is submitted through the same submission workflow as the sequence data.

**Before submission, ensure that your sequences meet the quality control (QC) thresholds for your surveillance network. You can follow your own internal QC process or use FDA's free GalaxyTrakr platform:



Navigate to the My Submissions page in the NCBI Submission Portal: https://submit.ncbi.nlm.nih.gov/subs/



Click "Sequence Read Archive" to start a submission.

2.1 Download and populate the sample (BioSample) and sequence (SRA) metadata templates:

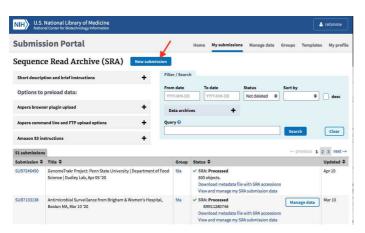
Custom metadata templates and guidance are available in the following protocol: qui



Note

Organize your submissions by BioProject, only submitting to a single BioProject per submission workflow. Populate the metadata spreadsheets for each isolate you intend to submit (you can submit metadata for a single isolate or a collection of isolates under a single BioProject).

2.2 Click the "New submission" box.



2.3 SUBMITTER tab:

Populate with submitter info. The "submitter" is the name of the person, or user group, who is physically doing the submissions, not a supervisor or PI.

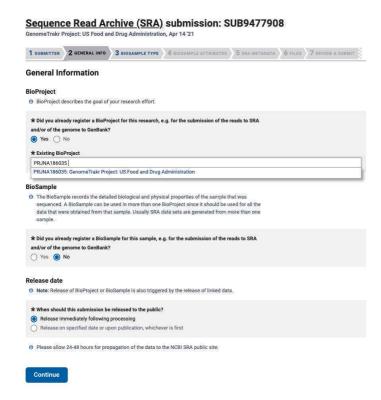
Select the appropriate submission group name (see **Step 1.2** for creating a new submission group), and describe the submitting organization or laboratory name. This will be auto-populated from the contact info you included in your NCBI user account. Click "Continue" to proceed.



2.4 GENERAL INFO tab:

1. BioProject: Did you already have a data BioProject for this effort? If not please follow instructions in Step 3 for creating a new data or umbrella BioProject. Return back to this sub-step with the data BioProject accession in hand.

Click "Yes" and paste in your data BioProject accession, e.g. PRJNA614995.



- 2. BioSample: Click "NO" here. You will be registering BioSamples within this current submission
- 3. Release date: Choose "Release immediately following processing".
- 4. Click Continue.

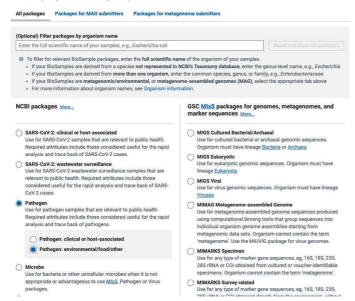
2.5 BIOSAMPLE TYPE tab:

You are choosing the appropriate metadata package here for your sample (i.e. what kind of samples are you submitting?).

 $Select \ "\textbf{Pathogen"}, then \ "\textbf{Pathogen:environmental/food/other"} for microbial pathogen submissions.$

Preview BioSample Types and Attributes

* Select the package that best describes your samples.



2.6 BIOSAMPLE ATTRIBUTES tab:

Choose "Upload a file using Excel or text format (tab-delimited) that includes the attributes for each of your BioSamples".

Then click "Choose File" and browse to your populated metadata template.

Note

If you have not yet populated your GenomeTrakr BioSample metadata template, see **Step 2.1**.

Sequence Read Archive (SRA) submission: SUB9477908

Antibiogram data: please provide if you have it!

Click "Continue".

Continue

NCBI will do a validation check on your metadata. Resolve any red "errors" reported back by editing the spreadsheet and replacing the uploaded file. Review any yellow "Warnings" and proceed if everything looks ok.

Click "Continue".

2.7 SRA METADATA tab:

Choose: "Upload a file using Excel or text format (tab-delimited)".

Sequence Read Archive (SRA) submission: SUB9477908 GenomeTrakr Project: US Food and Drug Administration, Apr 14'21 1 SUBMITTER 2 GENERAL INFO 3 BIOSAMPLE TYPE 4: BIOSAMPLE ATTRIBUTES 5 SRA METADATA 6 FILES 7 REVIEW & BUBMIT SRA metadata 0 For more detailed help with SRA submission please read the SRA Submission Wizard Help. * How do you want to provide your metadata? Use built-in table editor © Upload a file using Excel or text format (table delimited) * Metadata file SRA_metadata-GTexample xisx 53.7 kB 2021-04-14 17:11 Delete 0 Use one of these ways to fill out SRA metadata: Download Excel spreadsheet (designed to make it easier to select the correct metadata values), edit, save and then upload the modified Excel file.

Upload your populated SRA metadata template (see Step 2.1 for where to get this file)

Click "Continue".

NCBI will do a validation check on your sequence metadata. Resolve any red "errors" reported back by editing the spreadsheet and replacing the uploaded file. Review any yellow "Warnings" and proceed if everything looks ok.

Click "Continue".

2.8 Files tab:

Each laboratory will establish its own path for transferring files.

In general, selecting the web browser option should work for uploading ~48 sequences at a time. For a more stable internet connection, your laboratory can use FTP or Aspera. Directions for doing so pop up after clicking the FTP radio button.

0	 Each file must be listed in the <u>SRA metadata table you uploaded</u>. If you are uploading a tar archive, list each file name, not the archive name.
	 Unique file names that do not contain any sensitive information should be used for all files. File names as submitted appear publicly when data is retrieved from the cloud.
	 Files can be compressed using gzip or bzip2, and may be submitted in a tar archive, but archiving or compressing your files is not required. Do not use zip!
* How	do you want to provide files for this submission?
O We	b browser upload via HTTP or Aspera Connect plugin
Do	not use web browser HTTP upload if you are uploading files over 10 GB or more than 300 files.
O FTI	P or Aspera Command Line file preload
All	files for a submission must be uploaded into a single folder.
O Am	azon S3 bucket

Note

It is generally not recommended to check the Auto-submission box as this would not allow you to edit corrections if needed.

2.9 REVIEW & SUBMIT tab:

Check over your entire submission, then click submit.

If corrections are needed, you can go back and select individual tabs to edit your submission.

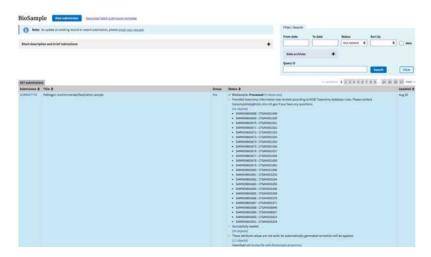
Note

If you are having trouble finalizing your submission, contact the relevant NCBI database for assistance and include your submission ID in the email subject (SUB######):

BioSample (for source metadata issues): biosamplehelp@ncbi.nlm.nih.gov **SRA** (for raw sequence or sequence metadata issues): sra@ncbi.nlm.nih.gov

2.10 BioSample accessions:

BioSample accessions will be automatically created upon submission and will be available on the "my submissions" page of the Submission portal by clicking on "## objects" within the submission record. You can also download by clicking the "Download attributes file with BioSample accessions". Accessions will start with SAMNxxxxxxxx. You will also receive an email within 12 hours, but typically much faster, containing these same accessions.



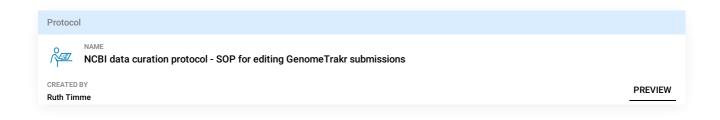
2.11 SRA Accessions:

SRA run accessions will be available on the "my submissions" page of the Submission portal by clicking on "## objects" within the submission record. You can also download by clicking the "Download metadata file with SRA accession". Accessions will start with SRRxxxxxxxx." You will also receive an email with these same accessions within 24 hours, but typically much faster, containing these same accessions.



2.12 Important data stewardship and curation notes:

- Develop an internal melDthod for storing and tracking your BioSample and SRR accessions! They are required for making future updates to your records.
- For updates, corrections, or retractions to your BioSample and SRA records, follow the guidance provided in the NCBI Curation Protocol. Some edits can be made within the submission portal and others need to be done via email.



Safety information

Caution: It is possible for a single BioSample to have more than one SRR ID. Two scenarios include:

- 1. Two runs were submitted for the same isolate/BioSample, which is not generally recommended for surveillance. Follow **Step 3** in the NCBI curation protocol to retract one of them).
- 2. if the initial submission was retracted and new a new run was submitted. It's important to keep track of both IDs, even if one was retracted.

BioProject Creation

3 Create a new BioProject

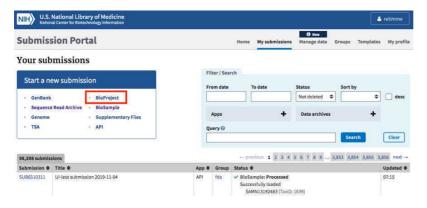
BioProjects are an organizing tool at NCBI that pulls together different kinds of data submitted across multiple NCBI databases. Each BioProject has a unique URL, providing a home page with a title, description, links to lab websites, publications, funding resources associated with a particular project, along with links to the deposited data. A basic data BioProject holds actual sequence data, assemblies, and their associated metadata. An umbrella BioProject is a way to group two or more data BioProjects together, which is useful for coordinating disease surveillance and for looking across the grouped BioProjects in a single view.

This protocol describes the steps for creating a new data BioProject linked to an existing umbrella BioProject (usually established by a coordinating group, e.g. GenomeTrakr, NARMS, Vet-LIRN).

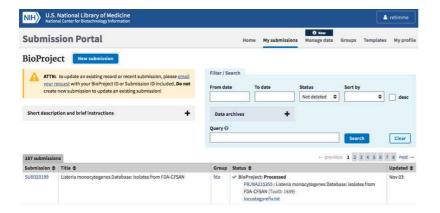
*If you need to create a new Umbrella BioProject, modifications are summarized in Step 3.12.

3.1

Navigate to the "My Submissions" page, https://submit.ncbi.nlm.nih.gov/subs/, and click "BioProject" in the "Start a new submission" box.



3.2 Click the "New submission" box:



3.3 Submitter tab:

Populate with submitter info. An NCBI "submitter" is the name of the person or submission group who is managing the submissions, not a supervisor or PI.

Select the appropriate submission group name (see **Step 1.2** for creating a new submission group), and describe the submitting organization or laboratory name. This will be auto-populated from the contact info you included in your NCBI user account.

3.4 Project type tab:

Project data type: Genome sequencing and assembly.

Sample scope:

For a Data BioProject: select multi-species. This will allow you to submit multiple different species to the BioProject.

3.5 Target tab:

For a Data BioProject. Populate ONLY the Organism name here:

For targeted-pathogen BioProjects:

Organism name = Include a Genus name, e.g., Salmonella sp.

For non-targeted pathogens

Organism name = "bacteria"

Leave the strain info and Description fields blank.

3.6 General info tab:

Click "Release immediately following processing".

Include a brief title describing the effort.

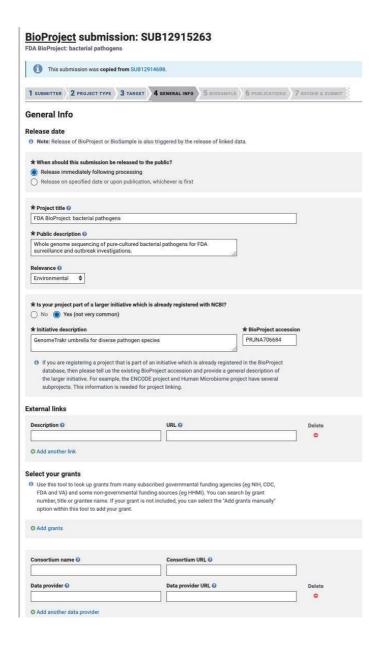
■ Data BioProject Title: e.g., "GenomeTrakr Project: NY State Dept. of Health, Wadsworth Center".

 $Public \ Description: e.g., \ "Whole-genome \ sequencing \ of \ pure-cultured \ microbial \ pathogens \ as \ part \ of \ XXXX \ surveillance \ effort."$

Relevance: environmental.

Is your project part of a larger initiative that is already registered at NCBI?

■ Data BioProjects. Click "Yes" and include a brief description and umbrella BioProject accession number (see Step 1.5). This will properly link your data project to the umbrella.



3.7 BioSample tab:

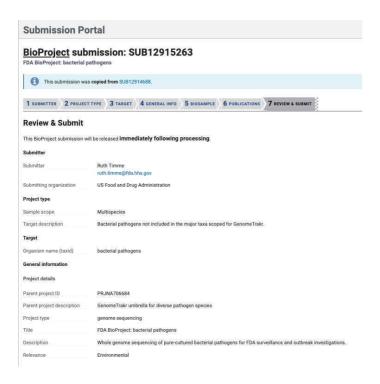
Leave blank!! You will create biosamples separately.

3.8 Publications tab:

If relevant, include publications from your laboratory.

3.9 Review and Submit tab:

Check if everything looks correct and edit if necessary, then click " ${\bf submit}$."



Example for a new non-targeted BioProject

3.10 The BioProject accession will be available within a few minutes on the "my submissions" page of the Submission portal, "PRJNAxxxxxx." You will also receive an email containing the new accession.



3.11 If you are part of a coordinated surveillance effort, like GenomeTrakr, please alert the coordinating body that a new BioProject was created under an existing umbrella.

For GenomeTrakr, contact genomeTrakr@fda.hhs.gov

3.12 Creating a new Umbrella BioProject:

Proceed as outlined in the above steps with the following modifications:

PROJECT TYPE tab:

For an *Umbrella BioProject*: select multi-species. This will allow you to link multiple data BioProjects representing different species under a single umbrella.

TARGET tab:

For an *Umbrella BioProject*: Leave the Organism name field blank. Include a list or description of species you intend to include in this effort. E.g. "bacterial foodborne pathogens", or "SARS-Cov-2"

GENERAL INFO tab:

Umbrella BioProject Title: e.g. "Microbial pathogen surveillance at NY State Dept. of Health, Wadsworth Center."

Is your project part of a larger initiative that is already registered at NCBI?

■ For an Umbrella BioProject: click "NO"

The last step is to email bioprojecthelp@ncbi.nlm.nih:

Example email:

Note

"Dear BioProject and PD help teams,

Please convert the PRJNA##### to an Umbrella BioProject. Our laboratory will be submitting data under the XXX effort (SARS-CoV-2, GenomeTrakr, Vet-LIRN, NARMS, HAI, or more general pathogen surveillance).

I'd be happy to provide any additional details you might need.

Thank you, '

After the conversion is complete you can use the new Umbrella accession to properly link any new data BioProjects being created.

3.13 Important data stewardship and curation notes:

- Develop an internal method for storing and tracking your BioProject accessions! They are required for every BioSample and sequence data submission to ensure
 proper linkage.
- Bookmark URLs for each of your data BioProjects to monitor the public-facing view of your submissions.
 e.g. Virginia DCLS's GenomeTrakr Salmonella BP: https://www.ncbi.nlm.nih.gov/bioproject/219491
- For updates to your BioProjects, follow the guidance provided in the NCBI Curation Protocol. Some edits can be made within the submission portal and others need to be done via email.

Protocol

NAME
NCBI data curation protocol - SOP for editing GenomeTrakr submissions

CREATED BY
Ruth Timme

PREVIEW