# TransfectionTracker README

*Disclaimer: This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY that it will perform flawlessly or be fit for a particular purpose. The use or mention by NIST of commercial products does not imply endorsement or indication that they are the only, or best, products.*

## Purpose of this program

This program allows collection of information about gene editing operations and activities performed on transfected cells. It allows tracking of what is done and when to individual cell samples over time.

## Instructions for using TransfectionTracker1221

**TransfectionTracker1221.xlsm**

## Table of contents

GENERAL OVERVIEW

DATA ENTRY: STEP-BY-STEP

FEATURES OVERVIEW

1. The **Calendar** worksheet
2. Navigating the **Calendar** worksheet
3. Using the *#* and *Plate* columns
4. ***Activity*** *Discontinue*
5. ***Activity*** *Thaw*
6. ***Activity*** *Sort*
7. Other worksheets
8. Controlling and making changes to the worksheets
9. **Do NOT…**

## GENERAL OVERVIEW:

1. This program was created in Microsoft Excel for Microsoft 365 MSO (16.0.13127.21490) 32-bit.
2. The program is composed of interrelated worksheets that are accessed by named tabs that run along the bottom of the screen. Worksheets include **Calendar**, **Metadata Template**, **Cell Samples**, **ActivityList**, **Data Validation Criteria**, and **Documentation**.
3. In this document, **Bold** lettering indicates the name of a worksheet. ***Bold Italics*** indicates an input available on a worksheet such as ***Activity*** and ***Cell Sample Name*** on the **Calendar** or ***Data*** from the toolbar at the top of the page. *Italics* indicates a choice of input often from a drop-down list. Underline indicates examples of free text.
4. Two versions of the program are provided. One is populated with existing data so the user can see examples of what data are collected, how data are tabulated, and examples of reports created by querying the data. The version indicated by “.clean” has no saved data. The user can begin to populate this version with new or test data, or they can modify it to suit their own data needs.
5. Refer to the **Documentation** worksheet within the program for additional specific information.

## DATA ENTRY: STEP-BY-STEP:

1. On opening the program, in response to dialog boxes, Enable Editing, Enable Content. If you intend to add data, answer NO if you see a question to open in ReadOnly mode.
2. From the **Calendar** worksheet: Type in a date or use blue arrows on upper left of the **Calendar** to navigate.
   1. From ***Activity*** for that date, choose *Transfect.* Use button at upper right of that day to ***Save***. A ***Metadata Sheet Selection*** box will appear; use the drop-down list to choose *Metadata Template* (subsequently, the new metadata sheet that is about to be created will be a choice option). Click ***Proceed***. A message that the data have been saved will appear; click *OK*. The **Metadata Template** will open. Cell D5 will be prepopulated with the selected date.
      1. Provide the minimum amount of information by making a selection from the drop-down lists in cells D11, G11, and D12. You will see error messages in cells L11 and L12 if the ***Original plasmid backbone information*** (box to the right) contains data that are inconsistent with the information in D11, G11 and D12. An error here will not prevent proceeding. A transfection designator will be created in cell D44 with this information and the worksheet will be renamed.
3. Navigate back to the **Calendar** worksheet. The cell sample name that corresponds to the transfection designator (and which is the name of the new metadata worksheet) now appears on the **Calendar** worksheet in the ***Cell Sample Name*** column corresponding to the ***Activity*** *Transfect*. Press the ***Save*** button again. The new transfection designator now appears in the drop-down list under ***Cell Sample Name***.
4. After entering data on the **Calendar**, press the ***Save*** button before navigating away from the **Calendar** page.

## FEATURES OVERVIEW:

1. The **Calendar** worksheet allows entry of activities performed on each sample for any date.
2. In the **Calendar** worksheet, navigate to any date desired using the large BLUE arrows in the upper left of the Calendar window, or use the calendar icon to enter a date. In the box for the desired date, use drop-down arrows under headings ***Cell Sample Name*** and ***Activity*** to show lists of cell samples and activities to select from. The names of all cell samples that have been created will appear in the drop-down list and in the **Cell Samples** worksheet, which is updated when new samples are created.
   1. The ***Activity,*** *Transfect,*provides a template for collecting metadata about a new transfection. The user can choose the **Metadata Template** worksheet or a previously created transfection worksheet to modify. As the data for the new transfection are entered in the worksheet, the name of the worksheet is updated to reflect the date (which is automatically entered when the ***Activity,*** *Transfect,* is initiated from the **Calendar**), and other data that the user inputs about that specific transfection including the gene being modified, the fluorescent protein sequence being used and a designation for the guide RNA. A transfection designator (line 44 on the worksheet) is assigned by concatenating this information and the worksheet is automatically renamed with the transfection designator, which is the new cell sample name. Thus for each transfection, a worksheet named with the date and other information about the transfection is created in the workbook. An electronic folder named with the transfection designator can be automatically created within the operating system by providing the url of a network computer in cell A6 of the Documentation worksheet.\*\*
   2. When the new transfection worksheet and the corresponding transfection designator are created, the new cell sample name is added to the **Cell Samples** worksheet and becomes available in the drop-down menu in the **Calendar** worksheet under ***Cell Sample Name.*** The newest addition to the **Cell Samples** worksheet will be at the top of the ***Cell Sample Name*** drop-down list.
   3. In the use case shown here, each cell sample can be chosen on any day of the **Calendar** for an activity such as feeding, imaging, passaging, etc. (In this use case, the results of imaging measurements were used to determine whether or not there was a fluorescent transfected clone in the well plate.)
   4. When a clone is identified, it is given a new name by choosing the button to the right of the date labeled **Designate New Clone**. The user is presented with a drop-down menu containing existing cell sample names from which they make a selection. This is followed by a free text window to assign a *Clone ID*, which is generally a position on a multi-well plate. The *Clone ID* will be appended to the original cell sample name and the newly created name will be added to the **Cell Samples** worksheet and appear in the ***Cell Sample Name*** drop-down list on the **Calendar**. A new subfolder designated with the name of the new clone can be created in the folder that was named for the transfection designator.\*\*
   5. Worksheets can be temporarily hidden with the *Hide/Unhide* option by right clicking on the worksheet tab. This will reduce the number of worksheets visible (but accessible) in the workbook.
3. The columns labeled ***#***and ***Plate*** can be used to record the # of wells used and the total number of wells in cell culture plate for activities such as *Passage*, *Sort*, and *Freeze*. Exceptions to this rule for entries in the ***Plate*** column:
   * + 1. # of 10cm plates (type in 10cm)
       2. # of vialsfor freezing (type in the word vial)
       3. # of flasks of size (T125) (type in T125 or other flask designation)
4. Select ***Activity*** *Discontinue* when no versions of that clone are being carried further because of loss of fluorescence or other reason. Add reason to the ***Notes*** column as free text.
5. The ***Activity*** *Thaw* applies only to cells from a bank previously subjected to ***Activity*** *Freeze*. If you take a sample from the bank, indicate ***Activity*** *Thaw*. This might be followed by ***Activity*** *ExtractDNA*.
   1. A *Thaw* event is counted as incrementing passage number.
6. ***Activity*** *Sort*will append the **Cell Samples** worksheet with a new cell sample name to indicate sort number (\_Sort#). This new name will appear in the ***Cell Sample Name*** drop-down list on the **Calendar**. This action can also initiate the creation of a new folder with the appended name in the appropriate Transfection folder if that feature is enabled.\*\*
   1. Details of ***Activity*** *Sort*can be captured as free text in adjacent ***Notes*** column.
   2. The sort number automatically increments when a previously sorted sample is sorted again.
   3. The ***Activity*** *Sort*is counted as anincrement to passage number.
7. Other worksheets:
   1. Existing cell sample names are listed in worksheet **Cell Samples**. All activities are listed in worksheet **Activity List**.
   2. Data collected on the **Calendar** worksheet are organized in tabular form in worksheet **Data**. These data can be in the form of a data range or designated as a table by highlighting all cells and selecting from the toolbar ***Insert*** / *Tables* / *Table*.
   3. Examples of three **Transfection Metadata** worksheets (ex. **20200120mChOCT4sg2**) that were created for clones resulting from three transfections.
   4. \*\*The **Documentation** worksheet contains instructions to direct the automatic creation of folders and files with human readable names on a network drive. By default, the lines of code that enable that function are comment lines.
   5. Summary data can be created by queries. Examples of queries are **TransfectionsReport**, **DiscontinuedReport**, **FreezeReport**, **ExtractDNAReport**, **20200113mChOCT4sg2Report** and **Passage#s…** worksheets. As new data are added to the **Data** worksheet (such as from new entries on the **Calendar**, these **…Reports** worksheets can be updated from the toolbar by *Data* / *Refresh All*.
8. Controlling and making changes to the worksheets: [N.B.: These tips are meant to guide a user, not to serve as an Excel tutorial.]
   1. Whether you are using TransfectionTracker\_v1221.xlsm or TransfectionTracker\_v1221.clean.xlsm, consider saving a renamed version that you can write over without changing the original file.
   2. The **Metadata Template** has been designed for a particular use case, i.e., the collecting of information about clonal cell lines that are transfected by electroporation and identified and isolated by their fluorescence signal. The **Metadata Template** is created to capture some of the variations on a general protocol that are likely to occur and/or are being specifically tested. The metadata capture approach is designed to make it easy to record relevant specific details about the transfection and clonal isolation. Other use cases could require a modification or redesign of the template. This is relatively easy to do even without making changes to the VBA code by leaving in place cells that are specifically referred to in the code, namely D5 (date of transfection) and D44 (the transfection designator). If those positions are maintained, a new template could be created and substituted for the **Metadata Template** presented here. An example of modification of the template is shown by the differences between the metadata worksheet for transfection **20200120mChOCT4sg2** and the **Metadata Template.** The former was modified to add additional options on line 33 of the **Metadata Template** regarding the vessel for the transfection reaction.
      1. If a different naming scheme is desired, one can change the concatenation argument in cell D44 of the **Metadata Template**. Unprotect the worksheet as described in 8d below. Cell D44 currently references the values of three cells, D5 (the date), H11 (the fluorescent protein) and D12 (the guide RNA designation). Choose different cells to include in the concatenation instead, or create new cells with the desired new information, and reference those values in D44.
      2. The **Data Validation criteria** worksheet can be edited to add options to existing drop-down lists. With your cursor on the cell that you want to add drop-down options to, choose ***Data*** on the toolbar and the *Data Validation* option under *Data Tools*. In the pop-up box, choose *List*, and as the *Source*, navigate to the **Data Validation** worksheet and highlight the cells that you want the user to be able to select. If you add terms to one of the lists, you will have to expand the size of the list by dragging your cursor to include the added options. You can always eliminate or substitute terms in these lists. If desired, you can protect this sheet to keep anyone else from making changes.
      3. New drop-down lists can be added to the **Data Validation criteria** worksheet and can be selected from another worksheet as described above.
      4. Drop-down lists can be filtered by highlighting the contents, selecting *Data* from the toolbar, and the *Filter* option from *Sort & Filter*.
   3. Simple queries (the results of which are shown in the worksheets named **….Report**) can be generated by designating the **Data** worksheet contents as a table, highlighting the data, and selecting from the toolbar ***Data*** / *Get & Transform Data* / *From Table/Range* / *Table* (icon). A *Power Query Editor* dialog box appears, and data of interest can be selected from the ***Activities*** column. A new worksheet with the selected data is created which can be renamed. As new data are added to the **Data** worksheet (such as from new entries on the **Calendar**, these **…Reports** worksheets can be automatically updated from the toolbar by *Data* / *Refresh All*. A similar approach was used to generate the …**Report** worksheets for each transfection by selecting on ***Cell Sample Name*** in the*Power Query Editor* dialog box. Further queries of these selected data were used to generate the **Passage#s…** worksheets. [N.B. Do not assign the **Cell Samples** worksheet as a table, since it needs to operate as a data range.]
   4. Protecting and unprotecting workbooks, worksheets, and cells provides control by restricting worksheet cell entries while allowing intentional changes to be made. The protected status of the workbook and worksheets can be seen by choosing ***File*** / *Info*. Five worksheets in the current workbook are protected: **Calendar**, **Metadata Template** and metadata worksheets for three transfections.Protections can be removed from the ***File*** */ Info* page by pressing *Unprotect*, or from the worksheet at the tool bar by choosing ***Review*** / *Unprotect Sheet*, by using the password aplant. From a worksheet, it is possible to designate, through ***Home*** / *Cells* / *Format* function, which cells are to be protected and which are to be available for user input. In the **Metadata Template** worksheet, the orange-colored cells are not protected so the user can enter or select values for those cells.
   5. If entries are removed from the **Data** worksheet, they will be removed from the **Calendar** worksheet as well when the calendar date is scrolled.
   6. The activity ***Transfect*** could be renamed to accommodate a different kind of experiment or to use this tracking system for routine handling of multiple cell samples. For example, ***Transfect*** could be substituted in the **ActivityList** for ***Start a new cell line*** and the **Metadata Template** could be modified as described in part 8b above. However, it would be necessary to be sure that the new activity name was substituted in all relevant lines in the VBA code.
9. **Do NOT:**
   1. …Type in a cell sample name or an activity into a cell on the **Calendar**. Choose only options from the drop-down lists. If additions to the drop-down lists are needed, add them in the **Data Validation** worksheet.
   2. …Insert a row, column or cell into the **Calendar**. If a row is added inadvertently, it may not have a drop-down arrow associated with it. If this happens, simply use a row for that date that does access a drop-down list.