## Lab 4.2: Gene Expression Data Analysis

The data will be made available to you as a compiled Excel spreadsheet. You will use this period to mine the data and make decisions about controls, time-points, comparisons, etc., so that you can tease the answer to your question out of your mountain of data. Note some of the steps below are optional. Make decisions about what you think needs to be done with the data to answer your question and test your hypothesis.

### Suggestions for Mining the Data

1. **Manage your data file.**
   1. Copy the file to your desktop, save it as an Excel file, and work on it there. Delete unneeded columns.
   2. Make quick-and-dirty scatterplots of OD vs. time and fluorescence vs. time, for all the plate rows you hope to use in your comparison, just so you get an overview of population growth and induction. (You may discover wells or parts of the time course that have to be omitted for one reason or another.)
2. **Manage the time:** convert minutes to hours
3. **Manage cell density and population size**
   1. Correct for the OD of LB
   2. Convert OD of the culture to cell concentration in millions of cells/mL (remember your conversion factor from Unit 3?)
   3. Calculate the number of millions of cells in each 0.2 mL well.
4. **Manage the fluorescence**
   1. Correct for any background fluorescence
   2. Correct for different population sizes by calculating the fluorescence per million cells in each well.
5. **Manage the sugars**
   1. Calculate the concentration of each sugar in each well. (you should already know this)
   2. Calculate the number of sugar molecules in each well at the start of the experiment.
6. **Choose the index** or indices that will best answer your question(s). Depending on your particular investigation, **you might choose:**
   1. fluorescence per million cells at a given time (Figure 1, L)
   2. time needed to reach a given fluorescence per million cells (Figure 1, R)
   3. fluorescence at a given population size
   4. time to reach maximum fluorescence per million cells
   5. maximum fluorescence per molecule of inducer per million cells
   6. growth rate of cells vs. growth rate of fluorescence (review reproductive rate calculations from module 3)
7. **Make a variety of graphs** to try to illustrate the behavior of the cells under the different conditions in your experiment. Try tabulating data, too.

Figure 1. Change in fluorescence over time. Left: Different levels of fluorescence achieved at a particular time. Right: Different lengths of time required to achieve a particular level of fluorescence.

8. Your group should spend some time thinking about what data story you’re going to write for your Unit 4 lab report. What do you see in the data? Discuss with prof/TAs before you leave lab for the day.