OSCAR Schedule

Wednesday, June 1

- Worked on protocol similar to Marina's
- Determined specific concentrations of cortisol, carbenoxolene, NMDA receptor antagonists (Memantine, AZD6765, MK-0657) to add to each dish by looking at other research studies conducted in vitro on cell cultures
- Performed calculations (but not all) on how much of each chemical will be needed to know how much to buy
- Researched prices on chemicals to estimate how much they will cost
- Started writing Python program for the analysis that will be done after data collection
- Attended OSCAR orientation meeting

Thursday, June 2

- Continued to work on protocol with steps included. (Emailed Marina about a question I had on her protocol when the inhibitors are added).
- Started writing the protocol of analyzing the electrical activity using Python.
- Started writing Statistics Background section. Researched methods for analyzing the explanatory variables: type of NMDA receptor antagonist, cortisol concentration, and day number (It would be expected that the hippocampal neural firing rate would return to baseline as more days pass) and their effect on the response variable hippocampal neural firing rate.
- Learned about a 2^p factorial experiment which will be used to determine what variables affect the neuron firing rate the most. Also researched more about a two-way ANOVA if one of the variables does not affect the neuron firing rate much. If time allows, might increase p to 4 to include "injection" meaning repeating the experiment again and seeing how neuron firing rate changes (Literature suggests that patients who receive multiple ketamine injections have the antidepressant effect extended with each injection so it would be interesting to see if this trend is followed in this experiment).
- Explored a .h5 file produced before this experiment using MATLAB and Python. It is a file that the program NeuroExplorer can give. Comes with a lot of data that won't be necessary so should only need the .mat file to find out how many neurons fired in each plate.
- Learned more about the Python library seaborn for plotting graphs. Already knew matplotlib, another plotting tool, but seaborn can produce more sophisticated/professional graphs.
- Modified an existing immunofluorescence protocol for this project. (Will need to check if filter for immunofluorescence works since Marina said it had problems).
- Started writing protocol for the model/simulation part of the project. Will work more heavily on this at a future time.

- Reviewed and submitted IACUC revisions

Friday, June 3

- Went to the lab to feed cells
- Started protocol on immunofluorescence analysis
- Refamiliarized myself with ImageJ since it's been awhile
- Researched methods on best way to calculate dendrite number and maximal dendrite length
- Researched statistical methods to analyze the data. Think it would be best to have images before and after treatment and compare those two groups. Was thinking a two-way ANOVA, but I don't think that would work. It would work if only using one group of immunofluorescence images. I like the first option better so more research will have to be done to determine best statistical test
- Started researching how the analysis would be done in Python. Could use pandas, but will need to research how to use tests from the Python stats library on pandas dataframes.
- IACUC will be reviewed next Friday. When IACUC approves, will order chemicals.
- Next week, want to start working on model/simulation part of project. Will email Dr. Cebral since he teaches a Modeling and Simulation in Biomedicine class for some information (topics covered in class, textbook used). Already took a computational modeling class, but would like to develop a more sophisticated model/simulation.
- End of Week 1 thoughts: Making good progress on protocols/analysis. IACUC should be approved soon. Only concern I can think of is if the filter on the microscope for immunofluorescence works and what antibodies, if any, do we have. Else would have to buy some to image neurons, astrocytes, and nuclei. For analysis, should keep in mind that other methods for analysis (notably JMP) can be used and may be better.

Monday, June 6

- Emailed Dr. Cebral and Dr. Blackwell since they both teach a class on modeling. Dr. Blackwell sent me the link to the textbook used in her neuron modeling class.http://www.genesis-sim.org/GENESIS/iBoG/iBoGpdf/
- Read the first three chapters of that book. Most of it was review for me.
- The GENESIS simulation program requires UNIX which I don't have/know so I don't think I will use that textbook. Continue to look for books on computational modeling, preferably in Python or MATLAB.
- Finished the calculations and protocol for the electrical activity.
- Worked on the Analysis of the electrical activity section.
- Reviewed regular expressions (tools to find a subset of a string) and wrote the code to put the data of the two dishes for each group in one place (Ex. Mem_H_14_Day1_AFT (10 spikes) and Mem_H_18_Day1_AFT (15 spikes) to Mem_H_Day1_AFT (10 spikes, 15 spikes).

- Debugged that code with sample data using the same format that the actual data will be in.
- Reviewed Pandas (table library in Python) and put the sample data (random data that I generated) in a table. Think I'll be able to conduct the factorial statistical analysis of the table, but will have to research how to do that.
- Researched more into Seaborn (Python plotting library), but still not sure best way to plot data since there's three variables (Cortisol concentration, treatment/control, and day number). Will need to do more research
- Researched more into immunofluorescence analysis. Cannot perform two-way ANOVA since an assumption for ANOVA (Samples are independent from each other) is not met. Analyzing response variables before and after treatment requires a paired statistical test.
- Will have to do a paired statistical test, but haven't done one with two response variables so more research will have to be done.

Tuesday, June 7

- Researched more resources into computational modeling. Found two books: Modeling and Simulation in Python and Computational Modeling Methods in neuroscience
- Started reading both and got a good idea of how the model/simulation will be done
- Using Python's Object Oriented Programming (OOP) tools, create classes Neuron, DepressedNeuron, and Patient. Will incorporate type of NMDA receptor antagonist and cortisol concentration in determining probability of neuron spiking. Start with a small neuron size (100) and determine probability of spiking. Will read more about neuron spiking probability.
- This type of simulation will be similar to one I did when I was learning Python using MITOpencourseWare. The class: https://ocw.mit.edu/courses/6-0002-introduction-to-computational-thinking-and-data-science-fall-2016/
- The fourth assignment is a simulation of disease spread that I already did before so that will be helpful to reference in this simulation I am trying to do here.
- The model will accompany the simulation. Am thinking that since drugs typically decay exponentially, the antidepressant effect will also decay exponentially which is how the model will look and be compared to the results from the electrical activity gathered in this experiment.
- Used pandas to create table similar to what will be done with the real data. Will need to research more to graph data from table.
- Researched more into statistical test that will be used in the immunofluorescence analysis. A paired sample t-test will be used twice: once for the maximal dendrite length and another for the dendrite number.
- Started writing code for model/simulation in Python. Still need to figure out exactly how the model/simulation will be created. Will need to include the following parameters: voltage, NMDA receptor antagonist, cortisol concentration. Thinking place neurons on a grid and if the voltage reaches a threshold, the neuron will fire. Otherwise, it will not. If a

neuron fires, literature shows that nearby neurons will be more likely to fire so I will try to incorporate this feature to make the model/simulation more realistic.

Wednesday, June 8

- With the help of my mentor, purchased chemicals that are going to be used in this project. The chemicals were a little more than anticipated so won't have enough money in the budget. Really want to perform immunofluorescence so will buy conjugated antibodies with some of the stipend. Remaining money can be used later for miscellaneous lab materials (cell culture medium, pipette tips).
- Graphed sample data using Seaborn. Had to change table so will need two tables of data: one for graphing and another for the analysis.
- Continued to read computational modeling books.
- Still figuring out the code to create model/simulation. For firing rate might implement a Poisson model, but need to do more research.

Thursday, June 9

- Continued to write protocol for the analysis in ImageJ.
- Made protocol using a sample immunofluorescence image.
- Wrote step-by-step guide for converting a raw immunofluorescence image into an image where the maximal dendrite length and dendrite number can be measured.
- Have sample final image for analysis, but still trying to determine best way to take measurements. Probably a combination of ImageJ plot profile and human observation.
- Furthered developed graph for electrical activity. Looks better and clearer than before, but still some errors that need to be fixed. Main problem is the colors look strange.
- Graph for immunofluorescence image measurements should be similar. All the measurements will be plotted to gain an understanding of the general behavior of the data. For the table for statistical analysis, the mean of the data will be used.
- Continued to think about model/simulation. Created a tree using in graph theory on how I would build it. At the top is the simulation. Below that, is the patient and time points. Below that is the creation of the neuron grid, whether or not the patient is on an NMDA receptor antagonist antidepressant, and cortisol levels representing how much stress a patient can be under. The next row is a neuron and depressed neuron. The last row holds the properties of neurons: probability of spiking, whether or not it spiked at this time, and the voltage.
- These are the building blocks for the model/simulation. The parameters that can be changed are the NMDA receptor antagonist used, the cortisol concentration, and how depressed the patient is which will be represented by how many depressed neurons are in the neuron grid.
- After finishing this model and collecting the electrical activity, can compare between them and determine how accurate the model/simulation predicted the behavior of the neurons

Friday, June 10

- Went to the lab to feed cells
- Completed the Initial Research Assessment with my mentor
- Finished the protocol for the analysis of the immunofluorescence images in ImageJ
- Started and completed the Responsible Conduct of Research CITI training program to prepare for the seminar on Wednesday.
- End of Week 2 thoughts: Making good progress on all three parts of project. Supplies for the electrical activity should arrive soon. Hopefully IACUC will approve soon. For the immunofluorescence, really good that we have antibodies. Won't need to purchase. Will need to learn how to use filter on microscope. Model/Simulation going good. Have to start simple and then develop more complex features as I progress.

Monday, June 13

- Revised the electrical activity protocol to include making stock solutions from raw materials.
- Successfully created a graph to visualize neuron spikings from the different groups and cortisol levels.
- Reviewed immunofluorescence protocol to determine alternative way of counting dendrite numbers and lengths. Determined the way it is now is fine.
- Created a graph that will show how dendrite length/number will vary before and after treatment of cortisol/NMDA receptor antagonist.
- Not sure whether a paired t-test or a two-way ANOVA is more appropriate to determine if there is a difference before and after treatment.
- Continued to work on the model/simulation.
- Researched tkinter, a Python GUI library, to create a visual representation of the neuron grid filled with neurons and "depressed" neurons.

Tuesday, June 14

- Looked into previous protocols on operating immunofluorescence microscope and image software. Will test them out next time in the lab.
- Developed code to plot the data that will be obtained from the experiment directly.
- Started to write protocol on conducting a full factorial experiment using JMP. There are three categorical variables: Group, Cortisol Concentration, and Day each with 4 levels. If one of the variables does not contribute much to the response variable hippocampal neuron firing rate, a two-way ANOVA will be performed.
- Continued to look for statistical tests for the immunofluorescence analysis. Decided that a two-way ANOVA followed by a post hoc Bonferroni test for multiple comparisons would be best. Two will be performed: one for maximal dendrite length, and one for

dendrite number. (Might conduct a paired sample t-test followed by the Bonferroni test to see if the results match.)

- Dr. Cebral responded to my email and he gave me a pdf on a book on partial differential equations. Will read it to incorporate into my model/simulation. Specifically, the diffusion equation, which is a function of time and position. Currently, the model assumes that the drug is instantaneously well mixed when it enters the body and that the effect is the same everywhere on the neuron grid. So this would not depend on position. A more realistic representation would be to have the drug diffuse as a function of time and position. So it would be f(x,y,t) since the grid is in 2 dimensions.
- Looked into libraries in Python on solving PDEs. Will need to consider whether using an existing one or making my own using finite difference methods. Will need to research more about solving PDEs since I'm not too familiar with them.

Wednesday, June 15

- Looked into aesthetics for the graphs made in Seaborn so that they look nice and easy to understand.
- Looked into normalization methods. Not sure what to normalize to.
- Created a sample excel spreadsheet where the maximum dendrite length and number will be recorded. Loaded into Python and graphed it with a boxplot.
- Will look more into normalization methods for both electrical activity and immunofluorescence data. Thinking about normalizing using Pandas data frames rather than in Seaborn.
- Looked more into the 2D version of the diffusion equation. Think I can use the analytic solution, but when I looked at a graph, it isn't exactly what I was looking for. In that solution, the peak is always in the center. In the model I want, I want to inject the drug onto the center of the neuron grid and have is spread evenly in every direction.
- Confirmed that the analytic solution to the diffusion equation was right by doing the derivatives using Sympy, a Python library for computer algebra.
- Think I would have to modify wave equation so that at every time step, the peak would move in all directions. Maybe look into the wave equation.
- Looked more into it. A 2D version of diffusion of an instantaneous point source will be good. The analytical solution will be used. Will have to configure parameters to make the model/simulation as realistic as possible.
- The way I'll incorporate this is that this equation is going to be used to find the concentration of the NMDA receptor antagonist at a specific cell. The higher the concentration, the more likely the cell will spike. Will need to do more research on this relationship. Will need to scale concentration of drug with size of neuron grid.
- Attended Research seminar.

Thursday, June 16

- Developed way to normalize data from electrical activity. Still need to figure out how to implement custom error bars onto Seaborn plots.
- Researched more about NMDA receptor antagonists diffusion coefficients to use in the analytical solution of the 2D diffusion equation. Determined 6, 12, and 24 um^2/s diffusion coefficients were reasonable. Each of the three NMDA receptor antagonists will be assigned one of these diffusion coefficients.
- Researched more into doses. Determined that 75 mg would be reasonable. It would be taken at the beginning of the simulation. Want to incorporate simulating a patient taking another dose after a few days to see the outcome.
- With regard to the drug, it makes sense for me. However, with the way it's set up now, it seems that the higher the dose, the more effective it will be. This is true, but a higher dose means more toxicity introduced into the body which isn't good. Also, the diffusivity of the drug is also important to consider. The longer the drug is in the body, the more effective it can be. Changing the diffusivity of a drug is possible since there are methods already in place, like laser drilled holes in pills, that alter the diffusion rate. Though this goes back to the whole toxicity issue. Would be interesting to incorporate a toxicity component to this model/simulation and do model parameter estimation to determine "best" dose and diffusion constant with "best" meaning having an increase in neural hippocampal firing rate for as long as possible while also keeping toxicity to a minimum.
- Received email from IACUC requesting more information on protocol so the approval will have to wait a little unfortunately.
- Worked on addressing IACUC comments. Most of the comments address the adult/breeding rats. Since breeding was already approved under a previous protocol and the rats used will be obtained from those rats, it does not have to be repeated in this protocol.

Friday, June 17

- Went down to the lab to feed cells.
- Interacted with the immunofluorescence part of the microscope while in the lab using a past protocol. Found the equipment and software. Next time, find a sample slide to go through process of image acquisition.
- Updated IACUC protocol and addressed comments. Submitted comments and application.
- Looked more into numerical methods like optimization methods to determine way to deal with efficacy and toxicity of a drug and use model parameter estimation to determine best dose and diffusion coefficient associated with a particular cortisol concentration.
- End of Week 3 thoughts: Made good progress on the code for electrical activity and immunofluorescence analysis. Think it may be good to repeat experiment to include multiple injections. If this were to occur, would need to update the analysis for electrical activity to include a four factorial experiment. Making good progress on the model/simulation. Want to make it as realistic as possible. Hopefully IACUC will approve protocol soon.

Monday, June 20

- Modified the code for the electrical activity to graph the normalized data with error bars
- Continued to write protocol for electrical activity by conducting a full factorial experiment using JMP and analyzing the results
- Looked into the pharmakinetics of ketamine to determine reasonable values for ED50 and TD50 which are important for determining efficacy and toxicity. The values that will be used are 10 mg/kg and 35 mg/kg respectively.
- Thinking of implementing multivariate optimization methods to determine best dose and diffusivity given a specific cortisol concentration and depression level. This could help give a patient the best course of treatment with these NMDA receptor antagonists.
- Looked more into calculating probability of a neuron spiking.

Tuesday, June 21

- Continued to write protocol on performing a two-way ANOVA and a post-hoc Tukey test in JMP
- Looked more into probability distributions including the gamma, exponential, Poisson, distributions to incorporate an element of randomness. Decided on drawing numbers from a log-normal distribution since neural firing rates typically follow a log-normal distribution
- Adjusted the ED50 and TD50 values to 0.57 mg/kg and 2.56 mg/kg respectively since these values are more accurate than the ones listed above.
- Started to write code to optimize dosage by creating two sigmoidal functions: one for efficacy and one for toxicity and subtracting them.
- Started looking into optimization methods for one variable and then move onto multiple variables
- Researched more about integrate and fire neuron models

Wednesday, June 22

- Started and finished Deconvolution of Immunofluorescence images protocol describing the background of deconvolution and how it is used in immunofluorescence microscopy to create better images.
- Developed code to index into grid to get position of drug to use in diffusion equation at that location. The point (0,0) is in the center of the grid, but Python starts the index at the top left of the grid. Developed way to get correct values for both indexes at the same time.
- Attended Abstract seminar.

Thursday, June 23

- Developed function to visualize diffusion of drug as a function of position and time using a heat map
- Researched optimization methods to use in Python to minimize cost function which in this case would be the summation of two exponential functions resulting in an exponential rise followed by an exponential decay which is what is expected for how the increase in hippocampal neuron firing rate behaves.
- Researched multiple optimization methods in Python in order to compare model to data. Could use scipy optimize curve fit, but would have to look into incorporating constants and multiple exponential functions.

Friday, June 24

- Went down to the lab to feed cells
- Interacted more with the immunofluorescence microscope. Still having problems with the software
- Looked into spike firing rate models. Will use a stochastic integrate and fire model to implement probability of a neuron spiking.
- Researched more into multivariable analysis. Will use a modified Hill equation to maximize efficacy and minimize toxicity of the drug with a constant cortisol concentration and depressed level, depending on how many depressed neurons are on the neuron grid, to find the best dose and diffusivity
- End of Week 4 thoughts: Made good progress on the model and simulation. IACUC still hasn't approved protocol which is unfortunate. For presentation, will use model and simulation since the other parts won't be ready in time. They're complex enough to talk about for presentation.

Monday, June 27

- Completed Mid-Research Assessment
- Fine tuned spike probability function, which is a modified exponential integrate and fire equation, to yield reasonable spike probabilities.
- Wrote code for Python to go through neuron grid and compute whether or not that neuron spiked.
- Tested code for graphs produced by simulation. Graphs show an exponential rise followed by an exponential decay which is expected. Also, a higher cortisol concentration prolongs the sustained increase in hippocampal neuron firing rate which is the hypothesis for the electrical activity part of the project.
- Researched more into multivariable optimization methods. Will have two functions: an efficacy function which is to be maximized and a toxicity function which is to be minimized. The input parameters will be cortisol concentration and how depressed a patient is and the output parameters will be the dose and diffusivity that maximizes

efficacy and minimize toxicity. The constraints will be that the input parameters have to be positive values. Once I get optimization method to work, might incorporate cost as a constraint.

Tuesday, June 28

- Modified exponential integrate and fire model for neuron spiking probability.
- Inputted variation of parameters in simulation such as dose, diffusivity, size of neuron grid, and cortisol concentration given by the numbers 1.2, 1.4, 1.6, 1.8, 2.0 ranging from lowest concentration to highest concentration.
- Researched Numba, a Python library for faster code processing, to see if I could use it in my code. Modified code to include Numba, but it has some strict requirements that cannot be met in this simulation.
- Besides Numba, reviewed code to look for ways to improve efficiency. Found a way by removing sympy variables in drug diffusion calculation function and use numpy arrays. Code performed much faster to allow for larger grids of neurons to be used
- Modified spiking simulation function to include a time delay before the drug is applied to the patient.
- Simulation is looking a lot better now. With the time delay, there is a low spiking rate before the application of the drug. Once the drug is applied, there is a sharp exponential rise followed by an exponential decline. Also, the higher the cortisol concentration, the slower the exponential decay back to baseline.
- Will need to develop model, in this case two decaying exponentials added together, to compare to experimental results. Will need to use simulation to develop model.

Wednesday, June 29

- Now that simulation is complete, can now create model
- Simulation shows an exponential rise followed by an exponential decay, which is what is expected, so the model equation will be two exponentials subtracted from each other
- Looked more into Scipy's curve_fit function to find the parameters of the model equation: $S(t) = A_1 e^{-\frac{t}{\tau_1}} + A_2 e^{-\frac{t}{\tau_2}}$ which is the number of spikes as a function of time.
- Started with a single exponential term to test curve_fit function. Produced incorrect results. Researched more into it and changed the initial guess values and got a correct curve.
- Then moved onto the two-exponential term model equation. Produced strange results (straight line, couldn't converge to an answer). Looked more into it and started to change boundaries on parameter values by trial-and-error. Eventually found boundaries that produced bi-exponential curve that fitted the simulation data
- Produced equation that fit that specific simulation data (Even though randomness is involved, it can be controlled using np.random.seed)

- Will need to generalize model equation to account for meaningful variables such as cortisol concentration instead of plain numbers that just fit the data
- Looked more into pharmakinetics of ketamine, specifically the diffusion of ketamine through the brain. In terms of efficacy and toxicity, the diffusivity rate is opposite to the dose of the drug; a smaller diffusion rate will lead to a higher efficacy and toxicity while a larger diffusion rate will lead to a lower efficacy and toxicity
- Will need to combine efficacy and toxicity equations of dose and diffusion constant and perform optimization methods.

Thursday, June 30

- Researched ways to relate diffusivity and efficacy/toxicity in a similar way that dose is related to ED50/TD50
- Could not find ways to directly relate diffusivity with efficacy/toxicity. Will need to use simulation and ED50/TD50 values to create efficacy/toxicity sigmoidal curves for diffusivity
- Will need to create efficacy and toxicity functions for dose and diffusivity and combine them into one net benefit equation. A minimization algorithm could be applied to find the values of dose and diffusivity that produce the largest net benefit
- Either that or keep efficacy and toxicity equations separate and use multivariable optimization to find values of dose and diffusivity that maximize efficacy and minimize toxicity

Friday, July 1

- Went to the lab to feed cells
- Researched more about logistic regression and multivariate regression with regard to diffusivity on efficacy and toxicity
- Will need to combine efficacy and toxicity equations to one net benefit equation and use optimization methods to determine what dose and diffusivity maximize this equation
- End of Week 5 thoughts: IACUC got approved today so hopefully will perform surgery by Week 9. Simulation is done so 3 major parts left: develop the model parameters using values and changes in the simulation, create an optimization function that gives the maximum of the net benefit equation given a specific cortisol concentration and how depressed the patient is, and write a function that compares the model and the experimental data by creating residual plots and determining the R squared value to determine how well the data fits the model

Tuesday, July 5

- Developed model parameters using simulation with different cortisol concentrations

- Started writing code to compare how well model fits the data
- Fitted model to simulation graphs and calculated R squared value to assess how well model fits the data
- Looked more into the Seaborn library to determine if a catplot could overlap with another. Determined it could not. Will have to use matplotlib to create a 4x4 subgrid to overlap the model onto the data and calculate the R squared value

Wednesday, July 6

- Developed script to go through data dictionary, interpolate the data points using a cubic method, plot the interpolated data and the model on one graph, and calculate the R squared value to see how well the model fits the data
- Modified the spiking simulation function to include 1 additional dose after the initial dose.
- Started modifying the spiking simulation function to include more than 1 dose delivered at a given time. Will need to find way to use diffusion equation depending on when that specific dose was delivered.

Thursday, July 7

- Updated simulation script with comments to make it easier to understand
- Finished modified spiking simulation to include multiple doses after initial dose
- Modified spike firing rate function for neurons of the class Neuron to fire less since they were firing all the time before
- Changed simulation parameters to see how firing rate is changed including using multiple doses in a row to see if firing rate reaches steady-state

Friday, July 8

- Went down to the lab to feed cells
- Researched more into ED50 and TD50 for ketamine.
- Adjusted neuron grid to a 15x15 grid. A higher nxn grid will produce the same results as the 15x15 grid. Previously used a 11x11 grid which was determined to be too small
- Interacted with simulation by using extreme values for dose and diffusion coefficient. Will need to quantify efficacy and toxicity in terms of ED50 and TD50 and the simulation
- Looked at resources for how to make a video presentation
- End of Week 6 thoughts: Making really good progress on simulation and model. The last part is the trickiest with determining optimal dose and diffusivity. I need to start thinking about the video presentation and writing the abstract. Will need to see other video presentations to get an idea of how it should be done. I don't want it to be boring and me

just showing a bunch of graphs so will really need to think hard about the best way to present this which sounds difficult.

Monday, July 11

- Started writing outline for video presentation.
- Wrote list of information I want to talk about in the presentation. Will need to think more about adding creativity to presentation.
- Started writing objective function to minimize to find optimal values of dose and diffusion coefficient. Ran into many problems and will need to fix function

Tuesday, July 12

- Started Marina's experiment
- Continued to write outline for video presentation.
- Wrote net benefit objective function to minimize to find dose and diffusion rate that produces the maximum efficacy while minimizing toxicity. Will need to modify it to include cortisol concentration and level of depression

Wednesday, July 13

- Continued Marina's experiment
- Continued to write outline for video presentation
- Reviewed past video presentations to get a general idea on how to make one.
- Attended video presentation seminar

Thursday, July 14

- Continued Marina's experiment
- Started to write script for video presentation
- Continued to develop objection function to minimize to calculate optimal dose and diffusion coefficient. Used gaussian functions instead of sigmoidal functions for efficacy and toxicity for diffusion coefficient. Graphs don't look correct so will need to troubleshoot

Friday, July 15

- Finished Marina's experiment
- Continued to write script for video presentation

- Modified comparing experimental data to model script. Can't use R squared for nonlinear regression. Will use standard error of the regression
- Modified objective function for minimization. Instead of gaussians, will stick with sigmoidal functions for both dose and diffusion rate
- End of Week 7 thoughts: Almost done with simulation. Will have to modify some graphs for the presentation. I have a general idea on how I'm going to do the presentation so I'll start recording next week. Will also need to start other stuff like blog post and abstract.

Monday, July 18

- Continued to write script for video presentation
- Started writing OSCAR blog post
- Researched video editing methods. Will use Adobe
- Researched more into using standard error of the regression to calculate how well data fits the model
- Wrote more code for optimization of dose and diffusion rate

Tuesday, July 19

- Finished OSCAR blog post
- Continued to write script for video presentation
- Researched methods to merge audio and video from two separate sources.
- Continued to write code for optimization of dose and diffusion rate using multiple algorithms. Minimum is odd since the point algorithms give isn't on the function curve. Will need to debug

Wednesday, July 20

- Continued to write script for video presentation
- Continued to prepare powerpoint for video presentation
- Learned about Audacity features for audio editing
- Attended fellowships seminar

Thursday, July 21

- Submitted OSCAR blog post
- Started to film video presentation
- Fixed the efficacy/toxicity graph to find the minimum

Friday, July 22

- Finished powerpoint slides for presentation
- Week 8 thoughts: I have everything I need to start recording and editing my video presentation. I also have to start writing abstract.

Monday, July 25

- Started editing video focusing on audio like removing noise and recording voice lines
- Wrote abstract for video presentation

Tuesday, July 26

- Continued putting together video
- Created rough cut of video presentation, Still need to edit more

Wednesday, July 27

- Fixed color and camera shaking
- Made small cuts with mistakes with words
- Looked into effects for video
- Looked into music for video. Will add

Thursday, July 28

- Added music to video
- Adjusted volumes
- Made general edits
- Finished video

Questions from Nathalia on 220606:

1. Great summary/details/writeup, thank you!
2. Cebral – I think – said he won't be working this summer...

That's fine. I also emailed Dr. Blackwell and she sent me a link to the textbook used in her neuron modeling class.

3. What is JMP?

JMP is a statistics program. I might use it for data analysis if needed.

4. Did you get Marina's updated protocol (with my photos) for the drug experiments?

I don't think so. I'm using the protocol on Microsoft Teams Marina put on May 4 and there's no pictures in that one.