Robertson Lab Trainee Guidelines **March, 2013**

While in the lab, you will be conducting a novel research project as a main activity. This will provide you with the opportunity to enhance your understanding of the research process, gain experience in experimental techniques, analytical thinking, experimental design, writing manuscripts and fellowship applications. In addition, your contributions will help advance biomedical research. If successful, you will have a chance to learn about how to present your results both in meetings and in the literature and meet brilliant and exciting people in your field from all over the world. This laboratory will provide an opportunity for you to train and develop as a scientist who will eventually be able to manage your own research program at an academic institution, biotechnology or pharmaceutical company, or other career choices that you may choose. It should be an exciting adventure.

That said, I wanted to provide you with some guidelines that I believe are important:

1. It is essential that you accurately record and share enough information so that others can reproduce your results.

2. **From my perspective, perhaps the most important thing is that you be honest in your experiments and in your presentation of the results. This is absolutely essential, and I will not tolerate any scientific fraud. Fortunately, this has not, to my knowledge, ever been an issue in my lab. I want to keep it that way.**

3. **Therefore you should have all the primary data for each manuscript that we publish with notes as to the data you have used for each panel in the figures in the manuscript as well as supporting data all saved on your computer and on the backup drives. No exceptions.**

3. It is essential that you learn and follow safety rules so the lab is a safe place for everyone.

4. Please try to do what you can to help others and make the lab a pleasant experience for everyone.

In conducting research, make sure you follow the "Guidelines for the Conduct of Research in the Intramural Program at NIH", found at: http://www.nih.gov/science/irnews.htm and the University of Pennsylvania guidelines found at:
http://www.med.upenn.edu/bgs/docs/BIOETHICSHANDBOOK4-04.pdf

A.Laboratory Notebooks:

An important part of the research process is keeping accurate records in lab notebooks. The NIH as well as the University has rules and advice about this in the "Guidelines for the Conduct of Research in the Intramural Program at NIH". Also, NCI guidelines for lab notebooks can be found at: http://ttc.nci.nih.gov/resources/brochures/labrecords.php

Please follow them Specific points I'd like to make:

Please keep a bound notebook in which you describe your experiments. Not loose-leaf. Please write legibly. Keep in mind that others may need to refer to your notes long after you have left the lab, and your notebooks will be useless if they are illegible. This can happen even 7-10 years after you have left the lab.

Please organize your notebooks as outlined below. Again, the idea is to make it easier for people to understand your notes after you have left the lab. Attention to lab notes is not optional in this lab -- it is required. Your notes are every bit as important as the experiments you perform.

Write out your plans *before* you start your experiment. This practice allows you to anticipate potential problems and will ensure that you have all the reagents and supplies you need before you get stuck in the middle of a protocol. Never undertake a new protocol without checking to be sure all reagents are available in the lab. If they are not, order whatever is needed on the white board. Do all necessary calculations ahead of time. This can be critical for some more critical assays -- you don't want your precious samples sitting around while you try to figure out what and how much to add. You are also much less likely to make mistakes if you have thought the experiment through beforehand. While all of this may seem self-evident, many people don't bother to plan ahead, and their work shows it. Do not use scrap paper for notes or notepads as you will have to rewrite them again and this takes double your time.

1. **Start a new page for each separate experiment.** The goal is to give some organization to your notes so that they will be easy to follow, even months or years later. The actual determination of what constitutes a separate experiment is somewhat arbitrary and is left to your discretion. I am certain that you can determine what constitutes a separate experiment. If you need clarification come ask me.

2. **Notes should be carefully dated.** Date each new entry. If you later annotate a write-up to reflect new thoughts or conclusions, date and cross-reference your annotations with the page number of the preceding notes that will be helpful for someone trying to follow your notes. This is very important -- it makes clear to anyone reviewing your notes that these additions were intended as annotations, not as fraudulent changes.

3. **Each individual experiment should be given a number.** The system you use is up to you but should be consistent. For example, 2005-19 might be 2005, experiment 19 (and 19-1 or 19.1 would be page 1 of that experiment). Your initials plus the experiment number would also be acceptable, but the advantage of using the year is that it will make it much easier for you to find things in the future. I strongly encourage using the year as this will help identify reagents that were generated in the same time frame for inventory and simplifying things.

4. **It is suggested that you keep a running table of contents; it will be much easier to find things later on.**

5. Each experiment should also contain the following information:

Title: Sufficiently descriptive to allow quick recognition of contents of the experiments.

Aim: What was the rationale for designing the experiment in this way or for choosing this set of conditions?
Material and Methods: Please be as detailed as possible, including calculations, recipes for buffers or other reagents. If you do something very routinely and have made no changes at all in the protocol, refer back by number to an earlier experiment. If you have changed conditions from an earlier protocol, refer back to that experiment and summarize the changes.
Raw Data: Including scintillation counter or spectrophotometer printouts, X-rays film (dated and indexed with experiment number). If your large X-ray films are kept in a set of old film boxes, make sure it is clear in your notes where a particular X-ray film can be found. This should not be necessary at this point as you all use the Odessy/LiCor. All gels photos and digital images should be stored as a raw data directly in notebooks pasted and annotated for clarity. You should also be sure to have a back up file with all the initial data with the same nomenclature if this is needed in the future. All digital data should be saved for gel pics, western blot, phophorImager, Luciferase, FACS, ELISAs etc.
Conclusions/Summary/Results: What size fragments lit up on a Southern blot? Which bands indicate your clone or did the diagnostic digests you performed on a new plasmid prep match the map? Which of a series of reaction conditions worked most effectively? If you take the trouble to do this routinely, it will save you a great deal of time later on: you won't have to reinvent the wheel constantly.
Important Notes: Are there any caveats about the interpretation of the results? Might the experiment work better if the conditions are changed slightly the next time? If an experiment did not work or was uninformative, what factors might make a difference? (Unless you are sure you made a careless mistake in designing or executing an experiment, it is not worth repeating the experiment until you have spent some time trying to determine what might have gone wrong.) What is the next step that would be critical?

6. **NUMBER ALL SAMPLE TUBES WITH AN EXPERIMENT NUMBER BEFORE YOU PUT THEM AWAY.** A system of this sort makes it much easier to locate samples and reduces the amount of information you need to include on tube labels. **Your samples should also ALWAYS be dated, initialed and labeled for identification.** A tube labeled 1, A, etc. is unacceptable; it is too easy to collect a lot of tubes and then to forget what they contain. All new recombinant viruses, clones and cell lines generated and received should be inventoried and passed on to the lab personnel responsible for maintaining the Lab Inventory. All information necessary for supporting this clone also has to be provided. All the maps and critical information provided. This should be done immediately not when you get around to it. It should be part of what you do. Also make sure that when we receive reagents from other labs that this is clearly documented as to who send it and any specific information put into the records. This ensures that we give proper credit to our collaborators and others who have been generous in providing these reagents.

7. Occasionally, after a long series of similar experiments, it can be helpful to go back and **review the results and then write a summary.** This practice can save you an enormous

amount of time when you are ready to prepare a manuscript or begin writing your thesis. If appropriate, design a template sheet that can be used to record and summarize data.

8. At this time I would not suggest keeping notes on computers as we have no way of knowing how they were manipulated. Additionally, the guidelines are a bit vague so until there are strict guidelines please keep all primary notes in the manual notebooks provided.

9. All primary data from the equipment saved on the hard drives including microscopes, FACS machines, PhosphoImager and digitals scans etc should be backed up and stored on your allotted space on the backup drives once a week. NO EXCEPTIONS.

10. In the event that you have generated data enough for a manuscript it is critical that every piece of data that you have generated and will show in the manuscript can be backed up by the primary data from where in the gels you have cut this section, actual numbers of data from scans, FACS, ELISAs ImageQuant etc. You are expected to have all of this saved in a separate file with the manuscript title so someone can find it.

11. I do understand that we are all different and have different ways of doing things. These are to help you to be more efficient and effective in your work. Additionally, it should be a natural way of doing things once you get into the habit of following these guidelines. As always any questions please come see me.

B. Authorship

There are a number of "ground rules" for authorship on papers. The NIH Guidelines for the Conduct of Research has guidance on this on page 10, and I follow this; it is essentially the same as found in the universal rules for authorship. In general, to be an author, one must:

1. Contribute to the Conception, Planning, and design of the work that led to the paper or interpreted the evidence it presents, or all of the above.
2. Wrote the paper, or reviewed successive versions and take part in the revision process.
3. Approved the final version.

One issue I have found to come up periodically over the years is that of **first authorship**. While there are many possible scenarios, the *first author is generally the person who played the major role in carrying the ball during a project and interpreting the results under the guidance of the senior author*. "From my perspective, for a researcher to be first author, it is essential that he/she steer the project to completion, pull the data together, write a draft manuscript, and then continue to contribute to the project through to submission". With present computer and Internet technology, this can be done even if the person is at another institution. In general, the researcher given the opportunity to do this is the person who was the lead researcher on the project - this is usually obvious, although for long projects that span the tenure of some people in limited time appointments, there may be some discussion on this matter. However, it is essential for that individual to pull the data together and take a major role in writing it up. I am happy to provide

substantial help and guidance to them in this process - I understand that people may not have experience in writing a paper or may not have English as their native language and I will do whatever I can to help and guide them. However, if a researcher does not finish the project before they leave, pull together a first draft of a manuscript within a reasonable time from completion of the work (usually 2-3 months), and help steer it to publication, this causes a problem. *If the person has not completed the project at the time they leave or, after discussion, does not promptly write a first competent draft and then continue to be involved in the submission process, that person risks abandoning the privilege of being first author.*

Publication of our results is the process by which it is recorded that the work that has been done - all the research done here involves precious resources supported by the NIH and other foundations, and usually involves the contributions of many people, and I accordingly view a failure to write work up very dimly. If a researcher abandons their right to first authorship in this way on work they have completed, other scenarios (for example the senior author or another major contributor taking the lead in interpreting the data and writing it up as the first author), but this is a problematic situation. I much prefer that the logical first author in fact take his or her due role and get proper credit. In a similar way, for people who do not complete work or leave before work is completed, we need to find an appropriate way to deal with authorship issues if someone has to finish the work and gets it out.

I expect that no one will leave work not written up, but wanted to clarify my position on this. I also wanted to stress the importance of projects being completed (if they are worth completing). If anyone has questions or concerns about it, please let's talk. But I wanted to air this up front to prevent any misunderstandings down the line.

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