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Undergraduate Student-Faculty Research Program

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Mid-Year Report

As mentioned in my past two blogs, I have learned and mastered the proper techniques in order to begin my research. These techniques include 3-D culturing of cancerous MCF7 breast cells, Protein Extraction, Cell Lysis, Protein Concentration Assay, Gel Electrophoresis, and Western Blotting. The proper execution of these techniques is essential in obtaining hopeful results. Week after week, I would perform these techniques in the exact order listed and each week I received similar but different results. I later came to realize that even though I am performing the same procedures over and over again, each time around had its slight differences. Resulting from these differences was an increase in my troubleshooting skills. Towards the end of the semester, I was able to determine if something specific happens how to repair the problem as well as what certain results mean in comparison to the others.

In addition to the techniques, I have been replicating the work of my mentor, Nancy Krucher, in order to acquire all of the essential background information needed for my area of research. My main focus is the Retinoblastoma (Rb) protein which is a tumor suppressor protein found in all cells and acts as a brake for cell division. In cancer cells, Rb becomes highly phosphorylated and allows cells to pass a specific restriction point in the G1 phase of the cell cycle thus continuing onto cell division. Clearly, the continuous division of cancerous cells is not what we want, therefore how does one stop this process from occurring? I have been working with the technique that Dr. Krucher has taught me called PNUTS Knockdown, which is supposed to cause cancerous cells to undergo apoptosis, also known as programmed cell death. When I first began research over the summer with Dr. Krucher, I introduced this PNUTS Knockdown procedure into my 2-D breast cells cultured in 96-well plates and compared it to my positive control that is known to kill off cells: Staurosporine. Fortunately, the knockdown of PNUTS was a success in cell death. Therefore, Dr. Krucher decided to move forward from 2-D to 3-D cell cultures and implement the same procedures in hopes for results of cell death once again. However, Dr. Krucher recently discovered that PNUTS Knockdown is not effective in the 3-D cultures and must now test out other methods to induce cell death. Currently she is working on introducing a specific drug that takes several weeks to show its effects whether they produce the wanted results or not. Therefore, I must wait until I return from the break to see if the drug was effective in the 3-D’s.

In the meantime, I have been perfecting my skills and techniques rather than growing new 3-D cultures. Moreover, this entire semester, I was enrolled in my Bio 490 course titled Introduction to Research in the Sciences. Throughout this semester, I have learned how to properly read, write, and interpret scientific writing while simultaneously compiling work and results for my research in the lab. Obtaining feedback from both my Bio 490 professor as well as Dr. Krucher was very helpful although sometimes frustrating when the two conflicted. In the end, I produced a thorough research paper as well as a PowerPoint presentation full of factual information and statistical results from my work so far in the lab with Dr. Krucher. Additionally, I attended Dr. Krucher’s seminar at the end of the semester in which she discussed all of her research from the last 15 years as well as her hopes for the future in her research. Through her seminar, I gained some ideas and pointers on how to present my own research to my Bio 490 class. Between my Bio 490 class, this research program, and Dr. Krucher’s seminar, I have developed a stronger foundation of knowledge for overall research and its components.

Although I have only conducted in a semesters worth of research, I have come to realize how challenging it really can be. Lots of dedication, time commitment, and patience are needed when conducting in research. I have to keep reminding myself that I am still only a beginner. Therefore, if do not understand something right away or I do not obtain instantaneous results, I cannot become frustrated. It’s okay to stumble upon small mistakes here and there-it is only just the beginning. As long as I keep reminding myself of that idea, I can only move forward with my research. On the other hand throughout this semester, I was able to come to accept results that may seem misleading thus allowing me to be more open-minded to a wide range of results. I am not afraid to question why something is or even try something new when what I initiated before did not work. Dr. Krucher continues to encourage me by saying I am doing a wonderful job and inspire me to become a better researcher. She reminds me that everything means progress and to not be discouraged by my end results. Furthermore, I expect to become increasingly comfortable with research by the end of next semester, become even more knowledgeable on the topic and the research of other scientists in the same field, and discover some sort of drug or procedure that will induce apoptosis in the 3-D cell cultures. I am ecstatic to see whether the drug Dr. Krucher tested actually causes apoptosis or not. Conducting in research has sparked my curiosity and keeps me interested and wanting to learn more thus feeding my anticipation to return to research in the spring semester.