

Greta Huang -

When I first walked through the doors at the NASA Space Radiation Lab (NSRL), I was absolutely floored. The lab setting was nothing like I had ever seen before; retina scanners, panels of computer monitor and towers of sophisticated electronic equipment. Hidden in the back, there were several cell culture rooms, lit yellow with lights designed to protect the retinol in growing skin tissue culture, filled with incubators and pipettes. It was with these sorts of rooms that I became familiar with over the course of my six week internship at Brookhaven National Laboratory.

I met my fellow interns, Collin Francis and Sajid Hasan, who would be working at the NSRL with me over the course of the summer. Collin was a part of the HBCAC Prevention is the Cure program, like me, but Sajid had come to work with us as part of the High School Research Program at Brookhaven. We were introduced to our truly amazing mentors: Dr. Michael Sivertz, Dr. Stefan Tafrov, and Dr. Lawrence Hoff.

During our internship, our major focus was on a cellular senescence project headed by Drs. Tafrov and Tafrova, biologists working at Brookhaven and Stony Brook University, respectively. We were to study the effects of radiation exposure on keratinocytes cells found in the surface of the skin. One line of these cells, called HaCat cells, had a type of mutation key to cancer formation, while the other line was simply normal human keratinocytes. The objective was to determine the role of P53 mutation in response to carcinogenic environmental factors, like exposure to radiation. We learned about basic cell culture techniques for maintenance of cell viability, which were a constant throughout the course of our project. Senescence-associated beta-galactosidase assays were performed in order to determine cell response levels to radiation. Radiation types, energies, and cellular exposure response were a constant topic of discussion in our lab, and both of our mentors were always an open source of information. There were many meetings concerning journals on the topic; emailed photos and past studies were frequently shared with my fellow interns and me.

As an added bonus, we were able to experience and learn about many other areas of science during our stay at Brookhaven National Laboratory. Dr. Sivertz's focus is on physics research for NASA, operating the ion beam at NSRL throughout the year. We explored the topics of particle physics and radiation, and researched carbon ion radiation cancer treatment, as he also headed the group facilitating the construction of the first carbon ion treatment center in the United States. Although there are already several proton therapy treatment centers in the U.S., there are only a few carbon ion facilities worldwide, mainly in Germany and Japan. These cancer treatments, known as particle therapies, aim to destroy tumors without the debilitating effects of surgery. Through this research, we were able to learn a lot more about radiation and how it can be both detrimental and beneficial to humans.

My lab mates and I were also able to do a study on muon lifetime. Muons are essentially giant electrons, part of a category of elementary particles in the standard model called leptons. They make up the majority of the particles which get through the Earth's atmosphere. At least one muon passes through every single cell in your body a year, causing cellular damage and mutation which can lead to cancer. By furthering our understanding of these particles, we understand more about the cancer-causing factors of our environment.

Dr. Hoff, one of our mentors, took us on several tours of the facilities at Brookhaven National Lab. We were able to visit the National Synchrotron Light Source, Relativistic Heavy Ion Collider, PHENIX and STAR (two of the detectors), among other places. We learned about how these facilities ran, and the actual mechanics behind the equipment required for these facilities to work, some of which was completely beyond my understanding. It was an amazing experience to see and learn about such sophisticated equipment; I never expected to be able to see these places, and certainly am privileged to have been a visitor.

Over the past six weeks, I've learned so much about so many different fields, and I know my lab mates have too. Although I may not encounter much of this information again until well into my graduate school years, it has been so helpful and exciting to explore the scientific field. I'm infinitely grateful to my mentors and the Huntington Breast Cancer coalition for making my summer experience possible."