

Lawrence Lin

NYU Polytechnic Institute Internship 2012

Great Neck Breast Cancer Coalition: Summer Laboratory Research Internship

If you had asked me two months ago, I would not be able to tell you a single thing about working in a lab. I would not be able to tell you the nervous feeling of taking the subway into Brooklyn, venturing into a place far, far from home, while trying to fit in with all the college kids working hard around you. And worst of all, I would not be able to tell you what an amazing experience researching at NYU Polytech was.

The first time I met my professor, Dr. Gross, was at an orientation meeting on June 21st. Finding NYU Poly was quite an accomplishment since I had never truly navigated the Brooklyn streets on my own before. The first thing I realized was my sense of direction, or rather my lack of it, and I must admit Brooklyn scared me a bit. After some aimless wandering, I managed to find NYU Polytech. I walked into my professor's office and promptly introduced myself. That's when I met the other students I would be working with throughout the summer. I was later introduced to our mentors and the other professors. We spent that first day discussing our research plans for the summer. That was the first time I had ever heard of cellulose nanowhiskers, my summer research topic.

Cellulose nanowhiskers are nanofibers derived from the demolition of cellulose, an organic compound commonly found in plants and bacteria. Cellulose is composed of $\beta(1\rightarrow4)$ linked D-glucose units, which can be broken down into nanofibers, which then have a variety of applications. Cellulose is an attractive compound because of its unique

properties and characteristics. When broken down into nanowhiskers, cellulose is best known for its ability to reinforce polymers, such as plastics. As a result of this, plastics can be made stronger and more heat and impact resistant. Current petroleum based plastics utilize chemical additives such as BPA (Bisphenol A) for modification in order to obtain desirable properties and to maximize their efficiency. Unfortunately, many of these chemical additives, although convenient, pose alarming health hazards. When exposed to heat or pressure, they often find their way into our foods and then into our bodies. Studies show a strong correlation between BPA and the development of breast cancer. At NYU Polytech, I focused on the reinforcement of bioplastics in particular, with the hopes of replacing petroleum-based plastics with stronger, more environmentally friendly and health conscious bioplastic alternatives, free of carcinogens. As an added benefit, cellulose is easily obtainable from plants and bacteria, and can be produced on a very large scale. It is renewable, reusable, sustainable, and biodegradable, serving as a very environmentally friendly alternative to other similar compounds. This rare combination of characteristics allows cellulose nanowhiskers to be highly considered in cancer prevention research.

Step by step, I continued to progress in my research. After reading enough journal articles, I began to cultivate my own bacterial cellulose. Although tedious and time consuming, this allowed me to personally examine cellulose with my own eyes, as opposed to simply reading about it. When that was completed, I began to break down the cellulose, employing different methods in search of the best results. First I utilized chemical breakdown methods, such as enzymatic and acid hydrolysis. Then I turned to physical breakdown methods, such as homogenization and sonication. I collected the

results in test tubes, preparing them for analysis while hoping that they would be successful. The tricky part was that success was hard to identify. Nano sized particles are a *billionth* of a meter, much smaller than the human eyes can see without magnification; so I had to seek out other methods of confirmation. When everything was ready, I analyzed each test tube individually using a dynamic light scatterer. This machine utilized light, shining it through the test tube to gather data. It would then calculate the amount of light that bounced off of the particles in the test tube, determining the size and abundance of the particles. The results were captivating. Almost all the methods had successfully produced cellulose nanowhiskers, although they varied in size. Some results were more promising than others, but nonetheless I was ecstatic. I remember walking out of the lab that day feeling more accomplished than ever.

The joys that accompanied this newfound freedom in conducting my own research were astounding, rivaled only by the euphoria of a successful experiment. Instead of a detailed, specific lab worksheet distributed by my science teacher, I created my own procedure and my own papers. Instead of constant supervision from my teacher, I experienced individuality that gave me the opportunity to demonstrate my own responsibility. The feeling was magnificent.

I will forever be grateful to the Great Neck Breast Cancer Coalition for this unique opportunity to grow; the opportunity to witness what real scientific research was like. Einstein once said, "The only source of knowledge is experience", and after this summer, I'm afraid I cannot disagree. The experience of interning at NYU Polytech is unparalleled; the things I learned I will keep with me for the rest of my life. When I was

little, I used to think that the best and only way to help others was through the field of medicine and healthcare. Now, I am certain that there are other alternatives. Alongside the treatment and curing of diseases, we cannot forget about the *prevention* of diseases, an equally important aspect in our health. Thank you Great Neck Breast Cancer Coalition for giving me the opportunity to help others and make a real change in the world. And thank you Dr. Gross, along with the rest of my mentors, for your unwavering support and guidance, taking time out of your busy schedules to supervise my experiments. My only regret this summer is not being able to fully complete my experiments on the reinforcement of bioplastics; my only reassurance is that I shall return next summer, more determined than ever, because although my summer is over, my research is not.