

Catherine Wang's Essay

Silent Spring Institute Internship 2011

Great Neck Breast Cancer Coalition: Students & Scientists Breast Cancer/Environmental Research Scholarship Program

On July 5th, 2011, I woke up at eight in the morning and embarked on a four hour ride to Newton, Massachusetts. Around one in the afternoon, my family and I arrived at my host family's home. Agi and her son, Zac, gave me a warm welcome, and I knew the next two and a half weeks at a foreign house would be comfortable. The following day, my roommate, Megan, and I walked to the Silent Spring Institute together. We met Dr. Brody, our mentor, Melissa, and the other scientists at the laboratory. Afterwards, we were shown our cubicles and given packets and articles to read. We were expected to understand the significance of Silent Spring Institute and some studies that were conducted by them. Our actual work began after laying the foundation. Our experiments were related to optical brighteners, a chemical found in laundry detergents.

We researched optical brighteners, and we learned that they are chemicals added in laundry detergents to give white clothes the illusion of being "whiter than white". After the optical brighteners in clothes absorb the ultraviolet rays given off by the sun, the excited electrons return to ground state and emit blue light. The blue light serves to counteract yellow stains and discoloration in white clothes. Optical brighteners are derived from endocrine disruptors and stilbene-type chemicals. Endocrine disruptors can cause breast cancer, and if the optical brighteners somehow degrade and revert back to these harmful chemicals, they would threaten human health.

In 1941, FDA approved a stilbene estrogen, diethylstilbestrol, which is a synthetic chemical used to treat menopause and miscarriages in women. However, the chemical was classified as a carcinogen and banned from further usage. Diethylstilbestrol uses stilbene as its chemical building blocks, same as optical brighteners. Usually, dirty laundry water are mixed with black water and filtered together. The filtered water is then given off to waterways. If the water was not filtered thoroughly and humans ingest the water, the optical brighteners would enter the body. If the optical brighteners or diethylstilbestrol degrade back to endocrine disruptors or stilbene-type chemicals inside the human body, they could increase the risk of breast cancer.

For our hands-on experiments, we tested with actual laundry detergents. On the first day at the institute, my partner and I walked to CVS and bought five detergents. One was used as the standard, one was the alternative, and the other three were experimental detergents. We decided to test for the photo-degradation of the detergents, since that is the main issue we are concerned about. We had to dilute the detergent into a 500ppm solution using a two-step dilution process, which took a whole week as we had to wait for the bubbles from the detergent and water mix to settle before moving on. We used a fluorometer to test the presences of fluorescence in each diluted detergents. When a liquid is put inside the cuvette and read by the handheld device, the fluorometer would give a fluorescence unit that corresponds to the liquid's fluorescence. The higher the unit, the brighter the liquid would glow under the ultraviolet light. After setting up the fluorometer with the standard detergent, we carried on with the rest of the experiment. We had to separate each detergent into amber bottles (to prevent the photodegradation of the detergent) and clear glass vials (to allow for photo-degradation). We took two trials of

data each time we measured, and then averaged the data to lessen the error the fluorometer might possibly make. Even though taking the data of the degradation process was really tedious, the results were well worth it. After we graphed the data, we found out that optical brighteners do photo-degrade faster, meaning they break down faster when in contact of sunlight. Whilst there are no significant studies showing that the optical brighteners would revert back into the endocrine disruptors, we can at least say that optical brighteners *do* degrade in nature.

On the weekly Wednesday results sharing meeting during lunch, Megan and I gave a PowerPoint presentation on our project and our results. During the presentation, Dr. Brody and other scientists constantly stopped us to give us advice. They treated us as a part of their institute and not as some highschoolers. They gave us feedback and told us what we needed to change and improve on our presentation. Overall, the internship at Silent Spring Institute proved to be a unique experience. It was very rewarding, and it definitely gave me a productive summer.