

Christine Lee

Soto/Sonnenschein Laboratory, Tufts University School of Medicine

GNBCC Summer Internship July – August 2013

When Cheryl first sat us down and started to explain what the lab does and its scientific background, I have to admit most of it flew over my head as quickly as it came. There was one idea, however, that caught my attention: mutations do not cause cancer. I thought, *well, there goes biology class*. But over the next few days, as Kaeli and I read dozens of papers on the Tissue Organization Field Theory, it gradually made sense to me. It sought to explain cancer by focusing on how cells behave in relation with each other and with the surrounding stroma rather than individually. Studies where tumor cells were induced to form normal structures in normal stroma provide evidence to support this theory. The lab studies how chemicals in our environment can induce cancer in mammary glands by mimicking estrogen and changing the organization of the matrix, which in turn allows the formation of abnormal structures.

Throughout the three weeks, each of the members of the lab took turns giving Kaeli and me mini-lectures on their field of expertise. We learned about the structures of ovaries and mammary glands and how to analyze the structures. We were shown the all the procedures of processing tissue from a mouse necropsy to wholemounting or embedding in paraffin, sectioning, staining, mounting, and observing. I had previously been in a lab for a short span of two weeks, but the equipment in this lab was much different and I was excited operating simple equipment like the tissue floating bath. Though we learned all of this in a short span of three weeks, I did not feel pressured under the lab environment. Each day we learned a new topic or observed another technique but the lab members were funny and enthusiastic. The occasional lunch meeting could be more than an hour long but, even then, there were jokes and a lot of laughing. (Kaeli and I were also lucky enough to be there at the Tessie's birthday celebration and we got to eat fudge cake.)

Kaeli and I learned two techniques to stain slides, one called H&E (hematoxylin and eosin) staining and the other ICC (immunocytochemistry). The ICC process used antibodies to stain the slides. The H&E process involved placing slides in different Coplin jars of stains and

washes, which is actually more frustrating than it looks because the slides stick together, but they turned out really pretty. We were then able to observe stained slides of mammary tissue. We assessed the development of the tissue on the slides and compared the treatments that they each received. Studies have linked increased cell budding in mammary tissue with an increased risk for breast cancer and we saw increased cell budding in tissue treated with ethinyl estradiol, which is synthetic estrogen used in oral contraceptives.

We also observed the E-Screening bioassay, which involves growing cells in different concentrations of compounds suspected to be estrogenic. By comparing how the cells grow in that medium compared to in estrogen, one can determine whether the compound is an endocrine disruptor. I think that this process is very representative of what the Soto/Sonnenschein lab does. For one, the E-Screen tests the estrogenicity of the compound at various doses high and low, as opposed to some research that has been done using only high dosages of compounds because it is assumed that harmless at a high dose means harmless at a low dose. Secondly, watching Greg spray ethyl alcohol in the fume hood and over his hands the umpteenth time, I saw for myself how the scientific process should be kept as clean and controlled as possible to ensure reliable results.

Overall, this internship was a great experience for me. The lab members were very enthusiastic and encouraging and I learned in depth about chemicals in the environment and their link to breast cancer. I now understand the activism behind banning BPA and finding an acceptable substitute because it is important not only to find treatments for cancer but to prevent it before it happens.