

# Community Outreach: High School Students involved in Breast Cancer Research

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## Introduction

The Great Neck Breast Cancer Coalition (GNBCC) and the Huntington Breast Cancer Action Coalition (HBCAC) awarded scholarships to two high school students, Vita Jaspan and Melissa Wing, with the aim of improving communication between the scientific and public communities. We spent two weeks at the laboratory of Dr. Ana M. Soto and Dr. Carlos Sonnenschein at the Tufts University School of Medicine in Boston in order to learn about the environmental links to breast cancer. Under the guidance of Dr. Soto, Dr. Sonnenschein, and our mentor Cheryl Schaeberle, we gained extensive knowledge as to the ubiquitous nature of endocrine disrupting compounds (EDC's) in the everyday environment as well as the effects of Bisphenol-A (BPA) on living cells.

At the laboratory, we actively participated in research involving these EDC's. Techniques practiced within the laboratory setting included taking photographs of mouse mammary gland tissue using a microscope (photomicrography), and analyzing the relative fractions of three types of structures (ducts, terminal ends, and alveolar buds) present in these glands. We also learned various staining techniques including Hematoxylin and Eosin (H&E) staining and immunohistochemistry (ICC) staining. Using ICC staining, we were able to mark the presence or absence of the protein Ki67, which is commonly associated with cell proliferation. We also learned about groundbreaking laboratory techniques such as culturing tissue in 3D, which greatly facilitates the study of EDC's on living tissue.

Work in this lab has demonstrated how exposure to EDC's such as BPA, even at very low concentrations, increases the risk of mammary gland tumors in mice and rats. The hypothesis (and fear) is that these results are applicable to humans and may be responsible for increasing rates of the development of breast cancer in humans. Our goal, as students, is to spread this knowledge to members of our communities, and, hopefully, raise awareness of these issues. We hope to do this by keeping in close contact with the GNBCC and HBCAC and to speak publicly about what we have learned. We also hope to get involved in our schools by organizing an outreach group to help share this information with our classmates. We now serve as a link between the scientific and public communities and will help to educate our peers about the effects of EDC's.

## Laboratory Techniques Learned

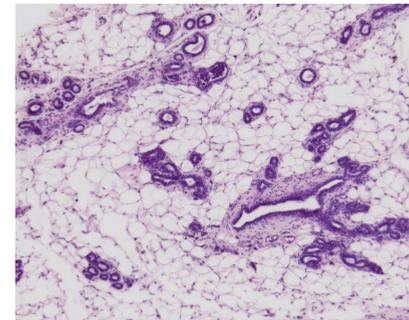
- Sectioning tissue
- Staining tissue
  - Hematoxylin & eosin staining
  - Immunohistochemistry staining
- Photomicrography
- Quantitative analysis of morphological structures in mouse mammary gland

## Tissue Staining

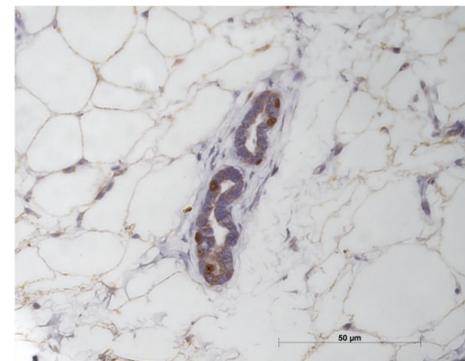
One way to analyze mammary glands from treated and untreated animals is to embed them in paraffin, cut the tissue into 5µm thick sections and stain the sections with Hematoxylin and Eosin to see basic structures.



Vita Jaspan and Melissa Wing (pictured right and left, respectively) performing a Hematoxylin and Eosin stain on tissue.



Tissue sections are also analyzed after immunohistochemistry to localize proteins to different cellular types or areas.



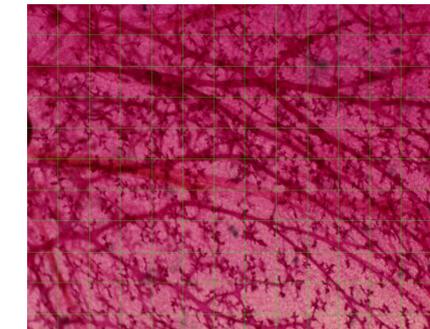
This section shows cells that have been treated to show which nuclei have the protein Ki67. This is a marker for cell proliferation. The dark brown nuclei are positive.

## Quantitative Analysis of Morphological Structures

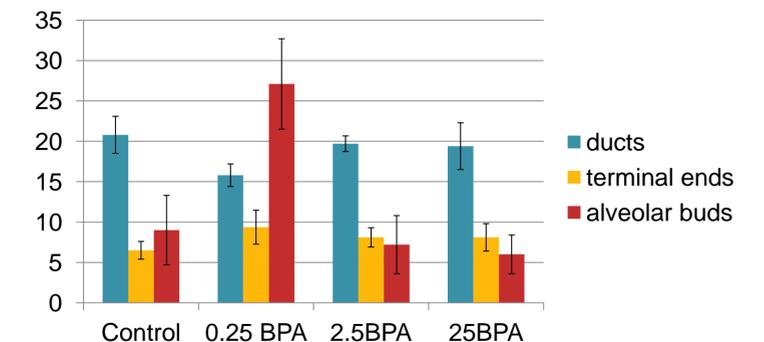
The mammary glands of treated and untreated animals are attached to a glass slide, fixed with formalin, and stained with a Carmine stain. This clearly shows the ductal network of the mammary gland.

In order to quantify the different structures in the gland: Ducts, terminal ends, alveoli, we use a grid method of sampling randomly throughout the gland. In the image below, a representative mouse gland is shown with the grid superimposed on the image.

Pictured right is an image of a mammary gland being used to quantify structures using the grid method.



Previous work in the lab showed that the endocrine disruptor BPA affected the relative density of these structures. (L.N. Vandenberg et al. Reproductive Toxicology, Volume 26 (2008) page210-219)



This graph shows the relative volume fraction of three types of structures found in a 3 month old mouse mammary gland. The x-axis shows the amount of BPA in µg amounts that the mice were exposed to per kilogram body weight per day while they were embryos in utero. These animals were not exposed after birth. The amount of alveolar buds is significantly different in the 0.25 BPA group when compared to the controls.

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