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Internship at Ob/Gyn Epidemiology Center
Senior Project Final Product

During my month-long internship at the Obstetrics and Gynecology Epidemiology Center at Brigham and Women's Hospital, I performed data entry to support research studies, worked on inventorying and organizing biological specimens, helped prepare manuscripts for scientific journals, and attended several lectures at the hospital and at Harvard Medical School.

Throughout my time at the research center, I gained exposure to the discipline of epidemiology and to the kind of work that scientists perform in their epidemiologic research. The word epidemiology is based on the Greek roots epi (upon), demios (the people), and logia (to speak). Today, epidemiology is the "study of the distribution, determinants, and occurrence of disease and health-related conditions in populations."¹ Although epidemiology has its roots in the study of epidemics, the science has evolved to include the study of any disease or event that occurs on a relatively large scale. In many ways, the work of an epidemiologic scientist is similar to that of a clinician. While the clinician's main unit is an individual patient, however, an epidemiologist's main unit is a group of human beings. Epidemiology is also an eclectic science that draws on the methods and knowledge of many different disciplines. It involves knowledge and application of biomedical sciences, statistics, sociology, demography and psychology. In the end, however, the

¹ Epidemiology Past and Present (Photocopied and given to me by mentor)

study of epidemiology relies on the scientific method: systematic observation, experimentation, measurement, and hypothesis refinement.

Currently, the Ob/Gyn Epidemiology Center is conducting a number of different research projects, including a major study about ovarian cancer. Although fewer than 2% of US women have ovarian cancer, it is the fifth most common cause of cancer death in women.² Ovarian cancer is also extremely deadly because there is currently no approved method of screening for the disease, though genetic testing for the breast and ovarian cancer genes (BRCA1 and BRCA2) can help predict the risk of the cancer. Ovarian cancer is difficult to detect; there are few symptoms before the disease spreads throughout a patient's body. These subtle symptoms can include "abdominal bloating, pelvic or abdominal pain, frequent or urgent need to urinate, trouble eating or feeling full quickly."³ In general, risk of ovarian cancer increases with age and is higher in women with a family history of cancer. The risk of ovarian cancer also increases in women who have not had children, breast-fed or used birth control pills. Because better methods of treatment are required that can overcome the cancer's resistance to chemotherapy, research has been focused on novel methods of therapy that involve the patient's immune system.

The Ovarian Cancer Study began in 1992 and includes over 2000 women from Eastern Massachusetts and New Hampshire.⁴ There are two groups of women in this study: one half are cases, or women with ovarian cancer, while the other half are controls, or women without cancer. Each woman is

² Ovarian Cancer Study, Annual Newsletter, 2008

³ Ovarian Cancer Study, Annual Newsletter, 2008

⁴ Ovarian Cancer Study, Annual Newsletter, 2008

interviewed about their reproductive history, medical history, and lifestyle. Through a comparison of their responses, scientists are working on identifying risk factors of ovarian cancer. All participants also provide a blood and urine sample. These are very useful resources because scientists are studying them to find genetic differences between women who have ovarian cancer and those who do not. They allow scientists to search for potential tumor markers that can be used to screen ovarian cancer.

In this study, the research center has made several recent findings. One of these recent findings is that Ginkgo biloba, a plant used in traditional Chinese cooking and medicine, may decrease the risk of ovarian cancer. While 4% of women without the disease (controls in the study) took the herb, only 2% of women with the cancer (cases in the study) took the herb.⁵ Furthermore, in laboratory tests, components of Ginkgo biloba were able to stop the growth of ovarian cancer cells. Their research has also shown that “women who had not had a medical visit in the past five years or had no regular healthcare provider had almost a three-fold increase in ovarian cancer risk compared to women who had regular health care.”⁶

Their recent research has also revealed that women who ovulated more in their lifetimes have a higher risk of ovarian cancer because the immune system may fail to detect and produce a response to a protein in the body called MUC1. Many cancers over-express MUC1, a high molecular weight protein of the human mucin family. Anti-MUC1 antibodies have been shown to correlate

⁵ Ovarian Cancer Study, Annual Newsletter, 2008

⁶ Ovarian Cancer Study, Annual Newsletter, 2008

with a more favorable prognosis of ovarian cancer. The scientists measured anti-MUC1 antibodies in 705 control women, found events that predict antibodies, and “estimated ovarian cancer risk by comparing profiles of events generating antibodies in controls with those in 668 ovarian cancer cases.”⁷ A number of conditions (including demographic, reproductive, and medical) were examined to see how they affect the likelihood of controls having various levels of MUC1-antibodies. They found that the events that increased antibodies were “oral contraceptive use, breast mastitis, bone fracture or osteoporosis, pelvic surgeries, nonuse of talc in genital hygiene, and to a lesser extent intrauterine device use and current smoking.”⁸ Thus, pelvic surgery, IUD use, breast infections and bone fractures actually increase immune response to the protein MUC1 and in turn decrease risk of ovarian cancer.

Currently, little is known about what predicts ovarian cancer survival – be it better diets, different reproductive histories or genetic makeup. In the future, the Ovarian Cancer Study plans to study what distinguishes long-term ovarian cancer survivors.

Over the course of the internship, I attended four different lectures. The first lecture I attended was hosted by Harvard Medical School. The presentation was by Dr. Elizabeth Blackburn, who was visiting Harvard as part of a lecture series called “Leaders in Biomedicine.” Professor Blackburn is a leader in the area of telomere and telomerase research. In her talk, “Roles of telomeres and telomerase in human health and disease,” Dr. Blackburn

⁷ Cancer Epidemiology, Biomarkers and Prevention (Photocopied and given to me by mentor)

⁸ Cancer Epidemiology, Biomarkers and Prevention (Photocopied and given to me by mentor)

discussed the molecular nature of telomeres, ends of chromosomes that protect the chromosomes and preserves genetic information as chromosomes divide. She also discussed her discovery of the enzyme telomerase, which replenishes telomeres, as well as its role in human diseases. The second lecture I attended was a presentation by Jennifer Prescott, a scientist at a research center at Brigham and Women's Hospital. She presented her research and analysis about the relative telomere lengths in breast cancer patients versus those who do not have breast cancer. The third lecture I attended was somewhat similar to the previous one. It was a presentation by Katie Terry examining genetic variation in telomere-related genes and ovarian cancer risk. Both of these lectures were more discussion-based. Each scientist was presenting her raw, unpublished research and looking for constructive criticism to improve their study. Both of these discussions were extremely engaging and I truly enjoyed being part of them. I gained exposure to how scientists present and refine their research. The last lecture I attended was a presentation by David Hunter called "The Epidemiology of the Genome." David Hunter is the Professor of Epidemiology and Nutrition at the Harvard School of Public Health and an Associate Epidemiologist at Brigham and Women's Hospital. He discussed his investigation in the Nurses' Health Study, a long-running cohort of 121,000 women. Using molecular techniques, Dr. Hunter analyzed inherited susceptibility to cancer. He also studied the molecular markers of environmental exposures.

Overall, my internship was a quite rewarding experience. Although a substantial portion of the internship was administrative work, I learned that epidemiologic research on a basic level involves studying surveys and performing data entry. I also enjoyed working in the laboratory organizing and inventorying biological specimens. Finally, the presentations I attended and discussions I participated in provided me with a wonderful glimpse of the kind of work that research scientists perform.