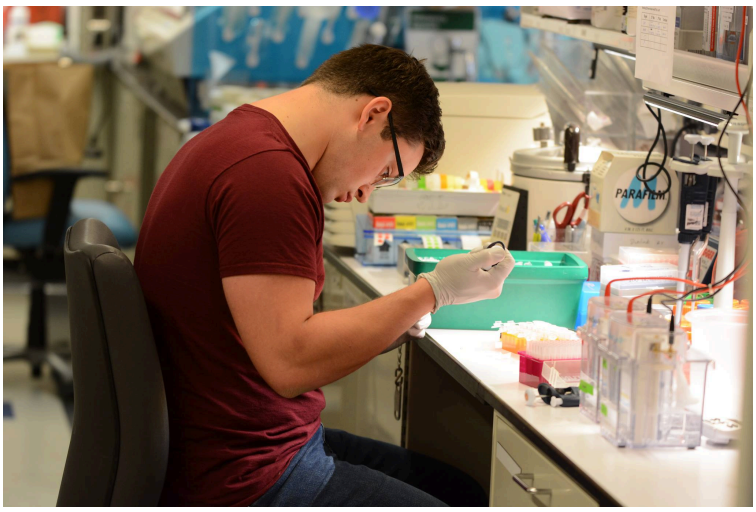
Student Name and Class Year: Jack Sears '17
Internship dates: May- August 2016 (this is my second summer at NIH)
Sponsoring Agency: National Institutes of Health: National Cancer Institute, Experimental Pathology Laboratory
Location: Bethesda, Maryland

"My time at the EPL has been incredibly formative and enlightening, it has provided me with essential lab bench skills that I will be able to apply in the future, as well as publications that will hopefully provide me the opportunity to continue this type of work into graduate school and beyond."



I spent this summer gaining valuable laboratory experience learning new techniques, a better understanding of the research process, and advanced my academic and vocational goals, which include graduate school (MD/PhD.) and a career in public health research. The past three months I worked (8 A.M - 5 P.M weekdays) as an intern in the Experimental Pathology Laboratory (EPL) of the National Cancer Institute on the Bethesda, Maryland campus of the National Institutes of Health focusing on developing an enhanced fixative in line with advance the lab's research goals. The EPL examines translational pathology research collaboratively with the Laboratory of Pathology, which investigates the biology and genetics of cancer and other diseases.

My main project for the summer was to develop a new and enhanced fixative for histopathological, immunohistochemical, and molecular diagnostics. A fixative is a solution that "fixes" tissue samples to prevent them from changing on a cellular and molecular level as when researchers perform diagnostics it is imperative that their biopsies do not degrade. While there is currently a well-accepted "gold standard" fixative, neutral buffered 10% formalin(NBF), recent events such as the Environmental Protection Agency labeling formaldehyde as a "probable human carcinogen" has caused many to try to develop a new more benign fixative with better diagnostic

capabilities than NBF. This summer I helped to continue research on the EPLs newest fixative, phosphate buffered ethanol 70% (BE70). Previous studies showed that BE70 outperformed NBF and other alternative fixatives, however they did not look at what over fixation, leaving tissue in the fixative for more than 24 hours, which is quite common, does to tissues in BE70.

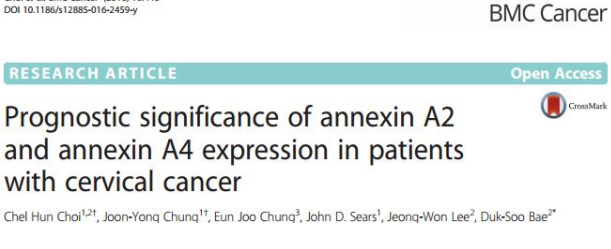
Through many of the same processes that I learned last summer such as protein, DNA, and RNA extraction, and BCA assays as well as many new and important ones such as western blots and PCRs I collected a substantial amount of data for the project. I then processed the data using analysis skills I gained in SA212 at Colby for my final results which showed that BE70 to be significantly better for molecular and histopathologial diagnostics as well as a more benign solvent compared to NBF. I presented my findings to the lab each week at our lab meeting and presented my final results at the National Institutes of Health's annual summer symposium.

Working at the EPL for the past two summers has been incredibly important and transformative experience for me. Along with learning new, this experience has helped me better understand the scientific process, appreciate the progression of an experiment, and acquire a fuller picture of what life is like as a researcher. I am currently working on a manuscript for my research from this summer and have already had two of my projects from last summer published. My time at the EPL has been incredibly formative and enlightening, has provided me with essential lab bench skills that I will be able to apply in the future, as well as publications that will hopefully provide me the opportunity to continue this type of work into graduate school and beyond. None of this would have been possible without the stipend provided by the Environmental Studies department and I cannot thank them as well as my public health and research mentor Gail Carlson enough for helping me get them most out of my internhsip.

Laboratory Investigation , (22 August 2016) | doi:10.1038/labinvest.2016.90

A melanin-bleaching methodology for molecular and histopathological analysis of formalin-fixed paraffin-embedded tissue

Joon-Yong Chung, Jiyeon Choi, John D Sears, Kris Ylaya, Candice Perry, Chel H Choi, Seung-Mo Hong, Hanbyoul Cho, Kevin M Brown and Stephen M



Choi *et al. BMC Cancer* (2016) 16:448
DOI 10.1186/s12885-016-2459-y

BMC Cancer

RESEARCH ARTICLE Open Access

Prognostic significance of annexin A2 and annexin A4 expression in patients with cervical cancer

Chel Hun Choi[1,2†], Joon-Yong Chung[1†], Eun Joo Chung[3], John D. Sears[1], Jeong-Won Lee[2], Duk-Soo Bae[2*]