Biomedical Science Major
The Ohio State University

Biomedical Science Annual Report 2010

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Welcome Class of 2014!

Zeenath Ameen
Dublin Scioto HS

Elizabeth 'Libby' Butler
Bay HS

Alexandra 'Allie' Butz
Canton Central Catholic HS

Jordan 'Jori' Chambers
Lake Zurich Sr. HS (IL)

Rachel D'Amico
Wyoming HS

Callie Drohan
Hudson HS

Christine Fung
Beavercreek HS

Brian Hurwitz
St. Xavier HS

Matthew 'Matt' Koerbel
Kings HS

Andrew O'Neil
Bishop Watterson HS

Mark Rudolph
Ottawa Hills HS

Michelle Schussler
Cabell-Midland HS (WV)

Tyler Siekmann
William Mason HS

Katherine 'Katie' Stanfill
Liberty HS

Radhika Tampi
Pickerington North HS

Chelsea Torres
Cape Coral HS (FL)

Hannah Weber
Central Crossing HS

Clem 'John' Wegman III
St. Xavier HS

Curtis Weisenberger
Continental HS

Jennifer Wisel
Hilliard Darby

BMS Graduates Second Class

From early on it was obvious the students in the Biomedical Science Class of 2010 held diverse interests, and this diversity is reflected in their plans for graduate education. Three members of the class are entering MD/PhD programs, Amanda Harper (Ironton HS, OSU), Tyler Miller (Ottoville HS, Case Western), and Abby Short (Thomas Worthington HS, Northwestern). Three are entering PhD programs in Biomedical Science, Eric Hill (Oak Hills HS, Northwestern), Alex Jaeger (Archbishop Moeller HS, Duke), and Josh Stowell (Toledo Central Catholic HS, Michigan). Two are entering graduate programs in Public Health, Alex Liber (Sylvania Southview HS, Emory) and Adrian Zoller (Gilmour Academy, OSU). Seven students are entering medical school, Jenn Chao (Mount Hebron HS (MD), Arizona), Allyn Checovich (Lake Catholic HS, OSU), Claudia Chou (Lakota West HS, OSU), Christine Glendon (St. Vincent-St. Mary HS, Case Western), Matt Magyar (Avon Lake HS, Toledo), Kirstin Reeve (Archbishop Alter HS, OSU), and Steve Roderer (Centerville HS, OSU). One student is entering law school, Dan Bain (Loveland HS and OSU). Several students are taking a gap year before starting graduate studies. They and their future plans are: Maddie Driskill (Montgomery Blair HS (MD), dentistry), Emily Ginier (Worthington Kilbourne HS, medicine), Adrienne Strong (Lakewood HS, anthropology PhD), and Tarangi Sutaria (Gaithersburg HS (MD), medicine).

"Almost alumni" at the BMS Pre-commencement Celebration.

Congratulations and good luck to the Biomedical Science Class of 2010!

BMS World Travelers

Because Biomedical Science courses are only offered once a year, students have to be on campus during the regular school year. This has not stopped BMS students from traveling the world. Places they visited and lived in the last year include:

Summer Research internships and field work: Cal Tech, Stanford, New York University, the National Institute of Health (Bethesda, Maryland), St. Jude Children's Hospital (Memphis), Tanzania, India, Belize and Sweden.

Research presentations and conferences: Chicago, Washington DC, France, and Brazil.

Summer study abroad: Germany.

OSU sponsored Winter break trip: London.

Doing Research: One Student's Experience

My name is Jason Pradarelli, and I'm a senior in Biomedical Science. I was born and raised in Muskego, Wisconsin, but Buckeyes now have priority over the Badgers in my heart. My strongest medical interests lie within the fields of pediatric surgery and global and public health. Currently I work in a brain tumor research lab, and I'll be completing a senior thesis as a continuation of the project I started during my junior year.

Overall, my lab is studying novel therapies for brain cancer. The mission of my entire lab is to investigate changes in the tumor microenvironment associated with disease progression and in response to treatment. The term "tumor microenvironment" refers to the region that would count as "home" of the tumor cells, and not tumor cells themselves. These would include the extracellular matrix, surrounding blood vessels and also immune and other normal cells that are drawn to the tumor.

More specifically, my lab aims to improve the efficacy of oncolytic virus (OV) therapy for brain tumors. OVs are genetically-modified viruses that are designed to specifically kill cancer cells while leaving normal cells unaffected. OV therapy has entered clinical trials, and although it has been shown to be safe in human subjects, it has failed to show a significant increase in survival in patients with brain tumors. Thus, the goal of my current project is ultimately to enhance the efficacy of OV therapy.

Before I dive into details of my current research, let me set the stage for where I am today. Upon entering college, I did not have any urge to conduct scientific research—I thought it was something I would just skirt by because it was a requirement for the major. When I first started working in my research lab in the middle of my freshman year, I didn't feel very enthusiastic at all. For the first year, I worked roughly 10 hours/week, primarily assisting my graduate student mentor by making solutions, maintaining experimental cell lines, and sectioning samples of tumor tissue. During the summer after my sophomore year, I took on a project under my own wings, and although I was still under the guidance of a grad student, the project failed miserably. Our plan was to study the behavior of hypoxic tumor cells, or tumors cells that can survive with little to no oxygen, when treated with oncolytic virus. I spent the entire summer attempting to establish a cell line that could survive in low-oxygen conditions; when we discovered that even this initial step could not produce consistent data, we abandoned this approach to brain tumor therapy and moved on to a different project on brain tumor therapy.

The pitfalls of summer 2009 led me to my current project, which is still in progress due to its promising implications. I am currently investigating the effects of a copper-chelating drug, tetrathiomolybdate (TM), on the efficacy of OV therapy. Copper is known to play a key role in angiogenesis, or the formation of blood vessels. Therefore, by removing copper from the body, TM reduces angiogenesis, resulting in "choking" of tumor cells now devoid of oxygen and nutrient supply. Less blood vessels also reduces the likelihood of recruiting immune cells coming from blood into the tumor which can wipe out our cancer-killing virus from the tumor area. To study the effects of TM on OV therapy, we are implementing both *in vitro* and *in vivo* tumor models.

The TM project has been successfully rolling since September 2009, and now I work most closely with a post-doctoral researcher instead of a grad student. As this project is my senior thesis, I spend 15-20 hours/week in lab, balancing several *in vitro* experiments simultaneously with multiple mouse studies. While on this project, I have learned to time-manage a handful of concurrent experiments.

As a result of my commitment to my work, I traveled to Washington, DC, for an all-expenses-paid research conference in April 2010. At the American Association for Cancer Research (AACR) Annual Meeting, I presented my research during an undergraduate poster competition and at a dinner with specialists from the brain cancer field, both of which were extremely fun. I have realized that undergraduate research has been a critically important aspect in my understanding of both science and medicine.

As I mentioned earlier, my initial reaction to research was to avoid it if at all possible. Now, although I do not intend to carry out basic science research throughout my career, I can truthfully say that learning to think with a scientific mind will augment my comprehension and performance in the medical world. Performing research has helped me to appreciate the challenges in taking a promising disease therapy from the research bench to an actual treatment in the clinical setting.

I certainly have my work cut out for me, but I'm excited to get moving, and I honestly believe that my opportunities through Biomedical Science have jump-started my life's work. Good luck to you all!

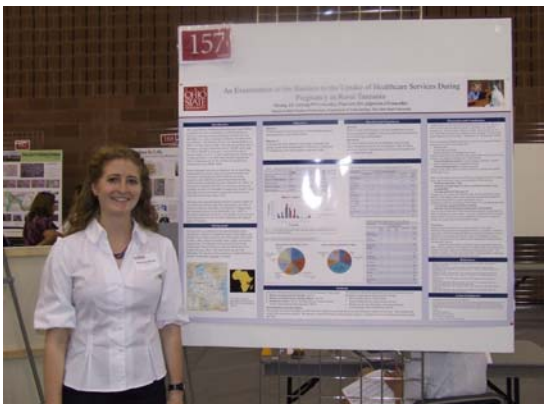
Adrienne's Story

Like thousands of high schools seniors looking ahead to college, Adrienne Strong dreamed of one day becoming a physician. She was smart, loved science and wanted to help people, so medicine seemed like an obvious choice. Thanks to an open mind, a sense of adventure, and the gumption to create opportunities instead of just waiting for them to present themselves, Adrienne's four years of college gave her many adventures that allowed her to critically evaluate her goals, her passion and her future career.

When she started at OSU in the fall of 2006, Adrienne had already studied French for five years and Spanish for four! Her goals when she entered college included doing a dual degree in Biomedical Science and French and minoring in German, or African Studies, or Public Health. "As an incoming freshman I knew Biomedical Science would be a constant and that I wanted to keep up with my French. I knew I was also interested in Africa and global health but I really had no clear idea of how I was going to tie all those somewhat disparate interests together," says Adrienne.

Knowing the Biomedical Science major required her to be on campus during the school year, Adrienne planned on using her summers to do study abroad. The summer after her freshman year she participated in a three week medical service learning trip to Tanzania that changed her life. When she returned to campus for her sophomore year, she took up Swahili in lieu of German, continued with her premed classes, started working in an infectious disease lab, and started plotting her return trip to Tanzania.

The summer after her sophomore year, Adrienne spent a month in Tanzania, this time shadowing physicians and focusing on women's health. Again, Adrienne returned to campus with new ideas for her future. Instead of doing a double major with French, she decided to minor in French and pick up a second minor in Anthropology, with a focus on medical anthropology. Adrienne also continued to take classes in Swahili and public health, while finishing up her pre-med requirements and continuing her work in infectious disease.



Adrienne sharing her research results at the 2010 Denman Undergraduate Research Forum.

During her Junior year, Adrienne also decided to do her senior honors thesis on the barriers to the use of healthcare services during pregnancy in rural Tanzania. She decided to quit working in the infectious disease lab after her junior year and focus on medical anthropology. At this time her goal was to pursue an MD/PhD after graduation, with the PhD in medical anthropology. She spent almost the entire summer before her senior year back in Tanzania, interviewing women for her honors thesis.

When she returned to campus for her senior year, Adrienne felt very uncertain about what she wanted to do after graduation. She was still interested in doing the MD/PhD simultaneously. She also pondered doing just an MD…or just a PhD… or doing one, then maybe following up with the other. Says Adrienne about this dilemma, "It was hard to start thinking outside the box again, to reevaluate what I wanted and to critically examine whether or not the path I had set out on was indeed the best fit for me." Adrienne considered what she knew: she knew she loved Africa and wanted to spend a significant portion of her career there. She knew she was passionate about educating medical professionals about the importance of incorporating local medical traditions and ideas into their health prescriptions. She knew she was passionate about women's healthcare in Africa. She also knew she wasn't ready to commit to a plan just yet and decided to take a gap year after graduation. After applying to a variety of different programs, Adrienne found out in the spring that she had been named a U.S. Fulbright Scholar. This prestigious honor allows her to spend a year in Tanzania furthering her research.

So what does the future hold for Adrienne after her Fulbright year? Probably a PhD in Medical Anthropology. "Maybe down the line I'll take up the clinical side of health again but, for right now, I am looking forward to a career in which, as a medical anthropologist, I can work collaboratively with international and non-governmental organizations, as well as local communities to markedly improve the quality and suitability of healthcare in sub-Saharan Africa."

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Grever Internship Turns Five Years Old in 2010

Dr. Michael Grever believes in the value of physician shadowing for students interested in a career in medicine. As Chair of Internal Medicine at the OSU Medical Center, Dr. Grever established a summer internship for Biomedical Science students to spend eight weeks going on morning rounds and witnessing first hand the doctor-patient relationship. Students spend the morning in clinics and have their afternoons free to work in their research labs. One goal of the internship is to help students better understand the relationship between basic research and clinical application. "During the internship I had the opportunity to sit down with a multiple myeloma patient, the cancer I study in the lab, and hear about her trials and triumphs since she was first diagnosed," says former Grever intern Shauna Collins. "Learning firsthand about the disease I'm studying gave me a greater sense of purpose and motivation in my research and instilled in me a sense of direct connection to the people being affected daily by the cancer our team is working to cure." The students can not touch the patients or discuss their health with them, but they go on rounds as part of the team, watch procedures, attend lectures, and have 24 hour access to the hospital. Additionally, they have regular lunches with Dr. Grever to process what they have been experiencing. Since the internship's inception in 2006, Dr. Grever has mentored 31 Biomedical Science students. While a couple of the former interns have decided to pursue careers outside of patient care, most have gone on to medical school or MD/PhD programs. "The opportunity to every day go into a top academic hospital, be apart of a medical team, see patients, and get a feel for the clinical setting made me 100% sure that practicing medicine was what I wanted to do with my life," states former intern Tom Kaffenberger.

Dr. Michael Grever with the 2010 Summer Interns.