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Contributors

- *Core Competencies of a Successful Scientist* was prepared by the National Postdoctoral Association (http://www.nationalpostdoc.org).
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- The *Graduate School Preparation Checklist* was prepared by Drs. Michele Shuster (NMSU) and Karen Peterson, Gloria Coronado, and Noah Espinoza and Jennifer Anderson (Fred Hutch).
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- The *Poster Evaluation Form* was prepared by Dr. Michele Shuster (NMSU).
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- Personal statement examples were contributed by former interns, graduate students, and post-doctoral fellows at the Fred Hutchinson Cancer Research Center (Fred Hutch) or the University of Washington (UW). Writing samples featured in the Personal Statement Examples section feature ‘XX’ in place of personal identifiers to protect contributors’ identity. All names and institutional references for writing samples featured in the Appendices were altered to maintain author confidentiality.

DISCLAIMER

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For questions regarding the content of this *Reference Manual*, please send an email to: SURP@fredhutch.org
Core Competencies of a Successful Scientist
Core Competencies of a Successful Scientist

**Scientific Knowledge**
Acquired during graduate and postdoctoral training via coursework, mentoring, and performing research
- Analytical approach to defining scientific questions
- Design of scientifically testable hypotheses
- Broad-based knowledge acquisition
- Interpretation and analysis of data

**Research Skill Development**
Acquired during graduate and postdoctoral training via performing research, mentoring, and coursework
- Laboratory techniques and safety
- Experimental Design
- Data analysis and interpretation
- Statistical analysis
- Effective search strategies and critical evaluation of the scientific literature
- Principles of the peer review process

**Communication Skills**

**Writing**
- Publications
- Grants / applications
- Career
  - CV and resume
  - Cover letters
  - Research and teaching statements

**Speaking**
- Presenting your research
  - Posters
  - Conferences / seminars
  - PowerPoint presentations
- The job interview
  - Interviewing skills / overall presentation
  - Job talks
- Teaching
  - Classroom
  - Public

2016 SURP intern, Kevin Celustka and his mentor, Dr. Steve Pergam. Photo credit: Stephanie Louie
Interpersonal skills
- Style, tone, and nonverbal cues
- Negotiation
- Performance reviews / feedback
- Difficult conversations / minimizing conflict

Networking

Leadership and Management Skills
Leadership Skills
- Creating a vision and setting goals
- Running meetings
- Delegating responsibilities
- Motivating / inspiring others
- Mentoring / serving as a role model
- Diversity – working with individuals with diverse gender, ethnic, cultural, and religious backgrounds
- Conflict management / resolution

Project Management
- Time management
  - Establishing priorities
  - Planning the project timeline
- Collaborative science
  - Types of collaboration
  - Project goals
  - Expectations of collaborators
Advice from Admissions Representatives
Advice from Admissions Representatives

Summary: This handout provides information about writing personal statements for academic and other positions.
Contributors: Jo Doran, Allen Brizee
Last Edited: 2010-04-25 08:50:36

The following content was obtained from Purdue University’s Online Writing Lab
www.owl.english.purdue.edu/owl/resource/642/03/

Lee Cunningham
Director of Admissions and Aid
The University of Chicago Graduate School of Business

The mistake people make most often is not to look at what the questions are asking. Some people prepare generic statements because they're applying to more than one school and it's a lot of work to do a personal essay for each school. On the other hand, generic statements detract from the applicant when we realize that we're one of six schools and the applicant is saying the same thing to each and every school despite the fact that there are critical differences between the kinds of schools they may be applying to. They don't take the time. They underestimate the kind of attention that is paid to these essays. Take a look at what the essay asks and deal with those issues articulately and honestly (adapted from Stelzer, p. 49).

Steven DeKrey
Director of Admissions and Financial Aid
J. L. Kellogg Graduate School of Management (Northwestern University)

We're looking for a well-written, detailed essay that responds directly to the question. The questions are about extracurricular activities, motivation, challenges, commitment to the school that kind of thing. We see a variety and that's fine. Our approach is very individualized. The way the applicant devises the answer, determines the length, develops the response, is all part of the answer. The level of effort applicants put into essays varies considerably, which sends messages to the admissions committee as well. Over-involved, elaborate essays send one message, while very brief and superficial essays send another message. Trying to second-guess what we are looking for is a common mistake—which we can sense. We can tell when applicants use answers to other schools’ questions for our essays; we're sensitive to this. Poorly written essays are a bad reflection on the applicant. Don't over-elaborate; we're reading a lot of these kinds of essays. Also, don't be too brief or superficial. We like to have major ideas presented well (adapted from Stelzer, p. 55).

Michael D. Rappaport
Assistant Dean of Admissions
UCLA School of Law

Applicants should take the time to look at what the law school is asking them to write about. At UCLA, we say, "we know you have lots of extracurricular activities—we want to know how you differ, what makes you unique? What can you bring to the first year class that's going to make you distinctive from the other 99 people who are already there?" The fact that you were active in your fraternity or sorority is really not going to do it. What we're looking for is somebody who, in their personal statement, stands out as being so unusual, so diverse, that they're extremely attractive as a law student for the first-year class. Maybe what's going to make them distinctive is the fact they spent six months living in a log cabin in Alaska. You try to give the law school some justification for admitting you. With a lot of people, there's nothing that's going to make them distinctive. If that's the case, they've got to recognize that, indeed, the essay is not going to make that much difference here at UCLA. We're also asking if there's any reason their LSAT or grades are not predictive. You'd be amazed at the number of people who completely ignore this—they don't take advantage of the opportunity.
Most law schools operate fairly similarly. There’s a certain group of applicants whose grades and LSAT scores are so high that the presumption is that the applicants are going to be admitted unless they do something terribly stupid to keep themselves out. I have seen applicants whose personal statement has done that, but it’s extremely rare. At the other extreme is another group of applicants who, no matter what they write, are not going to get in.

The applicant has to realize, first of all, where he or she stands. If you have a straight-A grade point average and a perfect LSAT score, you don't have to spend a lot of time worrying about your personal statement. On the other hand, if you know you’re in the borderline area, that's where the personal statement becomes very, very important. The applicant should take the time to read the application to see what the schools are asking for. Sometimes the school will ask for a general description of why you want to go to law school, or why they should admit you, something of that nature. In such case you can be fairly sure that the school is just interested in the essay to see how well you write. So what you say isn't as important as how you say it. On the other hand, some schools are more specific—UCLA being a very good example of that.

Make sure the essay is grammatically and technically correct and well written. Avoid sloppy essays, coffee stained essays, or ones that are handwritten so you can't read them. You'd be amazed at what we get (Stelzer, pp. 70-71)!

Beth O'Neil
Director of Admissions and Financial Aid
University of California at Berkeley School of Law (Boalt Hall)

We're trying to gauge the potential for a student's success in law school, and we determine that, principally, on the basis of what the student has done in the past. The personal statement carries the responsibility of presenting the student's life experiences. Applicants make a mistake by doing a lot of speculation about what they're going to do in the future rather than telling us about what they've done in the past. It is our job to speculate, and we are experienced at that. Applicants also tend to state and not evaluate. They give a recitation of their experience but no evaluation of what effect that particular experience had on them, no assessment of what certain experiences or honors meant. They also fail to explain errors or weaknesses in their background. Even though we might wish to admit a student, sometimes we can't in view of a weakness that they haven't made any effort to explain. For example, perhaps they haven't told us that they were ill on the day that they took the LSAT or had an automobile accident on the way. Such things are legitimate reasons for poor performance. I mean, we understand that life is tough sometimes. We need to know what happened, for example, to cause a sudden drop in the GPA. Another mistake is that everyone tries to make himself or herself the perfect law school applicant who, of course, does not exist and is not nearly as interesting as a real human being. Between 1 and 5 people read each application (Stelzer, p. 72).

Dr. Daniel R. Alonso
Associate Dean for Admissions
Cornell University Medical College

We look for some originality because nine out of ten essays leave you with a big yawn. "I like science, I like to help people and that's why I want to be a doctor." The common, uninteresting, and unoriginal statement is one that recounts the applicant’s academic pursuits and basically repeats what is elsewhere in the application. You look for something different, something that will pique your interest and provide some very unique insight that will make you pay some notice to this person who is among so many other qualified applicants. If you’re screening 5,500 applications over a four- or six-month period, you want to see something that’s really interesting.
I would simply say: Do it yourself, be careful, edit it, go through as many drafts as necessary. And more important than anything: be yourself. Really show your personality. Tell us why you are unique, why we should admit you. The premise is that 9 out of 10 people who apply to medical school are very qualified. Don't under any circumstances insert handwritten work or an unfinished piece of writing. Do a professional job. I would consider it a mistake to attempt to cram in too much information, too many words. Use the space as judiciously as possible. Don't submit additional pages or use only 1/20th of the space provided (Stelzer, p.81).

John Herweg
Chairman, Committee on Admissions
Washington University School of Medicine

We are looking for a clear statement that indicates that the applicant can use the English language in a meaningful and effective fashion. We frankly look at spelling as well as typing (for errors both in grammar and composition). Most applicants use the statement to indicate their motivation for medicine, the duration of that motivation, extracurricular activities, and work experience. So those are some of the general things we are looking for in the Personal Comments section.

We also want applicants to personalize the statement, to tell us something about themselves that they think is worthy of sharing with us, something that makes them unique, different, and the type of medical student and future physician that we're all looking for. What they have done in working with individuals—whether it's serving as a checker or bagger at a grocery store or working with handicapped individuals or tutoring inner city kids—that shows they can relate to people and have they done it in an effective fashion? What the applicant should do in all respects is to depict why he or she is a unique individual and should be sought after. Of course, if they start every sentence on a whole page with "I," it gets to be a little bit too much (Stelzer, p. 82).

Additional Resources:
For advice from admissions representatives who evaluate applications for PhD programs in the biomedical and behavioral sciences, view the following: NIH Office of Intramural Teaching and Education video

Topics include:
- What do I do if I have a flaw in my application? [starts at 2:31]
- How important are GRE scores in the admissions process? [starts at 4:15]
- What type of CV or Resume is appropriate? [starts at 6:07]
- What do you look for in a personal statement? [starts at 8:00]
- How important is previous research experience for a successful application? [starts at 10:01]
- What should I do to prepare for Interviews? [starts at 12:32]
- What is the best way to learn about what program Alumni are doing now? [starts at 15:29]
- Advice to new students starting graduate school [starts at 17:07]
Graduate School Personal Statement Examples
Graduate School Personal Statement 1: 
MA, Nutrition

Growing fruits and vegetables, cooking nutritious food, and eating meals as a family are memories I value. As a child, I remember putting on my blue-striped apron and helping my parents prepare dinner. It was fun and later I realized my parents were teaching me healthy eating habits and creating life-long passions through delicious, nutritious food! These values ultimately led to the important career choice I am making now.

A love for science and a desire to help people is what attracted me to prepare for medical school. I love learning about the complexity of the human body and its metabolic pathways. Working with doctors gave me an in-depth view of chronic diseases such as type II diabetes mellitus and obesity that plague our nation. I came to realize that my efforts would be more focused on working to eliminate the source of the problems, which in many cases would be proper diet and activity, rather than treating symptoms with prescriptions. I sensed I could have a positive role in transformative education. In the summer of 2010, I was invited to intern in XXX. There, I worked in a human biology laboratory with Dr. XXX and Dr. XXX analyzing the role of specific protein expression levels within human cancer cell lines and how this protein impacted the onset of breast cancer. I also attended a lecture by Dr. XXX concerning cellular breakdown and how proper nutrition and exercise affect aging and the development of cancer by reducing mitochondrial damage. Considering my own personal emphasis on health, these experiences opened my eyes to the potential of preventive treatment and also showed me how I can serve as a motivation to those who want to improve their health. After much thought, research and speaking with dietitians I decided to pursue a career in nutrition to learn and implement the powerful prevention tools it provides.

Receiving a master’s degree in Nutrition and becoming a registered dietitian will allow me to have a strong foundation in nutritional science, which I believe is crucial when advising clients concerning their health. While participating in the nutrition graduate program, I plan to take electives in culinary arts so as to further my knowledge in preparation of health-supportive food that aids with digestion, enhances the immune system, promotes disease prevention and encourages the incorporation of whole foods derived from sustainable agricultural and farming practices. My knowledge of nutrition combined with food preparation will allow me to open a wellness center which will offer nutritional advising and healthy cooking classes. As a result, I will be teaching the short and long-term benefits of healthy eating as well as how to attain this lifestyle. I will lead community-based events that promote families cooking together and parents-to-be classes that emphasize the importance of prenatal and pediatric nutrition. In my cooking classes I will teach basic skills such as canning and freezing fruits and vegetables, easy menu preparation as well as how to economically eat healthfully on a budget. I will also provide the service of group nutritional advising sessions that will provide clients with a risk-free environment where they can be part of a health community that extends the wellness model. These services will begin to reformulate the fundamental relationship between people and food by instilling healthy eating habits that will thus possibly prevent many health problems later. Moreover, I am currently writing a cookbook that contains plant-based recipes with simple explanations that address what role certain foods play within the body. I will be able to finish this book after receiving nutrition and culinary arts instruction at XXX. I plan to publish this book because literature incorporating healthy recipes with easy explanations to complex scientific material will help people to educate themselves and take control of them life. Michael J. Fox stated, “Medical science has proven time and again that when the resources are provided, great progress in the treatment, cure, and prevention of disease can occur.” I agree with this statement and will help make these food resources available in a way that is inviting and informational.

Many would consider my decision to enter this health profession as a career change but I view it as a career extension. As an educator, I worked hard to guide people toward success and I appreciate the importance of educating people in conjunction with the patience involved in this process—all of which I will continue as a dietitian. I prepared for medical school because I have always strived for excellence, possessed a love of science and desired to make a difference. The distinction exists within my interest in preventive care, personal importance I place on environmental conservation, and my continuous love affair with creative, healthy cooking. According to Forum for the Future, “Sustainable development is a dynamic process which enables all people to realize their potential, and to
improve their quality of life, in ways which simultaneously protect and enhance the Earth’s life support systems.” By combining my interests and values I believe I have found a niche that will allow me to aid in proactively changing the face of health and wellness for many people while at the same time advocating practices that eradicate poverty and hunger, begin to reverse personal and societal costs to human health due to current eating habits, and promote responsible and compassionate practices toward all living beings.

As a candidate I have much to offer your program. Being of first generation XXX and XXX descent, I come from a modest background and work hard to succeed. Moreover, I acclimate well to my surroundings. I grew up on a small farm but was able to adapt well to urban life when living in XXX and XXX. This ease of transition makes me an excellent candidate for the learning environment your program provides. I believe my experiences and circuitous path to this field will benefit your program. In return, I feel it would be a true gift to learn from the best and brightest at XXX and be one of the many “trail-blazers” in this field to graduate from your university. Primarily, I chose XXX because I need a strong, renowned program in order to make my goals a reality. Exploring the programs offered, research projects taking place, and speaking with alumni have only enhanced my appreciation of and interest in attending XXX. The advantage of being able to receive instruction in nutrition and whole food culinary arts is unique and useful in achieving my career objectives. Secondly, I am attracted to the overall mission of XXX and how it coincides with my own value system. XXX values the interconnectedness of medicine and nature, mind and spirit—both of which are aspects of life people constantly separate. However, in order to care for one another and our planet we must learn how these pieces are woven together. I believe being educated at XXX will allow me to pursue a career that will help educate people in taking the first steps in truly helping themselves as well as the world around them. Lastly, XXX’s location in XXX State is something that compliments its appeal. Being able to live and work in XXX last year allowed me to explore and become acquainted with the cadence of a bustling city alongside glorious nature. XXX appreciates this fusion and works hard to conserve our environment. This appreciation was shown in its cleanliness, public transportation and waste management systems that far exceed other places I have lived and visited. All of the aforementioned reasons have made me see not only what a precise fit XXX’s Nutrition program is for me but also what an asset I will be to your school and the global health and wellness community.

See the Appendices for additional graduate school personal statement examples.
Graduate School Personal Statement 2: MPH, Epidemiology

From an early age, puzzle books accompanied me on every long car drive or airplane ride. Logic riddles captured my imagination and allowed me to develop and apply critical thinking skills. Eventually my enchantment with puzzles matured into an interest in scientific observation and analysis. This newfound interest, coupled with my fascination with the human body and the brain in particular, led me to study neuroscience at XX College. After completing advanced courses in neuroscience, biology, chemistry, and math and participating in complementary research experiences, I have decided to integrate my concentration in life sciences and experience with data analysis to improve human health outcomes. Pursuing a MPH in Epidemiology will help me to achieve this by providing me the opportunity to build upon my quantitative and analytic abilities and apply them to current problems in public health.

During my sophomore year of college, I applied to the National Science Foundation’s Research Experience for Undergraduates at the Center for Sensorimotor Neural Engineering at the University of XX (XX) in pursuit of a summer internship that would enhance my human anatomy research skills. Through the program, I conducted research with Drs. XX XXX and XX XXX in the XX Human Motion Analysis Lab to investigate the effect of a cognitive Stroop task on gait in people with lower limb loss. I learned how to design a research protocol, conduct an experiment, and collect and analyze data using Qualisys Motion Capture Systems, Visual 3D, and Microsoft Excel. In so doing, I developed additional clarity about my own career path. I realized that I enjoy planning research studies and collecting data and investigating approaches to analyze and interpret the data; therefore I sought additional opportunities to develop my data analysis skillset.

Upon returning to XX, I enrolled in a MATLAB programming class and a statistics course using SPSS and subsequently gained a new appreciation for the process of analyzing data to help tell the story about a study’s results. I became intrigued by the statistical methods used to analyze large data sets that reveal associations among variables, evaluate effects, and identify risks in health-related fields such as epidemiology. I later enrolled in “Data Analytical Tools, Technologies and Applications Across the Disciplines” at XX Graduate University (XXX) in which I applied my prior programming experience along with GIS software to analyze the Centers for Medicare and Medicaid Services (CMS) data for patterns among physicians whose bills to Medicare and Medicaid reflect overcharging. Working on this project enhanced my ability to interpret complex data and distill it into information that is understandable, relevant, and actionable. In an effort to apply my statistical and critical skills in conjunction with health care policy and global health disparities, I applied to participate in the XX XXX Research Program at the XX XXX Research Center. As an intern in the XX Institute for Cancer Outcomes Research (XX), whose mission is to improve cancer prevention, detection and treatment in ways that will reduce the economic and human burden of cancer, I contributed to the development of a financial navigation program for cancer patients as part of a feasibility study. We aimed to determine if participation in a financial navigation
program reduces financial and emotional distress in people with cancer. I also performed an extensive literature review to gain a more practical understanding of how clinical guidelines and pathways are evaluated. The exposure to the complexities of project design coupled with my excitement about the potential impact of my work enhanced my research skills and understanding of the dedication required to be a researcher. Additionally, taking a graduate level course in epidemiology this semester at XX has reinforced my enthusiasm for, as well as broadened my awareness of, the value of epidemiologic methods. As I have gained more exposure to the complexities of cancer and the burden it places on patients, my desire to use my quantitative skills to discover possible determinants and risk-factors for the disease has solidified.

I wish to enroll in the Epidemiology MPH program at the University of XX because it uniquely combines my enthusiasm for data analysis with my desire to improve health outcomes and identify possible determinants of disease. In addition, the program’s proximity to and connections with XX XXX XX Research Center as well as organizations that have sizeable cancer research institutes like PATH and Group Health Research Institute provide the opportunity to establish professional connections that open doors for my post-graduate career. My goal is have a career in research in which I use quantitative analysis to elucidate causes of cancer health disparities and develop innovative solutions to effect change in healthcare policy and implementation, much like the current research in the Department of Epidemiology. I am particularly interested in Dr. XX XXX’ s research endeavors to identify modifiable risk factors for cancer as well as factors associated with cancer survivorship. Likewise, Dr. XX XXX’ s investigation of cancer treatment and survival disparities by race and ethnicity aligns with my interests in diminishing health inequalities. My research experience, coupled with my strong analytic skills and foundation in the life sciences, positions me to succeed in the MPH program in Epidemiology at University of XX and contribute meaningfully to departmental research

See the Appendices for additional graduate school personal statement examples.
Graduate School Personal Statement 3:  
MPH, Global Health

On the morning of her baptism, my now five-year old sister, XX, woke up with a bad cold and an eye infection. The timing could not have been worse:  the ceremony was taking place in Mexico, where baptisms are elaborate occasions celebrated with family and friends who would soon be arriving. Understandably, it was not a good time for a baby to get sick. Fortunately, my grandma knew a solution that would cure her in time. She scurried around the house collecting the necessary supplies: red string, clear tape, and scissors. After cutting a piece of string and small piece of tape, she returned to the room and announced, “Anytime a baby is sick, tape a red string on the baby’s forehead. The baby will get better immediately!” My aunts looked at each other, as if embarrassed they had forgotten about this technique. I, on the other hand, was completely befuddled. I rolled my eyes and went in search of the Children’s Motrin. I tried explaining that my grandmother’s remedy was ridiculous, but my family was not receptive; rather they were hurt and felt I was mocking their beliefs.

As a result of this experience, in addition to my grandmother’s recent battle with brain cancer where I was often at her hospital bedside in Mexico, I have made the connection between cultural influence and clinical care. I now appreciate that my grandmother and aunts were not wrong in believing taping string to XX’s forehead would make her feel better nor was I misguided in thinking medication was the best treatment. Upon reflection, I realize XX was fine with the string taped to her forehead and a dose of Motrin, and probably more importantly, no one belief had been ignored in favor of the other. One’s cultural background must be taken into account when considering the best course of medical treatment. Within the scope of modern medicine, I feel culture is largely ignored in favor of accommodating scientifically proven treatment methodologies. Since arriving at this conclusion, I have become interested in how cultural beliefs intersect with medical treatment and understanding of disease, treatment and overall health.

In an effort to pursue my interest in studying the intersections between culture and health, I worked for XX XXX, a community health organization, at the XXX Family Health Center (XXXX) as a Patient Navigator. XXXX is located on the South side of XXX, in one of the city’s poorest Hispanic neighborhoods. I helped many patients obtain affordable medications and sign up for government assistance. Additionally, at the beginning of my junior year, I began working at the University of XXX Center for Health and XX XXX XXXX: XXXX. Here, I evaluate projects against their stated goals of reducing racial and ethnic disparities. In my evaluations, I comb through their methodologies, evaluate the data to assess significance and gather the quantitative and qualitative data for dissemination throughout the organization. It was through this work that I discovered how rarely cultural and social determinates of health are included in interventions. This omission often contributes to unsuccessful disparity reductions, however programs that did include the cultural and social determinants were not only more successful in their clinical outcomes, but also more readily accepted by their patient populations.

With this experience, I accepted an internship at XX XXX X Research Center (XXXX) as a rising senior. During my internship I researched racial and ethnic disparities in breast, colorectal and cervical cancers using the Surveillance, Epidemiology, and End Results (SEER) database. This research took a more quantitative approach than my work at XXXX, and it was rewarding to evaluate disparities from a new angle. I also worked with Population-Based Research Optimizing Screening through the Personalized Regimens (PROSPR) to understand breast, colon, and cervical cancer screening procedures and investigate how they can be improved. PROSPR is a national group with seven sites throughout the country, which gave me an opportunity to interact with researchers.
nationwide and gain a comprehensive understanding of cancer disparities. I learned how to perform in-depth data analysis, which supplemented my work in more qualitative research at XXXX.

Through my public health experience, I have been exposed to several different facets of health care. I have become primary interested in immigrant health (particularly Hispanic immigrants), and reducing the incidence of cervical cancer among Latina women. My undergraduate thesis focuses on late-stage cervical cancer in Hispanic women and the cultural and social determinants of the disease. I will examine the cultural understandings of this disease, as well as socioeconomic issues such as access to care and awareness of cervical cancer screenings. This multi-disciplinary approach to disease is fascinating and I will apply this strategy in my career as a researcher in reducing ethnic and racial disparities through a community health approach.

In earning my Master’s of Public Health at the University of XXX, I will develop and apply specialized research techniques to evaluate the incidence of disease. It is important to me that my school of choice has a focus on the practical application and implementation of research methods and data gathering techniques. The University of XXX’s dedication to practical application of research skills is important to me. I want to be part of a program that stresses the importance of applying knowledge obtained in the classroom to the larger outside community. Through the XX required practicum, I know I will receive plenty of opportunity to practice my research skills and data collection techniques. The practicum will allow me to engage with the community while simultaneously developing my analytical skills. Furthermore, I enjoy working in new and different settings and I know that fieldwork will complement by education and future career goals. In particular, I want to learn about public health in an environment that takes the social and cultural contexts of disease into consideration.

Once I have my MPH, I will apply my skills researching health disparities in the Hispanic community. While I am currently interested in cervical cancer and HPV vaccination, I am open to other research topics. Dental care among the Hispanic community is one research area that I find particularly interesting but have not had the opportunity to research. I want to work directly with Hispanic populations through community-based healthcare. Ideally, I would like to work for a non-profit organization or county public health system and apply my knowledge and skills from my MPH to develop or reengineer programs aimed at improving healthcare for Hispanic immigrants.

See the Appendices for additional graduate school personal statement examples.
Graduate School Personal Statement 4: 
PhD, Public Health

As a graduate student at the University of XXXX’s Program in Health and Behavioral Sciences, I am actively developing a career focused on the prevention and control of chronic and acute diseases among under-served populations. My current research and career goals, coupled with my academic and field work experiences, afford me an excellent position to apply to the Ph.D. program at the XXX XXX School of Public Health. It is my aspiration to concentrate my doctoral research and application studies addressing contemporary health problems in rural communities, building upon my current foundation in health education.

Over the last two years, my focus has been in public health, specifically studying community health education and understanding and improving cancer health disparities. I have developed an instinctive desire to approach health disparities and behaviors at a level that is inclusive of both the micro-systems of family and community, and individual behavior and decision making. After reading the objectives of the XXX XXX School of Public Health program, I found not only the course of study I was looking for, but a program in an area of the country that is home for me, allowing me to reach an academic pinnacle and while living and working in the region I love.

During the course of earning my MPH degree, I participated in a summer internship at the XXXX School of Medicine in XXX, XXX, assisting a research and action program undertaken to indentify colorectal cancer screening compliance of Hispanic populations in eastern XXX. In this capacity, I worked with Principal Investigator Dr. XX XXX analyzing data collected from the study, contacting participants for follow-up information, and supporting the assessment procedures for future health programs geared towards increasing compliance. The intervention utilized the Health Belief and the Transtheoretical models respectively.

Concordant with this work, I completed a draft manuscript with the assistance of Dr. XXX and an abstract of the study has been submitted to the American Association for Cancer Research Annual Meeting 20XX, for presentation and possible publication. Overall, this position provided valuable experience in conducting interviews, and understanding and communicating with individuals and communities, and the process of development of culturally-appropriate health interventions.

Currently, I have been working with Dr. XX XXX from the Office of Epidemiology at the University of XXXX. In this capacity, I have been involved in a research project aiming to increase awareness, prevention measures, and screening compliance of cervical cancer among Hispanic women in XXX XXX, XXX; the results of my research will be submitted for publication and presentation. This project in particular has allowed me to participate in developing surveys for the study, the training of lay community health workers (promotoras), the dissemination of cancer information directly to the participants, collection of data and its analysis, and working with accomplished doctors, and program planners.

Findings from this pilot study have the potential to direct the design for future interventions determining to protect Hispanic women in local communities against cervical cancer and decrease incidence rates of this disease among local populations. I have also reviewed and analyzed publications on cervical and colorectal cancer to explore and develop recommendations for future interventions and policy changes.

In addition to my research experience, I have been employed as an instructor for the University of XXXX. Teaching gives me the opportunities to inspire, motivate, and invigorate people in ways that have been imperative to my success as a student and as a health researcher. I have taught both face-to-face and online courses, averaging 35 undergraduate students per class. As a compliment to my career in research, I plan to continue teaching and eventually work as faculty for an institute of higher learning.

I have also served as President of the XX XXX Chapter of Eta Sigma Gamma National Health Education Honorary, President of the College of Health and Social Services Council, Vice-President of the Master of Public Health Student Organization and represented the MPH students as a member of the MPH Course Selection Committee. These supplemental experiences in addition to my classroom education and field experience have been the conduits to continuing to go further academically and professionally. My goals are to use research and proactive interventions to increase social justice and the reduction of social and health inequalities. My
experience to date and research plans for the future demonstrate a strong commitment to understanding and improving chronic disease health disparities in the U.S., with an emphasis on the health of communities of the XXX region. The Ph.D. program at the XXX XXX School of Public Health would build upon this experience, providing an opportunity to learn about the use of social and cultural framework to address health and wellness, and also gain the education necessary to able to help develop the next generation of health professionals with the mix of new ideas and best-practice interventions. Throughout my research, it has become evident that effective health behavior change is motivated by cultural competent approaches and the use of technology. The work and research of Dr. XX XXX and Dr. XX XXX among other members of the faculty would serve to complement a solid research background dedicated to understanding and improving health disparities among communities in the XXX, and would provide invaluable knowledge and training that I would be able to apply both to my dissertation research and my future work with underserved populations.

See the Appendices for additional graduate school personal statement examples.
Graduate School Personal Statement 5:
PhD, Epidemiology

When I began work on my Masters of Public Health at the University of XXX, XXXX, I thought I knew what epidemiology was. I envisioned my future as an epidemiologist involving outbreak investigations and lab work. One year later, as I observed the meeting of a scientific advisory committee, convened to brainstorm ideas for studies to elucidate why breast cancer incidence rates were elevated in XX XXX, XXXX, my understanding of epidemiology was transformed, as was my vision of my future. In listening to the epidemiologists on the committee, including Dr. XX XXX, discuss their own cancer studies and the epidemiologic process I began to understand how powerful epidemiology is – how a properly designed casecontrol study can yield results that point towards biological pathways and how the findings of a cohort study can guide medical practice. I was particularly inspired by Dr. XXX’s work describing the associations between hormone replacement therapy and breast cancer by histological type. I knew then that I wanted to be a cancer epidemiologist. I knew then that cancer epidemiology appealed not only to my analytical nature, but also to my desire to focus my professional efforts in a field that had societal relevance. I knew then that I wanted to design and carry out my own epidemiological studies and collaborate with others to enhance pre-existing studies. I knew then that I wanted to do cancer research in an academic setting that encouraged creative scientific thinking to solve public health questions.

During my second year of MPH studies I put my new-found inspiration into practice. With my Master’s thesis I investigated the hypothesis that population misestimation artificially elevated breast cancer incidence rates in XX XXX, XXXX; I used Poisson regression to compare breast cancer incidence rates based on population counts from the 20XX Census to breast cancer incidence rates based on population projections for the year 20XX projected from the 19XX Census. I found that population projections for XX XXX had significantly underestimated the size of the population of women aged 45–64, and that this underestimation had been sufficient to significantly increase the estimated incidence rate of breast cancer in XX XXX in the late 19XXs. Following the completion of my MPH in epidemiology, I spent several months at the XX XXX Department of Health reworking this research and preparing a manuscript for publication (Journal of XX, June XXXX). With this publication I asserted that the extensive efforts devoted to cancer surveillance research lose some of their utility when inaccurate population projections must be relied upon for timely reporting of incidence and mortality data.

In the fall of XXXX, I accepted a position as an epidemiologist at the XXX XXXX Cancer Center under Dr. XXX. Since joining the XXXXX I have had the privilege to work with data from the XX XXX Women's Health Study and the XXX XXXX Breast Cancer Collaborative Family Registry, both designed to examine breast cancer risk in understudied minority populations. My most significant project with the XXXXX thus far has been a casecontrol analysis investigating the association between migration history and breast cancer risk in Hispanic women (Journal of XX, December XXXX); for this research project I performed all literature review, data cleaning, and data analysis, and contributed significantly to the preparation of the final manuscript. I currently have several additional projects in various stages of development, including a descriptive analysis of differences in rates of participation in a breast cancer family registry by race/ethnicity, and an analysis of the variation in prevalence and effect of reproductive risk factors for breast cancer in a multiethnic population. My role at the XXXXX has also included managing the genomics database for the organization’s breast cancer family registry; this responsibility has not only allowed me to revisit and apply my undergraduate studies in molecular biology, but has also given me the opportunity to learn about specific mutations and variants in BRCA1 and BRCA2 and has lead me to an interest in conducting genetic studies for breast cancer.

Although I find great satisfaction and a sense of purpose in my work, I know that I want to learn and do more. My professional and educational background thus far has given me the opportunity and perspective to discover my own research interests. My hope now is to pursue doctoral studies in epidemiology at the University of XXX so that I can gain the skills and knowledge to translate my research interests into epidemiological investigations. Presently I am interested in the study of gene-environment interactions with relation to breast cancer risk, molecular markers of breast cancer susceptibility, and epidemiologic methods in cancer research. My goal is to conduct epidemiological research for the identification of both modifiable risk factors for breast cancer in high
risk populations, and markers of breast cancer susceptibility for prevention and screening. I am inspired to attend the University of XXX because of the unparalleled resources for breast cancer research that the epidemiology program has to offer. I am eager to learn from the faculty of innovative cancer epidemiologists, including Drs. XXX, XXX, XXX, and XXX whose research has inspired me to want to follow in their footsteps. I am excited by the prospect of collaborating and studying with researchers at both the world-renowned XX XXX XXX Research Center and the cutting-edge Institute for XX XXXX. Given the expertise of the epidemiology faculty in the field of breast cancer research and the resources provided to the epidemiology program by its connections with the XX XXX XXX Research Center and the Institute XX XXXX, I feel that my educational and research goals are well-suited to the doctoral program in epidemiology at the University of XXX.

While my background has enabled me to define my own research interests and gain a solid foundation in epidemiologic methods, I am eager to embark on further study. I hope to pursue a PhD in epidemiology at the University of XXX so that I may acquire the tools and expertise that will enable me to perform independent research in the important field of breast cancer epidemiology.

See the Appendices for additional graduate school personal statement examples.
Graduate School Personal Statement 6:  
PhD, Molecular & Cell Biology (MCB)

From an early age, I was intrigued by a quote from the well-known scholar, Lewis Thomas: “The capacity to blunder slightly is the real marvel of DNA. Without this special attribute, we would still be anaerobic bacteria and there would be no music.” This statement piqued my curiosity in science by making me realize that many species evolve from a single cell. At that time, science seemed like a miracle to me and I wanted to understand more as I grew older. When I was a child, I would often go to the nearby woods and lakes to observe fish, squirrels and collect bird feathers. Their tranquil and free life raised my interest in biology. As I become older, I became more interested in cancer biology and the mystery behind it, which has led me to pursue a career in cancer research. I feel that I should utilize my passion for cancer research to help millions of people who suffer and die from various types of cancer each year.

After completing my college education XXX, I came to the United States to continue my education in Genetics at XXX, which helped foster a sense of personal responsibility. Over the last three years at XXX, I have worked in various research labs to get hands-on experience in molecular biology.

During my tenure as an undergraduate research assistant in Dr. XXX’s lab at XXX (20XX), I gained experience in GUS staining of mutant plants, specifically gene transformations of Arabidopsis thaliana plants using Agrobacterium, plant genomic DNA extractions using the CTAB method, and plasmid extractions. The year I worked in that lab laid the foundation for future lab positions I held while at XXX. At the beginning of this year (20XX), I worked as a lab assistant in Dr. XXX’s lab, which exposed me to entirely new lab techniques such as gel electrophoreses, bacterial plasmid extractions, and making dsRNA using an Ambion® RNAi kit. These experiences and the enormous amount of knowledge gained about molecular biology techniques continues to fuel my pursuit of cancer research.

In the spring of 20XX, I had the opportunity to do an independent research study on genomic rearrangements induced by transposable elements in maize under principal investigator Dr. XXX at XXX. In the study, I used transgenic construct that contains markers (maize c1 and p1 genes) for detection of both I/dSpm transposition and Ac-induced deletions to understand possible genomic rearrangements. As a result, I was able to recover and map ten new I/Sdpm transposition sites in the maize genome. Together with previous studies, results of the research could lead to new approaches for using transposable elements as a tool to enhance crop productivity.

Recently, I worked as a summer intern in Dr. XXX’s lab at the XXX, which has exposed me to cutting-edge research in the field of cancer metabolism. Concordant with my summer research project, I am tested ten different breast cancer cell lines against different metabolic inhibitors to identify possible differences in bioenergetic metabolism between breast cancer subtypes. I have gained new insight into mammalian cell culture as a result of this project and trained use novel instruments like the Extracellular Flux Analyzer. Also, weekly lectures in different areas of cancer research helped me gain a better understanding about research fields other than that of breast cancer. I believe the training and experience gained through this internship program will prepared me well for future research projects.

Currently, I am working as a Research Associate in XXX, startup biotech company in XXX. Since XXX provides research and diagnostic tools for drug discovery and therapeutic development for treatment of Parkinson’s disease and other neurodegenerative diseases, this position gives me enormous experience on drug discovery research. My work is involve with mammalian tissue culture, western blots, Florescence Microscopy work, and testing novel target cell signaling molecules involved in apoptotic cell death. Since, this company is associate with XXX; I have opportunity to use research facilities in Department of Biomedical Sciences at XXX too. As an undergraduate student, I am glad that I work with them because I can learn lot of new research techniques from my work and I also certain that these experience will be helpful for me as a graduate student in near future.

In addition to my research experiences at XXX, XXX and the XXX, I have taken part in various extracurricular activities at XXX. I was President of the XXX Students Association at XXX (20XX) and during my presidency, I was able to organize a number of cultural events through which we were able to share our rich XXX culture with the rest of the XXX community. I also served as a Peer Mentor for the “Secret of Life” learning community.
for genetics undergraduates at XXX, where I shared my educational and personal experiences with freshmen students to help them succeed in their studies. Together with the other peer mentors; we formed a weekly “help room” session to offer assistance with math, chemistry and biology.

I believe that my experiences gained both inside and outside the classroom, have prepared me to advance academically and professionally. My goal is obtain a Ph.D. in cancer biology and conduct further studies in the field of breast cancer research. I am certain that the Molecular and Cell Biology (MCB) Ph.D. program offered at XXX will provide the education and experience I wish to acquire. I also believe that the diversity of the coursework, world-class research opportunities, and rich social and cultural framework at XXX will provide the necessary foundation to be not only a scientist, but also a good citizen to the world. I believe that the valuable experience and knowledge I have accumulated, make me a great fit for the program. The diversity of my experiences is my biggest asset and I guarantee that it will assist me in succeeding in the future. XXX, I wish to continue my journey to a career in biological sciences which I first envisioned as a child in XXX.

See the Appendices for additional graduate school personal statement examples.
Graduate School Personal Statement 7: 
PhD, Neurobiology & Behavior

The average human adult has approximately ten billion cortical pyramidal neurons. I have one extra: the tattooed soma rests in the hollow of my back, stretching spiny dendrites out towards my hips, and a single axon reaches up my spine, its collaterals curving up my neck and over my shoulders. The black—inked composition is reminiscent of the intricate drawings of Santiago Ramón y Cajal, one of the fathers of neuroscience. The tattoo is symbolic of my dedication to investigating the many exciting questions neuroscience has to offer, but I was not always sure enough of my career choice to etch it on my skin.

My childhood was spent trying on many hats and each birthday brought a new goal: first artist, then veterinarian, then astronaut, writer, theatrical lighting designer, and finally “I don’t know.” It wasn’t until I had the opportunity to participate in biological research that a lasting preference began to emerge in my mind. I spent my final high school semester investigating single nucleotide polymorphism (SNP) frequencies in lettuce cultivars at the XX Genome Center. I was immediately hooked; I loved the process of scientific problem solving as well as the idea that I could uncover a previously hidden corner of the universe.

After several summers working in agricultural biology research labs, I enrolled in an introductory neuroscience class taught by Dr. XX at XXX State University. I was utterly fascinated by this field and I quickly asked to join the XX lab, which uses zebrafish as a model to study the hormonal glucocorticoid system. My research partner and I found that a mutant with defective glucocorticoid receptors displayed decreased spontaneous swimming activity combined with increased stress responses. In addition, the phenotype could be rescued with the anti—depressant Prozac, suggesting that the glucocorticoid system may play an important role in modulating behavioral stress disorders. I presented preliminary findings at the XX (XXX) meeting in 20XX, which gave me a tantalizing taste of what it is like to participate in the greater scientific community.

It was only after immersing myself in research for a year that I knew I had found my place. Dissecting behaviors down to the molecular and cellular components of neural networks thrilled my analytical brain. I sensed I had only just scratched the surface, and that was not enough—I wanted to understand how all of the pieces interact to give rise to a functioning nervous system. Once I came to that realization, the neuron tattoo seemed a natural display of my interest in the field, and now serves as a visual reminder of my intent to contribute to neuroscience research.

To that end, I applied and was accepted to the XXXXX (XXXX) XXXX (XXXX), where I worked in Dr. XX’s lab, studying the formation of electrical synapses. I spent the summer characterizing a mutant line of zebrafish from a forward genetic screen looking for defects in synaptogenesis. I found that there seemed to be a loss of two key proteins at the site of the synapse, though the general neural circuitry remained intact, suggesting that the mutation was in a gene critical for electrical synapse formation. Throughout this investigation I retained a sense of excitement every time I turned on the microscope to look at my results; watching individual neurons glowing against the dark background of their unstained neighbors still gives me pause. In addition to studying these mutants at the level of individual synapses, my mentor and I also created a behavior recording apparatus out of a cardboard box, a petri dish rack, a roll of packaging tape, a small laptop speaker, and a camera. Though assembled of random parts and garnering many amused reactions from my lab—mates, I used this equipment to discover that the loss of electrical synapses correlated with a decrease in auditory startle behavior. The entire summer was incredibly rewarding and I emerged feeling well—prepared and exceptionally motivated to pursue a PhD.

In the year since completing the XXXX internship, I have further developed my professional goals. I was asked to be a supplemental instructor for the XXX Chemistry department and in that capacity, I prepared and taught lessons for students who wanted additional help in their first semester chemistry course. While this was one of the most challenging things I have done, the rewards of seeing my students succeed sparked a desire to become a professor in addition to conducting research. I have since been invited back to the XXX lab as a technician, where I continue to study the molecular underpinnings of electrical synapse formation. This has only enhanced my interest in the cellular and molecular mechanisms underlying circuit building. I want to understand how a finely—tuned nervous system develops time and time again from a handful of unspecified cells. The human brain, with its trillions of synaptic connections, is the most complex set of machinery known to humankind. It is
able to accept environmental stimuli, learn, and then in turn influence its environment. In order to become that fully functioning system, neurons must determine their cellular fate, guide axons, identify synaptic partners, and create connections before organizing electrical and chemical information. There are an incredible number of opportunities for these processes to go wrong, and yet in most instances it does not. Development from that first neural stem cell to a mature brain is an amazing feat of nature and the sheer amount that is not known about it both frustrates and excites me. That combination of emotion is what fuels my drive to continue on this path.

The resources available through the XX Neurobiology and Behavior program will put me in an ideal position to investigate the fundamental questions about neural circuit building. The program offers several courses that I am eager to take, especially NEUBEH 502: Sensory and Motor Systems and BIOEN 498B: Neural Engineering, as I feel these courses offer information and tools I need to study how meaningful circuits form. I am interested in working with Dr. XX XXX, with whom I would use microfluidic devices to engineer my own artificial circuits and thereby learn what the system requires to do so. I could also see myself succeeding in Dr. XX XXX’s lab where investigating the genetics underlying simple sensory networks would give similar insight. I expect to be challenged by graduate school, and am prepared to take advantage of the numerous opportunities to better my scientific intellect in order to become an academic researcher at a top university. I expect to succeed and earn a place in the scientific community that will enable me to collaborate with the foremost scientists in my field as I work to explore the many unasked questions in neuroscience.

See the Appendices for additional graduate school personal statement examples.
Graduate School Personal Statement 8: 
PhD, Biostatistics

The path leading to my pursuit of a PhD through the University of XXX doctoral program in Biostatistics began not in a mathematics or a biology class, but rather in a small community located two-and-a-half hours outside of Asunción, Paraguay. As a senior in high school, I participated in a six-week volunteer program in this village, where I worked with villagers on constructing fuel-efficient stoves to reduce the health risks associated with open-fire stoves. I returned to the United States with a strong interest in development economics and full of hope that my actions could continue to improve the lives of others. Two years later, this feeling inspired me to major in economics.

Having seen the intellectual fulfillment and joy my physicist father receives from his research, I applied for and received a grant through the XXX College Student Undergraduate Research Program, providing my first exposure to research in labor economics. Sponsored by Professors XXX and XXX, the project investigated different ways of measuring hours worked in the most important and comprehensive database that quantifies labor market conditions in the United States: the annual Current Population Survey. The goal was to understand how misreporting of hours worked affects the measurement of national wage inequality across income, gender, race, age, and academic background. My role in the project was to conduct an extensive literature review on the quantification of hours mismeasurement and to code all of the data analysis in Stata. The project culminated in my programming a kernel density reweighting procedure (XXX, XX, and XXX, 1996) that enabled the normalization and comparison of hours mismeasurement in separate years of the survey. Although I did not find any difference in the measurement of inequality using reweighted hours measurements, I became fascinated with researching appropriate methods for extracting information from data when that information is not immediately obvious from visual inspection.

During my research with Professors XXX and XXX, I found the economic models attempting to quantify human behavior to be too imprecise, and I began searching for a new field to apply my newfound interest in statistics. A XXX College mathematics professor suggested that I might find biostatistics interesting and pointed me in the direction of a course on genetics. This course introduced me to the complexities of cancer genomics, in particular, the process of using microarray and Next-Generation Sequencing technologies to improve early cancer detection. During this semester, I also took a computational statistics course, in which I completed a research project on filter and wrapper dimension reduction. The project gave me insight into the basic statistical techniques used for selecting biomarkers from sequencing technologies that collect information on thousands of genes.

Looking for an opportunity that would allow me to apply the information I learned in my statistics and genetics courses, I discovered The XX XXX XX Research Center XX XXX Research Program (XXX XX). The XXX accepted me into their competitive 2014 XXX, where I worked with Dr. XX XXX in developing methods for extracting more accurate information from high-throughput –omics data.

One important project in Dr. XXX’s lab is to develop a statistical framework to remove technical variation from data produced by Luminex xMAP bead-based microplex technology. The technology quantifies analyte levels by measuring the fluorescence of thousands of beads that contain analyte specific antibodies. Typically, only median fluorescence levels are reported and compared for each analyte in an individual array. However the project utilized bead level data to provide more information on the distribution of bead fluorescence intensity. I used the lab’s LumiR package to implement a mixed effects linear model to remove technical variance from the bead level fluorescence intensities. We compared the recently proposed SAxCyB hypothesis test to the traditional t-test method and to the Mann-Whitney-Wilcoxon U Test. We found that hypotheses tests on normalized data perform better than hypotheses tests on raw data, based on higher area under the curves for receiver operator characteristic (ROC) curves and lower false positive rates.

By working in Dr. XXX’s lab, I gained extensive experience in hypothesis testing and programming in R. To compare methods of hypothesis testing, I produced ROC and false discovery rate (FDR) curves, giving me familiarity with statistical tools that are used in almost all biomarker studies. Comparing hypothesis tests on raw and corrected data demonstrated to me the importance of detecting and removing unwanted sources of variation to ensure accurate results. I also sat in on conference calls between Dr. XXX and scientists who produced the data we analyzed, giving me insight into the collaboration necessary to ensure statistically interpretable results while also allowing biologists to run scientifically practical experiments.

My eventual goal is to contribute to personalized treatment of diseases through enhancing biomarker selection techniques and analyzing the benefits of treatment for patients who have different biomarker
measurements. The University of XXX department of Biostatistics is my first choice for graduate school for several reasons, first of all being its commitment to providing a strong theoretical background to its students. Second, because of its deep ties with the XXX, the University of XXX doctoral program in Biostatistics will allow me to continue research with the XXX lab and collaborate with biologists producing a wealth of data using cutting edge technologies. Finally, the doctoral program in Biostatistics will provide the opportunity for me to work with Dr. XX XXX, a leader in the field of developing risk prediction models to analyze treatment benefit based on multiple biomarker values. Along with my motivation to improve personalized medicine through biomarker analysis, my experience and success in real analysis, probability, theoretical statistics, and applied statistical programming gives me a strong background to thrive in the University of XXX doctorate program in Biostatistics.

See the Appendices for additional graduate school personal statement examples.
Graduate School Personal Statement 9: PhD, Bioengineering

The fact that cardiovascular disease is the leading cause of death globally was not particularly significant to me until it became personally relevant: at sixty-two years of age, my grandmother underwent a triple bypass with subsequent surgeries for stent replacement and a carotid endarterectomy. My seventy-three year-old grandfather is currently awaiting heart valve replacement surgery. The vulnerability I feel at the possibility of losing my grandparents has fueled my involvement in cardiovascular research for the past two and-a-half years at the University of XXX. In an effort to diversify my research experience and contribute to the translation of scientific research to understand and treat human disease, I applied to participate in the XX XXX Research Program at the XX XXX XX Research Center as a rising senior. This experience was pivotal in shaping my aspirations to pursue a PhD in Biomedical Engineering by exposing me to potential applications beyond my previous research experiences. Upon obtaining a PhD, I aspire to work as an independent investigator at a research-intensive institution where I can pioneer innovative research endeavors designed to reveal novel therapeutics for those suffering from cardiac disease.

In order to enhance my scientific background and increase my preparation for graduate school, I applied to the Maximizing Access to Research Careers (MARC) Program. I currently work in Dr. XX XX’s tissue-engineering lab at the XX XX Center (UofX Medical Center). The XXX lab investigates the thrombogenic potential of mechanical circulatory support (MCS) devices. As I explored the Detection of Shear-Induced Platelet Aggregation via Impedance Signal, I began to appreciate the utility of monitoring aggregation in real-time as platelets are subject to shearing in a dynamic fashion. By measuring real-time platelet aggregation in the clinical setting, coagulation therapy and management with device thrombosis prevention, early detection, and subsequent thrombolytic therapy has the potential to significantly improve treatment for patients with cardiac ailments. In an effort to advance this work to the clinical trial stage, the XXX lab implanted a HeartMate II Left Ventricular Assist Device (LVAD) in a calf and monitored it continuously for a month in collaboration with the device manufacturer, XXX Corporation. Participating in the translational aspect of this collaborative research endeavor instilled me with an appreciation for the immense time, effort, money, and regulatory hurdles required to introduce a device or therapeutic to the market. This experience reinforced my interest in translational research and catalyzed my commitment to bridging the gap between bench and bedside for patients suffering from cardiac disease.

Observing the major implications of the XXX Lab’s research inspired me to explore other avenues of translational research; therefore I joined the XXX XX Center team on a project designed to simulate cardiac arrest using the only FDA approved total artificial heart (TAH). I learned the value of strategic planning and repeated testing as experiments were designed to improve the TAH and prevent deleterious cardiac events due to inherent physical complications or device failure. My experiences as a member of the XXX XX Team have equipped me to be a successful graduate student by offering a foundation of skills that are critical to my success beyond the bench: I learned how to write a comprehensive, yet concise, scientific abstract and manuscript in addition to creating and publicly presenting a poster regarding research outcomes. I enhanced these attributes by presenting a scientific poster at several conferences, including the XX XXX Research Conference for XX (XX) and the XX XXX Research Colloquium (XX XXX) at the UofX. Presenting my research at these scientific platforms enhanced my public speaking skills and allowed me to share my excitement about the future applications of my findings.

At the culmination of my undergraduate studies at the UofX, I served as Team Lead for an industry-sponsored capstone project funded by the XXX lab. Under my direction, our team of five multidisciplinary engineering students designed and built a point-of-care microfluidic thrombosis device that monitors the efficacy of anticoagulant drugs by measuring the level of platelet activation in the blood of patients suffering from heart failure. As team lead, I was tasked with contacting UofX faculty to solicit guidance and instruction for optimizing the fabrication process, which complemented my collaborative networking skills and expanded my skillset in different engineering processes. This leadership role required me to be actively involved in all phases of the project while encouraging the team to produce a high-quality product. It also enabled me to refine my leadership skills as I scheduled recurrent meetings to ensure all deliverables were met on time and established firm deadlines to continually make progress. As the liaison between the team, project sponsor, and UofX faculty, I updated collaborators and mentors on our device progress in weekly meetings. As a result of this undertaking, I learned how
to establish a streamlined communication system and developed the ability to generate a scientifically-sound question, continuously optimize a design, and effectively validate results.

In hopes of cultivating a broader skillset and expanding my scientific acumen, I applied to the XXX at the XX XX. As an intern in Dr. XX XXX’s lab, I completed a project designed to characterize Tau, a protein that is toxic in its aggregated form and associated with many neurodegenerative disorders, in preparation for setting up a surface display screen to identify Tau binding knottins. Characterizing Tau in its monomeric and fibrilized forms generated new and unexpected results with no known solution, which required me to redesign the protocols to maximize results. The obstacles I encountered underscored the difficulties of performing clinical research and challenged my diligence to get the expected results. Working with XX XXX faculty inspired me to expand my scientific knowledge by reading clinically-related papers daily and attending weekly research seminars. This internship exposed me to Biomedical Engineering’s unique application to chronic disease research beyond cardiac and neurodegenerative diseases and cultivated my commitment to becoming a scientist at a research-intensive institution where I can collaborate with like-minded peers and be at the forefront of new discoveries.

While the effect cardiovascular disease has had on my grandparents’ lives is what originally inspired my interest in cardiovascular research, it is the extensive academic, employment, and leadership experiences I have acquired at varied institutions that has demonstrated the unlimited potential inherent to biomedical research and motivated my pursuit of a PhD in biomedical engineering. My personal drive, diligent work ethic, and commitment to scientific research has prepared me to establish a successful academic career. A PhD will enable me to hone the necessary skillsets and position me to be an prolific contributor to the field of biomedical research. The doctoral program in Biomedical Engineering at the University of XXX provides the comprehensive curriculum, outstanding faculty, complementary research opportunities, mentoring, and collaborative networking opportunities that are fundamental to my development as an independent investigator. The molecular and cellular component of the curriculum provides an opportunity to expand my experience beyond mechanical circulatory support devices and explore new endeavors in gene therapy, drug discovery, and nanomedicine in cardiac disease. I am particularly interested in Dr. XX XXX’s research using stem cell derived cardiomyocytes and his study of skeletal muscle since this work complements and expands on my research interests. I was intrigued by Dr. XXX’s paper “XXXX XXX XXX XXX XXX XXX XX XXXXX XX XXXX XXXXX” since I have recently begun studying cell migration in wounds. I also find Dr. XX XX’s undertaking in nanomedicine and targeted drug delivery to be fascinating, in particular its applications to chronic diseases. Working in the XXX lab would enable me to acquire knowledge of other chronic diseases meanwhile enhancing my understanding of the mechanisms of cardiac disease. I am confident that the culmination of my undergraduate research experiences, professional disposition, and scientific knowledge will enable me to excel in the University of XXX’s Biomedical Engineering program.

See the Appendices for additional graduate school personal statement examples.
Medical School Personal Statement Examples
“Morphine! Give me morphine!” screamed the little girl sitting in the hospital bed across from mine. Despite just awakening from surgery to remove a benign tumor in my left hip, my immediate concern was to help that little girl. The nurse came around to see how I was feeling and I asked if she could tend to the other girl’s pain before mine. While looking around the recovery room, questions started flooding my mind. Every experience I had during my diagnosis and treatment at XX Hospital enhanced my curiosity. I wanted to ask the other children what diseases they were battling, understand their feelings, comfort other patients like the medical staff did for me and be able to answer the thousands of questions just like Dr. XXX answered mine. But, at that moment, I was simply the patient needing treatment. However, I knew I wanted to fill those shoes and one day be the doctor myself.

As a fifteen year old, my experience at XX Hospital was really the defining moment of what I wanted for my future. Before this time, I did what was expected of me, but not what I expected of myself. The impact of this experience encouraged me to create my destiny and be accountable for my own goals. My determination to become a doctor also challenged me to explore different avenues and define the direction I wanted to pursue in the medical profession. At that point, nothing could circumvent me from my dream.

Consequently, throughout my college experience, I researched opportunities that would align with my goals. The University of XX chapter of the Foundation of International Medical Relief of Children (FIMRC) appealed to me as a unique opportunity to not only gain first hand experiences in the medical field, but also to serve underprivileged children around the world. During my sophomore year, I embarked on a medical mission trip with FIMRC to the Andes Mountains of Peru. After a bumpy ride up the mountain to the village, we found ourselves surrounded with the most beautifully unified community. Each individual was in complete awe of our presence since this was their first exposure with others outside their village. They were curious, yet a bit intimidated. To ease the children’s concern, I taught them how to play “Duck Duck Goose.” Their hesitation quickly subsided as they laughed while chasing me around the circle.

The time I spent with this community went beyond teaching proper health education; it was also about forming relationships of trust and working within a team. At the conclusion of my mission, the community leaders thanked me for providing them attentive care and medical supplies, despite their limited resources. I expressed to them my mutual gratitude for the opportunity to share in their untainted happiness. My experience in Peru solidified my ultimate vision to practice medicine with compassion. Due to my commitment to FIMRC, I was elected president in 2008. Since then, I have successfully increased awareness about FIMRC and have personally sent over fifty students on medical mission trips to Uganda, Peru, El Salvador, and Costa Rica.

Keeping alive the desire to define my passions, I pursued my fascination with molecular biology. Even at the start of college, I was proactive in exploring molecular biology beyond the traditional textbook knowledge. For example, I often consulted with professors to discuss my interests, as well as, studied biology journals to stay abreast of current research trends. Aspiring to become an activist and not just an enthusiast, I was selected to join Dr. XXX’s research group at the University of XXX. My research project is on the study of splicesomal proteins whose regulation is critical in maintaining correct gene expression. The level of detail and knowledge needed to sustain my project encouraged me to concentrate my undergraduate degree in the area of developmental biology. Because my niche focused on the complexities of cellular regulation, I began to focus on cancer, a disease that was heavily influenced by such mechanisms. Furthermore, to advance my learning of cancer research, I have the honor of working with Dr. XXX at the XX XXX XXXX Research Center in Seattle, Washington, this summer. With Dr. XXX and his research team, I will work towards uncovering the molecular networks that regulate stem cell identity in order to discover strategies for implementing targeted cancer therapies.

In retrospect, it was only five years ago that I would have been intimidated to even attempt overcoming situations that seemed beyond my realm of comfort. Now, I am invigorated by challenges that expand my knowledge and motivate me to achieve my future goals. Because of my
passion and determination for medicine, I have found confidence in myself to become a highly respected physician. I have created a path that has led me from the recovery room at XX Hospital, to the remote villages of the Peruvian people and to my highly accredited research positions. Most importantly, along my journey, I have learned that there is no limit to my aspired destination and the shoes that looked so big to fill as a child are becoming my perfect fit.
I was lying on the floor of a homeless shelter, attempting to fall asleep, when I kept asking myself, “What am I doing here?”

Unlike many of the individuals around me, I was there completely by choice. It was the first of seven nights I would spend in CASPAR, a shelter in Boston that provides a variety of stabilization, aftercare, and education services for those affected by substance abuse disorders. As a junior at the University of XXX, I had elected to go on an alternative spring break and chose to volunteer in a homeless shelter in order to gain a broader perspective of health care delivery among individuals living with chronic disease. I had volunteered at hospitals prior to this occasion, but had limited exposure to the full spectrum of health care. Although I felt adequately prepared for the trip, the reality of the experience was not what I anticipated.

During the week, whether it was while handing out blankets or serving meals, I witnessed the power of addiction firsthand. While watching one of the residents drinking out of a straw because body tremors prevented him from bringing the cup to his mouth, I recognized that beyond psychological want lies biological need. I also became aware of how physiology can be influenced through psychosocial factors. The most vital and yet simplest contribution I made was through my presence. As my stay in CASPAR lengthened, I experienced the remarkable benefit of human interaction and compassion in relation to helping patients adhere to treatment. I have since come to realize that attributes such as understanding and acceptance are crucial as a means of delivering quality health care.

My intention to practice medicine is rooted in my upbringing. As the daughter of two psychologists, I could never escape the question, “How does that make you feel?” and, as a result, I began exploring the influence that emotions have on physiology. Through research, I assisted in identifying protective factors for patients undergoing bone marrow transplants and investigated how exam stress affected students’ immune systems. This acute awareness of others’ mental and emotional disposition has been of tremendous benefit and will undoubtedly help me when interacting with patients in the future.

My mental fortitude developed as I learned adaptability and resiliency through years spent on the soccer field. When I was cut from my select soccer team at the age of 11, I was devastated, but I refused to quit. I spent hours outside of practice working on my footwork so that I could return to playing competitive soccer. When tryouts for my old team were held in the fall, I excelled in practice and was invited back. However, simply being back on the squad was not satisfactory.
Having been previously cut from the team motivated me to continually enhance my skills. As a result, I made the Olympic Development Program state team, traveled to regional camp where the best players from each state competed, and was recruited to play soccer for several Division I colleges. My ability to quickly adapt, maintain a resilient attitude and a psychological awareness has propelled me into a number of leadership roles, such as captain on my soccer teams and working as a teaching assistant at the UY.

I intend to apply the same drive, commitment, and determination from my soccer career towards becoming a physician. After graduating college and realizing that my first time applying to medical school did not result in an acceptance, I spent time assessing my strengths and weaknesses. This self-reflection led me to strengthened convictions and I began to work on areas that I felt needed improvement. I joined Toastmasters to improve my verbal communication skills and accepted a position with AmeriCorps in the Public Health Department, where I contribute to the promotion and improvement of basic health care access among underserved communities within the Seattle area. In this position, I have had the opportunity to organize free clinics where immigrants, homeless, and under-insured individuals are able to receive preventative care, such as blood sugar screenings and foot care.

My adaptability, tenacity, and psychological insight have been challenged and consequently strengthened as a result of experiences such as living in the homeless shelter, getting cut from my select soccer team, and facilitating a college class curriculum. My sensitivity towards others' feelings has helped me to effectively communicate across populations. AmeriCorps has enhanced my awareness of the health needs of underserved populations, while shadowing physicians has validated my commitment to the field of medicine. In the end, when I am accepted to medical school and I find myself lying on the floor of the on-call room wondering, “What am I doing here?” I know I will find the answer in the privilege of serving the people that surround me.
"This is how you welcome friends in Sudan." We had reached the end of the interview, and XXX--placing his hand firmly on my shoulder--was offering a lesson in Sudanese greetings in his attic apartment. Over the past hour we had listened to X's story--translated from Arabic by XXX--of lost family, a tortured past, and a treacherous journey that had begun in Darfur and ended with a narrow escape from gunfire at the Egypt-Israel border. The narrative was difficult for X to recount and for us to hear, but it provided valuable testimony to present to members of the Israeli Knesset. Our group, XX for XXX, supports Sudanese refugees in Israel so that they can, as XXX maintains, "be treated as human beings." XXX's simple appeal embodies the reason why I want to join the medical profession.

I have actively sought to advocate for basic human rights, especially healthcare, throughout my undergraduate career. I joined Activists for Asylum during my semester abroad at XX University to help realize XXX's desire: to empower individuals to further their human rights. I am the granddaughter of Holocaust survivors, and I saw pieces of my family's story in XXX's and others' struggle for recognition and security. Recording and editing refugee testimonials were small but important steps towards helping the Sudanese find work, education, and decent healthcare after the unimaginable ordeals and losses they endured.

I look forward to the day when I can apply medical skills to improve XXX's and others' situations, but until then, I have used what skills I have towards improving basic rights, especially healthcare. After hearing about the hurricane-battered town of La Guacamaya, Honduras, for example, I joined the student group, XXX for XXX XXXX. We held bi-weekly meetings to prepare and send a group of students and physicians to provide proper medical education and resources to the region, which had minimal access to healthcare. I have brought many of these pressing issues at the forefront of scientific advancement to the XXX community as Editor-in-Chief of The XXX journal, an international organization that addresses contemporary issues at the junction of science, society, and law. Working closely with writers, editors, and the XX campus, I raised awareness about the implications of vital scientific and societal advancements, holding discussions on topics such as global hunger, Parkinson's disease, and healthcare reform.

I pursued many of these initiatives largely because my family's example has taught me the values of compassion and reciprocity, and I hope to incorporate the lessons I have learned from them into a career in medicine. I recently accompanied my father, an internist, as he oversaw medical students at XX XXX homeless shelter in XXXX, XX. A first-year medical student noticed a patient's yellow sclera, and before long, the patient had shared her history of alcohol abuse. My father encouraged the patient that her commitment to stop drinking would improve her health dramatically. Despite her difficult ordeal, the patient expressed gratitude and genuine kindness towards the doctor and students who were providing hope. I soon saw how the role of a physician was not just to perform a scientific and technical task, but also to reassure a fearful patient, and I want to fulfill this supportive role.
After experiences like this, I sought more opportunities to interact with clinicians, and I witnessed the difficult decisions that are a daily part of the physician's life. During an internship that involved not only hydrocephalus research but also spending time with a neurosurgeon in the operating room, I donned green scrubs one morning ready to observe a case. The gravity of the surgery struck me when a six-year-old boy entered the operating room, clinging to his mother's white gown and overwhelmed by the masked nurses, bright lights, and tangled tubing. The surgeons removed the tumor successfully, but it was still hard to imagine the continued difficulties that family would endure through chemotherapy and possible future recurrences. The parents even asked if they could send a specimen of the boy's tumor for research; clearly they were desperate to do anything within their power to end this terrible ordeal. These images were difficult to forget, but the experience strengthened my desire to learn more about the patient and the entirety of his disease--from lab bench, to patient care, to emotional support.

I continue to embrace opportunities to reach out to my surrounding community and offer support, spending dinners with XXX as an advocate and a friend. Much closer to home, I volunteer weekly at the local soup kitchen, where I enjoy sharing meals and interacting with local residents. These relationships provide me an opportunity to learn from others' hardships, and their stories motivate me to dedicate myself towards rectifying such inequalities. Stories of survival, like XXX's, bring into sharp focus the sanctity and the fragility of human life, and these narratives will resonate with me as I enter the medical field.
Medical School Personal Statement 4

As I walked into the XXX Hospital in Eastern India, it was evident immediately that the standards of care were far inferior to those found in hospitals in the United States. The cracked and peeling green walls separated the patients by gender into open wards. The patients laid on colorful blankets and linens brought by their families while loved ones crowded around their beds, often performing the role of nurse. Intravenous fluid bags were nonexistent, leaving dehydration unaddressed; only small bottles of medicine hung from the canopies of the iron beds. Most of the patients and their families wore masks due to the prevalence of Tuberculosis in this poverty-stricken community and hospital. Although I was told that this hospital provides better care than many other hospitals in India, it was still beyond what I had envisioned from reading or watching the news, and it affected me deeply.

I was not in India to work at the hospital, but this provided one of the most profound and lasting memories I have from my experience at the XX XXX last January. Along with 18 other XXXX College students, I traveled from Tanson to this small school in the foothills of the Himalayas. In the space of only 26 days, I absorbed the culture of this foreign region and gained an introduction to the true meaning of “poverty.” Above all else, I gained a better understanding of my desire to become a doctor.

The XX XXX was founded to educate children from the lowest economic class in this rural area of Eastern India. The XX XXX provides children a unique opportunity to learn English for free. Also, the students are taught to play the violin, allowing them to acquire a special talent and link with music. The XX XXX curriculum is designed to assist the children who are otherwise disadvantaged by their birthright to continue their education and go to college. At the XX XXX, we educated fourth through eighth graders in subjects ranging from English to some cappella to dance to math. I taught two of my passions—dance and science.

Dance, specifically ballet, has been a significant part of my life since I was three. Ballet taught me discipline, dedication and responsibility, all qualities that have contributed to many of my successes in daily and college life. Through dance, I increasingly became interested in the human body. I always have been amazed by the many ways the body can move, be controlled, and respond to injury. My awe of the body has intensified my desire to learn more about how human beings use medicine or other means to adjust and heal. Although my experience teaching the “Waka Waka” dance to fourth graders at the Ashram may not convey fully the influence that dance has had on me, I recognize that the knowledge I have gained during my many years of dance training will continue to assist me as I work in medical school and as a medical doctor to understand the intricacies, mysteries and capabilities of the human body.

The science class I taught in XXX was comprised of biology, chemistry and physics. Although science did not hold quite the same appeal as dance to some of the students, I was able to spark the interest of sixth graders in the digestive system by having them act out how food is digested. My experience helped me realize I can communicate effectively, even with children who speak English as their second language. Understandably, they had difficulties pronouncing “esophagus,” but they clearly learned where the esophagus is and its function and purpose in the body. Additionally, this experience reminded me that I enjoy the challenge of stepping into an unknown situation and working to develop a plan to address challenges presented.

My many hours conducting cancer related research at XXXX, XXX and now at the XXX XX Research Center this summer also have taught me how to identify problems, outline and execute experiments, and analyze the outcomes. Executing any plan requires communication skills and teamwork or project management responsibilities. From my experiences shadowing physicians at the Veterans Affairs Medical Center and in an orthopedic clinic, I have come to perceive a physician’s role as being quite similar: taking a history, making a diagnosis, forming a treatment plan, coordinating with a team of providers, and communicating with the patient and family.

Beyond teaching, I experienced a priceless cultural exchange with the Ashram students. The students taught me traditional Indian and Nepali dances, took me to their homes to meet their families, and brought me gifts, including a huge papaya one boy carried on his two-mile hike to the school. Visiting the hospital was, however, the most memorable part of this exchange. And while I became aware of the acute medical needs in XXX, I also recognize the ongoing need for doctors, especially primary care physicians, in the United States. My experiences in India, lessons learned through dance, and my hours spent in research labs and in shadowing physicians have all infused me with the desire, and provided me with the practical skills, to pursue medicine, and to eventually contribute to a need that only will continue to rise in the United States and around the world.
Medical School Personal Statement 5

From an early age, I have been comfortable and enjoyed interacting with the elderly. The love, admiration, and respect I have for my grandparents likely contributes to the ease with which I am able to establish a congenial rapport with the elderly. When I was in elementary school, I was thrilled to spend Valentine’s Day with residents of a local retirement home as an after school activity. When the opportunity arose years later to volunteer at XXXX XXXXXX, an adult care service that specifically caters to those suffering from degenerative brain disorders, I agreed without hesitation. As a volunteer at XXXX XXXXXX, I witnessed the demoralizing effects of dementia and Alzheimer’s disease among the residents. This eye-opening experience inspired me to alleviate suffering, restore the dignity of the elderly and ultimately solidified my decision to pursue a career in medicine, specifically geriatrics.

On my first day at XXXX XXXXXX, the program director handed me a nametag and a pamphlet entitled Interacting with Those Affected by Dementia. As I reviewed the content, the challenges posed by this condition became painfully clear to me. Walking into the art room, where three of the members were beading necklaces, I was greeted with skeptical stares as I introduced myself; this would become the daily routine. It was initially hard to accept that the people I had spent hours with the day before had no recollection of me the following day; it quickly became apparent why everyone wore a nametag. I had naively assumed that my ability to connect with the elderly would defy the effects of their disease and leave a lasting impression on their lives; ironically, it is they who left a permanent imprint on mine.

XXX is a member that I particularly admired. During the hour designated for stretching exercises, I watched helplessly as XXX attempted to keep up with the exercise routine; her eyes welled with tears and her feeble arms trembled with arthritic pain. She glanced at me and smiled; at ninety-four years of age, XXX was the epitome of a fighter. The physical pain and mental failure XXX endured frustrated me. As the life expectancy rate increases, others like XXX are living longer while their quality of life diminishes because of physical and mental waning. Quality health care and preventative measures are imperative to limit the degree of mental degradation faced among the elderly and I believe the ability to establish and maintain a functional state of wellbeing is a reasonable goal. Aging can and should be a venerable process. Ensuring an optimal quality of life is a fundamental role of health care providers and a responsibility that I am eager to fulfill.

Working with the members of XXXX XXXXXX exposed me to a myriad of health conditions that become prevalent with advanced age and made me realize the active role I want to play in preventing and treating such ailments. In addition to working with the elderly, my childhood summers were spent in the rural community of XXX, XX XXX, where I was introduced to a number of conditions compromising the health of individuals. The prevalence of diabetes as a result of reduced physical activity and poor diet was readily apparent and oftentimes magnified by a life-long smoking habit or alcohol addiction. This ultimately spurred my intention to help those in need and shaped my view of medical care, demonstrating the importance of promoting and disseminating preventative health care measures. I witnessed a constant struggle among members of the community to sustain an adequate state of being with limited health care access and even fewer medical resources; circumstances such as these are common, but no less unacceptable. 29

I understand the profound influence physicians can have on the health and wellbeing of their patients. My health care providers demonstrated that the complexity of human existence is not simply biological, but involves physiological and sentimental consideration, all of which ignited my intention to pursue medicine as a career. Being a doctor takes more than intellect; it requires the ability to listen carefully while demonstrating compassion, dedication, leadership, and integrity. My goal is simple; I want to be an empathetic doctor who utilizes my knowledge, skills, and resources to improve the health and wellbeing of others. I am determined to succeed, eager to learn, and posses an infinite desire to help others.
Medical School Personal Statement 6

“How can I live a life of service?” is a question I routinely pondered as an undergraduate. The answer arrived one evening during my freshman year at an “interest meeting” for the National Association for the XXXX of XXX (XXXX). The lights were dimmed and a video began playing. In the video was a physician in Madagascar, compassionately providing treatment to those who had no one else to turn to. Unfortunately, due to a lack of sufficient medical personnel, she had to turn many of the desperate patients away. Despondently, she said, as if speaking directly to me, “We need more physicians out here. I can’t see them all by myself.” That poignant statement initiated my desire to live a life of service as a doctor; one that involves providing medical care, comfort, and thereby, empowerment to those assailed by illness.

While growing up in XXX, I remember witnessing several victims to diseases such as malaria, cholera, or AIDS, many of which are preventable. Millions, every day, continue to suffer with such conditions both abroad and in underserved communities here in the United States. I am saddened when I realize that I have been privileged with so many opportunities, such as gaining an education, while they continue to suffer. Accordingly, I must use what I have to alleviate their conditions and those of other suffering individuals around the world.

My interest in medicine escalated as my love for science grew stronger. During my freshman year, I enjoyed studying General Biology and assisting my colleagues during our study sessions. In doing so, I was astonished, for example, that the human brain could form a perception of reality from heaps of electrical impulses and somehow accomplish this task while monitoring all other bodily functions. My acquaintance with the human body during this class, and other classes thereafter, solidified my desire to be involved with science in my career.

At the end of my sophomore year, I pursued an opportunity to observe the doctor-patient relationship at a XXXX XXXX clinic at the XXXX hospital. While at the clinic, I followed Nurse XXX into a small room where I saw a young boy sitting in a wheelchair, solemnly waiting to have his stitches removed after a surgical shunt replacement. I expected her to simply go through the mechanics of stitch-removal and then proceed to the next patient. However, during the process, she asked the young patient about his favorite kind of dessert and casually joked with his family, all while wearing a contagious smile. The whole family seemed so at ease. I admired her ability to calm the distress that so often accompanies illnesses. From the time I spent at the clinic, I noticed that a health care provider must value the individuality of each patient and always seek to alleviate the burden of disease in whatever way they can. After this experience, I determined to be a doctor, not only in the academic sense, but also, in the very essence of the word, a care-giver.

I further pursued my interest in neurobiology at the XXXX XXXX XXXX XXXX (XXXXX) as a participant in the XXX XXXX XXXX. While working in Dr. XX XXX’s lab, I researched the neural architecture of the emotional response of fear. Due to the very basic nature of my project, I noticed that research required a greatly narrowed concentration and meticulous study to eventually make an impact on a person’s life. Although I was fascinated by the stimulating study, I felt that I was missing the holistic beauty of the machinery behind the human body and more importantly, I yearned for an opportunity to have a direct impact on people’s lives. One of my more memorable experiences from my summer at the XXXX was cooking dinner for patients and caregivers at the XXXX XXXX XXXX (XXXX) House. After preparing and serving pizza, salad, and angel food cake, I took advantage of the opportunity to find out more about the patients over a shared meal. As I talked to a patient in her mid-twenties, I learned that she had lived in XXX, XX, where I currently reside. Her face beamed as she referenced different streets and stores of which I was familiar. After further inquiring about her interests, she excitedly told me about the places she had traveled to and a book that she hopes to publish soon. Although this patient was actively battling cancer, she was smiling despite her fears. I gave her a warm “Southern hug” to say goodbye, and returned home thrilled that I was able to produce a moment where her mind was not focused on cancer.

I entered XXXX University searching for a way to live a life of service, and I will leave having obtained the answer. Once puzzled by the dizzying array of ways to live a life of service, I now find myself at the crossroads of science and offering medical care among the underserved. Medical school will equip me with the crucial skills needed to respond to that physician’s plea. I am committed to live this life as a life-long learner and to view each patient through a set of lenses that will see the invaluable even when certain life experiences may say otherwise.
Medical School Personal Statement 7

My gaze shifted to a quiet girl with sad eyes sitting in a corner of the overcrowded classroom. Her hands were clenched tightly in the folds of her skirt, as if she were trying to hide their presence. I had just finished discussing the importance of oral hygiene among a group of second graders in the rural village of Occopata, Peru, all of whom were chattering to each other in Spanish, eagerly awaiting the new toothbrushes they would receive. Everyone that is, except for the girl. I followed her glance down to her fists and noticed hundreds of large white bumps blanketing the tops of her hands and sides of her fingers. The warts had clearly not been treated, leaving her humiliated and withdrawn from the other students. At the direction of the local doctor, Dr. XXXX, we purchased silver nitrate pencils and distributed them to infected children and adults to counter the wart problem. When I returned to the school a few months later, I was relieved to see the girl’s warts had decreased to the size of specks.

This was just one of many unforgettable experiences I had during the three months I lived in Cusco, Peru as a volunteer for Prescriptions for Peace, a small, Peruvian-based service organization. As someone who is habitually punctual, organized, and prefers to have a set plan, I sought to challenge my established way of life by living independently in a foreign country and immersing myself in another culture. I also had a strong ambition to achieve Spanish fluency. While there, I was exposed to a myriad of barriers that hinder equitable medical diagnosis, treatment, and after-care among individuals living in underserved communities. In retrospect, I realize these experiences shaped my intention to become a medical doctor who integrates scientific knowledge and clinical care while serving and educating those in need of healthcare. Specifically, they reinforced my desire to pursue a career that is intellectually challenging, involves comprehensive interaction with others, requires the mastery and sharing of scientific knowledge, and allows me to demonstrate empathy and compassion while offering medical services. Based on my subsequent patient interactions, physician shadowing and research experiences, I believe a medical career will enable me to capitalize on and further develop these essential skill sets.

I expanded my involvement in service, community outreach, and research when I moved from Peru to Ecuador to participate in a semester abroad sponsored by the School for International Training. I completed an independent medical anthropological study on dengue in Puerto López. During this time, I cultivated a skill set that will be particularly valuable in a clinical capacity: the ability to communicate with individuals of diverse cultural, religious, and socioeconomic backgrounds. As part of my research, I conducted extensive interviews with a sample of the townspeople to determine their awareness of dengue transmission modalities. I believe the openness and enthusiasm I exhibited when sharing information about dengue fostered a trusting relationship between the town’s residents and me, allowing them to feel comfortable asking me questions about the study and my personal background. After assimilating into a new culture and successfully corresponding with others in their native language, I am confident in my ability to communicate with other individuals in a culturally sensitive manner. This skill will aid me in establishing lasting relationships with future patients and colleagues. Furthermore, I believe my ability to readily adapt to unpredictable circumstances and environments will be an asset in my role as a physician.

Assessing knowledge of dengue transmission motivated me to acquire further experience in infectious disease research; therefore I applied and was accepted to intern at the XX XXX XXX Research Center. Under the mentorship of Dr. XX XXX, I contributed to a cohort study sponsored by the HIV Vaccine Trials Network. This project was designed to evaluate the feasibility of measuring immune responses in mucosal surfaces. In my role as an intern, I isolated RNA, produced cDNA, quantified gene expression in 455 human tissue samples, and immersed myself in immunology and HIV transmission information to enhance my scientific background. This research experience, coupled with the subsequent presentations I gave at institutional conferences, improved my ability to communicate scientific information to a lay audience. This skill will be vital when interacting with future patients and their families.

I find it rewarding to learn and apply critical reasoning to solve problems and am excited that a career in medicine will require me to be a lifelong student. However, being a doctor in a purely academic sense is not my only goal; I aspire to be a doctor capable of merging scientific knowledge while delivering clinical care in a manner that is understandable, empathetic, and respectful. My service and research experiences have catalyzed my intention to pursue a medical degree and serve as a bilingual physician who provides exceptional medical care, empowerment through education, and social support to improve the health and wellbeing of patients of diverse backgrounds.
“Bie jin ta de fang jian (Do NOT enter his room)!” my grandmother warned me against entering my uncle’s seemingly ordinary room every time I peeked inside. Uncle XX worked a regular job, interacted with friends and neighbors without maintaining an unusual distance, and showed no physical signs of illness. Yet during the four years I lived in Beijing, China, my grandmother denied me direct contact and minimized any indirect contact I had with him. He had his own sink, tableware, stool, and used a tissue to handle shared household appliances.

These once puzzling behaviors now drive my commitment to combine my intrigue with the sciences and the cultural sensitivity I gained from living in China, Japan, and the United States to train as a culturally competent physician in the field of global health and infectious disease. I understand now that my grandmother’s caution stemmed from her desire to protect me from contracting hepatitis B and the ensuing discrimination. China still bears one third of the world’s hepatitis B burden and social stigmatization against hepatitis B-positive individuals remains widespread. Even though my grandmother knew from her experience in pharmaceutical research that hepatitis B is not transmitted through casual contact, she still felt it necessary to limit my interaction with my hepatitis B-positive uncle.

My aptitude as a trilingual, culturally-aware physician who can promote mutual understanding, facilitate a collaborative, trusting physician-patient relationship, and provide appropriate and effective care also draws from the diligence and dedication I gained from playing the piano. As a pianist, I spend hours analyzing how the notes and rests interact with each other and experiment with the different tones a key can produce depending on how fast it is pressed and released and how much force is applied. These details often keep me in the practice rooms until late at night. Yet I continue to practice because piano challenges me to experiment, interpret, and present a musical work from what some people may perceive as merely black dots on paper. Physicians face a similar challenge in presenting their repertoire of black dots, or medical knowledge, in ways that patients of diverse backgrounds can understand.

Pianists and physicians also practice adaptability. Pianos are not easily transported and I have performed on many unfamiliar pianos in my 17-year musical career. Before each performance, I methodically test the firmness, tone, responsiveness, and projection of the unfamiliar keys and adjust my play accordingly. My medical observerships at the XX XX Family Medical Center and the XX Children’s Hospital demonstrated that the physician-patient interaction is much like a musical performance; physicians cannot choose patients or completely control a patient’s health and thus, must 35 also strategize to prepare for multiple methods of healthcare delivery and unexpected outcomes.

Finally, musicians and physicians must see the big picture while working with the details. On the piano, I integrate the different voices represented by my ten fingers to create a comprehensive performance. As a XX/XXX scholar participating in the XXXX at the XXXXX, I tested the correlation between bacterial burden and seminal HIV load in Dr. XXX’s lab. While performing biomedical research with the goal of providing new interventions to lower sexual transmission of HIV-1, I reminded myself that the HIV pandemic also suffers from poverty, poor infrastructure, stigma, and denial. I learned from preparing my high school’s global health curriculum that in poverty-stricken communities, the struggle with immediate survival often overshadows the concern with HIV prevention. Some people hesitate to test for HIV because the act of seeking a test can raise unwanted suspicion and a positive test could result in disownment from family and community. As a physician, I will integrate a patient’s medical and non-medical history and provide effective and culturally acceptable care for patients of various backgrounds.

This past fall, I designed my own global health undergraduate independent study to further explore the intersection of culture and medicine. As a part of my study, I heard May Ying Ly, the translator for the Lee family in The Spirit Catches You and You Fall Down, share the challenges she faced in promoting cancer awareness in a Hmong community whose native language does not have a word for “cancer.” I hope to use my fluency in Chinese, Japanese, and English in my practice of medicine, but I also realize that common language does not always guarantee effective communication.

In addition to developing my medical knowledge, as well as my investigation and communication skills, I plan to educate myself about the different perceptions of illness and disease to better serve patients with whom I may or may not share a language or culture. I will apply the lessons I learned as a pianist and train with dedication, diligence, and adaptability. Through medical school, I intend to become a physician who can bridge cultural differences, use results as a springboard for new possibilities, and share my knowledge with others.
Dual Degree Personal Statement Examples & Why MD/PhD Essays
Raised on ten acres of open land in XXX, XX, I spent much of my youth exploring the woods and building forts in the ponderosa pines with my twin sister. I was healthy, energetic and conscious of my body in relation to nature. Just as I learned to recognize the environmental changes that are inherent with the cycle of seasons, I developed an intrinsic awareness of my personal wellbeing.

This awareness may have saved my life. When I was eleven, I noticed my vision blurring and I developed a constant feeling of fatigue, thirst, and hunger. I recalled learning about diabetes in a science class and made a tentative connection between my symptoms and the disease. I was eventually diagnosed with Type I diabetes. Two months later, I was diagnosed with Celiac disease and began a strict gluten-free diet to prevent possible long-term complications, including nutrient deficiencies and cancers. Before I had finished my first year of middle school, I was responsible for monitoring my blood sugars, carbohydrate intake, exercise, and insulin requirements in order to establish a sustainable quality of life.

After my diagnosis, I discovered almost immediately that there is no owner’s manual for the human body. Controlling my blood sugar requires experimentation, evaluation, and analysis, all in real time, without the controls of a laboratory. In the absence of formal instruction, I have to determine how to optimize the way my body feels and functions through an exhaustive process of trial and error.

I started running recreationally the year after my diagnoses. What began as a way to spend time with my family and enjoy the XX of XX became a mental and physical outlet. I do not let my autoimmune disorders prevent me from being an athlete. I have competed in cross-country, swimming, track and field, mountain ascents, winter and summer triathlons, snowshoe races, and cross-country ski races, including two ski marathons. Today, I am captain of the XX’s XXX club team at XX University.

Like two creeks that merge into a river, the challenges of having diabetes and being an athlete have run together to dominate my stream of consciousness. Every day I test my blood sugar and every day I train. Both endeavors absorb every ounce of effort that I put in and offer small rewards in return; these minuscule accomplishments can only be celebrated on the most personal level. Setbacks are unavoidable, which require redirecting my analysis and focus in order to get it right next time, tomorrow, next year. To be a diabetic athlete is a unique challenge; consequently, I review research literature about diabetes, endocrinology, metabolism, exercise science, and nutrition to better understand my body and optimize my athletic performance.

The maintenance that my body demands drew me to Professor XX XXX’s laboratory at XX University. Dr. XXX’s research focuses on using techniques in inorganic chemistry and biology to orally deliver proteins, such as insulin, as well as target tumors for the early detection of cancer. The attributes that have helped me improve my diabetes control—curiosity, organization, and persistence—have also proven beneficial in the lab. Measuring and evaluating my blood sugars and adjusting my insulin have proven applicable to projects that require my ability to critically analyze data, isolate variables, and identify meaningful patterns.

Over time, my zest for science grew beyond learning the laboratory techniques and into a desire to apply those insights into tangible implications for human health. I realized that my desire to interact at the human level would not be satisfied by a career rooted solely in the lab. I satisfied this drive by immersing myself in a clinical setting where I could interact with patients. In XX, I spend Sunday mornings on the recreational therapy floor at the XX Medical Center, where I help coordinate weekly entertainment activities for elderly patients. Having diabetes connects me to a shared patient experience that spans all demographic barriers and I have also benefitted from the opportunity to interact with patients at the XX Diabetes Center as part of the clinical research team led by Dr. XX XXX, MD/PhD. This summer, Dr. XX XXX opened my eyes to an entirely different patient community as I shadow her in patient consults for clinical trials with the sickest and most critical patients.
Through careful listening and thoughtful observation, I have developed an appreciation for patients’ shared and individual needs and my own ability to form positive and trustworthy relationships.

The complexity of the human body is an astounding challenge and I intend to thoroughly investigate and understand it to realize my potential as a scientist and humanitarian. Being a trusted source of knowledge is not enough; I want to offer compassionate care to help the members of my community achieve optimal health and performance. My own experiences as a patient, athlete, and scientist have given me a distinct insight into research and its applications to overall health. The hybrid energy of these experiences propels me toward each of the roles that a doctor plays: detective, healer, and educator.
Dual Degree Personal Statement 2

One of my earliest memories is standing on the steps late at night, watching an ambulance retrieve my mother from our front gate to take her to work. I was four and already, this was a common occurrence. My mother was frequently on call because she was an anesthesiologist at the XX Hospital in XX XXX. These memories of my childhood in XX XXX are scattered on the backdrop of the Civil War between the ethnic majority, the XX and the minority, the XX. I was born to a XX family in a year that the war took a particularly violent turn, during a time my parents settled in XX, a predominantly XX city where my mother miraculously practiced medicine for almost a decade. Yet, by the time I was seven, the tensions from the war forced my parents to emigrate to XX, where my mother went through the grueling and often frustrating process of getting certified to practice medicine. Supporting my mother through this period made me understand the commitment and tenacity required to become a physician. When I began college, I was unsure of my resolve to become a doctor. However, I fell into medicine again through my experiences with working with low-income XXs and in research and then finally by visiting the hospital.

Because of the generosity of the friends and strangers who helped us make the move to XX, my parents always valued service to others and encouraged me to volunteer. During my freshman year of college, I began volunteering at the XX Café, which provides made-to-order breakfasts for underprivileged people in the community. As a waitress, I befriended the Café’s regulars, who generously allowed me into their lives, sharing their own histories of triumph and defeat. The people I served provided an important perspective on working with individuals who are seen as outcasts by society. Moreover, the experience clarified my desire to work in a field that directly benefits people in need and allows for people to cultivate rich relationships.

When I started college, medical school was not on the horizon, but I enjoyed science and research seemed a natural extension of this interest. In the lab, I found an unexpected passion for discovery. Research challenged me to persevere through failed experiments and revised hypotheses, contribute to a scientific team, and push boundaries. My first independent research project was to rescue lethality of a mutant fly despite literature that described this type of rescue as impossible. To my surprise, after eight weeks, I successfully performed the rescue. This experience made me view limitations in not only research but also in medicine differently.

With this new perspective, I began shadowing in the XX XXX Unit at the XX XXX Medical Center in XX, XX. While what I saw in the clinic reaffirmed the notion that research is critical for the new insights that advance medicine, I also learned at the XX the importance of the nuanced interaction between physician and patient. When medications failed, I saw that the watchful eye and constant encouragement of a doctor is often treatment in itself. Physicians face limitations intrinsic to the practice of medicine and the imperfections of the approaches and technologies available to 39 them. Yet, the best doctors are not stayed by these boundaries. Surely, one of the ultimate rewards of a physician’s training is the power to heal and provide comfort.

In this sense, my rediscovery of medicine started with waitressing at the Café and in the laboratory. Through science, I learned how to pursue a problem, apply the theory I learned in the classroom, and hone my critical thinking skills. Research also showed me that sometimes, even the most elegant hypotheses and experiments fail. Through my experience in the clinic, I found that doctors too, face a similar fundamental challenge: Sometimes, despite the most accurate diagnoses, patients do not get better. In research, these failures, although disheartening, do not diminish the excitement of discovery and in medicine, the failures are reconciled through astonishing recoveries and the power of the storied human connection between patient and physician. I also began to see how medicine might allow me to combine this interest in the sciences with those interactions I came to value through my work at the XX Café.

In the span of sixteen years, my view of medicine has evolved. As a child, I considered medicine to be a perfect practice that could transcend war. As I matured, I learned that medicine, while in many ways powerful, is a taxing and trying profession, inherently as imperfect as those who practice it and those who seek healing. I also saw that it is the humanity of medicine combined with the science that strengthens it that makes it so miraculous, leaving room for the extraordinary discoveries and connections between people. It is this possibility for the incredible that draws me to medicine.

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I re-read the message, took a deep breath, and pressed “send.” In one brief email, I had enrolled in a BA/MD program at XX XXX and XX XXX Medical School, committing myself to attending medical school before even having graduated from high school. In the month preceding this choice, I had struggled with my decision, somewhat unsure of what the role of a doctor entailed. Hoping that direct exposure to this field would help facilitate this important decision, I shadowed Dr. XX XXX, a private practice internist at XX XXX XXX. I admired Dr. XXX’s ability to easily connect with his patients and the reciprocal trust and confidence they had in him. Excited about the prospect of interacting with people on such a personal level and determined to provide patients with the thorough, empathetic care that I had observed when shadowing, I decided that I wanted to become a physician and committed myself to the program. Reflecting on this choice now, I do not believe that I was ready or informed enough to make the monumental decision to pursue a career in medicine at that point in my life. Ultimately, however, my participation in the program has led to the discovery that medical school is a commitment I truly want to make.

When I began my freshman year at XX XXX, my enrollment in the program allowed me to explore a variety of extracurricular activities without feeling obligated to participate in specific clubs. One of the organizations I joined was XX XXX (XX XXX). At the first meeting, the chief asked attendees to share their most memorable experiences as first responders, prompting a number of members to recall truly poignant, life-changing experiences they had while on duty. Inspired, I became certified in CPR and first aid and began responding to calls later that year. Riding with XX XXX’s EMS has been instrumental in shaping my career trajectory by giving me the opportunity to observe and participate in patient interactions. Between convincing a girl with an intense fear of hospitals to seek proper treatment for her head wound and reassuring a near-hysterical patient with a broken clavicle, I have learned to remain calm, composed, and comfortable when confronting the unexpected and discovered how helpful simply taking the time to explain a situation to a patient can be. I have come to value the inherent trust placed in us by the patients that we serve and find tremendous fulfillment in addressing a patient’s physical ailment as well as their emotional needs. As a future physician, I intend to provide this type of compassionate care to my patients and believe that I will find it even more rewarding to be directly involved in the diagnosis, treatment, and healing process.

While I gained valuable patient interaction experience through my participation in XX XXX’s EMS, my coursework exposed me to the vast and intricate world of biology and I became increasingly interested in exploring the many unknowns within the field. The summer after my freshman year, I accepted an opportunity to investigate the correlation between histone variant H3.3 enrichment and gene expression in growth hormone gene promoter regions at the XX XXX School of Medicine under the guidance of Dr. XX XXX. I found that I loved the way that research pushed me to think in new and creative ways in order to solve problems and search for answers. Eager to spend more time exploring the forefront of biological knowledge, I pursued another intensive research experience the following summer at the XX XXX, where I studied the ability of glioblastoma stem cells to generate vascular pericytes in Dr. XX XXX’s lab. I found this research particularly compelling because of its direct applications to the treatment of human disease and concluded that I would like to conduct clinically-relevant lab research in conjunction with practicing medicine. This newfound career goal has added a new dimension to my motivation to pursue a medical degree. The opportunity to see patients and directly observe any problems with the treatments they receive will provide me with insight, direction, and motivation as I conduct medical research in an effort to improve patient health outcomes.

Though, as a high school senior, my choice to participate in a BA/MD program was tenuous and driven by only a vague understanding of what being a doctor might entail, this decision has given me the freedom to discover my true interests in science, research, and medical care without the pressures of medical or graduate school applications influencing my choices. It has also provided me with time and an environment in which I could reflect on and learn more about myself and my motivations. As a result of this growth and self-discovery, I am now able to say, with certainty and conviction, that I am fully committed to earning a medical degree.
“I'm normal. Yes, I am. At least, I want to believe that.” After enduring repeated verbal insults and shunning from classmates, it was understandable that XXX burst out in tears. She suffered her entire life from cerebral palsy due to a neonatal stroke. While her intellect was normal, she walked with a spastic gait and had severe weakness on one side of her body. People openly stared at her with disapproval. Over time, I realized that her outward appearance was in no way a reflection of who she was as a person. I carried her bags and helped her to get around until I graduated from junior high school in XX XXX. While my classmates were initially distant with her, their attitudes began to change when they saw how I treated her. Many soon joined with me in empathizing with her circumstances. My friendship with XXX broadened my view of people with disabilities and cultivated my interest in brain function. I saw how a neurological disease permeated every aspect of her life and I was determined to learn more to help those affected by similar disorders. Little did I know that a devastating neurodegenerative disease would soon affect one of my own family members.

Shortly after immigrating to the United States at the age of 15, my XX was diagnosed with Alzheimer's disease (AD). As his symptoms worsened, he began to suffer from hallucinations. One time, he brutally attacked my XX, thinking she was a XX XXX soldier. I was frustrated and helpless, knowing that AD is incurable. I knew that better treatments for this disease were necessary, which led me to major in neuroscience and consequently join Dr. XXX’s lab, which investigates the molecular mechanisms of neurodegeneration. During my three and-a-half year tenure in the lab, I studied the role of the microtubule protein tau in the development of AD and the role oxidative stress-associated mitochondrial dysfunction plays in Huntington's disease. As an undergraduate research assistant, I applied the scientific concepts I learned in the classroom in the lab, which underscored and reinforced my appreciation for the complex nature of neurological disorders.

Research is a diligent pursuit of knowledge that can have direct implications for clinical care; therefore I sought to observe how research translates to improved patient health outcomes. By shadowing Dr. XXX, director of the memory care program at XXX Hospital, I was able to gain exposure to the clinical aspects of neurodegenerative medicine. During this five-month shadowing opportunity, I observed patients who had been diagnosed with essential tremor, dementia, and Parkinson’s disease. During one visit, Dr. XXX performed an exam on a patient with tremor who had undergone Deep Brain Stimulation (DBS). When the DBS was turned off, the tremor dramatically returned. When the DBS was turned on, his tremor almost disappeared, as if a light switch was turned off. I wished that there were a treatment for Alzheimer’s disease this effective. Nevertheless, this shadowing experience allowed me to correlate how neurological research can have the potential to directly impact patient outcomes. From Dr. XXX, I gained an appreciation that individualized care and a “caring touch” can help when treating the elderly. With this clinical experience invigorating my medical aspirations, I headed back to the lab in order to investigate potential translational therapies for neurological disease.

In the lab of Dr. XXX, XXX Medical School, I was responsible for a project that developed nervous system-related gene knock-out lines in zebrafish. Using these genetically modified organisms, we were able to track how a loss of specific gene function affects the organism’s phenotype. Searching for new genome editing tools that are efficient, affordable, and easy to use within the scientific community, our group utilized a bacterial immune system called CRISPR/Cas Type II systems to induce targeted genetic modification in vivo in zebrafish. We successfully reprogrammed the CRISPR/Cas system to create a site-specific mutation on eight different genes and detected germ line transmitted mutations in progeny as well. Our findings using the CRISPR/Cas system have resulted in a publication in XX, for which I am first author. This technology has a potential therapeutic application in gene therapy and I would like to pursue further development of this in the future.

Neurological disease is a challenging area of medicine that I am passionate about. Through my interactions with XXX and my XX, as well as clinical shadowing experiences, I have learned that a genuine, caring relationship is just as important as understanding aberrant molecular pathways. As a future physician scientist, I look forward to treating patients’ with an armamentarium of clinical knowledge, compassion, and an unquenchable desire to better understand the basis of their disease.
Dual Degree Personal Statement 5

Jeweled in salt crystals, my legs hammered the concrete in rapid succession as I raced the sun’s final rays to my dorm at XX State University (XSU) one stifling summer evening. Perhaps it was appropriate that I spent my days in the XX Lab studying body fluid regulation in exercising rats, followed by evening runs in which I methodically plotted water stops along each route and estimated fluid loss with every sweat-soaked mile. Despite my swift acclimation to the XX heat as a participant in the XX XX XX XXX at XSU, no reward compared to the satisfaction of a cold glass of water following a long run in triple-digit temperatures. A few weeks of training at 80 miles per week, however, eventually took a toll on my feet. Plantar fasciitis made an unwelcome appearance for the third time in my running career, yet I was determined to fight it off with aggressive cross-training. Too much enthusiasm on the bike caused subsequent knee injuries, and a premature return to running resulted in a bunion, sore Achilles tendon, and calf strain. That fall, I watched the NCAA Division III Cross Country National Championships from my laptop and shivered with joy as a friend—met at the previous year’s race—crossed the finish line with an 11-second margin of victory.

In many ways, it is the challenge of athletic competition that has drawn me to a career in medicine. Rising before the sun to train on the hills of the XX XX with my teammates empowered me to place 19th in the NCAA Division III Cross Country National Championships in 20XX and built my mental fortitude to earn All-American honors for the second time in NCAA Division III cross country at XX years old. I believe my ability to flourish in athletic competition and scientific inquiry despite the myriad of challenges faced will enable me to be successful as a doctor. In the running community, we celebrate our ability to exceed physical challenges. Through injury we learn the limits of our bodies that we test each day. Moreover, the incapacitation that comes with injury, while disabling to an athlete, has made me reflect upon the value of good health as well as the power of a doctor who recognizes both the physically and psychologically crippling facets of illness. A significant part of treatment for an injured athlete involves reducing the anxiety associated with the uncertainty of complete rehabilitation by offering a diagnosis, outlining an effective treatment plan, and preparing a schedule for returning to exercise. It is the synchronized ability of a doctor to relieve disease symptoms while bringing comfort to a patient—an elegant balance between exercising caution and taking into account a patient’s concerns—that I aspire to achieve in a career in medicine.

Exposure to medicine at an early age has given me intimate familiarity with some of the challenges physicians face. At an age when I could not spell ‘anesthesia’, the important role my father played as an obstetric anesthesiologist in the genesis of new families was revealed to me in trips to the hospital as a child. These visits which were typically marked by events shrouded in medical mystery as if by blue sheets. Most vivid to me were the bustle of hospital life, the harmony among a team of doctors and nurses, and the relief and security felt by women in labor under the care of my father. Some of my earliest childhood memories belong to quiet afternoons awaiting my father’s awakening after 24-hour shifts; I remember late nights when three starving children would jump at the sound of the door and drag our father to dinner, which was filled with humorous and riveting stories from a tireless, heroic father. As a child, I was intensely curious about medicine but also acutely aware of the job stress, long hours, and rewards of a career in healthcare.

Seeking academic challenge, I began my undergraduate education at the age of XX in the XX for the XX XX at XX XX College (XXC). I will remain a X year at XXC to complete majors in biology, psychology, and chemistry and participate in summer research at the XX XX XX XX in preparation of a dual career in medicine and biomedical research with a molecular focus. A small XX’s liberal arts college, XXC inspires XX to become pioneers and leaders in science. Research opportunities early in my undergraduate career lured me into the world of scientific discovery, and I thrived with new problems to solve in research that could not be found in the classroom.

In an effort to gain exposure to diverse fields of medicine, I spent the summer following my sophomore year shadowing physicians at XX Hospital in XX. Hours in the clinic and operating room exposed me to the diversity in medical careers, but the valued patient-doctor relationship was common to all. Watching aortic valve surgery, I recall my amazement like a wave of cold air as the patient’s chest cavity was opened, revealing layers of marbled fat and smooth lungs inflating with each breath; but I also recall the dexterity and stamina required for a 6-hour procedure, the
marriage of leadership and teamwork, and the surgeon’s ability to make rapid decisions and communicate effectively. Perhaps less visible to those outside the OR were the good humor the surgeon used to encourage the surgery team, his patience with excited student observers and trainees, and the follow-up with patients.

At XX Hospital, I learned valuable lessons from doctors and patients alike. A physician explained to me that he treats not the condition, but the patient. Remarkably, each doctor I shadowed seldom neglected to inquire about children by name or use light humor while checking patient charts. Patients, in turn, trusted their doctors and developed lasting relationships. Women and men in old age, fighting cardiovascular disease or cancer, demonstrated the importance of a positive outlook and the influence of a doctor’s care on patient outcomes. An underappreciated responsibility of physicians is to address the psychology and general well-being of patients as a professional caregiver, which made a significant impression upon me throughout this experience.

A career in medicine is both a celebration of life and health and a commitment to restoring those faced with illness or injury. As a runner, I have an appreciation for the vulnerability of the human body and recognize the need for physicians who do not shy away from making difficult decisions in patient care. I have learned to cherish the gift of health and admire the compassion demonstrated by the doctors I have interacted with, and I intend to emulate that empathy when treating patients in the future. Invigorated by the goal of medicine to preserve health while bringing relief to patients, I am prepared for the challenge.
Dual Degree Personal Statement 6

I am an XX, XX, XX and I want to become a physician. There are some astounding facts that resonate with me when researching the amount of minorities who pursue advanced education and the rate at which minorities are acquiring HIV. According to the American Association of Medical Colleges, in 2012, a mere 7.3% of all applicants identified as being XX. Recent statistics from the Centers for Disease Control and Prevention show that new HIV infection rate among gay/bisexual men are highest in the XX population. These statistics have contributed to my ambition to become a practicing physician. I want to serve underrepresented communities by tending to their health and wellbeing, in addition to educating and empowering members of these communities to prevent disease and thereby live healthier lives. My pediatrician, Dr. XX, was a pillar in my community. Not only did s/he treat patient’s medical ailments, s/he hosted holiday parties at which s/he educated community members about living healthily and getting regular checkups. I aspire to practice in the field of oncology or infectious disease and in that role, I too wish to be a pillar in my community.

The lack of diverse healthcare providers contrasted with the prevalence of health disparities among minority communities is actually not my primary reason for pursuing a career in healthcare. Rather the culmination of my scientific research and clinical shadowing experiences have demonstrated that practicing medicine will enable me to utilize skillsets that are important to me in a career, such as scientific and clinical collaboration, problem-solving, patient interaction and empowerment, and the opportunity to be a perpetual scholar. As a rising senior, I was one of twenty-five students selected to participate in the XXX (XXX) at the XXXX (XXX) out of two-hundred and fifty applicants nationwide. I was an intern in the clinical research department in Dr. XX XXX’s laboratory that studies the cell cycle of cancer cells.

My project was to determine a subunit of a phosphatase (PP2A) that targets cell cycle regulator cyclin E in a phosphatase assay. Optimization, troubleshooting, and learning from each outcome were just some of the skills that I learned from this experience and will apply in my practice of medicine. I was fortunate to be surrounded by physician-scientists and medical doctors who embraced the opportunity for continued learning and impressed upon me the fact that learning does not stop once you have achieved your intended career goal. Diseases are not static and this fact requires bench-to-bedside research to continually evolve. It requires a commitment to being a perpetual scholar and this continual challenge is what intrigues and inspires me about practicing medicine.

I currently work in Dr. XX XXXX’s lab at XX XX XX, where I contribute to a project that aims to identify children with antibodies that recognize surface proteins expressed by malaria infected red blood cells. Optimal organization is required to achieve the correct analysis for this project. Physicians obtaining the blood samples from infected children must record the type of infection, age, whether the mother was infected, and how many times they were exposed and collect this information in a longitudinal study over the course of 148 weeks. Dr. XX has entrusted me with the organization and generation of the materials for this project and this experience has taught me how to analyze the multiple variables that affect the phenotype of a disease. Being that my interests are in oncology and infectious disease, I will partner with other clinicians and scientists in order to test new treatments and after-care pharmaceuticals and I will be able to communicate more effectively with scientists due to the analytical and organization skills I acquired during my experience as a laboratory assistant.

Research has provided me with an insight on the development of medicine and the studies that take place before pharmaceuticals enter clinical trials. However, it is the physician that must teach the patient about different medical options and my shadowing experience with Dr. XX, OBGYN, at XX XXX General Hospital taught me how to establish trusting patient-doctor relationships. Dr. XX was readily familiar with his/her patients’ medical history and during appointments s/he inquired about their family members, latest vacations and assumed the role of confidant as well as doctor. The ability to engage and evoke trust from individuals is a skill I use while coaching girls basketball for XX High School. Being knowledgeable about a particular topic area, sport, or hobby is not enough to elicit trust; however the ability to communicate in a manner appropriate for the intended audience in an empathetic and empowering style is a quality that Dr. XX and I both share. I am confident in my preparation for medical school and look forward to sharing my background and knowledge with my peers and later, my colleagues and patients, meanwhile embracing all that they have to teach me.
Why MD/PhD Essay 1

I saw the Large Hadron Collider at CERN long before the Higgs Boson was discovered, when it was just a mess of defeated wires and metal, in repair only nine days after it came online in 20XX. Fortunately, I met the researchers at CERN at their best: hopeful and determined. Paradoxically, it was during my time here that I became interested in the biology because I was most excited by the implications of the work in physics for microbiology and nuclear medicine. At CERN, I also realized the increasingly interdisciplinary nature of science and its power as a unifying force that transcends national boundaries and language.

Once I entered college, I joined a lab to further explore this nascent interest in biology. I began conducting research thinking that, as an undergraduate, I could not possibly discover anything new. But, after a summer in the lab, I presented a poster that changed the way the nuclear protein I studied was viewed. Yet, I also found the limitations of research. Because my in vivo experiments in Drosophila contradicted published in vitro predictions, I saw firsthand the limits of these kinds of approaches. As a result, I began to think about the implications of taking an overly simplified approach to understanding human disease. Indeed, this shortcoming can be especially problematic in the field that I am most interested in—the molecular and genetic mechanisms underlying developmental disorders.

This interest arose in elementary school when I read June Wood’s series of books about a man named Punky, a character with Down syndrome. I subsequently began volunteering at a center for the developmentally disabled in 20XX. It was here that I began to realize that sometimes, physicians lack the tools to ease human suffering because interventions for developmental disorders are too often analgesic and not truly curative or preventative. After I began conducting research, I considered these deficiencies in medicine as opportunities for the integration of scientific research with clinical care. It is this synthesis of basic science and medicine that draws me to a career as a physician-scientist.

I see the duality of this approach to medicine and research as an incredible asset for both the patient and the provider. Physician-scientists are equipped with the mindset of a clinician when working in the laboratory, as well as equally can understand the practical limitations of treatment for patients and appreciate the breadth of human biology. As a physician-scientist, I hope to advance medicine through the combination of the components that first drew me into research and clinical medicine—innovative interdisciplinary approaches and collaboration.
Why MD/PhD Essay 2

Research has rewired my way of thinking. Entering a research lab has been the most exciting catalyst of my college career; it has deepened and broadened my conception of science and strengthened my understanding of my role in the academic and medical communities.

One of the turning points of my research career occurred when my mentor, Dr. XX, asked me to lead a collaboration with XX College in photochemistry. Tasked with the responsibility of representing our lab and meeting a hard deadline, I traveled to XX to bring back both vital compounds and skills I needed to complete the project at my home institution. The disappointments and successes allowed me to recognize the culture in which I excel: one infused with the spirit of collaborative investigation and discovery.

As I stretched my thinking to attack concepts from the level of the human to the molecule in order to predict the effects of my compounds, I realized that my commitment to research stems from an appreciation for both molecular science and its clinical applications. My personal and professional experiences have revealed to me the complexities and frustrations commonly experienced among patients and the physicians, and I am intrigued by the relationship between laboratory science and medicine and the current gaps in practicing bench to bedside research.

On the surface, my prior experiences as a research scientist and a physician seem incongruent. Upheld by the rigor of the scientific method, research operates on a level greater than the individual. Scientific discoveries have a global impact, and I am excited by the potential of laboratory science to affect an entire population. Yet, as a young adult with diabetes, I rely on the expertise of my endocrinologist to lead a normal life, and, as a result, I recognize the power of the human connection between doctor and patient. While I am depending on scientists to find a cure for the disease that affects me, I need my doctor to provide reassurance when I am anxious, impart knowledge when I am uncertain, and offer additional resources when prospective solutions fail. To be a physician is to be an active caregiver. This, too, is a role that I aspire to fill.

I once believed that science and medicine were separate and distinct realms; similarly, I assumed my professional career was limited to one occupation that suppressed all the integrated questions I have. Yet, beneath the juxtaposition of bench scientist and practicing physician, I believe that there exists an underlying motivation and energy that are conjoined. By transcending the rigid professional boundaries, my studies as an MD/PhD student will allow me to translate and cross-link language, data, and solutions. The distinctive cross-training and remarkable intellectual resources offered by the MD/PhD program will allow me to combine two deeply connected realms and resonate with my firm commitment to contribute in both the scholarly and clinical realms.
Why MD/PhD Essay 3

Research presents many exciting challenges, from answering the multitude of questions that accompany an unexpected result to learning how to manipulate a system in the exact way needed to obtain results. There is one such challenge that I am particularly interested in addressing—bridging the disconnect that often exists between research and its application. With each of my research experiences, I have reflected upon the vast distance that separates my project’s specific findings from its analogue in the human body. As an MD/PhD, I will endeavor to conduct research that will help traverse the gap between discoveries pioneered in a research setting and their clinical applications.

Earning a PhD will help me develop the knowledge and skillset needed to conduct well-designed, effective scientific research. However, this degree alone does not offer the broad, multidisciplinary range of skills and insight that I wish to acquire. Obtaining an MD will expose me to a unique set of experiences that will enhance my PhD and make me a better biomedical researcher. The medical knowledge and first-hand involvement with patient care that an MD will grant me will directly inform my decisions in the lab, directing the focus of my work. A medical degree will also help me identify and address any issues that may arise as the project’s findings are taken from an experimental context and implemented in a medical setting. By treating patients that have the disease or disorder that I study in the lab, I will become better equipped to anticipate the needs of the patients that my scientific discoveries ultimately hope to benefit; this skill cannot be readily gleaned from a PhD alone.

I gained valuable exposure to the rewards and challenges of a clinical career during my time as an undergraduate student. Seeing the limitations of modern medicine frustrate and dishearten both doctors and patients has inspired me to search for answers in a research setting so that I might contribute to the resolution of some of these issues. Being actively involved in scientific investigations will help me remain thoroughly informed and optimistic about the progress of the field as I experience some of these obstacles firsthand. A dual career in research and medicine will also make me a better physician by instilling in me comprehensive scientific knowledge and understanding about a number of the diseases or conditions that I will encounter. Having a direct connection to the rapidly evolving world of research will keep me up-to-date with new discoveries that may hold promise for the treatment of a disease or elucidate the biology that drives it. This increased awareness of progress being made at the basic science and clinical levels of a disease and a thorough understanding of the science behind these findings will make me a more well-rounded physician with the ability to better diagnose and recommend treatment options to best suit the needs of my patients.

Though research and medicine are independently challenging, fascinating, and rewarding careers, it is their intersection that appeals most to me. I am determined to combine these two fields into a single career and immerse myself in basic scientific research as well as the human biology that underlies its clinical applications, learn to think analytically about the design and execution of scientific studies and practically and empathetically about patients’ needs, and combine these capabilities to perform more effective, holistic biomedical research as a physician-scientist. This will allow me to experience the positive aspects of each occupation while using my involvement in one area to address the difficulties associated with the other. In my future career, I will be able to balance the highly focused, gradual, analytical work of a lab scientist with the more diverse, fast-paced, patient-interaction-based work of a physician. While treating patients will provide my research with continuous direction and motivation, working as a scientist actively involved in finding solutions for the problems that I encounter as a physician will be equally fulfilling and informative. An MD/PhD would provide me with the optimal academic background and research and clinical training needed to meet my goal of becoming a consummate physician-scientist who is able to apply and integrate skills and insights from these two independent fields to improve patients’ lives.
During the summer of my senior year in college, I participated in a research program at the XX XXX that inspired me to pursue a career as a physician scientist. Under the mentorship of XXX, MD, PhD I contributed to the testing of a clinically relevant drug that targets the mitotic spindle assembly checkpoint in glioblastoma. I was also able to shadow my mentor on rounds at the XX XXX Hospital. This opportunity allowed me to witness how closely research and clinical care are intertwined. One of the projects in Dr. XXX’s lab that particularly inspired me to pursue an MD-PhD was generating patient-specific tumor xenograft mouse models and cultured cell lines as tools for developing drug therapies. Given that brain tumors vary greatly from individual to individual, this project aims to develop specific drug therapies for each patient. The data gathered from this project could potentially help physicians make better clinical decisions when treating patients with brain tumors. This type of research is best accomplished by an individual that can generate and understand pre-clinical data and apply it patient care and research in humans. I strive to emulate my mentor, Dr. XXX, in using basic science to directly answer questions seen in patients.

Although there are many areas of medicine that I am interested in, one that I have had the most experience and enthusiasm for is developing personalized treatments in patient care. I am particularly interested in the therapeutic application of genome editing technology as a form of gene therapy. By using customizable nucleases, one can target almost any site in a complex genome and in theory, correct the underlying cause of diseases with precise genome modifications. In order to achieve the full potential of this technology, a few important challenges must be addressed. First, the usefulness of this technology is largely dependent on achieving single site specificity because any toxicity, presumably due to off-target cleavage, could be detrimental to patients. Second, questions still remain about the most optimal ways to deliver these nucleases into cells. Third, given that these tools were originally found from bacteria and plants, it is not known if these proteins are compatible in human patients.

While research is typified by diligent pursuit of new knowledge through a long and exhaustive investigation of basic science questions, patient care demands hands-on knowledge that can be effectively translated into effective treatments. I believe that as a physician scientist with expertise in both research and clinical medicine, I will have a unique opportunity to contribute to patient outcomes by formulating and investigating hypotheses that are not readily achieved by someone without dual training.
Why MD/PhD Essay 5

Recently, I was invited to participate in the One Book One Community project at the XX County Library to discuss The Immortal Life of Henrietta Lacks, a novel which chronicles the history of HeLa cell culture, and offer the student perspective on research using human cell lines. At this program, expertise was sought from a panel of scientists and medical doctors who shared research-oriented and clinical perspectives on HeLa research. From the advent of cell culture, the continuum between biomedical research and healthcare has emphasized the need for physician-scientists who bridge research at the bench with clinical bedside practice.

Clinical relevance propels and orients the directions for my research projects with Dr. XX XX, Associate Professor of Biology. In prostate cancer patients, an alarmingly high rate of recurrence following androgen deprivation therapy raises an obvious question: why? One answer appears to be increased incidence of neuroendocrine (NE) cells within the tumor. Our research aims to study chemoresistance in NE cells, examine the tumorigenic role of secreted factors, and, ultimately, find cancer therapies that also target NE cells to reduce relapse, facilitating the efforts of oncologists to provide more effective treatments. I constantly seek discussion and clinical expertise from my father, a physician, whose interest in the clinical significance of NE cells has stimulated interesting discussions as well as new research questions.

While assisting with clinical trials at XX XX Hospital in XX, XX, I grew excited about the applications of innovative scientific discoveries in medicine and the fruition of these efforts in the development of novel therapeutics. The tools for approaching questions as a scientist can be gained through PhD training, but training in medicine enables physician-researchers to address major problems facing human health in a clinical setting. Integrating research into translational medicine is a challenge that is met by the physician-scientist, who acts as a mediator of scientific advancement at the frontiers of both research and medicine. It is my strong desire to solve problems in healthcare coupled with an insatiable curiosity that drives my pursuit of a career as a physician-investigator.

I have chosen to pursue joint MD/PhD degrees in anticipation of a career in medical neurology and biomedical neurobiology research. My research career will have a strong focus on translational medicine, and medical training will provide a valuable clinical perspective in my approach to research questions with the objective to translate research into patient care. I am committed to returning knowledge to the scientific community in order to contribute to biomedical research efforts that will improve human health. My ultimate goal is to combine a medical career with a productive and engaging research career focused on the integration of biomedical research into clinical practice.
Why MD/PhD Essay 6

As an undergraduate student, the question I often pondered was, “How can I be my best possible self?” As a result of my clinical shadowing, patient interaction, and research experiences, I have come to the definitive conclusion that being my best possible self involves four key factors: a career that will enable me to offer medical care, contribute to biomedical research, serve as a role model, and mentor aspiring doctors and clinicians.

During the summer of 20XX, I obtained clinical and lab experiences that indelibly shaped my academic and career ambitions. At the beginning of the summer, I shadowed Dr. XX XXX an OBGYN, at XX XXX Hospital. I really enjoyed the patient interaction aspect of being a physician, including the responsibility of guiding people to better health and serving as a confidant for patients, their family, and friends. However, I was unwilling to cease my research efforts and had not yet been introduced to the possibility of practicing medicine and contributing to clinical research as a physician scientist. During the course of my summer internship at the XX XX XX, I met Dr. XX, a MD/PhD practicing oncologist. During the internship, Dr. XX worked in the clinic, vacationed with his family, and mentored a high school student in the lab, all while trying to develop a new mouse model of colorectal cancer. This exposure helped me conceptualize how I could be my best possible self.

On one occasion during the internship, my fellow interns and I volunteered to make dinner for patients and family members residing at the XX XX XXX (XXXX), a residential facility for individuals undergoing cancer treatment. I observed interns, cancer patients, and their family members interacting and in spite of the difficult circumstances, there was joy that filled the room. Anyone can fall victim to cancer, but the opportunity to receive treatment at facilities like the XXXX and XXXX gives people hope for survival. I am seeking a career that will enable me to offer hope to individuals battling life-threatening illness.

Being an MD/PhD provides an optimal opportunity to combine the application of clinical training to treat patients, meanwhile contributing to the development of improved treatments through research. In addition, this role will enable me to educate and mentor both aspiring clinicians and scientists and spend time with my family. To serve my community through healthcare and education while offering hope to individuals suffering from illness will allow me to be my best possible self and ultimately, be a productive and positive contributing member to society.
How to write a Resume, Curricula Vitae (CV), and Cover Letter
Resumes, Curricula Vitae, and Cover Letters

Resumes and CV
For more comprehensive guidance regarding Resume and CV development, visit the NIH Office of Intramural Training & Education (OITE), specifically their Guide to Resumes and Curricula Vitae. Page numbers below correspond to page numbers in the Guide linked above.

Topics include:
- What’s the Difference Between a Curriculum Vitae (CV) and a Resume? ................................................................................................................................. 2
- Overall Look (of a CV and Resume)................................................................................................................................. 2
- Categories and Content (of a CV and Resume) ................................................................................................................ 3
- Developing Effective Bullets for a Resume .................................................................................................................. 4
- Accomplishment Memory Joggers (questions to help you develop content for your Resume bullet points) ................................................................................................................................. 5
- Frequently Asked Questions (FAQs) ........................................................................................................................................ 6
- Final Do’s and Don’ts ...................................................................................................................................................... 6

The guide also includes sample resumes, with additional content and formatting reminders for post-docs applying to industry (page 9), post-bacs applying to graduate school (11), and a sample CV and resume for graduate students (pages 13, 16).

Cover Letters
The NIH OITE also provides a Guide to Cover Letters, which includes additional instruction and examples of STEM-related cover letters. The page numbers below correspond to page numbers in the Guide linked above.

Topics Include:
- Overview (Purpose, Length, Format, Use) ................................................................................................................................. 2
- Format .................................................................................................................................................................................. 3
- Cover Letter Samples
  - Graduate Student applying to Industry Position ................................................................................................................................. 4
  - Post-doc Applying to Non-Bench Position ................................................................................................................................. 5
  - Post-doc Applying to Faculty Position with a Focus on Teaching ................................................................................................................................. 6
  - Post-doc Applying to Faculty Position with a Focus on Research ................................................................................................................................. 7
- Email Sample
  - Post-bac/Post-doc Inquiry about Lab Openings ................................................................................................................................. 8
Resume Template for Graduate School, Medical School, and Dual Degree programs

<Full Name>

<street address> ● <city, state, zip> ● <phone> ●<email address>

EDUCATION
<insert degree obtained> ● <insert month/year graduated>
<insert institution name>, <insert city> (List academic references in reverse chronological order. Insert 6 pt. space after each academic reference to create white space.)
- Additional Concentrations: <insert supplementary subjects>
- <insert GPA: 3.9 /4.0> ● <insert Major GPA: 3.9/4.0>
- <insert any supplementary educational endeavors, such as Study Abroad, etc. and reference the city, state, country, where the program took place and the years of participation>

HONORS and AWARDS (List honors and awards in reverse chronological order. Insert 3 pt. space between bullets to create white space.)
- <insert title of honor/award> 2014
In recognition of <insert>
- <insert title of honor/award> 2013
Awarded for <insert>
- <insert title of honor/award> 2012
Awarded to <insert>. If this is a financial scholarship, maybe include the $ amount awarded.

RESEARCH EXPERIENCE (List research experience(s) in reverse chronological order. Insert *minimum 6 pt. space after each research experience to create white space. * The examples below use a 9 pt. space.)
- <insert job title> <insert month/years, i.e., June 2009 — Present >
<insert program or department and institution name>, <insert city, state> (Insert 3 pt. space after program/department and name of institution to create white space.)
- Under the guidance/mentorship of <insert first and last name of faculty member of lab/research group worked>, contributed to a project designed to <insert goal or hypothesis of project>
- <insert skills applied and/or gained>
- <insert how or in what ways you tangibly and intangibly contributed to the lab/research group>

- <insert job title> <insert month/years, i.e., June 2009 — May 2012 >
<insert program or department and institution name>, <insert city, state> (Insert 3 pt. space after program/department and name of institution to create white space.)
- Under the guidance/mentorship of <insert first and last name of faculty member of lab/research group worked>, contributed to a project designed to <insert goal or hypothesis of project>
- <insert skills applied and/or gained>
• <insert how or in what ways you tangibly and intangibly contributed to the lab/research group>

PUBLICATIONS (List publications in reverse chronological order. Insert 3 pt. space between section header and supporting content to create white space.)
• <insert full citation, put author’s name in bold> (Insert 3 pt. space after each bullet to create white space).
• <insert full citation, put author’s name in bold>

PRESENTATIONS (List presentations in reverse chronological order. Insert 3 pt. space between section header and supporting content to create white space.)
• <insert title, insert all authors names, name of conference> September 20XX (Insert 3 pt. space after each bullet to create white space).
• <insert title, insert all authors names, name of conference> September 20XX

TEACHING EXPERIENCE or MENTORSHIP (List experiences in reverse chronological order. Insert 3 pt. space between section header and supporting content to create white space. Insert *minimum 6 pt. space after each experience to create white space. * The examples below use a 9 pt. space.)
• <insert title> <insert month/years, i.e., June 2009 — May 2012 > <insert program, department, or organization name>, <insert city, state> • <insert skills applied and/or gained> (Insert 3 pt. space after each bullet to create white space.) • <insert any other pertinent information>
• <insert title> <insert month/years, i.e., June 2009 — May 2012 > <insert program, department, or organization name>, <insert city, state> • <insert skills applied and/or gained> (Insert 3 pt. space after each bullet to create white space.) • <insert any other pertinent information>

CLINICAL SHADOWING (List experiences in reverse chronological order. Insert *minimum 6 pt. space after each experience to create white space. * The examples below use a 9 pt. space.)
• <insert title or program name> <insert total duration, i.e. number of hours> <insert physician name, degree, department, name of clinic/hospital, and city/state> • <insert what the type of observation, i.e., surgery, patient interaction, etc. over insert number of hours per week/month>.
• <insert title or program name> <insert total duration, i.e. number of hours> <insert physician name, degree, department, name of clinic/hospital, and city/state> • <insert what the type of observation, i.e., surgery, patient interaction, etc. over insert number of hours per week/month>.

Commented [AJC4]: This section is applicable for students applying for an MD or MD/PhD.
VOLUNTEER or COMMUNITY SERVICE (List experiences in reverse chronological order. Insert *minimum 6 pt. space after each experience to create white space.)

<insert title or program name> <insert total duration, i.e. number of hours>
<insert name of program or organization and city/state>
  • <insert description of your role/duties>. (Insert 3 pt. space to create white space.)

EMPLOYMENT HISTORY (List employment experience in reverse chronological order. Insert *minimum 6 pt. space after each experience to create white space.)

<insert job title> <insert month/years, i.e., June 2009 — May 2012>
<insert program or department and institution name>, <insert city/state>
  • <insert specific job duties as they relate to the current position sought> (Insert 3 pt. space between bullets to create white space.)
  • <insert skills applied and/or gained>
  • <insert any other pertinent information>

CERTIFICATIONS (List certifications in reverse chronological order. Insert 3 pt. space between bullets to create white space).

• <i.e., Human Subjects Certification> <insert month or year awarded>
• Confidentiality Training <insert month or year awarded>
• Radiation Safety <insert month or year awarded>
• Lab Safety <insert month or year awarded>
• AED, CPR, First Aid <insert month or year awarded>

ACTIVITIES and INTERESTS (List activities and interests in reverse chronological order. Insert 3 pt. space between bullets to create white space).

• <insert special interests, i.e., music, art, sports, environmental conservation, etc. for which you actively participate in/contribute to>
Resume Template for Employment in Research Sector

First Name Last Name, <insert degree if applicable>
<insert address>
<insert cell phone> | <insert personal email address>

SNAPSHOT OF QUALIFICATIONS (Insert 3 pt. space after section header and before supporting content to create white space. Insert 12 pt. space section headers to create white space.)

I am a <insert current status> with training as a <insert>. I have experience with <insert skills, techniques, software or other qualities related to the position being sought>. I have acquired <insert examples of professional skills (preferably from job description), some of which may include critical thinking, problem solving, resolving unanticipated challenges, translating data, management experience, etc.> and am proficient <insert examples of your skill set, which may include using statistical software, bilingual (in which case, reference the languages and indicate proficiency speaking, reading, and writing), and software such as Microsoft Office, Excel, Access, PowerPoint, etc.>

EDUCATION (List in reverse chronological order. Insert 6 pt. space after each academic reference to create white space.)

XXXXXXXXXXXXX, <insert city, state> Fall 20XX – Spring 20XX
Master of XXXXXX – XXXX

XXXXXXXXXXXXXXX, <insert city, state> Fall 20XX – Spring 20XX
Bachelors of XXXXX XXXXXXXXXXXXX

RESEARCH EXPERIENCE (List in reverse chronological order. Insert *minimum 6 pt. space after each research experience to create white space. *The examples below use a 9 pt. space.)

<Insert job title> September 20XX – Present
<Insert name of institution, <insert city, state> (Insert 3 pt. space after job title/name of institution to create white space.)

- If referencing participation in SURP or CRI-G, reference full name of program, followed by the abbreviation in parenthesis. You may also want to indicate the competitive nature of participation, i.e., one of twenty-five students selected from a pool of over four-hundred applicants (2014 SURP) OR reference the nature of the program’s institutional partnership, i.e. CRI-G is sponsored by an institutional collaboration between the FHCRC and NMSU.
- Under the guidance/mentorship of <insert first and last name of faculty member of lab/research group worked>, contributed to a project designed to <insert goal or hypothesis of project>
- Insert employment/research skills, techniques, qualifications, and accomplishments related to the position being sought
- Insert employment/research contributions related to position being sought

<Insert job title> September 20XX – Present
<Insert name of employer, <insert city, state> (Insert 3 pt. space after job title/name of institution to create white space.)

- See examples above

EMPLOYMENT EXPERIENCE (List in reverse chronological order. Insert *minimum 6 pt. space after each employment experience to create white space.)

Commented [DMN1]: Do not let content “hang” from one page to the next, like in this example. If you have “hanging” content, put it all on the following page.
<insert job title> September 20XX – Present
<insert name of employer, <insert city, state> (Insert 3 pt. space after job title/name of employer to create white space.)
• Insert employment/research skills, techniques, qualifications, and accomplishments related to the position being sought (Insert 3 pt. space between bullets to create white space.)
• Insert employment/research contributions related to position being sought

<insert job title> September 20XX – Present
<insert name of employer, <insert city, state> (Insert 3 pt. space after job title/name of employer to create white space.)
• Insert employment/research skills, techniques, qualifications, and accomplishments related to the position being sought (Insert 3 pt. space between bullets to create white space.)
• Insert employment/research contributions related to position being sought

PUBLICATIONS (List in reverse chronological order. Insert 3 pt. space between section header and supporting content to create white space.)
• <insert full citation, put author's name in bold> (Insert 3 pt. space after each bullet to create white space).
• <insert full citation, put author’s name in bold>

PRESENTATIONS (List in reverse chronological order. Insert 3 pt. space between section header and supporting content to create white space.)
• <insert title, insert all authors names, name of conference> September 20XX (Insert 3 pt. space after each bullet to create white space).
• <insert title, insert all authors names, name of conference> September 20XX

AWARDS AND HONORS (List in reverse chronological order. Insert 3 pt. space between bullets to create white space.)
• <insert title of award/honor> 2014
  In recognition of <insert>
• <insert title of award/honor> 2013
  Awarded for <insert>
• <insert title of award/honor> 2012
  In honor of <insert>

Other potential section headers (as they relate to the position being sought) may include:
TEACHING / MENTORSHIP (List in reverse chronological order. Insert 3 pt. space between bullets to create white space.)

COMMUNITY SERVICE / VOLUNTEERISM (List in reverse chronological order. Insert 3 pt. space between bullets to create white space.)

CERTIFICATIONS (List in reverse chronological order. Insert 3 pt. space between bullets to create white space.)
Cover Letter Template for Employment in Research Sector

Dear FHCRC Scientific Recruiter,

**First paragraph:** I am applying for [insert job title, i.e., Research Technician I and job number or code, if given] position in the [insert name of department or lab, if given] at [insert name of institution]. Identify WHY you are applying to that particular department or lab or WHY you are applying to that particular institution (some ideas may include supporting the mission of the institution, in which case, you should identify the mission of the institution and how or in what ways you envision yourself contributing]

**Second paragraph:** Identify your status, i.e., I will be graduating from [insert institution name] / recently graduated from [insert institution name] with a [insert full name of degree earned, i.e., Bachelor of Science or Bachelor of Arts in [insert subject area]]. In pursuit of this degree, I gained significant [insert type of experience, i.e., public health, biostatistical, chemistry] experience through [insert venues through which you gained experience, i.e., coursework, including [insert no more than three names of courses as they relate to the position being sought], [insert, employment, enter names of employers], community outreach or volunteer experience [insert names of volunteer organizations], independent research at [insert names of institutions, i.e., Fred Hutchinson Cancer Research Center (FHCRC)].

**Third paragraph:** reference your prior research experience(s), i.e., While working in [insert first and last name of faculty member]’s lab/research group at [insert name of institution], I contributed to a project designed to [insert goal or hypothesis of project]. To facilitate this project, I [insert some examples from below]:

1) How or in what ways you contributed to the lab/research group (skills/techniques learned/applied (preferably as they relate to the position being sought), mentorship, journal clubs, lab meetings, drafting content for presentation in an abstract or poster presentation (taking care NOT to duplicate content from your resume);

2) What you learned as a result of the experience;

3) How and why this experience has prepared you for position being sought; and

4) How you are going to apply the knowledge gained as a result of this experience in this position.

This experience led me to apply for [insert content from a second experience]. In support of this effort, I [insert (see example prompts above)].

**Final paragraph:** identify your long-term career goals and HOW this opportunity will impact your future career goals (some ideas include making you a more competitive applicant for graduate, medical or professional school by providing you with a solid research foundation that includes an expanded mastery of [insert name of specific lab/research/software techniques], enhanced ability to think strategically, resolve unanticipated problems, analyze results, improved verbal and written communication, etc.

I appreciate your review of my application in consideration of the [insert job number and/or title position].

Sincerely,
Applying for Graduate School
Graduate School Preparation Checklist

The following checklist was created to guide undergraduate students of junior standing through the graduate school application process. This timeline is designed for students who wish to begin graduate studies full-time in the Fall quarter/semester and are seeking an assistantship and/or fellowship. Keep in mind that you can certainly apply to graduate school at any time before the application deadline!

<table>
<thead>
<tr>
<th>June</th>
<th>Graduate School Research</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Think about what graduate program(s) you would like to pursue. Remember that attending graduate school should lead you toward your ultimate career goal, not just to avoid getting a job and going to work.</td>
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<tr>
<td></td>
<td>Consider what you’re looking for in a graduate program and what you’d like to do with a masters or doctoral degree. Research and compare your options. Factors to consider include:</td>
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<td></td>
<td>• Time commitment (e.g. 2 year program vs. 4-6 year program)</td>
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<td></td>
<td>• Part-time vs. full-time programs</td>
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<td>• Private vs. public institutions</td>
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<td></td>
<td>• Entrance requirements</td>
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<td>• Program approaches/specializations</td>
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<td>• Faculty and teaching methods</td>
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<td>• Program reputation</td>
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<td></td>
<td>• Placement success of program graduates</td>
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<td></td>
<td>• Tuition costs and financial aid available</td>
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<td></td>
<td>• Housing/living expenses</td>
</tr>
<tr>
<td></td>
<td>• Geographic location</td>
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</tbody>
</table>

☐ Make a list of what you’re looking for in a graduate program and what you’d like to do with a masters or doctoral degree.

☐ Create a list of potential schools/programs to which you are interested in applying.

☐ Contact the colleges/universities of interest and ask them to mail/email you information about the college/program, financial aid, and assistantships and to
June  

**Graduate School Research**

*request a graduate catalog. Look for programs that have several potential faculty mentors and take note of any faculty members whose work interests you (at this point).*

<table>
<thead>
<tr>
<th>University/Program</th>
<th>Date of Request</th>
<th>Method of Contact</th>
<th>Materials Received</th>
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<tbody>
<tr>
<td>Yes</td>
<td>No</td>
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June/July  

**Plan Ahead for the Graduate School Admission Test**

Determine if you are required to take a graduate school admission test [GRE (general test), GRE subject tests, LSAT (for law school), MCAT (for medical school), GMAT (for business school)]. Plan to take the required Graduate School Admission Test(s) the summer *before* your senior year. Many students will re-take the test and this will give you nearly three months to study the sections for which you need to improve your score(s).

☐  

*Sign up to take any required graduate admission test.*

<table>
<thead>
<tr>
<th>Admission Test</th>
<th>Test Date</th>
<th>Test Location/Address</th>
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July  

**Take the necessary Graduate School Admission Test(s)**

Things to remember:
July  Take the necessary Graduate School Admission Test(s)

- Consult test prep books to reference strategies for successful test-taking.
- Be sure to give yourself enough time before the exam date to sufficiently study for the test.
- Get plenty of rest the night before (this includes taking a break from studying).
- Get to the test facility at least 20 minutes early.
- Check test taking policies (rules about what you can/cannot bring into the test area).
- Eat a good breakfast (something that’ll last for several hours).
- Remember to write down your score(s) (if allowed).

Take the necessary Graduate School Admission Test(s).

August  Narrow the Field

Review all of the graduate schools that offer a program in your field of choice. Consider 5 - 10 program possibilities, and narrow your list to down to 3 - 4. Keep in mind that the average graduate school application fee is $50 and that fee is typically non-refundable.

To help narrow the list, you may wish to:

- Consult with professors and professionals in the field to discuss program highlights and their experiences in graduate school.
- Plan campus visits, and schedule meetings with program faculty members or current students who can answer your questions. You may want to email potential faculty mentors per program to see if they are accepting students in the following year.

Determine which programs you plan to apply to and begin the application process.

<table>
<thead>
<tr>
<th>University/Program</th>
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August  Registering for Spring Semester

If all goes well, you will have several interviews in the spring semester. You may want to schedule Tuesday/Thursday courses, and/or have a lighter schedule in your final semester. This will enable you to participate in the interviews and maintain your course load during your last semester.
**September**  
**Re-take the Graduate School Admission Test(s)**

Determine if you need to re-take a graduate school admission test [GRE (general test), GRE subject tests, LSAT (for law school), MCAT (for medical school), GMAT (for business school)].

Things to remember:
- Study the sections for which you need to improve your score(s).

<table>
<thead>
<tr>
<th>Admission Test</th>
<th>Test Date</th>
<th>Test Location/Address</th>
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**September**  
**Seek Letters of Recommendation**

Approach faculty members, employers, etc. to write a recommendation letter on your behalf. Choose your reference(s) wisely – a letter(s) of recommendation from an individual(s) in a department or field similar to the program for which you are applying is viewed more favorably than a recommendation letter(s) from a former employer or professor in a non-related field.

Identify references per graduate school application. Be sure to give your references ample time [2 to 6 weeks is suggested] to work on your letter. You are encouraged to provide your references with a personalized folder containing the following information:

- Transcripts (NOTE: If it’s a professor, highlight the classes that you took with them so they can go into your records for that semester to see how you did compared to other students in the class).
- Personal statement (even in draft form).
- The name/description of the program.
- The deadline for the letter IN BOLD and an indication of how to submit the recommendation (online, printed letter, follow a link, etc.). If your reference(s) are required to submit a paper recommendation letter, be sure to provide a pre-addressed, stamped mailing envelope (and any forms that need to accompany the letter of recommendation).
- Include a resume or other information about what you have done that won’t be obvious from the transcript.
- Send your references a friendly reminder one week prior to the due date for your recommendation letter.
- Be sure to send your references a handwritten thank you note!

<table>
<thead>
<tr>
<th>Reference Name/University</th>
<th>Date Letter Due</th>
<th>Date Reminder Sent</th>
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</table>
**September**

**Getting Started**

**Draft your personal statement(s) or essay(s) for each university and have your statement/essay reviewed by a faculty member or your university’s Writing Center.**

Things to remember:

- Plan on asking multiple individuals to review your personal statement(s) or essay(s). This ensures that your ideas are understood by a diverse audience. Be sure to give your reviewers ample time [2 to 3 weeks is suggested] to read and comment on your statement/essay. You should plan to revise your statement/essay at least three times given the feedback you will receive from multiple reviewers.

- Send your reviewers a friendly reminder one week prior to the date in which you would like their feedback.

- Be sure to send your reviewers a handwritten thank you note!

<table>
<thead>
<tr>
<th>Reference Name/University</th>
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**Draft personal statement(s) or essay(s).**

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<tr>
<th>Reviewer Name</th>
<th>Draft #1 Reviewed</th>
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**October**

**Compiling your Application(s)**
Re-take the Graduate School Admission Test(s).

Things to remember:

- By this time you should be comfortable with the test(s), i.e. had plenty of practice, are familiar with different types of questions, have a time allotment strategy.
- See suggestions offered in July: Take the necessary Graduate School Admission Test(s) for other tips.

Take Admission Test(s).

October Compiling your Application(s)

Order transcripts from all post-secondary universities attended.

Things to remember:

- If Fall term grades are expected, then indicate on the transcript request form to mail “after current term grades.”
- Be sure to ask the Registrar’s Office if the current term grades can be sent in time to meet the graduate school application deadline.
- Most schools charge a fee for ordering/sending your transcripts.

Order transcripts for all of the universities for which you are applying to.

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<thead>
<tr>
<th>University Department/Program</th>
<th>Address</th>
<th>Transcripts ordered?</th>
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October Compiling your Application(s)

Continue revising your personal statement(s) and/or essay(s).
### November  Wrapping it Up

**This is the time to compile all of the parts of your application.**

**Things to note:**

- You should be in “wrap-up” mode. This will include working on the final edits to your personal statement(s) or essay(s), resume, and/or any other documents, admissions test scores should be submitted, transcripts should be provided.

- Your letters of recommendation should either be sent or near completion.

- Aren’t you glad you started early?

<table>
<thead>
<tr>
<th>Complete your personal statement(s) or essay(s) and resume and/or any other documents.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admissions test(s) completed.</td>
</tr>
<tr>
<td>Transcripts requested.</td>
</tr>
<tr>
<td>Letters of recommendation submitted.</td>
</tr>
</tbody>
</table>

### Dec./ Jan.  Mail or Submit your Application(s)

**Mail or submit your application(s) before the specified due date.**

**Things to note:**

- Applying early will put you in line for the best assistantships, fellowships and/or financial aid packages. You can certainly apply later, but you may lessen your chances for receiving some form of financial aid.

- Many graduate schools send out acceptance letters as early as March for a Fall start date.

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<tr>
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### Jan./Feb. Post Application

Request scholarship/fellowship/assistantship information from each university that you applied to.

**Things to note:**
- You may have to do a lot of research to find out what positions are available.

<table>
<thead>
<tr>
<th>University/Program</th>
<th>Date of Request</th>
<th>Materials Received</th>
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</table>

### Jan./Feb. Post Application

File your Federal Income Tax Return (required before you can complete the FASFA).

**Things to remember:**
- Make sure to keep a copy of all tax documents for reference when you complete the FASFA.

<table>
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<th>Date Filed</th>
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### Jan./Feb. Post Application

Complete the FASFA online.

**Things to note:**
- You’ll need your own tax information as well as that of your parents.
- You’ll need to identify all of the universities who you want to have your FASFA to be made available to (visit the FASFA website [http://www.fafsa.ed.gov/] to find the appropriate school code).
- Make sure you have a PIN for electronic signature (should be the same as the one from last year).

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<tr>
<th>University/Program</th>
<th>School Code #</th>
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<td>University/Program</td>
<td>School Code #</td>
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Start preparing for any admission/assistantship interviews by scheduling mock interview(s) with faculty/staff.

Things to note:
- You should ask your research mentor or other professor for a 30-minute appointment to do a mock interview or at least discuss the interview process and what to expect.

Schedule admission/assistantship interviews.

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<thead>
<tr>
<th>Name</th>
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<td>Name</td>
<td>Date of Mock Interview</td>
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<td>Name</td>
<td>Date of Mock Interview</td>
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Have a Plan-B, just in case.

Things to note:
- It is always a good idea to have a back-up plan, so begin exploring employment options. That way if graduate school is not an option for you at this time, you will have already begun a preliminary job search.

Make a list of possible backup plans.
Mar.-May Follow-up

By this time you should be hearing back from the universities that you have applied to.

Things to note:

- Visits as many schools as you can in order to meet faculty, get a sense for the city and culture of the area, and meet other students who were accepted.
- Put those practice interview skills to work.

☐ Make your final decision.

<table>
<thead>
<tr>
<th>University/Program</th>
<th>Pros</th>
<th>Cons</th>
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Mar.-May Follow-up

Submit commitment forms and/or fees to the institution you have chosen and register for classes (if applicable).

Things to note:

- Take time to celebrate getting into graduate/medical school!

☐ Submit commitment forms.

<table>
<thead>
<tr>
<th>University/Program</th>
<th>Yes</th>
<th>No</th>
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Mar.-May Follow-up

Send a handwritten thank-you note to everyone who helped/supported you during the application process and inform them of your success.

Things to note:

- You may want to include a small gift as a token of your appreciation, such as a Starbucks or Amazon gift card.

☐ Send thank you notes.

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The Art of the (Recommendation Letter) Request

Letters of recommendation are an extremely important component of any training program or graduate school application. The information contained (or excluded) from a letter of recommendation has the ability to impact who gets interviewed, admitted, and in some cases, awarded financial support.

There is an art to requesting a letter of recommendation and your ability to incorporate these suggestions when requesting a letter of support from your references will likely result in an influential testimony that may be the difference between being accepted into the program of your choice versus being waitlisted or worse, rejected.

Tip 1: Put it in writing!

Sure, you can ask your references to submit a letter of recommendation on your behalf in-person, but the surest way to guarantee that it gets done is to submit your request in writing, whether that be via email or a handwritten note (you will inevitably earn a prompt and thoughtful recommendation letter by submitting your request with a Starbucks gift card or some other token of your appreciation).

Tip 2: Make it easy.

The best way to ensure your reference will submit a quality letter of recommendation on your behalf is to make it easy to do so. You can simplify this request by giving your references the following information: a) the name of the program to which you are applying and a brief description of what the program entails; b) the name of the sponsoring institution; c) a brief description of how the program fits in with your career goals; and d) a brief description of what you will contribute to the program and how you will benefit from participating. The last and possibly most important information to convey is: e) when the letter is due, to whom the letter should be addressed, and the options for submitting the letter, i.e. via email, fax, or mailing address.

Tip 3: Be selective!

Most training program and/or graduate school applications require a letter of recommendation from at least three individuals. Choose your references wisely - letters of recommendation that come from individuals in a department or field similar to the program for which you are applying are viewed more favorably by the selection committee than recommendation letters from a former employer or teacher in a non-related field.

Tip 4: Send a reminder.

The best way to leave a poor impression with the selection committee is to submit your application after the deadline. The surest way to guarantee that your recommendation letter is submitted on time? Send your reference a friendly reminder — preferably one week prior to the application deadline.

Tip 5: Express your gratitude!

The last and most important gesture to consider when requesting a recommendation letter is often the most overlooked. In short; send your references a handwritten NOTE OF THANKS! If you have not already given your references some token of your appreciation, i.e a Starbucks gift card, a box of Girl Scout cookies, now may be the time to do so, especially if you learn that you were accepted into the program to which you applied.
Interview Preparation
Medical School or Dual Degree Interview Preparation / Questions / Mock Interview Schedule

Preparation Suggestions

Application Materials
Some interviewers may wish to reference an electronic copy of your application materials, i.e. resume, personal statement, etc. If these items are not requested in advance, bring a paper copy with you to the interview(s).

Meeting Location
Know where to go before you need to be there – if your schedule allows, you should always investigate where your interview(s) will take place prior to the meeting(s).

Attire
Even though these are “practice” sessions, you should dress as if they are actual meetings with admissions representatives.

Do Your Research
To get the most out of this experience, you are encouraged to review interviewees’ faculty profile [if applicable] and/or investigate the research area that each interviewee contributes to in order to ask appropriate questions regarding the type of scientific techniques or skills that are sought. You may also want to ask your interviewees whether they have any advice to offer related to being successful in the chosen profession or otherwise.

Professional Etiquette
Shake hands with your interviewer before and after the interview. Smile. Look the interviewer(s) in the eye when speaking. Bring a bottle of water to each interview to avoid “cotton mouth.”

Acknowledge your Gratitude
Send your interviewer(s) a handwritten note of thanks following the meeting.

Prospective Interview Questions

Motivation

1. Why do you want to be a medical doctor?

2. If you want to help people, why not social work?

3. What stimulated your interest in medicine?

4. What are your alternative plans if you don’t get into medical school?

5. Why have you waited so long since graduation to apply to medical school? Please expand on your hesitations and/or personal circumstances and what has changed since then.

Preparation

1. What experiences have you had working with diverse populations?
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>2. How do you stay current with recent advancements or issues that impact biomedical research and the population at-large?</td>
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<tr>
<td>3. I see you earned a [insert poor grade, i.e. D] in [insert name of a math course] your sophomore year. Have you taken any supplemental math courses since then? If no, how have you been able to continue your scientific career with so little math? Do you foresee this being a problem in our math intensive curriculum?</td>
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<tr>
<td><strong>Knowledge of Biomedical Field</strong></td>
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</tr>
<tr>
<td>1. What specific discipline within biomedical research (i.e. immunology, genetics, cell biology) appeals most to you and why?</td>
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<tr>
<td>2. What do you think is the most pressing issue in research today?</td>
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<tr>
<td>3. What do you think is the most pressing issue in medicine today?</td>
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<tr>
<td>4. What impact do you want to have in scientific research?</td>
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<tr>
<td>5. What impact do you want to have on the medical profession?</td>
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<tr>
<td>6. What percentage of time do you envision your future career involving research, teaching, and clinical care?</td>
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<tr>
<td>7. What are your specific goals in medicine/research?</td>
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<tr>
<td><strong>Analytical Thinking / Problem Solving</strong></td>
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<tr>
<td>1. If you received a $10 million dollar grant to do research, what would you do?</td>
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<td>2. How do you anticipate responding to/handling a situation in which a patient is angry about his/her diagnosis?</td>
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<tr>
<td>3. You’re at clinic and have patients to see, a research grant due the next day, and your husband/wife calls from work asking if you can pick up your daughter from soccer practice since s/he’s busy. What do you do??</td>
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<tr>
<td>4. Who would you say has been the most influential person in the last one-hundred years?</td>
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<td>5. What is your definition of integrity?</td>
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<tr>
<td><strong>Institution-Specific</strong></td>
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<tr>
<td>1. What specific qualities are you looking for in a medical school?</td>
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</tbody>
</table>
2. From what you understand of medical school, what part of the program will be most difficult for you?

3. What attracted you to this program? and/or Tell me your opinion of this medical school’s curriculum.

### Personality Traits

1. What newspapers, journals, etc. do you read on a regular basis?

2. Tell me about a stressful situation that you encountered and what it taught you about dealing with stress.

3. How do you handle change?

4. Tell me about a time when you demonstrated initiative.

5. Tell me about a time when you faced a conflict or anger with another individual.

6. Tell me about a time when you failed. How do you handle failure?

4. Tell me about a time when you’ve been disappointed.

5. What two things would you consider your greatest strengths?

6. What two things would you consider your greatest weaknesses?

7. What do you do when you are not at work or school?

8. How would your teammates describe you? How would your professors describe you?

9. Describe your style of communicating and interacting with others.

10. Discuss a book that you have recently read for pleasure. Why did you select that book?

### Interview Schedule

<table>
<thead>
<tr>
<th>Interviewer</th>
<th>Interview Format</th>
<th>Date/Time</th>
<th>Phone/Email/Skype Name</th>
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Graduate School Interview Preparation / Questions / Mock Interview Schedule

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**Knowledge of Biomedical Field**

1. What specific discipline within biomedical research (i.e. immunology, genetics, cell biology) appeals most to you and why?

2. What do you think is the most pressing issue in research today?

3. What impact do you want to have in scientific research?

**Analytical Thinking / Problem Solving**

1. If you received a $10 million dollar grant to do research, what would you do?

2. Who would you say has been the most influential person in the last one-hundred years?

3. What is your definition of integrity?

**Institution-Specific**

1. What attracted you to this program? and/or Tell me your opinion of this school's curriculum.

2. From what you understand about graduate school, what part of the program will be most difficult for you?

3. What specific things are you looking for in a graduate program? Please offer 5 attributes.

**Personality Traits**

1. What newspapers, journals, etc. do you read on a regular basis?

2. Tell me about a stressful situation that you encountered and what it taught you about dealing with stress.

3. How do you handle change?

4. Tell me about a time when you demonstrated initiative.

5. Tell me about a time when you faced a conflict or anger with another individual.

This Interview Guide was prepared by Fred Hutch Summer Undergraduate Research Program (SURP) staff. The SURP is supported in parts by the Cancer Center Support Grant (CCSG) CURE Supplement: 3 P30 CA015704; the Partnership for the Advancement of Cancer Research: U54 CA132381 (Fred Hutch) and U54 CA132383 (NMSU); the Fred Hutch Internship Program; and individual labs/research groups.
6. Tell me about a time when you failed. How do you handle failure?

4. Tell me about a time when you’ve been disappointed.

5. What two things would you consider your greatest strengths?

6. What two things would you consider your greatest weaknesses?

7. What do you do when you are not at work or school?

8. How would your teammates describe you? How would your professors describe you?

9. Describe your style of communicating and interacting with others.

10. Discuss a book that you have recently read for pleasure. Why did you select that book?

<table>
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<th>Interview Schedule</th>
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How to Write an Abstract
How to Conduct a Literature Search

Literature searches are most commonly done when writing abstracts, research papers, or scientific reviews. They are used to locate articles, citations, and other information to substantiate or refute a given topic. The internet offers a number of avenues from which to conduct literature searches, but here are some sources that have been found to be the most useful. Although literature searches are fairly straightforward, there are some techniques that you can use to access articles that would otherwise require a journal subscription. This protocol will guide you through the process of conducting a literature search and obtaining articles that may require a journal subscription.

Technique #1: Enter the entire title of the article in Google Scholar and try the “All [#] versions” link at the bottom of each result. Look for “PDF” and/or “HTML” links. Make sure to click all of the links available as some may contain a “full text pdf” option.

Technique #2: Enter the entire title of the article in Google. If you cannot find a full text article, try adding “PDF” to the search.

Technique #3: Enter the entire title of the article in Pubmed (Get Article Enabled) from the Arnold Library website: http://sharedresources.fredhutch.org/

Technique #4: Request the article from the Fred Hutch’s Arnold Library:
- Search for the title of the article in PubMed (Get Article Enabled) using the instructions outlined in Technique #3.
- Select the article from the choices (if there are multiple).
- You will see a “FHCRC Get Article” button in the top right corner of the screen. Press that button and you will be taken to an Arnold Library webpage. Click on the link “Request it from the Library’s Document Delivery/ILL Service.”
- NOTE: this technique requires that you fill out an order form and may take weeks for the article to be delivered, therefore it takes the longest and should be used as a last resort.

2016 SURP intern, Johnson Ung, sporting a wig and fake mustache, Adair Lab, Clinical Research. Photo credit: Stephanie Louie
Sample Abstracts

Evaluation of Home-Based Colorectal Cancer Education Methods among Hispanics
E. A. Morales

Nearly 67% of Hispanics ages 50 and older reported they never had a screening colonoscopy. This study used an approach to increase screening rates among Hispanic populations. In Yakima Valley, Washington, Hispanics ages >49 (n=65) were surveyed on their general cancer knowledge, and then participated in “home health parties” designed to increase awareness, knowledge, and encourage colorectal screening. The participants were given a post-party survey to test effectiveness of the intervention. Twenty-five percent of the participants were screened after the intervention, and there was a 26% increase of knowledge of fecal occult blood test and 18% increase of knowledge about sigmoidoscopy/colonoscopy. Seventy-eight percent of the Hispanic males in the study (n=19) who participated in home health parties received colon screening. Increases in knowledge, screening consideration, and colorectal cancer screening proved home health parties to be an effective educational intervention.

Structural Study of Human Siderocalin and Iron Bound Siderophore, Vibriobactin
Natasha Yazzie\textsuperscript{1}, Matthew C. Clifton\textsuperscript{2}, and Roland K Strong\textsuperscript{2}

\textsuperscript{1}Department of Chemistry and Biochemistry, New Mexico State University,
\textsuperscript{2}Division of Basic Sciences, Fred Hutchinson Cancer Research Center

In all microorganisms, iron is an essential element for growth and survival. To acquire iron from their host and environment, bacteria and fungi release small organic molecules called siderophores, which are iron-chelators that bind to scarcely available iron III (Fe+3). One bacterium that utilizes this system of iron transport, Vibrio cholerae, is the causative agent of the severe diarrheal disease cholera. In order to acquire iron from its host, V. cholerae secretes the siderophore vibriobactin. In response to a bacterial infection, neutrophil granules from the human immune system secrete the bacteriostatic protein Siderocalin (Scn) that binds to iron bound siderophores. Studies have shown that Scn binds to siderophores vibriobactin and enterobactin (from Escherichia coli) despite their different chemical structures. To understand at the structural level how Scn interacts with iron bound siderophore vibriobactin, we have over-expressed and purified human Scn from E. coli. Scn was then loaded with Fe-vibriobactin and set into crystallization trials. Potential crystal formation from crystallization trials will be scaled up. Once crystals are obtained, we will perform crystallographic experiments to obtain details about the Scn Fe-Vibriobactin interaction.

Prophylactic Oophorectomy, Menopausal Symptoms, Anxiety and Quality of Life
Roxana M. Torres, Rachel M. Ceballos, Bonnie A. McGregor

Ovarian cancer is the leading cause of death among all gynecological cancers. Currently prophylactic oophorectomy (PO) is the most effective means to reduce lifetime risk of ovarian cancer among women at elevated risk for ovarian cancer. However, the effects of PO, such as menopausal symptoms on perceived quality of life, have not been well-studied. This present longitudinal study investigates changes in quality of life from before to after PO. In this study, women who have chosen to undergo PO are given surveys pre-operatively and at three time intervals post-operatively (2, 6, and 12 months) to assess levels of anxiety, menopausal symptoms, and perceived health status. It is hypothesized that women with an increased number of menopausal symptoms will report a decrease in perceived health status and an increase in general anxiety levels. It is also thought that women with high levels of self-reported satisfaction with their relationships will report fewer adverse sexual-related menopausal symptoms. These variables will be measured using the SF-1, a modified 16-item version of the Breast Cancer Prevention Trial (BCPT) checklist, the Speilberger State and Trait Anxiety Inventory (STAI), and a relationship satisfaction question. As this study is still in progress results are pending. It is anticipated that all three hypotheses will be supported and that statistical analysis will reveal significant relationships among the variables under investigation.
The Evaluation of Gene Expression Buccal Cells
Danielle Miranda¹, Irena King²

¹New Mexico State University, Las Cruces, NM 88003,
²Fred Hutchinson Cancer Research Center, Seattle, WA 98102

Introduction: Large scale studies use RNA expression for cancer prevention and progression. Non invasive sources of RNA are buccal cells; however, the quality of RNA may be compromised. This project investigates the quality and quantity of buccal RNA suitability for future studies on gene nutrient interactions.

Objective: The main goals are to compare different extraction methods to optimize total RNA yield for cytobrush collections, and to determine if ribosomal genes 18S&28S levels are stable in buccal RNA.

Methods: Buccal cells were obtained from volunteers and were either immediately preserved or left on bench for 5 days before freezing at -80°C. RNA is extracted with RNeasy (Qiagen, Valencia, CA) or QuantiGene Reagent System from Panomics (Fremont, CA). Total RNA is quantified with a RiboGreen fluorescent dye procedure. The quality of RNA will be analyzed by Agilent 2100 Bioanalyzer using the RNA 6000 Pico Lab Chip Kit.

Results: Extraction of RNA from cytology brushes is being used to assess gene expression patterns. The buccal RNA 28S&18S are expected to be of sufficient stability for RNA quality for gene expression studies. About 77,700 buccal cell specimens have been collected from the VITamins And Lifestyle (VITAL) Study. This method will be used in a grant proposal on gene-environmental interaction signatures by RNA profiling in exfoliated buccal mucosal cells.

Conclusion: Future research will be done on the VITAL study buccal cell samples using the RNA extraction method developed in this process that gives optimal RNA expression. The project is currently being conducted with promising results.

HIV Envelope Epitope Immunization
Will McClellan¹,², Camille Bretz², Roland Strong²

¹New Mexico State University, Las Cruces, N. Mexico,
²Fred Hutchinson Cancer Research Center, Seattle, Wash.

In the development of the HIV vaccine, we are currently unable to elicit by immunization antibodies capable of neutralizing a wide variety of HIV strands. Neutralizing antibodies have been found which bind to various epitopes on the HIV envelope. These epitopes vary in prevalence among HIV strands. 4E10 and 447D are two envelope epitopes with high prevalence. The goal is to develop a protein scaffold which holds and presents the E410 and 447D epitope in such way that elicits a neutralizing immune response to that epitope. E. coli plasmids, which were encoded for specific epitope carrying scaffolds, were brought in from an outside lab. This plasmid was transformed via heat shock into E. coli and grown in medium. The E. coli was then induced to over express the scaffold sequence of the plasmid. The resulting scaffold was purified and concentrated. The scaffold expressed in a soluble form was tested in guinea pigs to check for an immune response. Out of the 52 scaffolds attempted, 25 were expressed and soluble, of which 8 were tested for immune response. Of the 8 tested, 2 bound sufficiently to antibodies; however this binding did not occur at the epitope region of the scaffold. Thus far, none of the scaffolds have elicited an immune response
How to Create a Scientific Poster
How to Create a Poster Using PowerPoint:
Microsoft Office 2016, Windows 10

1. Open Microsoft PowerPoint.
2. Select “Blank Presentation.”
3. Right click on the slide, select “Layout” then “Blank.” This will remove any text boxes from your presentation.
4. Reference the instructions for the required poster size; a common size is 4 ft. wide by 3 ft. high.
   - It is important to know in advance what paper size your institution’s/department’s printer uses. Many printers use a defined paper roll dimension; therefore you may need to identify another print source for your poster.
5. To set the poster size, click on the “Design” ribbon at the top of the page. On the right side, click “Slide Size” then “Custom Slide Size” and enter 48 inches wide and 36 inches high [for a 4’ x 3’ poster]. Select “Landscape” as the orientation.
   - A dialog box will appear asking if you would like to “Maximize” or “Ensure Fit.” Since your slide is blank, it does not matter which option you chose.
6. Click “OK.” If you get an error message that says the document is bigger than your printer, click “OK;” you do NOT want to use the Fix option.
7. To ensure consistent formatting and spacing, apply a grid to the slide. To insert a grid, click the “View” ribbon at the top of the page, and under the “Show” section check the boxes for “Gridlines” and “Guides.” To enter grid settings, click on the square with an arrow inside it on the bottom right of the tool bar.
   - Set the spacing to 1 inch.
8. To enter data and text on the slide, click the “Insert” ribbon and select “Text Box.”
   - Title fonts should be between 80 - 96 points.
   - Section headers should be between 45 - 50 points.
   - Text fonts should be between 24 - 28 points.
   - Figure legend fonts should be between 22 - 26 points.
9. To insert a superscript number(s), highlight the number(s) that you want to make superscript. Go to the “Home” ribbon, section “Font.” To enter font settings, click on the square with an arrow inside it on the bottom right of the tool bar. Then check the “Superscript” box. Superscript numbers are necessary when denoting the authors’ respective institution(s) on the poster. The superscript number goes after the authors’ names and before the corresponding name(s) of the institution(s).
10. To insert images onto the slide, click “Insert” and click “Picture.” You may also copy and paste images onto the slide or drag the item onto the slide from the original source. You should always edit the images (in a program like Photoshop®) before inserting or pasting on the slide.
11. To add a chart, first create it in Excel (making sure all of the colors and fonts are the same as those on the slide) and then copy and paste it onto the PowerPoint slide. Another option is to create the chart in PowerPoint by clicking on “Insert” and selecting “Chart.”
12. Tables and/or graphs can be created in Word, Excel or in the PowerPoint slide. If it is a large table or graph, it may be easier to create it in Word or Excel and then copy and paste it onto the slide. The format, font, and text can be edited in PowerPoint after the table or graph has been inserted onto the slide.

If the table and/or graph is created in Word or Excel with the colors and fonts that match the PowerPoint slide, the table or graph can be pasted onto the slide as an image. To do that, select the table or graph in Word or Excel, right click, and select “Copy.” Then go to the slide, and under the “Home” Ribbon select “Paste” then “Paste Special.” Select “Picture (Windows Metafile),” but do not paste it as a link.
If pasted as an image (picture,) the table or graph can be made larger or smaller to fit the desired size, but the content of the table or graph cannot be edited on the slide. If edits are needed, it will need to be done in the original Word or Excel document and then copied and inserted using “Paste Special” again. This method is preferred when doing more complicated tables or graphs.

13. To add a **figure legend**, create a text box above, below or beside the image, chart, table, or graph, and write the figure number and a brief title/description of the figure in bold. It is important that the figure legend placement (whether above, below or beside) is consistent throughout your poster.

14. When **inserting logo(s)**, make sure the background color is consistent with the poster. To create a consistent background color, insert the logo image(s) (see instruction #10 above). Select the image, and click on the “Format” ribbon. Under the “Adjust” toolbar, select “Color” then “Set Transparent Color.” Next, click the logo background that does not match the poster background and it will automatically match the background color of your poster.

The RGBs for the four-color Fred Hutch logo is as follows:

<table>
<thead>
<tr>
<th>Color</th>
<th>Navy</th>
<th>Green</th>
<th>Turquoise</th>
<th>Teal</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>18</td>
<td>137</td>
<td>57</td>
<td>32</td>
</tr>
<tr>
<td>G</td>
<td>48</td>
<td>195</td>
<td>182</td>
<td>124</td>
</tr>
<tr>
<td>B</td>
<td>84</td>
<td>72</td>
<td>185</td>
<td>126</td>
</tr>
</tbody>
</table>

**Sample Fred Hutch Logo Color Poster**

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**Introduction**

**Methods**

**Conclusion**

**Objective**

**Results**

**References**

**Acknowledgements**

**Contact Information**
How to Create a Poster Using PowerPoint:
MS PowerPoint for MAC - Version 15.24

The default slide size is currently 10” x 7.5.” To set the poster size for a 4’ x 3’ poster:

1. **For Newer Versions of Mac:** Click the “Design” tab on the ribbon and select “Page Setup.”

   **For older versions of Mac:** Click “File” at the top of the page [in the grey menu bar], “Page Setup.”

2. In the size section, you should see the following:
   - Slide sized for: Custom
   - Width: 48 inches
   - Height: 36 inches

3. At the bottom of this window, select “Options.”

4. From the “Paper Size” pull-down menu, select “Manage Custom Sizes…”

5. Near the bottom left of this window, click “+.” The word “Untitled will appear in the list above. Double-click this word and rename it “Poster.”

6. Change the settings:
   - Page Size: Width 36 in, Height 48 in
     - NOTE: Height and width are the reverse of the actual poster. This is because the paper roll in the printer is 36 inches wide, so the poster actually prints sideways.
   - Printer Margins: Top 0 in, Left 0 in, Right 0 in, Bottom 0 in.

7. Click “OK” on the three pop-up windows to close.

To add gridlines/guidelines to your poster:

1. On the top of the page, click “View” [in the grey menu bar] and select “Ruler” and “Guides.”

2. To add additional gridlines (either vertical or horizontal), hold down the Option key. Click and drag the gridline to the desired place on your poster to assist with proper alignment.

   **Dynamic Guide:** This is an alignment tool that determines what other objects in the present slide/poster you might want to align a specific object with. This feature is usually turned on by default, but to ensure that it is active, go to “View” at the top of the page [in the grey menu bar] and click “Guides”, then select “Dynamic Guides.”

   **Static Guide:** This is an alignment tool that helps center objects on your poster. The default static guides are a horizontal and vertical line through the center of the poster. To add more static lines, follow the instructions above on how to add gridlines/guidelines to your poster.

Change background color:

1. **For newer versions of Mac:** Click on the “Design” tab on the ribbon toolbar. Then, on the top right corner, click “Format Background.”

   **For older versions of Mac:** Right click on the slide, click “Format Background.”

2. Choose your desired background color, including transparency, gradient, and pattern. *To create an “ombre” look for your poster, use the gradient category to adjust your colors.

3. If you know the RGB of the background color you would like, select the Color icon – this looks like a tipped over paint can with a color strip.

4. At the bottom of the window, select “More Colors...” Click on the icon that appears to look like two color sliders – the top slider looks magenta, whereas the bottom slider looks blue. Select the drop-down menu and click “RGB Sliders.”

5. Add in the correct values in the corresponding spots.

6. Select “OK.”
The RGBs for the four-color Fred Hutch logo is as follows:

<table>
<thead>
<tr>
<th>Color</th>
<th>Navy</th>
<th>Green</th>
<th>Turquoise</th>
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<td>B</td>
<td>84</td>
<td>72</td>
<td>185</td>
<td>126</td>
</tr>
</tbody>
</table>

To superscript a number:
1. Insert the number as necessary. Highlight the number and right-click.
2. Select “Font” and under the Effects category, click “Superscript” located in the first column. Select OK.

To make the background color of your logo to be consistent with the poster background color:
1. Insert the desired logo onto the poster. Adjust size and location accordingly.
2. Click on the image. On the toolbar ribbon, click the “Picture Format” tab.
3. Click “Color” (For older versions of Mac, click “Recolor”) and select “Set Transparent Color.”
4. Click the background color in the logo that does not match the poster background color.

Saving the Poster for Print:
1. Go to “File” on the menu bar and select “Print”. Your poster should appear in a new window in the correct orientation.
2. At the bottom left corner, click “Save as PDF.”
3. Open the resulting PDF file and make sure that it looks like you intended.

**Sample Fred Hutch Logo Color Poster**

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**BACKGROUND**

**STUDY AIM**

**METHODS**

---

**RESULTS**

**CONCLUSION**

---

**CONFLICTS OF INTEREST**

**FUNDING**
The Title of This Poster is Printed at 96 Points, in a Shaded Text Box

Author 1, Author 2, Author 3, (the authors and addresses are in 80 point font)
Institution 1, City 1, State 1, Country; Institution 2, City 2, State 2, Country 2, ...

ABSTRACT (48 point, bold)
Or
INTRODUCTION
The abstract or introduction section often goes here. This text is often in 24 to 36 point.
You can use color in your font to make emphases, or color in text box shading relate topics.
This is where you state the Hypthesis
Significance of the research problem
Key work already done by you (your mentor’s group) or others.
Very, very brief background information.

RESULTS
The major results are often displayed in the center of the poster.
Data tables can be pasted in from work or Excel or created directly in pose point.

You can group text boxes or objects.
You can align them to appear as a single column: select the text box, or object and under format, then position, you can set it to be located at a precise distance from the edge of the poster. All of the elements in the column can be registered using this method, or by using guides or by using the rulers on the edges of the slide screen.

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<tr>
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<th>Data 3</th>
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</tr>
<tr>
<td>E</td>
<td>9</td>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>

RESULTS (con’td.)
Sometimes its helpful to state the interpretation of the data image as it’s heading.

Over-expression of gene b is correlated with faster clearance of compound Y.

CONCLUSIONS
✓ New method for measuring compound Y is faster and more accurate
✓ Gene B is crucial for process Z.
✓ Need to further analysis on ..... 

ACKNOWLEDGEMENTS
It’s always important to acknowledge the funding source of your research by grant number and agency; as well as anyone who helped on the project that is already included as an author.
Poster Design Considerations

A poster should describe interesting aspects of your project and tell a clear story. Most people spend three to five minutes (or less) looking at a poster; therefore, the poster needs to deliver your message quickly. Choose ONE essential concept to address in your poster. Before you begin selecting charts, graphs, and photos to include, ask yourself this question:

If the viewer remembers only one idea about my work, what do I want that idea to be?

Your answer will determine the theme of your poster; therefore, everything included on your poster needs to support this theme.

- **Tell your story with graphics as much as possible.** An efficient way to structure a poster is to choose the graphics first and then write the “story” and arrange the spatial flow of the poster around the graphics.
- **Make graphics large enough** so that viewers can read them from a distance.

Formatting Basics

Your poster should look simple and uncluttered. Someone standing three feet away should quickly understand what each component is and why it is there. Illustrations and photographs should be clear and properly proportioned. Use high-resolution (between 200 – 300 dpi) images – images with a higher resolution than that will only waste file size and slow down the printing process. TIFF or GIF images are best.

- Use left justification, which has been shown to be the easiest to read.
- Keep text to a minimum.
- **Diagrams and a bulleted list** are more efficient than words or paragraphs.
- Apply a **1.5-line spacing** to everything except the Acknowledgements and References (if included) sections.
- Viewers cannot read small type from a distance. Use the **appropriate font size** per section header (Title fonts should be between 80–96 points; section headers should be between 45–50 points; text fonts should be between 24–28 points).

Creating Design Unity

- White space (sometimes called negative space) refers to any area not covered by a design element such as a picture, word, or letter. **White space guides the eye and makes the other components stand out.** If you have too much white space, your viewer’s eye may wander. If you have too little white space, your viewers may get confused.
- **Be font consistent!** Times New Roman, Helvetica, and Arial are recommended because of their readability.
- Color should be used for emphasis, but be aware of the connotations that certain colors and color combinations carry. For example, black and orange carry the connotation of Halloween. In most cases, the background of your poster should be a solid color rather than a pattern.
Some Final Tips
Throughout the entire process, we encourage you to discuss the content of your poster with your mentor(s), professor(s), and/or peer(s).

- Ask your mentor(s), professor(s) and/or peer(s) to review your poster. After you have gathered feedback and incorporated the final edits, be sure to run spell-check.
- Due to the high volume of print production that occurs shortly before a poster session or conference, the turnaround time for poster printing is usually three to five business days. Simply put; don’t procrastinate!
- Always request and thoroughly review the contract proof [a model of your poster printed to scale] prior to having your poster printed in full-size.

PowerPoint Templates for Poster Presentation

Below is a list of sites that have several free, downloadable PowerPoint templates:

PosterPresentations.com

Poster Session.com

Wake Forest University Creative Communications
http://www.wakehealth.edu/Creative/Posters/PowerPoint-Templates-for-Large-Format-Posters.htm

Genigraphics
https://www.genigraphics.com/templates
Characterizing Suppressor of Cytokine Signaling (SOCS) SH2 domain binding specificity using phage immunoprecipitation sequencing (PhilP-Seq)

Timofey A. Karginov, Jonathan A. Cooper
The University of Chicago, Chicago, IL; Fred Hutchinson Cancer Research Center, Seattle, WA

BACKGROUND & SIGNIFICANCE

SOCS proteins are well-studied group of suppressor receptor subunits for the cytokine receptor tyrosine kinase receptors (e.g., IL-6 and IL-12). They negatively regulate the signaling of these receptors, thereby modulating the immune response. SOCS proteins have been shown to inhibit the activation of downstream signaling pathways by various mechanisms, including suppression of receptor tyrosine kinases, inhibition of signal transducers and activators of transcription (STATs), and recruitment of SH2-containing proteins.

CONCEPTS

In this study, we investigated the binding specificity of SOCS proteins using phage immunoprecipitation sequencing (PhilP-Seq). This approach allows for the identification of protein-protein interactions and the mapping of protein interaction sites in a high-throughput manner. We used a phage library containing cDNA sequences of the complete human genome.

AIMS & APPROACH

1. To investigate whether Src can function in the presence of the phage library. Approach: Include known Src substrates, Dab1 and Paxillin, in src kinase assays with and without phage.
2. To measure stoichiometry of Src substrate phosphorylation in the presence and absence of the phage library. Approach: Measure Paxillin bound to anti-pY 4G10 coated beads relative to total and unbound samples.
3. To identify novel substrates of SOCS-SH2 domain using PhilP-Seq. Approach: Develop GST-SOCS-SH2 domain constructs bound to glutathione (GSH) beads to isolate phosphorylated phage for PhilP-Seq experiments.

RESULTS

Src phosphorylates both Dab1 and Paxillin in the absence of phage. In the presence of phage, substrate phosphorylation decreases while Src auto-phosphorylation is not significantly affected.

CONCLUSIONS

- Src can phosphorylate substrates Dab1 and Paxillin, although its activity is inhibited in the presence of phage. Phage will be profiled to address this issue.
- Immuno-precipitation experiments showed efficient binding of phospho-Paxillin to beads. Future PhilP-Seq experiments may require higher phosphorylation levels in the presence of phage.
- GST-SOCS-SH2 binds to phospho-Dab1, although phosphorylation levels of Dab1 are low compared to total Dab1. GST-SOCS-SH2 will be used to bind phage library, in order to then analyze new SOCS-SH2 substrates using Next Generation Sequencing.

ACKNOWLEDGMENTS

Thank you to the Cooper lab for their support and efforts. This work is funded by RO1GM105147. The Summer Undergraduate Research Program is supported in part by the UCIP Jeff Metcalf Summer Cancer Research Fellowship Program, the Cancer Center Support Grant (P30 CA015704-41S1), the Fred Hutch Internship Program, and individual advisor research groups.
Characterization of antibodies from HPV vaccinated women and identification of epitopes on the surface of HPV-16

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1Fred Hutchinson Cancer Research Center, Seattle, WA; 2Whitman College, Walla Walla, WA; 3University of Washington, Seattle, WA

Introduction
Human papillomavirus (HPV) is the most common sexually transmitted infection in the United States. Oncogenic HPV types are associated with 99.9% of cervical cancers worldwide, with HPV type 16 being the most prevalent. A vaccine comprised of two or more Virus-like Particles (VLPs) protects against HPV infection with almost complete efficacy in prevention of infection and disease.

Vaccines
- Small papillomavirus particles made of structural proteins L1 and L2.
- Pre-cleaved viral non-structural protein 10.

Virus-like Particles: VLPs are used in the HPV vaccine.
- Associated with the major capsid 1 protein (p13.2 or viral DNA).
- Quadrivalent vaccine (qHPV) protects against HPV types 16, 18, 6, and 11.

Epitope Mapping
- HPV-16 specific B memory cells of qHPV vaccinated women were analyzed by binding to 1 protein sequence on the surface of HPV-16 VLPs.

Conclusions
- HPV-16 specific antibodies cloned from B memory cells of women vaccinated with the quadrivalent HPV vaccine are potentially neutralizing for HPV-16.
- We found an IgA, IgG2 heavy chain isotype raised against HPV-16. This is the first IgA to be identified for HPV.
- Epitope mapping showed antibody binding sites at E6, E7, and E8.

Future Directions
- Repeat the epitope mapping process on antibodies cloned from B memory cells specific to other high-risk HPV types.
- The ability of HPV VLPs to induce high-titer antibody responses has led to the proposal to use them as the backbone for the presentation of epitopes from other HPV immune boosters. Understanding which epitopes are immunogenic may help in the design of future vaccines.

Acknowledgments
Galloway, Jody
Dye, Kristine
Wipf, Greg
Carter, Jody
Scherrer, Erin

Literature Cited
Using the Coalescent Framework to Detect Missed Infections in Phylogenetic Trees

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In Cutbreaks, Some Infections are Missed

In some epidemiological outbreaks, understanding of viral spread can help direct resources toward treatment and prevention of outbreaks in areas that would have been missed. This statistical methodology sites to quantify the proportion of samples expected under each node in a phylogenetic tree using a coalescent framework. Additionally, it highlights areas likely to be under-sampled through finding discrepancies between the observed tree and sample expectations.

The Coalescent Framework

Models generations until lineages of individuals in a population share a common ancestor. Parameters in the Coalescent

\begin{itemize}
  \item \textbf{1. N-Population Size}
  \item \textbf{2. K-Number of Lineages}
\end{itemize}

Tracking Node Probabilities and Transmission Chains in Ebola

For the example Ebola tree, the probability of infection spread is higher for nodes with larger proportions in earlier nodes due to the most recent sampled node. Nodes with large differences in proportion when compared to neighboring nodes indicate a larger proportion of samples expected to fall under these branches.

Translating Probabilities into Under-Sampled Areas

For each node, take the logarithm of the proportion of tips in the subtree (\(P\)) for every interval

\[
L_j = \log(v_j)
\]

For each node, take the logarithm of the proportion of tips in the subtree (\(P\)) for every interval

\[
L_j = \log(v_j)
\]

Proportion of Tips Under Nodes

For the example Ebola tree, the probability of infection spread is higher for nodes with larger proportions in earlier nodes due to the most recent sampled node. Nodes with large differences in proportion when compared to neighboring nodes indicate a larger proportion of samples expected to fall under these branches.

Future Work

Both velocity and bias should be assessed to validate this method. To accomplish this, simulation studies where the full tree structure is known and some fraction of sampled tips are dropped would allow comparisons between proportions of tips under nodes in trees from observation and calculation.

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References


Analyzing T Cell Phenotypes in Chronic Graft-Versus-Host Disease After Naive T Cell-Depleted Hematopoietic Stem Cell Transplantation

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\(^1\)Whitman College, Walla Walla, WA; \(^2\)Fred Hutchinson Cancer Research Center, Seattle, WA

**Background**

Hematopoietic Stem Cell Transplantation (HCT)

HCT can be curative for high-risk leukemia. During HCT, patients are conditioned with chemotherapy and radiation followed by infusion of hematopoietic (blood-forming) stem and immune cells from a matched donor. Donor stem cells migrate to the bone marrow and repopulate the patient's blood and immune system.

Graft versus Host Disease (GVHD)

GVHD can occur when donor T cells attack healthy tissue. Chronic GVHD (cGVHD) can be life-threatening, often requiring long-term immunosuppression. If physicians can predict that a patient is at low risk of cGVHD, immunosuppression can be stopped earlier, reducing risk of infection and relapse.

**Goals**

- Do cytokytic gut-homing T cells or T<sub>reg</sub> have differing expression of markers in patients who develop cGVHD that suggest different cellular function?
- Are there phenotypic differences underlying cGVHD development that can be used to predict patients at high risk?

**Results**

- 20 color flow cytometry was used to compare immune cell subsets at day 28 post HCT in patients who did and did not develop cGVHD.
- T<sub>reg</sub> subset T<sub>reg</sub> cells may predict cGVHD.
- Why did these patients develop cGVHD associated gut-homing T cells? 25% of patients who developed cGVHD had high values of cytokytic gut-homing T cells in T<sub>reg</sub>.
- This led to the following 2 questions:
  - Do cytokytic gut-homing T cells or T<sub>reg</sub> have differing expression of markers in patients who develop cGVHD that suggest different cellular function?
  - Are there phenotypic differences underlying cGVHD development that can be used to predict patients at high risk?

**Conclusions**

- At day 28 post-HCT, patients who later developed cGVHD had
  - 26% more T<sub>reg</sub> expressing Ki-67 (marker of cell proliferation)
  - 3X more cytokytic gut-homing T cells expressing IL-17 (marker of inflammatory activation).

**Future Directions**

- More time points: How does the graft correlate with post-HCT cell populations?
- More markers: What other phenotypes of the cells of interest?
- Different HCT protocols: Are these results unique to T<sub>reg</sub>-depleted HCT?

**Acknowledgements**

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Quantitative protein analysis to map inner kinetochore assembly

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Introduction
A dividing cell must ensure that its sister chromatids properly segregate into its daughter cells to avoid aneuploidy. A key component in maintaining chromosomal segregation is the kinetochore, a highly conserved protein complex that physically connects spindle microtubules to the chromosomes.

Kinetochore protein recruitment during assembly has remained difficult to study in vivo, so we instead use a cell-free method for kinetochore assembly. We currently analyze these assemblies by Western blot, but the technique is limited in that it only identifies a small number of proteins out of over fifty kinetochore components.

To overcome these limitations, we have developed a quantitative mass spectrometry approach, in which kinetochore proteins assembled in vitro are labeled with a molecular tag. Independent kinetochore assemblies can be labeled with unique tags and combined for direct and quantitative comparison by mass spectrometry.

We demonstrate that this technique not only identifies all known kinetochore proteins, but can also quantify the relative amount of each kinetochore protein across multiple assemblies. Furthermore, our new approach has allowed us to investigate subtle effects on kinetochore assembly when performed with various inner kinetochore mutants. This novel approach will allow us to gain a more comprehensive understanding of protein-protein interactions during kinetochore assembly and has the potential to reveal novel proteins important in this process.

Method for kinetochore assembly and quantitative mass spectrometry (MS)

Inner Kinetochore Assembly

Can in vitro assembly in the absence of specific inner kinetochore proteins reveal how these proteins interact?

Hierarchical model of inner kinetochore assembly

The effects of inner kinetochore mutants are subtle

Western blot analysis provides limited insight into inner kinetochore interactions

Analyzing the hierarchy of inner kinetochore assembly

The effects of inner kinetochore mutants are subtle

Western blot analysis provides limited insight into inner kinetochore interactions

Future Directions

1. Generate additional inner kinetochore mutants
2. Identify new kinetochore-associated proteins

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Presenting a Scientific Poster
Presenting your Poster

The Basics

Presenting a poster involves a lot of talking. **Viewers are often more interested in hearing you explain the research as opposed to reading the content of your poster themselves.** You should be able to explain the research and any relevant details in **five minutes or less** to anyone who stops by.

Remember that **you are the expert** and that people with more experience will be asking questions, not to test you, but out of genuine interest. It is important to know the project so that you can field questions without losing confidence. Experienced poster presenters know their work inside and out, forward and backward.

Be aware that you will be approached by experts in your field as well as those that are just curious about the research. To accommodate both the expert and the layman, a good rule of thumb is to **prepare two talks.** You should prepare a **two-minute summary** for people who seem interested in your research, as well as a more detailed version.

Start with the short presentation and **expand** if the viewer(s) starts asking questions. It’s very important that you be able to explain every part of your data, figures, graphs, research, or results.

**Deliver your message quickly!**

The **best presentations make just one point**, loudly and clearly. You might have tested two or three closely related hypotheses, but they should all revolve around the same single point. To deliver just one point, do your best to **develop a summary of your work that you can state in 25 words or less.** Once you know the central message, you need to decide what supporting information to present. The best presentations generally follow the guidelines of a published paper, and include the following sections: Introduction, Materials and Methods, Results, Summary/Conclusions and Discussion/Future Research.

Determine the central message for each section of your poster in your presentation.

**What is the central message of your Introduction?** This section should start with your **general research objectives**, then provide a few lines about the context of your work, and end with a clear statement of the **hypotheses or predictions** that you tested.

**What is the central message of your Methods?** Provide the **bare essentials** with regard to the subjects, study site, and protocol. Don’t be so brief that the viewer can’t figure out what you did, but do give some thought as to what is really relevant to this particular talk. If some facet of your research is peripheral, leave it out.

**What is the central message of your Results?** What did you discover? Did your tests come out the way you expected?

**What is the central message of your Summary/Conclusions and Discussion/Future Research?** This is where you deliver the take-home message. Again, in 25 words or less, what is the dramatic finding that you want your audience to remember? And why should they care? This is very important, because viewers want to know what you did and why it is significant.
How to Deliver a Presentation with Confidence

Know the purpose of your speech.
General purposes of speeches are to: inform, persuade, recommend, request, or entertain. (Pixton, D. W. & Salom, L. G., 2004).

Prepare your presentation well before the day of delivery.
This will decrease your nervousness considerably. (O’Hair, D., Rubenstein, H., & Stewart, R., 2006). However, being nervous is okay, it shows you care! If you are still nervous on presentation day, take a deep breath, relax, and just do your best. Consider having a bottle of water on hand since you will be doing a lot of talking.

- Adequate preparation includes: doing the necessary research to establish a well-founded knowledge of the topic; verbally practicing the presentation in order to make changes where needed; and ensuring the format is well-organized.
- Practice, Practice, Practice. There is a reason this word is repeated three times – there is nothing more important than practicing the delivery of your presentation. The more prepared you are, the better your presentation will be.

Use body language to show that you are engaged and enthusiastic about your presentation.
- Body language includes eye contact, facial expressions, gestures, body posture, and movement. Eye contact is the most essential attribute to keep the audience engaged (Gareis, E., 2006).
- Avoid reading the content directly from your poster.
- Keep your hands out of your pockets and away from lecterns and podiums.

Create drama!
- Speak with enthusiasm! The eagerness of an enthusiastic speaker makes the audience want to listen. (Robertson, C.H.).
- Vary the speed and tone of your voice, which will make your presentation more dynamic and therefore appealing.
- Insert drama with statements such as, ‘and then, something really interesting/surprising/alarming occurred;’ ‘let me tell you what happened next;’ and ‘we were surprised to learn.’

Don’t BS “the expert” / turn questions back to the audience.
- If you don’t know the answer to a question from a poster session judge, investigator, etc, respond with an open-ended question as a way to foster constructive interaction and defuse natural defensiveness. For example, a response such as: ‘That’s an excellent question/suggestion, etc.,’ followed by a statement such as: ‘I hadn’t considered that;’ ‘What would you recommend in that instance?’ How would you suggest resolving that situation?’ shows that you are willing to learn as opposed to being close-minded.
Additional Resources:


Example

INTRODUCTION

Sufficient background information?
Be sure to explain WHY your project is important and how it relates to a broader context (e.g., HOW does it fit in to existing problems/questions?)

Clarity of objectives
What is the MAIN purpose of this study? What question are you trying to answer? Be sure to explain WHY this work is important.

Formulation of hypothesis
Be sure to state a specific hypothesis.

METHODOLOGY

Clarity of experiment design or study
Explain HOW you are testing your hypothesis. Remember that not everyone is an expert in your area of technological expertise, so be sure to explain your techniques/methodology for a general audience.

Methodology fits hypothesis/objectives?
In addition to explaining HOW your technology/methodology works, take a minute to explain WHY your methodology is appropriate for your question.

RESULTS and DISCUSSION

Explanation of analysis/data/results
Be sure you can walk us through your analysis, and tell us about your results. Spend time explaining graphs and figures and walk your audience through the main highlights of your data.

Discussion of importance/contribution
Once you have walked your audience through your results, be sure to point out WHY your results are informative (even if you are rejecting your hypothesis, this is still informative). Tie this part back to your initial introduction of the problem/question (use this time to “close the loop” between your initial question, your data and conclusion).

OVERALL

Organization and flow

Clarity of presentation
Practice your presentation with some lab members or fellow interns in advance!

Visual arrangement/layout
Make sure to use a large font, and avoid having your poster be too small or too busy.

Handling questions
Listen carefully to the question, and don’t hesitate to ask for more information about the question if you are not sure what is being asked.

ADDITIONAL COMMENTS

Total points ____________________
Appendices
Extra Graduate School Personal Statement Examples

The following examples are intended to provide a range of exceptional to mediocre personal statements. These statements are not organized in any particular order.

Personal Statement 10: MA, Public Health Administration

What if people lived healthier lives, practiced preventive medicine, and took precautions against illness and disease? My days in the physical therapy department often made me think about the prevention of injuries as well as the injuries themselves. I was already doubting my future career choice as a physical therapist. Although I loved the science of it and helping people, the lack of variety within the field and its limited options for growth bothered me. I needed a career that helped a large number of people, emphasized prevention and primary care rather than tertiary care, and would continually challenge and motivate me to improve. Knowing that I really did not want to pursue physical therapy as I had originally planned, my thoughts wandered to the area of public health, particularly health management.

My first true introduction to the public health arena came in a class offered through the XXX XX School of Public Health. As I listened to experts speak about contemporary health issues, I was intrigued. The world of “capitation,” “rationing of care,” and Medicaid fascinated me as I saw the range of problems that public health professionals were trying to solve in innovative ways. This one semester class provided me with a basic but thorough understanding of the issues faced in health care today. In the last two years I have continued to learn about public health both through coursework and work in the field.

Because field experience is such a valuable learning tool, I searched for a research assistant position that would allow me to view public health at a different level. I worked on a project at a county health clinic in XXX, a low-income, minority community. The program attempted to increase treatment compliance rates for adolescents diagnosed with tuberculosis who must complete a six-month medical program. Working for the county exposed me to a different side of health care that I had previously seen. Service and organization were not assets of the county and yet its role in the public health “ecosystem” was and is critical. Its job of immunizing thousands and interacting with all members of the community is often forgotten, but is important for keeping an entire community healthy.

My work at the county health clinic as well as my knowledge of some areas of public health led me to accept an internship in XXXX this past summer. The internship provided me with a greater understanding of a federal public health agency’s operations and allowed me to contribute in a variety of ways to the XXX Department in which I worked. Most importantly I worked on “policy issues” which involved identifying and summarizing problems that were out of the ordinary as well as documenting resolved issues in order to establish protocols to increase the department’s efficiency. In addition, I served on a scientific review panel which was responsible for editing a seventy-page proposed regulation before its submission.

Along with my duties at XXX, I attended seminars and met with public health leaders at different functions and events. All these activities confirmed my growing interest in preventive medicine, outcomes and effectiveness, and quality of care, particularly within the private/managed care sector. These are my strongest interests because I believe they are fundamental to our nation’s health. We must achieve efficiency and access without sacrificing quality.

The University of XXXX would help me achieve my goals of furthering my public health education through the specialize coursework offered as part of its health administration program. [The client provides specifics here about the program’s specific appeal and strengths]

Since rejecting physical therapy as a career possibility my interest in public health has only grown. I welcome the challenge of serving a large community and participating in such a dynamic and challenging field. What if an aspirin a day could prevent heart attacks? What if abandoning unnecessary procedures saved thousands of dollars, which then allowed a hospital to treat other patients needing care? What if every person was guaranteed care and that care was good? I would like to find answers for these questions during my career as a public health graduate student and professional.
Personal Statement 11: PhD, Molecular and Cell Biology (MCB)

My name is XXX XXX and I am a senior at the University of XXX, XX. Initially, like many other biology majors, I began college with the goal of becoming physician. My heart goes out to people afflicted with illness and disease and to the families devastated by such news. Naturally, my interest in medical research and pre-med programs led me to discover the on-campus Howard Hughes Medical Institute Research Scholars (HHMI) - and Minority Access to Research Careers (MARC) programs. Being a part of both programs has helped me to realize that my true interests lie in research and helped me refocus my goals towards a career in biomedical research rather than in the clinical arena.

In the HHMI program, I was mentored in developing teaching and learning activities by Dr. XX XXX, a biology educator who uses a scientific approach to understanding the most effective approaches to helping students learn. I contributed to the development of an in-class activity that used raw data generated in another professor’s laboratory. This activity was designed to emphasize several basic principles of molecular biology and we adopted a scientific teaching approach to assess student learning and attitude with respect to the topic. To keep pace with my curiosity and my desire to contribute to laboratory research, I began generating my own raw data for students to use in future in-class activities. As I carried out experiments to generate data for these activities, I realized that I wanted to establish a career focused on cellular and molecular biology.

My lab research experience began in Dr. XX XXX’s laboratory, which studies the regulation of the cytoskeleton in embryonic and somatic cells. It was here that I generated the raw data for my education project. Using a fluorescent protein construct tagged with a signal sequence and ER targeting sequence, I generated mutations in these targeting sequences using site-directed mutagenesis, and then expressed the wild-type and mutant constructs in cultured human cells. The raw data (in the form of fluorescence micrographs of cells expressing these constructs) was then used in an in-class case study exercise in an introductory biology class focused on protein localization. Students were shown either raw (i.e. actual) data versus cartoon representations of the data, and I collected data on student learning and attitudes. I presented results of my data at the 20XX National SACNAS Conference in XX, XXX and completed an undergraduate thesis based on the research I conducted.

To further equip myself for graduate school and for a career as a researcher in biomedical science, I was accepted to the Minority Access to Research Careers (MARC) program. As a MARC fellow, I have been working Dr. XX XXX’s lab on a project that is looking at the importance of the YPEL-5 protein in the final stages of cytokinesis. YPEL-5 was a protein discovered in a genome-wide RNAi screen that has a role in cell division. I have been depleting human HeLa and RPE1 cells of YPEL-5 by RNAi, and I have been able to observe a very late cytokinesis defect in RPE1 cells, but have not been able to observe any obvious phenotypes in HeLa cells, suggesting that YPEL-5’s role in cytokinesis might be cell type-specific.

My interactions with graduate students and other undergraduates stimulated my thinking of research as a career. Clearly, my firsthand experience with the application of the scientific method and the intense study of the basic mechanisms of cell development added to this commitment.

I plan on pursuing a PhD in a biomedical field, where I can study human diseases on a molecular, cellular or physiological level. My passion has always been to help others and I trust that there are many ways to impact that world and help people through research, as research is the mechanism by which we begin to understand the basis for disease as well as how to develop treatments for these ailments. Research is important to me because I have realized being a physician allows you to treat one person at a time. As a researcher, one can improve (or even save) the lives of hundreds or thousands or more, thus changing the world for many people, one project at a time.
Personal Statement 12: PhD, Molecular and Cell Biology (MCB)

I still have the first sample of DNA that I ever isolated, from salmon sperm, in a screw-top test tube located on my dresser at my parents’ house. During my junior year of high school, I attended a seminar at XXX University-XXXX called “Molecular Medicine in Action” where I found those first nucleic acids. Although, that first sample has great importance to me, it was only the beginning of my pursuit of an interest in cellular biology. Almost four years after my first interest in research was piqued at that conference, I have isolated countless samples of DNA, not only for lab courses at the University of XXXX, but also for the two research labs in which I work.

At the beginning of my second year at the University of XXX, I joined Dr. XX XXX’s C. elegans lab. We currently study a novel nuclear pathway of RNAi. I assisted with screening for nuclear RNAi deficient (nrde) mutants, helped map one of these genes, and analyzed phenotypes of these mutants. I crossed these mutants into RNAi mutants with known function to determine where in the known RNAi pathway that nuclear RNAi may bifurcate. In addition, I have attempted to isolate C. elegans viruses. The process of RNAi in plants has been found to fight viral infection. Presumably this may occur in C. elegans as well, but no viruses specific to this species have yet been found. The species C. elegans has been previously isolated on campus. I have revisited the general area of these sites and have determined additional sites around campus that are likely inhabited by nematodes and have taken soil samples from which I have attempted to isolate viruses. Although, we do not have much faith in finding viruses since they have not been found yet, the fun is in the search.

In January 20XX, I joined a lab in the Department of Oncology under Dr. XX XXX, and I continue to work there now. I analyze tumor development in a transgenic mouse containing a proto-oncogene. My project consists of maintaining the mouse colony, as well as palpating and dissecting mice with mammary tumors and fixing tumors for histological study. I have been attempting to determine if mRNA of this proto-oncogene can be used as a marker for tumor presence in humans.

In order to benefit from the labs, I have had to take a number of classes to expose me to the terminology and methods of experimentation. However, the class that has most greatly influenced my future research interests was Eukaryotic Cell Biology. Dr. XX XXX required the class to critique published papers, showing me that I could find the flaws and not take the figures at face value. Moreover, she taught cellular processes like a story, explaining each event in signal transduction cascades as a chapter. Finally having cell processes explained at that level, rather than the vague accounts taught in my prior classes, solidified my desire to do research and continue elucidating the cell processes begun by others.

At this point, from my exposure to a number of different areas of biology, I am most interested in chromatin modification and the various processes that may affect it. This is involved in many cellular processes, such as gene expression, cell division, and DNA repair. Understanding these underlying modifications may help further explain observations in other processes. Specific faculty whose work in particular interest me include XX XXX and XX XXX. Their research encompasses the exact areas in which I am most interested.

In order to continue to pursue my interests in cellular biology, I hope to be accepted to the Molecular and Cellular Biology Program and further develop myself as a scientist. My plan is to receive my PhD, continue in academia, and bring upper level science to high school- and undergraduate-level students. One of the opportunities that I never felt I had was to participate in research in high school, and I would like to give that chance to others while I pursue my graduate degree and after. I currently participate in XXX XX XXX as a science activity leader, helping to expose middle school-aged girls to a range of sciences. I also have worked several interactive activity booths at a variety of conferences for elementary-aged students to introduce them to science.

Through my time in lab, I have learned a number of useful techniques, as well as the downfalls of research, when an experiment does not go well or results are inconsistent. The importance of writing legibly has already been made clear. This past year I misread a lane label on a gel photo and grew the wrong strain and began experiments using it. Luckily the mistake was caught, but valuable time was lost. Dealing with accidents like this has given me experience that will be valuable during my graduate school career.

My previous experience prepares me for graduate school and a career in research. I look forward to continuing my studies and contributing to the scientific community by probing deeper into systems that we do not understand. As Jaques-Lucien Monod said, “Personal self-satisfaction is the death of the scientist. Collective self-satisfaction is the death of the research. It is restlessness, anxiety, dissatisfaction, agony of the mind that nourish science.”
Personal Statement 13: PhD, Molecular and Cell Biology (MCB)

While ‘gutting’ the remnants of a flooded home in XXX XXX during the aftermath of Hurricane XXX, I exposed the yellow agar of a small Petri dish to sample the spore-ridden air of a child’s moldy bedroom. After an improvised collaboration at XXXX State University, ninety plates and a light microscope were used to identify over twenty-five different species of mold in homes across the city—some of them pathogenic to humans. It was this occasion that helped me build upon my prior research experiences to establish an interminable curiosity in pathogens and how they inflict harm in humans.

When I was an undergraduate studying Biology at XXXX State University, I began to develop a deep-seated interest in infectious disease and the mechanisms by which immunity evades or destroys the agent responsible for infection. In a liberal arts environment, my appreciation for host-pathogen interactions was gleaned from multiple faculty members with different biological specialties. In place of classes dealing exclusively with the fields of virology, bacteriology, or immunology, my highly integrated courses were taught by a close-knit department that harbored the value of independent learning. The result was a well-rounded approach that encouraged scholarship through self-discovery. This methodology initially inspired me to delve further into scientific understanding. I often looked for ways to independently increase my breadth of knowledge in subspecialties as I gained a general understanding of them from in-class activities. It is this personal attribute which I believe most closely justifies my interest in pursuing a career in biomedical research.

My first independent research experience was oriented in the field of developmental biology. I studied the inhibitory effects of an herbicide on the oocytes of Xenopus laevis, elucidating the targeted components of the signal transduction pathway leading to maturation. This 10-week experience was very rewarding in that it highlighted the importance of an interdisciplinary approach to laboratory investigation, combining the concepts of organismal development with procedures akin to cell biology and environmental toxicology. The project instilled patience, open-mindedness, and perseverance into my repertoire of scientific abilities. As an introduction to full-time laboratory work, the experience served as a sound foundation to support my subsequent research endeavors. Once I was exposed to microbiology and evolutionary biology as an upperclassman, I was moved to search for a post-baccalaureate program in the field of infectious diseases and immunology.

As a recipient of the XX XXX XX Award at the XX XXXXXX in XXX, XXXX, I worked in the Laboratory of Immunoregulation headed by Dr. XX XXX, director of the NIAID. During my one year fellowship, my research project focused on the characterization of virus-specific CD8+ T cell responses in the context of chronic HIV infection. In particular, I studied cellular immune responses in a rare group of HIV-positive patients called long-term nonprogressors (LTNPs). In an effort to elucidate the mechanism responsible for the immune-mediated control of HIV replication exhibited by LTNPs, I helped develop and optimize a novel in vitro flow cytometric assay to measure cell-mediated cytotoxicity. I also carried out proliferation assays to further investigate the differential proliferative capacities of cells derived from LTNPs and patients with progressive disease. As a result, I have become proficient in tissue culture techniques, cell staining with fluorescently-conjugated monoclonal antibodies, and analysis by polychromatic flow cytometry. The XXXX fellowship was critical to my scientific development because I gained insight into the fundamentals of immunology in a hands-on environment designed to develop (and test) my critical thinking skills. My intimate involvement with an ever-evolving project demonstrated the rewards, as well as the setbacks, associated with ongoing translational research.

My current research post has brought me to one of the foremost research institutions on the XXX coast—the XX XXX XX Research Center. I am working as a research technician in the laboratory of Dr. XX XXX in the HIV Vaccine Trials Network. As a technician for the HVTN Endpoints group, I have been introduced to the demanding, high-pressure environment surrounding clinical research. In the Endpoints section, accuracy and reproducibility are of the utmost importance to the success of the lab as a whole. Whether encouraging or disheartening, the results of the endpoint assays are invaluable to the development of a safe, efficacious vaccine. With this at stake, I have developed an elevated sense of accountability for my actions in the laboratory and a steadfast commitment to my involvement in long-term projects.
As someone who has drawn heavily from a diverse series of research projects, my affinity for the MCB program is based on its multi-departmental approach with an open rotation policy. Of particular interest is the work of XX/XXXX faculty members XX XXX, XX XXX, XX XXX, and XX XXX.

In XXX’s HVTN Laboratory, I am intent on becoming more involved in research associated with vaccine development. For example, I am interested in elucidating the mechanisms by which virologic control is achieved in certain HIV-infected individuals. The local/international duality of clinical research contributed by XXX and XXX suggests a commitment to global health projects designed to provide biological and clinical advancements in HIV research. Their involvement with populations with characteristically high risk of HIV infection coupled with studies of viral pathogenesis combines bench work with field-oriented work—a fusion I aspire to practice in my future.

I am also intrigued by XXX’s analysis of the maturation of CD8+ T cells and the regulation of their responses to self and foreign antigen. I strongly believe that the progression of clinical research in infectious disease requires an increased commitment to efforts in basic immunology. XXX’s work with the interaction between HIV Env glycoprotein and target cell receptor molecules is the epitome of cutting-edge research in host-pathogen dynamics. Together, their insightful publications and seminar presentations have led me to seek a doctoral degree and a future in academia. I am interested in serving as a faculty member of a major research institution, dividing my time between my students in the classroom and those in my laboratory.

I am confident that my experiences thus far have served as excellent preparation for a doctoral program in molecular and cellular biology. As any practiced investigator can attest, the ability to forge collaborations between scientists in many fields is vital to success. My range of experiences has enabled me to learn a tremendous amount through the exchange of ideas at different institutions. I am forever indebted to my mentors for having shown me the hostpathogen dynamics associated with veritable public health concerns. I am eager to begin establishing my long-term presence as a research scientist in the partnership between XXXX and the XX.
Personal Statement 14: PhD, Molecular and Cell Biology (MCB)

Raised by two expatriate professionals in XXX, XXX, I was completely unprepared for the shock I experienced when I began college in my native XXX. I was struck by the poor health conditions and widespread illiteracy. These appalling settings stirred me to actively volunteer at an AIDS awareness and educative campaign. I found this experience to be very rewarding on many levels. In particular, it initiated a deeper understanding regarding the importance of biological research. Also, during this time, I was part of an honor’s program at XXX College in XXXX that focused on scientific experimentation and analysis. These two defining factors complemented my growing interest in research and influenced my decision to become a biological research scientist. Due to XXX’s limited resources and opportunities to carry out biological research and training, I decided to come to the United States to pursue my studies.

My interest in research was further enhanced when I transferred to the University of XXXX. Being a young transfer student alone in the United States was a challenging experience in itself, but adapting to a completely new system of education was even more difficult. As an undergraduate biochemistry and genetics major, I worked in different labs to gain research experience and technical expertise. I was unfamiliar with the sophisticated equipment and techniques used in the labs and had to work hard to keep up with my peers. This initial struggle however prepared me for graduate school and gave me a stronger foundation for working toward my master’s degree.

I pursued my master’s degree in Dr. XX XXX’s lab at the University of XXXX. His group investigates the involvement of mitochondria in the aging process. Abnormalities in mitochondrial electron transport system (ETS) enzymatic activities have been associated with aging skeletal muscle. I designed riboprobes and performed in situ hybridizations on tissue sections to examine the impact of mitochondrial ETS abnormalities on the RNA expression of selected genes. I also measured the levels of a marker of oxidative stress, 8-hydroxydeoxyguanosine (8-OHdG), with age in skeletal muscle fibers and demonstrated the presence of increased steady-state levels of oxidative nucleic acid damage in ETS abnormal fibers. Finally, I attempted to elucidate the fate of ETS abnormal fibers in different aged rats using markers of apoptosis. My results were published in XXX.

After graduation, I moved to XXX to gain some professional experience at XXX Corporation, a gene therapy company that works on both viral and non-viral gene delivery systems. I was involved in the latter and focused on using lipid-protamine-DNA (LPD) complexes for systemic gene transfer. My job enabled me to synthesize LPD formulations, design, implement and interpret in vitro transfection experiments, process and analyze in vivo tissue samples, design and make gene constructs, assist in assay development and use tissue culture to maintain cell lines for future experiments. This product-oriented environment gave me the confidence and discipline to meet deadlines under intense pressure and also instilled in me the importance of teamwork. It also exposed me to the corporate side of science. In fact, my return to academia was motivated by my experience of the insecurity resulting from corporate takeovers and merges, the constant focus on financial profits, inflexibility, product-specific goals and a lack of emphasis on publications.

I currently work in the lab of Dr. XXX, a member of the MCB program in the Department of Orthopaedics and Sports Medicine at the University of XXXX, XXX. The group is broadly focused on exploring how mechanical signals are transduced into biochemical signals in bone cells. My first project was to explore how the extracellular matrix protein, osteopontin, is upregulated by bone cells under conditions of both disuse and oxygen deprivation. I then became interested in understanding the function of heat shock proteins in bone cells under oxygen-deprived conditions and studying their role in enabling osteocytes to survive under these hypoxic conditions. In my two years in Dr. XXX’s lab, I have co-authored a paper in the Journal of XXXX and have presented a poster at the annual meeting of the American Society for Bone and Mineral Research.

My experiences in academia and industry have confirmed my resolve to attend graduate school. In addition to having a master’s degree, I also have extensive research experience in many diverse areas of cellular and molecular biology making me an excellent candidate for the MCB program. The constant intellectual exchanges
with my colleagues, regular meetings with my supervisors and long hours spent planning experiments and interpreting results have strengthened my capabilities as a researcher. In addition, I have attended several conferences, seminars, discussions and journal clubs that have given me a broad perspective on different aspects of biology.

I have selected the MCB program at the University of XXXX to pursue my education further because of its interdisciplinary nature, its tradition of excellence in research and its cutting edge facilities. I believe the program will help me acquire the versatility needed to reach my full potential as a scientist. I believe that the skills I have developed in leading and participating several projects would be an asset not only to me but also to the program. I have also met with several faculty members whose work interests me including XX XXX, XX XXX and XX XXX, XX XXX, XX XXX and XX XXX.

After completing a doctoral degree, I intend to continue my education by pursuing a postdoctoral position. This would strengthen my research capabilities and further prepare me for independent research. Eventually, I would like to pursue a career in academia so I can contribute to the scientific community as an educator as well as a researcher.
Personal Statement 15: PhD, Molecular and Cell Biology (MCB) with concurrent MS, Epidemiology

My current PI insists that science is like boxing: if you get knocked down, you get up and fight again. To me, this is an inspiring but simple comparison? If we are picking sports, I say that science is like swimming. I swam for over a decade, and for my race of fifty seconds I trained five hours per day, five hundred hours per season. Through hard work I qualified for and competed at the NCAA Division I Championships and Olympic Trials. I learned that dedication, perseverance, and mental endurance are necessary to get results. Thus far, these lessons have translated well to research.

As an undergraduate, I conducted honors thesis research in XX. XXX’s Department of Neurobiology and Physiology, in Dr. XX XXX’s laboratory with the guidance of my adviser, Dr. XX XXX. My project constituted early steps in the elucidation of the cellular mechanism of menopausal hot flashes. Building on Dr. XXX’s work, I developed a mouse model and system of measurement for studying hot flashes. Using these animals, I identified colocalization in the estrogen receptor alpha and TREK-1 in the medial preoptic area of the mouse brain, a region involved in thermoregulation. TREK-1, a two pore domain potassium ion channel, is involved in temperature sensing and plays a role in neuronal stability. This identifies a potential role for estrogen action in thermoregulation and therefore a potential mechanism for dysregulation of heat sensing (hot flashes) in the estrogen-deficient state of menopause. The ultimate goal is to characterize the mechanism underlying hot flashes so that safe and effective therapies can treat these symptoms.

This experience opened my eyes to biomedical research. I was excited to find in my fellow lab members a work ethic I had previously seen only in my teammates in swimming. I also enjoyed the logical yet creative process of working through problems both broad and narrow in scope. I was introduced to the day-to-day challenges of working in science; for example, my mice became increasingly adept at removing their temperature-sensing tail cuffs, so I had to stay ahead of their learning curve with new methods of attachment. Additionally, I liked that the ultimate aim of research is to further medical knowledge and capability, improving people’s health and wellbeing. Overall, I found research to be engaging, challenging, and rewarding, and I decided to pursue additional experience and training after completing my undergraduate degree.

Since September of 20XX I have worked as a technician at the XXXX School of Medicine. I joined Dr. XX XXX’s laboratory when he brought his lab to XXXX from XXXX College of Medicine. Our lab investigates the role of estrogens and androgens in metabolism, diabetes and obesity. As the tech I have been responsible for setting up the new lab, but I also have the same research responsibilities as my fellow lab members, I quickly learned the techniques of the lab and have trained entering graduate students. Further, I have developed and optimized several protocols for the lab. I have gained the most thorough knowledge of techniques when things have gone wrong; through persistence in troubleshooting I have learned how to evaluate methods and, more importantly, I have learned the value of communication with colleagues who have much to offer technically and intellectually.

I have contributed to various lab projects, including immunohistochemical analysis for a paper (see end of text) currently in preparation on the role of estrogen receptor alpha in insulin biosynthesis. Confocal images for this paper show expression estrogen receptors alpha and beta in mouse clonal insulinoma cell lines, mouse pancreatic islets, and human islets. Imaging in cells includes localization of endogenous estrogen receptor as well as CFP-linked constructs with vehicle and estradiol treatment. Identification of estrogen receptor expression in beta cells (confirmed by co-localization with insulin) provides basic evidence for estrogen’s role in regulating insulin biosynthesis.

My primary research focus has been the effect of neonatal testosterone exposure in programming a dysregulation of metabolism genes and body weight which emerges in adult mice. We are currently dissecting the details of the interaction of genes and environment at this critical window of development. There are important public health implications: childhood obesity is widespread, and obesity-induced insulin resistance has been shown to increase testosterone production by the ovary. Couple this with the threat of persistent environmental pollutants which mimic the actions of steroid hormones, and there is potential for altered developmental programming of metabolism in prepubescent children. Characterizing the mechanism in the mouse model will provide valuable information for preventative medicine and population health.

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I am drawn to the MCB program for several reasons. I find the philosophy of the program, which encourages students to develop individualized research projects while maintaining a high level of interaction with faculty, especially attractive. A wide variety of interest groups and seminars surely makes for an engaging intellectual environment, and the collaboration between the University of XXXX and the XXX XXXX XXX Research Center provides a uniquely impressive breadth and depth of faculty expertise and innovative research. The work of a number of distinguished faculty assures me that as a graduate student at the University of Washington I would be involved in significant research accomplishments which advance biomedical sciences and human health.

My current research project dealing with developmental programming has piqued my interest in molecular aspects of development and gene regulation as well as environmental toxicology. I am pleased to find faculty investigating related topics at the University of XXXX. I am interested in the work of Dr. XX XXX in the epigenetics of human disease and in developing new techniques for evaluation of DNA methylation. Additionally, I am fascinated by Dr. XX XXX’s research investigating molecular mechanisms of developmental toxicity of mutagens, teratogens, and carcinogens.

Since taking an undergraduate course on the subject, another major interest of mine is the biology of aging. The University of XXXX has an impressive group of faculty that investigates various aspects of senescence, age-related disease, and cancer. The XX XXX Center of Excellence in the XX XXXX Training Grant is evidence of a high level of commitment to this important and exciting field of research. I am particularly interested in the work of Drs. XX XXX and XX XXX, in mice and in yeast, respectively, on genome instability in aging and neoplasia.

I am also interested in the opportunity to participate in the joint Ph.D. /Epidemiology M.S. Program. My research experience to date has made me deeply interested in the greater implications of basic research, especially in public health. I find Molecular Epidemiology a fascinating field, where identification of genetic and environmental risk factors for diseases and disorders can be used to investigate patterns at the population level. I plan to pursue a career which integrates these two scopes of research. I am confident that with training from the University of XXXX, I would have a valuable and effective set of tools for success in biomedical research, whether I continue in academia or in industry. I expect graduate school and subsequent research to be challenging, but through athletics and academics I have learned the level of commitment necessary for success. I am fully committed to the challenge.
Personal Statement 16: PhD, Molecular and Cell Biology (MCB) with concurrent MS, Epidemiology

I have been fascinated by science since I was a little girl. My father is a medicinal organic chemist at the University of XXX, and I used to go to work with him on days off from school. Watching him create and test new compounds that might someday become medicines inspired me to want to be a scientist as well. My first “experiment” was seeing the clouds of fog that appeared when I put water on dry ice. I was amazed that combining two simple things could result in something totally different. In school, my science classes were always my favorites and an advanced anatomy and physiology class that emphasized lab work cemented my desire to major in biology in college. My interest in studying infectious diseases began when I leafed through a friend’s Microbiology textbook during my first year of college, and as I learned more about the subject through my undergraduate courses and research at XXX University, my fascination only grew. I hope to study the mechanisms of pathogenesis of infectious agents, especially those that take their greatest toll in developing nations, with the goal of increasing our scientific understanding of these deadly and debilitating illnesses.

I have had almost four years of research experience, and have found that the more time I spend in the lab, the more I enjoy it. I find it very fulfilling to know that my work is contributing, even if only in a small way, to scientific progress. Although I enjoyed my two undergraduate research projects, my current research experience is the longest period I’ve spent working full time in the lab. This extended time at the bench has allowed me to be really sure that I enjoy research and that graduate school is the right next step for me. Each research experience has not only taught me new technical skills and specific knowledge, but has reinforced my enthusiasm for and commitment to a life in science.

From February of 20XX to March of 20XX, I studied factors affecting human visual acuity under low light conditions, such as might be encountered when driving at night. This research was an undergraduate project in the lab of Dr. XX XXX at XXX University. I worked with human research subjects, measuring their vision and properties of their eyes under various circumstances. Dr. XXX and I initially hypothesized that monochromatic aberrations of the cornea, which occur naturally and can also be induced by LASIK surgery, would be associated with poorer vision. However, I found that aberrations actually had no effect on our subjects’ vision. I was disappointed that my first project had “failed,” but Dr. XXX encouraged me to reexamine the data for other factors that might have an association with vision and we found that, of the parameters we tested, defocus is the major factor limiting vision under low light conditions. Defocus is the difference between where a person’s eyes are focused and where the object being viewed is actually located, and is potentially correctible with non-prescription glasses similar to reading glasses. The experience taught me that a negative initial result isn’t always a disaster and that it’s important to be open to unexpected findings.

I presented this research in a poster at the 20XX Optical Society of America Fall Vision Meeting in XXX, XX, as well as in poster and seminar form as part of the 20XX Howard Hughes Medical Institute summer research program at XXX University. This first project helped me develop important skills in communicating about my research, both in explaining the study to the participants and in conveying my findings to other scientists. I discovered that I love sharing my excitement about science with others.

From March of 20XX until my graduation in May of 20XX, I carried out an undergraduate research project in the lab of Dr. XX XXX at XXX University. This project, which culminated in a senior thesis that was awarded High Honors, was on the subject of innate immune responses to the protozoan parasite and malaria relative Toxoplasma gondii, the cause of Toxoplasmosis. T. gondii is estimated to infect 15-20% of Americans and perhaps even higher proportions of the population of other countries, causing life-long, chronic infection that is usually asymptomatic but can cause devastating disease in fetuses and the immunocompromised.

I investigated the role of murine bone marrow-derived dendritic cells (BMDC) in the immune response to T. gondii, specifically looking for antimicrobial effector functions of BMDC in response to parasite infection. Using a combination of flow cytometry and microscopy, I found that BMDC, while unable to kill parasites, are able to control intracellular parasite replication in the presence of appropriate activating signals, such as interferon-gamma and LPS. Activated and unactivated BMDC were equally susceptible to infection, but T. gondii was able to replicate only in the unactivated cells. I showed that activated BMDC produce the anti-microbial compound nitric oxide (NO), and that this NO production is crucial in the control of intracellular parasite growth, as evidenced by the fact that BMDC in which NO production was chemically blocked lost their ability to inhibit parasite replication.
My time in the XXX lab helped me understand the patience and dedication involved in completing a project, and how each individual microscope field counted contributes to the final product. I found that all my hard work paid off in the sense of accomplishment I felt as I turned in the final draft of my honors thesis.

Since August of 20XX, I have been working full time as a research scientist in the lab of Dr. XX XXX at the University of XXX, XXX. I am currently involved with a number of projects, both independently and in cooperation with others. I study the regulation and functional effects of variations in the structure of the lipopolysaccharide (LPS) molecule found on the outer surface of gram-negative bacteria. I isolate and purify LPS from a variety of bacteria and determine its key structural features, which can vary according to strain and growth conditions. Additionally, I test the antimicrobial susceptibility of various bacterial isolates, culture primary murine macrophages and dendritic cells for bacterial infection studies, and determine the LPS phenotype of mutant strains.

Working on so many different projects has helped develop my ability to multitask and stay organized, as well as allowing me to learn many diverse techniques. I have also had the opportunity to train others in some of the procedures I use, and have found it extremely rewarding to share my experience in this way. I often work in collaboration with others, both within and outside of my lab, which has expanded my horizons beyond the confines of my own bench and allowed me to see the connections between what I work on and many other fields.

In addition to research, I have been fortunate to have the opportunity to do some teaching, and have found that I really enjoy sharing my knowledge and watching students get excited about learning. As an undergraduate, I tutored other undergraduates in chemistry and felt that I had helped them master concepts that had been difficult for them. While at XXX I also served as both a TA and an instructor for a Physical Education course in Cross Country Skiing. Many of was extremely rewarding to watch them gain confidence and move from being nervous about falling to having fun on skis. Developing lesson plans and thinking of ways to keep classes interesting was a challenge, but at the end of the course, the majority of the students said that they had really enjoyed the class and planned to continue skiing on their own. It was rewarding to see that I had succeeded in helping others get excited about something that’s important to me. I look forward to continuing my development as a teacher by serving as a TA in graduate school. I hope to pursue a career in academia, which will allow me express my passion for science both by conducting scientific research and by teaching others about the subject.

I would like to focus my graduate studies on the biology of infectious diseases and host-pathogen interactions, and I believe that the Molecular and Cell Biology program at the University of XXX is an ideal place for me to continue my education. The flexibility of the program and the opportunity to work with faculty in numerous departments at both the University of XXX and the XXXX is very appealing to me and is something not found at other schools. I hope to take advantage of the rotation system to experience a variety of research topics. At this moment, I am most interested in parasitology, but I know that my interests may change as I am exposed to areas of research that are new to me. I have had experience working in both a parasitology and a bacteriology lab, and enjoyed both. Since I have not had any direct experience in virology, I would like to rotate in a virology lab to broaden my perspective and ensure that I make an informed decision when I choose a lab. There are many faculty members affiliated with the MCB program whose research interests me, including Drs. XX, XX, XX, XX, XX, and XX.

Another feature of the MCB program that I find appealing is the opportunity to earn a concurrent MS in Epidemiology. Although it is important to study microbes in the lab to understand their basic biology, it is equally important to remember that they exist outside this controlled environment and often have devastating effects on real people and communities. I have always been interested in the epidemiology and public health consequences of infectious diseases, and I know that regardless of the lab I ultimately join, I will always keep these factors in mind. The concurrent Epidemiology MS program would give me a perfect opportunity to integrate my interests in basic research and public health issues. My interest in infectious disease research has only grown as I have gained more experience and spent increasing amounts of time in the lab throughout my undergraduate years and in my current research position. The MCB program at the University of XXX would allow me to continue my education through lab work, classes, and teaching experience, and would be ideal preparation for my goal of a career in infectious disease research.
Personal Statement 17: PhD, Stem Cell Research

I know that in order to become a successful scientist I must encompass an unwavering commitment to my work, and an inexhaustible desire to discover far beyond current knowledge. As a child, my curiosity of nature compelled me to bombard my parents with questions to which they often replied, “I don’t know, son.” Fortunately, their lack of knowledge motivated me to find the answers for myself, and I was soon drawn to science. However, in the deprived city of XXX, XXX I never encountered scientists or other scholars, besides my physician; this is not the ideal medium to nurture a child’s scientific ambitions. Nevertheless, the values my parents instilled in me of love, respect, and dedication to work and family will strengthen the relationships I make as I continue my scientific career. My desire to obtain a PhD stems from my ability to overcoming obstacles encountered growing up and the ideals inspired from my scientific research during college.

It was at the University of XXXX that my passion could finally be properly cultivated. Once there, I began my fellowship with the Minority Access to Research Careers (MARC) by completing the eight-week summer research institute that involved learning various skills from weekly rotations in eight faculty-research labs in Molecular Biology, Biochemistry, Cell Biology and Chemistry. After the training, I was to conduct research; not pre-determined experiments with known outcomes like- in my course labs, but actual cutting edge research. Predictably, I was excited to start working in my very own lab, and I initiated my research career in Professor XX XXX’s lab, where they explore the structure of the diffusion barrier in the nuclear pore complex (NPC) as well as the mechanism by which cargo is translocated through it.

The goal of my project was to identify domains of natively unfolded nucleoporins that specifically anchor them at the NPC; this is part of an ongoing project to elucidate the biogenesis of the NPC. Using DNA recombinant techniques, I expressed various evolutionarily conserved regions of nucleoporins as CFP (cyan fluorescent protein)-tagged fusion proteins in yeast, and visualized their cellular location by fluorescence microscopy. I detected nuclear envelope localization for a distinct subset of the fusions, thereby, uncovering the domains (i.e. NPC tethering) in these natively unfolded nucleoporin that anchor them to the NPC. With the tremendous technological advances, science is becoming more and more interdisciplinary and, consequently, additional skills from other scientists performing research in different fields are required. Therefore, in search of attaining more diverse research experiences, I participated in a summer research internship at XXX XXX University.

During this summer internship, I worked under the tutelage of Professor XX XXX to better understand the regulation of Plasminogen Activator Inhibitor-1 (PAI-1). The purpose of the project was to determine how a sirtuin deacetylase, 14-3-3 regulatory protein, and a FOX transcription factor affect the insulin and reactive oxygen species (ROS) expression of the PAI-1 gene. We measured the influence that each protein (alone and in different concentrations and combinations) had on the expression of the PAI-1 gene evaluated by luciferase assays. The results showed that the sirtuin and FOX protein, individually and when combined, inhibit the insulin and ROS expression of the PAI-1 gene. The 14-3-3 protein also inhibited PAI-1 expression. When I created an experimental peptide decoy that inhibits 14-3-3 function, I observed a partial rescued gene expression. During that eight week-long summer, I learned to work with human cell lines, acquired an entirely new set of techniques, and produced a significant portion of data to the XXX lab for future publications. It is incredibly rewarding to know that I have contributed, even in a small way, to the overall pool of scientific knowledge.

I want to keep on learning and discovering at the University of XXX, one of the leading research institutes in the nation. With the new surge of awareness and funding for stem cell research, it is truly the beginning of a scientific revolution. Stem cell research is a fresh and thrilling field that will aid to dissect the mechanism of many diseases as well as potentially treat them. This fall, in order to better inform and prepare myself for a career investigating stem cell biology, I enrolled in the “Intro to stem cell biology” graduate course offered at my college. In the class, we discuss some of the obstacles and methods that researchers at the University of XXX are currently conducting. Most notably, Dr. XX XXX’s research interest in stem cell gene transfer in larger mammals holds much promise for potential future human stem cell gene therapy. Especially with the recent success in producing primate embryonic stem cells by somatic cell nuclear transfer. However, I know that there are many other amazing researchers, such as Dr. XX XXX and XX XXX, also investigating many
important facets in relation to stem cell biology. The large, diverse, and choice population of researchers is the basis in my decision to apply to the University of XXX.

My ultimate goal is to become a professor and run my own research lab because I enjoy teaching and interacting with people, as well as discovering the unknown. I am a Chicano researcher but the Latino scientist is a rare breed in the scientific community. Therefore, I want to be the spark that ignites the change. I want to increase that subpopulation by outreaching to the Latino community and encouraging them to participate in science. The MARC program has had enormously positive impact on my life and I would like to establish a similar program in my future academic institute. I want to go back to my elementary school and talk to children to tell them that they can become a scientist and that they do not have to fall victim of their surroundings like so many others. I want to not only be a role model for my family members, but also for my entire hometown of XXX, XXX and Latino community.
Personal Statement 18: PhD, Microbiology

I want to pursue graduate studies in Molecular Microbiology and Immunology because I am fascinated by the interaction between host and pathogen, the idiosyncrasies of each relationship, and how knowledge of this interaction can be used to develop effective therapeutic interventions.

My interest in infectious disease began with a high school field trip XXX, a non-profit organization dedicated to improving global health by finding solutions to the world’s most devastating diseases. I was impressed by their altruistic intentions, but mostly inspired to pursue a career as a physician-scientist on the cutting-edge of biomedical research. It was only after observing and talking to physicians specializing in infectious disease at the XXX Medical Center that I realized infectious disease was my calling. As a result of this experience, I applied to several summer undergraduate research programs, and was invited to join two competitive programs, at XXX and at the XXX. I elected to participate as a summer undergraduate intern at XXX, where I studied antifungal immunity in the lab of Dr. XXX. My experience working in an immunology lab full-time led to my current decision to study cellular and molecular immunology and host-pathogen interactions en route to a doctorate degree.

Upon completion of my degree, I plan to pursue post-doctoral work to gain specialized experience in parasitology. Drawing from my undergraduate background in neuroscience, I am particularly interested in pathogens that are able to breach the blood-brain barrier, such as Toxoplasma gondii and Trypanosoma brucei. I find T. gondii to be especially interesting, as it is known to manipulate rat predator-evasion behavior in order to complete its life cycle, and more recently has been linked schizophrenia as an etiological factor. This microbe infects a substantial portion of the global population and is known to lead to fatal encephalitis in immunocompromised individuals; what could it be doing as it lies ‘dormant’ in a healthy host? As parasites and other infectious disease-causing agents are frequently an issue in developing nations, I want to work for a non-profit institute engaged in the development of affordable therapeutics and preventative meant to be dispersed globally. Eventually, I want to teach at a university where I can offer undergraduate students the opportunity to engage in cutting-edge research, just as my mentors did for me.

Over the past three years, I have been fortunate to work in two labs: Dr. XXX’ lab [XXX] on inhalant abuse and Dr.XXX’s lab [XXX] on antifungal immunity. I started in Dr. XXX; lab in February 20XX and ended in December 20XX. Dr. XXX has a very unique approach to the undergraduate lab set-up; instead of having students work on a single project, she assigns students to one of five student-led research ‘pods.’ With this configuration, her lab maintains a wide-ranging research focus. I led the research group investigating the potential use of Caenorhabditis elegans to study the effects of toluene, a common solvent in abused inhalants. We began with a behavioral study, measuring the effects of toluene exposure on worm locomotive behavior. We found that brief exposure to toluene decreased locomotive behavior, which led us to our next experiment where we compared levels of vesicular transporters before and after toluene exposure. In this phase of the project, I had the unique opportunity to learn how to operate a confocal microscope, which is capable of capturing very clear images of fluorescent transgenic worms. Although the learning curve was initially steep, we eventually found a significant effect of exposure on protein expression levels. The innovation and creativitybehind this project earned us an internally-funded undergraduate grant from XXX, which allowed us to purchase primers for the third phase of our experiment, using quantitative realtime PCR to measure changes in expression of vesicular transporters and receptors. Earlier this year, I also had the chance to present our research at the Northwest Regional Worm Meeting as a short talk. Although working in the lab was daunting at first, I believe the experience contributed to my confidence and resilience as a researcher, and I am grateful that my first introduction to the lab setting was so comprehensive.

As a result of the training I received in Dr. XXX’ lab, I was invited to work with Drs. XXX and XXX as part of XXX’s Summer Research Program [SRP] for nine weeks of last summer. My project was an extension of Dr. XXX’s, addressing the ability of mouse neutrophils to engage Aspergillus fumigatus spores in an in vitro model. We used leukocytes derived from the bones of mice with specific knockouts in proteins implicated in pathogen recognition and killing via Dectin-1 and Toll-like receptors [MyD88 and Dectin-1], and incubated them with Aspergillus. After incubation, we analyzed the cells with flow cytometry, using size, granularity, and surface
antigens to specifically gate for neutrophils. My results indicated that leukocytes with a double knockout of pathogen recognition receptor Dectin-1 and adaptor protein MyD88 are less effective at recognizing and binding to Aspergillus. My results were corroborated by an in vivo experiment conducted by Dr. XXX. Following several in vitro and in vivo experiments in which Dectin-1/MyD88 double knockout cells were better able to engage Aspergillus after coincubation with their wild-type counterparts, we hypothesized that Dectin-1 and/or MyD88 may be responsible for production of a soluble opsonin. At the end of the program, I presented our research endeavors and accomplishments at a competitive poster session. Upon the conclusion of this internship, Dr. XXX invited me back to the XXX to investigate the potential for pentraxin-3 to be the opsonin in question; although my results were inconclusive, Dr. XXX informed me that I will be included as an author when he and Dr. XXX submit for publication. I gained a better understanding of innate immunity by working in Dr. XXX’s lab, and additionally a strong appreciation for working as a full-time researcher.

When I asked Dr. XXX about graduate programs that he would recommend, XXX University was one of the first schools that he named. He cited XXX’s Immunology program as one of the top in the nation, a statement that immediately spurred my interest. After researching the basic science program and watching ‘The Inward Eye,’ I discovered that there were many reasons to be attracted to XXX. The core curriculum, integrative approach to research, and friendly yet intense academic environment, are a few of the reasons why I chose to apply. My main reason for applying is the cutting-edge research. I am most interested in Dr. XXX’s work on innate immune responses to Toxoplasma gondii, as his work completely overlaps with my personal research interests. I also find the work in Dr. XXX’s lab on the complex relationship of gut microbes and host immunity and the work in Dr. XXX’s lab on the interaction of bacterial toxins and human signaling events to be absolutely fascinating. Lastly, I am attracted by the vibrant culture of XXX, especially the emphasis on food, live music and entertainment, and the arts. I’ve never been to XXX before, but after talking with several friends who have, I know I will love living in XXX. The combination of so many positive factors - strong reputation, great environment, exciting research, and lively city life- make XXX University undoubtedly my top choice for graduate studies.
Personal Statement 19: PhD, Cancer Biology

If nothing else, my undergraduate experience has taught me that failures will almost always precede successes. Academically I’ve crashed midterms before acing finals. Athletically I’ve lost scrimmages against schools I hadn’t known existed before winning a national title against the bestranked team in the country. In research I’ve broken gels, mislabeled tubes, forgotten to feed cells fresh media, and mixed up PCR primers, all in route to finding meaningful results. To paraphrase, I’ve learned the lesson of “try, try again” quite thoroughly and, in the process, discovered a deep personal store of perseverance that is especially well-suited to an aspiring scientist.

Completing my undergraduate bioengineering degree in the College of Engineering at XXX has equipped me with a strong quantitative reference frame with which to approach scientific questions. Core bioengineering courses such as Stem Cell Technology, Cell and Tissue Engineering, and BioMEMS (Biological Microelectromechanical Systems) underline the value of using first principles to understand complicated cellular processes and rational design to successfully intervene when they founder. I have also completed molecular and cell biology courses to supplement my understanding of basic eukaryotic biology. Tumor Biology, Systems Biology, and Molecular Immunology especially captured my interest in the molecular machines and precise interactions which govern either protection from or entry into disease states. A marriage of academic experience in engineering and biological science uniquely qualifies me to contribute to innovative biomedical research at the graduate level.

Compelled to start sooner rather than later, I have participated in both basic science and translational research projects as an undergraduate. As a member of XXX's laboratory in the bioengineering department at XXX, I focused primarily on trying to understand and predict protein folding, particularly in relation to aggregation phenomena. Many neurodegenerative diseases, including Alzheimer’s, Huntington’s, and Parkinson’s disease, are characterized by mistimed aggregation in β-rich proteins, so I set out to understand if increased propensity for aggregation is exclusively restricted to disease states or rather a general property of all β-rich proteins. Working with postdoctoral researcher XXX (now a senior biochemist at XXX Laboratories), I performed dynamic protein folding simulations and in vitro kinetic experiments to characterize the tendency of a β-rich but non-disease related protein to aggregate under various conditions. However, even under favorable conditions, I found aggregation in the non-disease protein to be extremely fragile and rare. These results indicated that, unlike in disease state conformations, wildtype β-rich proteins are protected from aggregating. Dr. XXX, Professor XXX, and I have submitted a publication describing our findings to which I contributed experimental design, execution, data analysis, figure generation, and original text. My experience in the XXX laboratory was particularly valuable because it provided me with my first opportunity to conduct independent investigation and to participate in the publication phase of scientific research.

In addition to research in the bioengineering department at XXX, I spent the recent summer working as a research intern in XXX’s laboratory at the XXX in XXX. While there I was mentored by research associate XXX and contributed to a drug delivery project in which we characterized the specificity and efficacy of a novel vehicle called the “polyplex.” The polyplex uses RNA interference to help overcome a major problem in conventional cancer treatment, which is the innate resistance many cancers have to chemotherapy. We hypothesized that delivering pro-apoptotic small interfering RNA (siRNA) to cancer cells would help sensitize those cells and potentially allow loser-dose chemotherapies to be prescribed in the clinic with equal therapeutic benefit. My involvement entailed performing assays to quantify drug uptake, target RNA transcript knockdown, and cytotoxicity in human breast and ovarian cancer cell lines. I found that the polyplex successfully delivers siRNA into the cytosol of cells expressing targeted surface receptors and, furthermore, initiates degradation of sequence-specific RNA transcripts without a widespread effect on gene expression. At the conclusion of the summer program I presented my results in both a XXX laboratory meeting and a competitive poster symposium at the XXX, where I was awarded “XXX” by a panel of graduate and postdoctoral researchers.

Cancer Biology is my first-choice home program at XXX. More specifically, the research fields that I’m most interested in Pursuing are cancer stem cell biology and tumor immunology. Cancer stem cells are rare in both solid and hematopoietic tumors but are believed to act as the engines for cancer tissue ontogeny and metastasis.
They are, however, extremely difficult to target with conventional chemotherapy or radiation treatments because, analogous to normal stem cells, they are often quiescent and possess protection mechanisms from cytotoxic chemicals. I aspire to help advance the understanding of cancer stem cell biology in order to ultimately develop novel cancer stem cell-targeted therapies which minimize the risk of patient relapse and avoid deleterious side effects in healthy tissues. XXX faculty currently researching cancer stem cells who especially interest me are Drs. XXX, Herb XXX, and XXX. The prospect of joining Dr. XXX’s group particularly intrigues me because he is a pioneer of the cancer stem cell hypothesis and his laboratory routinely contributes to some of the most groundbreaking discoveries in the field, including the first ever identification of cancer stem cells in a solid tumor. I am also strongly interested in immune-tumor surveillance and cancer immunotherapy development. Interference with immune function has been recognized in multiple cancer subtypes, and it is now known that many tumors develop anti-immunogenic mechanisms such as reduced expression of major histocompatibility proteins or secretion of anti-inflammatory cytokines. I want to help generate a wholistic understanding of way immune cells interact with malignant ones as to allow immunoengineered cancer treatments which breakdown tumor protection strategies. Tumor immunology researchers at XXX who especially interest me are Drs. XXX, XXX, and XXX. XXX’s strong commitments to cancer stem cell biology and tumor immunology make it a great fit for my aspirations as a cancer researcher.

Besides having an impressive research base in the specific cancer biology fields that interest me most, XXX is also an attractive institution because of its uniquely creative and collaborative research environment. I greatly admire that XXX promotes collaborative research, with a strong example being the Bio-X Program, designed to encourage innovation through increased interaction between researchers on campus. I would love to work with molecular biologists, cell biologists, and translational researchers in order to gain novel perspective and learn from both basic biology and biomedical experts. Because of my background in bioengineering, I can also contribute in a valuable way by helping to translate cutting-edge technologies developed by engineers into improved cancer research strategies. I welcome the opportunity to contribute to the collaborative and cutting-edge research environment that XXX Biosciences is renowned for.

Lifelong struggles in academia, athletics, and research have prepared me with a special understanding of the intense perseverance that laboratory research requires. I’m well-schooled in losing, one could say, but for me past failures are less barriers than they are propellants to the recent successes I’ve enjoyed as a student, as an athlete, and as a researcher. As an undergraduate I’ve tasted both the frustration of scientific method and the gratification of scientific discovery, and as a graduate student I hope to continue learning how to construct meaningful ideas from experimental data. It is my long-term goal to become a principal investigator with the responsibility of leading my own cancer research group, and completion of the doctoral program in Cancer Biology at XXX would serve as an extraordinary step forward in that direction.
**Personal Statement 20: PhD, Cancer Biology**

I love that science gives me the opportunity to pursue endless possibilities, to question the knowledge of today, and to find solutions for tomorrow. Beginning my freshman year of college, I took every opportunity to surround myself with biology.

I started my freshman summer at the University of XXX, where I performed a statistical study examining whether co-morbidities and self-reported symptom assessments could predict outcome in gastrointestinal (GI) patients who had undergone chemoradiation. The study concluded that GI cancers vary symptomatically according to site and that if the patient’s symptoms were adequately managed, their outcome and quality of life was significantly better. Here I learned to construct meaningful results from large bodies of data. The following summer I returned to the University of XXX to conduct a study testing the efficacy of a slew of nitric oxide pro-drugs on breast epithelial cell lines. I also dedicated time to studying the drugs’ mechanism and cancer cell migration via angiogenesis. This experience was pivotal in my career as I learned standard laboratory practices and received my first exposure to working independently in a lab. I had originally chosen these programs simply to follow my interest in cancer, but later learned to see that cancer is a superb model of disease.

I spent the next two years of college working as a part-time assistant in a laboratory at XXX. Aside from maintaining the tab and aiding in other studies, I started my own experiments on the counter effects of a transcription factor (Y Box-binding protein-1, YB-1) on upregulated promoter (Matrix Metalloproteinase-1) activity caused by low levels of arsenic in a cervical cancer cell line. These experiments were the first of our knowledge that showed YB-1 to have a counter effect on upregulated genes. I enjoyed returning to study the environmental causes of cancer, but a class led me to become increasingly fascinated with the connections between psychology and biology.

To explore this newfound interest, I traveled to the University of XXX my junior summer to study psychoneuroimmunology. There I examined neural-immune interactions in rodent models following a live bacterial immune challenge. Our findings produced a paper (XXX, X.X, XXX, X., (2007). XXXX XXXXX XX XXXX XXXXXXX XXXX. J Neuroscience) that was submitted for publication in February and will hopefully shed light on brain cytokine production. It was my first in vivo study, and I found the experience enthralling due to its application to understanding human immunological interactions.

Studying cancer biology remains a top interest for me because the information we gain can be readily applied to the study of other diseases. In addition, I am intrigued by the relationship between genetic and environmental factors, how we can at least have some control over the latter. Similarly, psychoneuroimmunology excites me with the understanding that all physiological systems interact at some level, that a person’s affect can modify not only their neural structure, but also their ability to manage disease. I also hold interests in virology, specifically how a virus can disrupt the homeostasis of a system thus leading to tumorigenesis. I believe my record demonstrates my ability to adapt to different avenues of research. I am particularly interested in two labs associated with cancer: Kaposi’s Sarcoma-associated herpesvirus (Dr. X.XXX, XX), and genomic integrity (Dr. X.X.XXX, XX), as well as the labs studying immunotherapies (Dr. X. X. XXX, XX), stem cells (Dr. X-X XXX, XXXX), and HIV (Dr. X.XXX, XXX).

I believe by obtaining a doctorate, I will gain a better set of tools to find meaning in the massive amounts of information we gain from technology. I also hope to contribute new information to the scientific community, understanding that even a small finding can serve as a vital piece in an unsolved puzzle. Based on my experiences and the joy I get from discussing scientific research with others, be it at a conference or at the dinner table, I have every desire to remain in academia. In the future, I see myself inspiring undergraduate students as a professor. Working under female scientists gave me confidence and encouraged me to pursue my dream to be a scientist; I can only hope to do the same for others. Meanwhile, I would enjoy helping to shape public science policy and bridge the gap between the scientific community and the general public.
Role of Regulatory T cells in Immune Responses to Influenza
Sarah Krawczak1,2, Laura Richert-Spuhler1, Jennifer Lund1
1Fred Hutchinson Cancer Research Center, 2Whitman College

Background
Introduction to Regulatory T cells (Tregs)
- Tregs, defined by their expression of the transcription factor Foxp3 (Foxp3) are crucial in preventing autoimmunity and promoting immune homeostasis.
- During infections, Tregs play many roles, including potentiation of effector responses, as well as facilitation of disease resolution and protection from collateral damage.

Objective
Many studies have demonstrated how Tregs function to dampen over-exuberant immune responses. This study explores how Tregs may additionally function to facilitate and potentiate appropriate immune responses to pathogens.
- The aim of this study is to determine how immune responses to influenza virus challenges are impaired in the absence of regulatory T cells, and propose mechanisms that could lead to the observed impairment.
- Specifically, this study investigates how early Treg depletion affects dendritic cell function, potentially leading to impairment in effector T cell recruitment and responses.

Experimental Design
- Intranasal challenge with A/PR/8/34 strain (PR8, H1N1) and Pneumovax 23 vaccine to measure systemic immune responses.
- Treg depletion
- Time course of immune response in lungs and sera.

Methods
1. Lung, bronchoalveolar lavage (BAL), and Tracheobronchial lymph node (TBN) cell isolation.
2. Tissue processing
3. Count cells in each sample using hemocytometer
4. Analysis of cell samples using flow cytometry (FACS)
5. Reduce an ELISA on the BAL supernatant to determine antibody concentrations

Results
1. Reduce antigen-specific CD4+ and CD8+ T cell responses are impaired in the lung (but not in the TBN) in Treg depleted mice at day 9 of influenza infection.
2. The accumulation of follicular dendritic cells (FDCs) in the lung in Treg depleted mice is impaired.
3. The production of IgA is also impaired.
4. Parenchymal DC activation is delayed in Treg depleted mice.
5. Plasmacytoid pDCs and Ly-6C*CD11b+ DCs also trend toward an impaired response in the airway spaces of Treg depleted mice.

Conclusions
- Antigen-specific T cell responses were impaired in the lungs, but not in the lymph nodes of Treg depleted mice.
- The impaired accumulation of FDCs in the lungs of Treg depleted mice potentially indicates a negative impact on germinal center responses.
- Nasal IgA, but not IgG, production is impaired in the lungs of Treg depleted mice.
- Treg depletion led to delayed activation of CD11b+ but not CD103+ DCs in the lung.
- Delayed DC activation and impairment in FDC accumulation implicate early Treg responses as essential to facilitating appropriate adaptive immune responses during influenza infection.

Future Directions
- Determine the mechanisms of Tregs in orchestrating innate and adaptive immune responses to influenza virus.
- Determine the impact of early Treg depletion on germinal center B cell responses and the kinetics of T cell activation.
- Assess migratory signaling cascades.

Acknowledgments
- FHCRC, Dr. Jennifer Lund Lab
- Whitman College in partnership with FHCRC SURF, supported by HHMI
- The Summer Undergraduate Research Program is supported in part by the Cancer Center Support Grant (C305) CURE Supplement 3 (3P30 CA015794-40S2), the FHCRC’s Internship Program, and individual FHCRC lab research groups.
Tissue-specific lentiviral vectors for decoding the vascular niche of squamous cell carcinoma

Kamir Hiam, Julie Ryflewska, Silobodan Beronja

1Human Biology Division, Fred Hutch, Seattle, WA
2Department of Chemistry & Biochemistry, Kennesaw State University, Kennesaw, GA

Background

Tumor vascular space contains vascular endothelial cells, which are essential for tumor growth and metastasis. Lentiviral vectors have been used to target and study tumor vasculature. However, the specificity of these vectors is not well understood. In this study, we aimed to develop tissue-specific lentiviral vectors to target specific regions of the vascular niche.

Methodology

A viral vector system was designed to target specific regions of the vascular niche. The vector was engineered to express a specific marker in response to a specific stimulus. The marker expression was monitored using fluorescence microscopy.

Results & Conclusions

Table 1: Tissue-specific promoters cloned into pK2

<table>
<thead>
<tr>
<th>Gene Name</th>
<th>Promoter Name</th>
<th>Tissue Type</th>
<th>Chromosome-Locus</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD34</td>
<td>Adh34</td>
<td>Endothelial cell</td>
<td>11q22-q23</td>
</tr>
<tr>
<td>VEGF</td>
<td>AdhVEGF</td>
<td>Endothelial cell</td>
<td>1q21-q22</td>
</tr>
<tr>
<td>FGFR</td>
<td>AdhFGFR</td>
<td>Endothelial cell</td>
<td>10p11.2</td>
</tr>
</tbody>
</table>

Figure 1: In vivo validation of tissue-specific promoter activity in tumor vasculature

Figure 2: Quantitation of relative tissue-specificity

Relative Tissue Specifity

- CD34
- VEGF
- FGFR

Values: Relative activity of tissue-specific promoters

Values: Relative activity of non-tissue-specific promoters

Future Directions

Further research is needed to understand the role of the vascular niche in tumor growth and metastasis. The tissue-specific lentiviral vectors developed in this study provide a valuable tool for future studies.

Acknowledgements

The authors would like to acknowledge the support of the National Institutes of Health (NIH) and the Canadian Institutes of Health Research (CIHR). This work was supported by NIH grant R01 CA174916.

References

B Cell ELISPOT Assay Optimization for Quantifying HIV protein-specific B Lymphocyte Responses in HIV Vaccine Recipients

Christopher Everett, Bryan Simons, and Nicole Frahm

HIV Vaccines Trials Network, Vaccine and Infectious Disease Division, Fred Hutchinson Cancer Research Center, Seattle, Washington

Abstract

Assessing the efficacy of candidate HIV vaccines is an important step in determining the capacity of a prospective vaccine to prevent the spread of HIV. Previous work in our lab has focused on quantifying the acquisition of antibodies in immunization regimens designed to elicit an HIV-specific response. Recent advances in the field have focused on elucidating the role of B lymphocytes to mediate a more complete understanding of the cellular immune response to HIV infection. In this study, we performed optimization of a B Cell ELISPOT (BCE) assay as a rapid tool to understand HIV-specific antibody production in healthy B cells from HIV vaccine trial participants. Optimization was accomplished utilizing whole, boiled, and heat-inactivated HIV Env gp120 proteins as stimulus reagents to determine the optimal concentration to capture the antigen-antibody interaction. Positive responses were observed in HIV vaccine and control participants. The results indicated that the BCE assay is capable of differentiating these responses utilizing whole Env gp120. These findings suggest that BCE can be used effectively in screening B lymphocyte responses to HIV vaccine regimens. Similar methods could be used to expand the assay to include many epitopes of interest and future work will examine the use of this assay to evaluate more specific responses.

Methodology

HIV Env gp120

- Right: A recombinant gp120 was infected with dominant HIV Env gp120 proteins to provide a clear and precise measurement of HIV-specific B cell responses to HIV vaccine trial participants.

- Following initial optimization, samples from a previously published HIV vaccine trial were analyzed by B Cell ELISPOT to assess long-term memory B cell responses.

Results

Figure 1: Positive Antibody Response to HIV-specific Memory B Cell Response

- Positive antibody responses were observed 1 month following the first injection, with no significant changes observed in the Env gp120 Env gp120 protein responses.

- Reactions were observed in the Env gp120 Env gp120 protein responses.

- Reactions were observed in the Env gp120 Env gp120 protein responses.

- Reactions were observed in the Env gp120 Env gp120 protein responses.

- Reactions were observed in the Env gp120 Env gp120 protein responses.

Conclusions and Future Directions

- We observed successful recognition of whole Env gp120 Env gp120 protein responses.

- We observed successful recognition of whole Env gp120 Env gp120 protein responses.

- We observed successful recognition of whole Env gp120 Env gp120 protein responses.

- We observed successful recognition of whole Env gp120 Env gp120 protein responses.

References


Acknowledgements

The Vaccine Immunization Research Program is supported in part by the Cancer Center Support Grant (CCSG) (U24 CA 16672, the CHIP for AIDS (UC 16508), and the NICHD Lab (UC 16508). The project was supported by the NIH CT-VACC Clinical Trials Core.
Cardiovascular Health Status of Childhood Cancer Survivors Treated With Anthracyclines

Authors: Morrow Toomey¹, David Doody², Nancy Blythe³, Eric Chown²
Affiliations: ¹Whitman College, Walla Walla, WA; ²Fred Hutchison Cancer Research Center, Seattle, WA

PURPOSE
To examine the physical health effects from the addition of the cardioprotectant dexrazoxane (DRZ) to pediatric cancer treatment regimens containing anthracycline-based chemotherapies.

BACKGROUND
Anthracycline-based chemotherapeutic agents pose a unique challenge to researchers who seek to improve long-term health outcomes in pediatric cancer patients. Acute lymphoblastic leukemia, lymphoblastic lymphoma, and Hodgkin lymphoma treatment regimens containing these agents are associated with superior outcomes; yet, they also are associated with late cardiac events. In adult cancer patients, the cardioprotective dexrazoxane (DRZ) has been shown to mitigate associated cardiotoxicity when given in conjunction with anthracycline-based therapies. In children, studies of the efficacy of dexrazoxane have been scarce, limited.

METHODS
Population: Eligible individuals who were treated between 1986 and 2001 on DRZ randomized clinical trials conducted at Children’s Oncology Group (COG) sites across North America were prospectively approached for reassessment.

Outcomes: A follow-up examination and survey assessed individuals on height, weight, blood pressure, six-minute walk distance, physical activity, and smoking habits.

Analyses: Measurements and survey responses were compared across the treatment arms (no DRZ and DRZ) using both univariate tests and linear regression. A secondary analysis compared cancer treated individuals to an age-matched general population sample (2011-12 National Health and Nutrition Examination Survey) using logistic and dimensional regression, adjusting for sex, ethnicity, and age. Results are presented as odds ratios with 95% confidence intervals.

RESULTS
Table 1. Demographic Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Pediatric Cancer Survivor Study</th>
<th>NHANES (N=2,380)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DRZ (n=30)</td>
<td>No DRZ (n=29)</td>
</tr>
<tr>
<td>Female, (%)</td>
<td>33.3 (48.3)</td>
<td>40.7 (49.7)</td>
</tr>
<tr>
<td>Age at follow-up, median years</td>
<td>27 (27)</td>
<td>27 (27)</td>
</tr>
<tr>
<td>Age at treatment, median years</td>
<td>12 (12)</td>
<td>12 (12)</td>
</tr>
<tr>
<td>(range)</td>
<td>(2-20)</td>
<td>(2-20)</td>
</tr>
<tr>
<td>Race/ethnicity, (%)</td>
<td>70.0 (75.9)</td>
<td>72.8 (31.7)</td>
</tr>
<tr>
<td>White Non-Hispanic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others &amp; Unknown</td>
<td>30.0 (24.1)</td>
<td>27.1 (68.3)</td>
</tr>
<tr>
<td>Cancer Diagnosis, (%)</td>
<td>40.0 (31.0)</td>
<td>35.6 (35.6)</td>
</tr>
<tr>
<td>T-cell ALL</td>
<td>13.3 (20.7)</td>
<td>17.0 (17.0)</td>
</tr>
<tr>
<td>Lymphoblastic lymphoma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hodgkin lymphoma</td>
<td>46.7 (48.3)</td>
<td>47.1 (47.1)</td>
</tr>
</tbody>
</table>

Abbreviations: ALL, Acute Lymphoblastic Leukemia; NHANES, National Health and Nutrition Examination Survey.

Figure 1. Six-Minute Walk Distance (6MWD) Comparison

Table 2. Physical Measurements & Survey Responses

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Pediatric Cancer Survivor Study</th>
<th>NHANES (N=2,380)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DRZ (n=30)</td>
<td>No DRZ (n=29)</td>
</tr>
<tr>
<td>BMI Categories, (%)</td>
<td>6.6 (8.5)</td>
<td>7.1 (7.1)</td>
</tr>
<tr>
<td>Normal (BMI&lt;24.9)</td>
<td>38.7 (44.8)</td>
<td>40.7 (41.6)</td>
</tr>
<tr>
<td>Overweight (BMI 25-29.9)</td>
<td>36.7 (38.0)</td>
<td>37.3 (26.7)</td>
</tr>
<tr>
<td>Obese (BMI&gt;30.0)</td>
<td>26.7 (13.8)</td>
<td>29.2 (27.6)</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>116.9 (116.9)</td>
<td>116.9 (116.9)</td>
</tr>
<tr>
<td>Systolic (mmHg)</td>
<td>77.3 (96.3)</td>
<td>66.8 (75.6)</td>
</tr>
<tr>
<td>Diastolic (mmHg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BP Category, (%)</td>
<td>60.0 (75.9)</td>
<td>67.8 (57.2)</td>
</tr>
<tr>
<td>Normal</td>
<td>26.7 (20.7)</td>
<td>23.7 (27.9)</td>
</tr>
<tr>
<td>Pre-Hypertensive</td>
<td>13.3 (3.4)</td>
<td>8.5 (4.9)</td>
</tr>
<tr>
<td>Hypertensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise Habits, (%)</td>
<td>60.0 (75.9)</td>
<td>67.8 (48.1)</td>
</tr>
<tr>
<td>Met CDC Guidelines</td>
<td>40.0 (74.3)</td>
<td>37.2 (51.7)</td>
</tr>
<tr>
<td>Did Not Meet</td>
<td>1.7 (0.0)</td>
<td>3.3 (1.1)</td>
</tr>
<tr>
<td>Smoking Status, (%)</td>
<td>60.0 (75.9)</td>
<td>67.8 (57.2)</td>
</tr>
<tr>
<td>Never Smoker</td>
<td>26.7 (20.7)</td>
<td>23.7 (27.9)</td>
</tr>
<tr>
<td>Ever Smoker</td>
<td>13.3 (3.4)</td>
<td>8.5 (4.9)</td>
</tr>
<tr>
<td>Background User</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: BMI, body mass index; CDC, Center for Disease Control

Figure 2. Differences Between Cancer Survivor & NHANES Populations

DISCUSSION
Comparing DRZ Treatment Arms
- Individuals treated with DRZ arm had higher systolic and diastolic blood pressures at follow-up.
- Otherwise, no significant differences were observed in physical health between individuals in the two treatment arms.

Comparing Cancer Survivors to NHANES
- DRZ treated individuals were marginally more likely to have higher systolic and diastolic blood pressures.
- Cancer survivors were more likely to report meeting CDC exercise guidelines, but no more likely to exhibit measured, select physical health benefits.

Limitations
- SBP and DBP remain outcomes to be watched, as the current study size is small and recruitment is still ongoing.
- To further examine the efficacy of DRZ, future analyses will be on subclinical indicators of cardiovascular health.

ACKNOWLEDGEMENTS
No institutions or research programs are supported by grants from the National Cancer Institute, the National Heart, Lung, and Blood Institute, or the National Institutes of Health.
Development of a Comprehensive Financial Navigation Program for Patients with Newly Diagnosed Cancer

Naomi Schwartz1, Debbie Delaney2, Kate Watabayashi2, Karma Kreizenbeck2, Veena Shankaran, MD, MS2
1Pitzer College, Claremont, CA; 2Fred Hutchinson Cancer Research Center, Seattle, WA

BACKGROUND
- A significant proportion of cancer patients face serious financial hardships during treatment due to
  - Loss of work and income
  - Difficulty managing other fixed expenses during periods of intense treatment
  - Frequent expensive medical bills
- Cancer patients file for bankruptcy at higher rates than individuals without cancer

HYPOTHESIS
- A combined approach of financial literacy education, money management counseling, and proactive navigation through financial, employment, and insurance issues will decrease the incidence and severity of financial hardship and financial distress in cancer patients.

OBJECTIVES
- The goal of this project was to complete the development phase of a pilot study to establish a comprehensive financial navigation program for patients with newly diagnosed cancer. This will allow us to test the feasibility of implementing a financial navigation program and assess the impact of this program on financial status.

METHODS
- Components of Financial Navigation Program
  1. In-person financial literacy course delivered by Consumer Education and Training Services (CENTS)
  2. Direct contact with patient navigators from Patient Advocate Foundation (PAF)
  3. One-on-one financial counseling and budget planning with a trained CENTS financial counselor

RESULTS
- Key Accomplishments
  - Finalized PowerPoint presentation
  - Determined SCCA/PFS could provide: annual deductible, annual out of pocket limit, and copayment and coinsurance information
  - Developed an intake form for SCCA to complete for each patient
- Study Flow

FUTURE DIRECTIONS
- Study results will provide critical preliminary data to support future grant proposals to investigate the impact of financial navigation interventions on financial outcomes in patients with cancer nationwide.
- Randomized trial

REFERENCES

ACKNOWLEDGMENTS
I would like to thank Dr. Nancy Sklar for her support as well as Dr. Bethany, Karma Kreizenbeck and Kate Watabayashi for their guidance and advice throughout this project. This project was sponsored by PAF/PFS, with financial support from the Fred HutchFunds to Support Grants. This work was supported by the Fred Hutchinson Cancer Research Center Support Grants (CISG) CORE Supplement. 3P30CA011965-45022, the PFSRC internship program, and individual PTOC internships, grants.
The Association of Arsenic Exposure with Mammographic Density

Cristina Gago, Scott Adams, and Polly Newcomb
Fred Hutchinson Cancer Research Center, University of Southern California

BACKGROUND
Arsenic Exposure
Arsenic, one of the most pervasive and toxic heavy metals, can be found in various forms in the environment. It is classified as a carcinogen and endocrine disruptor. As a carcinogen, arsenic is known to be associated with kidney, lung, skin, liver, stomach, and bladder cancers. Exposure to arsenic may also act as an endocrine disruptor, affecting reproductive health and endocrine-related health outcomes.

Arsenic as a Carcinogen & Endocrine Disruptor
Arsenic is known to be associated with kidney, lung, skin, liver, stomach, and bladder cancers. The exact mechanism of how arsenic affects these cancers is not fully understood, but it is believed to involve alterations in DNA and RNA synthesis, as well as interference with normal cellular processes.

Arsenic & Breast Cancer Risk
The relationship between arsenic exposure and breast cancer risk is not fully understood. Some studies have suggested a positive association, while others have found no significant relationship.

Mammographic Density & Breast Cancer Risk
Mammographic density (MD) is a measure of breast tissue density and is an important risk factor for breast cancer. Higher MD is associated with a higher risk of breast cancer, especially in postmenopausal women.

Research Question
Is urinary arsenic concentration associated with mammographic density in U.S. women aged 40 to 69?

METHODOLOGY
Study Design: Cross-sectional
Population: U.S. women aged 40-69 (N = 440)
Recruitment: Volunteers recruited online through the Avon’s Breast Health Study
Measures:
- Lifestyle Factors: Participants completed a lifestyle and health survey, providing information on factors associated with urinary arsenic concentration.
- Mammographic Density: Each participant provided a mammography report (more than 18 months old) with a BI-RADS mammographic density score (scale of 1-4).
- Urinary Arsenic (U-A) and Creatinine: Each participant provided one urine sample, which was analyzed for arsenic levels and creatinine content.

Analysis:
Logistic regression was used to estimate the adjusted odds of having high MD (BI-RADS 3-4) versus low MD (BI-RADS 1-2) among participants who had available data on both arsenic and creatinine levels.

RESULTS

Figure 1. Bi-RADS Classification

Figure 2. Characteristics of the Study Sample

Table 1. Logistic Regression Results

Table 2. Characteristics of the Study Sample

DISCUSSION
No significant association was found between breast density and total urinary arsenic concentration.

The lack of association between total urinary arsenic and mammographic density score may be the result of:
- Varying routes of arsenic exposure
- Differences in inorganic versus organic arsenic exposure levels
- Inconsistent exposure durations of arsenic
- Limited sample size
- Exposure levels examined in this study may be too low to detect a response

Study Limitations:
- Lack of data on residential location and municipal water source quality
- Only 1 participant was measured, as opposed to specific arsenic components
- One urine sample was taken, therefore spikes in urinary arsenic levels (e.g., following seafood consumption) would not be accounted for
- Little data on dietary arsenic consumption was collected

CONCLUSION
No statistically significant association between total urinary arsenic concentration (continuous or quintile) and mammographic density in U.S. women aged 40-69 was supported.

FUTURE RESEARCH DIRECTIONS
- Examine the direct association between arsenic exposure and breast cancer
- Evaluate a cohort sharing a single municipal water source in order to control for inorganic arsenic exposure through drinking water
- Assess for variability in dietary arsenic exposure by measuring the consumption of foods known to have historically high levels of arsenic
- Utilize participant hair and nail samples to measure long-term arsenic exposure and its association with MD and breast cancer
- Take several urine samples from each participant at different time points to account for transient spikes in urinary arsenic

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Figure 3. Urinary Arsenic Distribution

Figure 4. Characteristics of the Study Sample

Table 3. Logistic Regression Results

Table 4. Characteristics of the Study Sample

Figure 5. Urinary Arsenic Distribution

Figure 6. Characteristics of the Study Sample

Table 5. Logistic Regression Results

Table 6. Characteristics of the Study Sample

Figure 7. Urinary Arsenic Distribution

Figure 8. Characteristics of the Study Sample

Table 7. Logistic Regression Results

Table 8. Characteristics of the Study Sample

Figure 9. Urinary Arsenic Distribution

Figure 10. Characteristics of the Study Sample

Table 9. Logistic Regression Results

Table 10. Characteristics of the Study Sample

Figure 11. Urinary Arsenic Distribution

Figure 12. Characteristics of the Study Sample

Table 11. Logistic Regression Results

Table 12. Characteristics of the Study Sample

Figure 13. Urinary Arsenic Distribution

Figure 14. Characteristics of the Study Sample

Table 13. Logistic Regression Results

Table 14. Characteristics of the Study Sample

Figure 15. Urinary Arsenic Distribution

Figure 16. Characteristics of the Study Sample

Table 15. Logistic Regression Results

Table 16. Characteristics of the Study Sample

Figure 17. Urinary Arsenic Distribution

Figure 18. Characteristics of the Study Sample

Table 17. Logistic Regression Results

Table 18. Characteristics of the Study Sample

Figure 19. Urinary Arsenic Distribution

Figure 20. Characteristics of the Study Sample

Table 19. Logistic Regression Results

Table 20. Characteristics of the Study Sample
Award-Winning Posters from the 2014 SURP Poster Session

2014 Best Poster Design Award
Cross-talk between nonsense-mediated mRNA decay and proteasome-mediated protein degradation

Wild type β-globin is detected by FLAG antibody, but not 391R β-globin

Discussion and Future Directions

Possible Explanations:
1. Unique C-terminal tag recognizes both protein species
2. Other molecules (e.g., proteasome activator) may influence protein degradation of β-globin
3. β-globin is not antigenic in some cell lines

References

Acknowledgements

Introduction

We hypothesize that there is a complex interplay between nonsense-mediated mRNA decay and the proteasome system. Understanding this relationship is crucial for developing new therapeutic strategies.

Experimental Strategy

We have developed a novel assay to monitor the expression and degradation of β-globin in real-time. This assay allows us to determine the relative contributions of both pathways to protein degradation.
The male oral cavity as an extraginal reservoir for bacterial vaginosis-associated bacteria

2014 Best Poster Presentation Award
Synthesis Modification of Lanthanide Phosphate Nanoparticles as Radioimmunotherapy for Acute Myeloid Leukemia

Derek P. Wong1,2, Alexandra H. Hernandez1, John M. Page1
1Fred Hutchinson Cancer Research Center, Seattle, WA; 2University of Chicago, Chicago, IL

Materials and Methods

Synthesis (Fig. 1) and Characterization (below)
- Transmission electron microscopy to visualize NPs, obtain size
- Visual comparison of solubility
- Immunofluorescence staining to visualize NP binding
  - After incubating HEL cells with primary antibody (either BCR or BHV1), a negative control that does not bind CD45, cells are washed, incubated with secondary antibody conjugated to Cy3
  - Cy3 emits red light - corresponds to locations of BCR or BHV1
- Cell blocking assay to compare NP binding affinity to cells
  - HEL cells are incubated with 125-iodinated BCR or NPs
  - After wash, cells are incubated with 125-iodinated BCR or NPs
  - NP binding detected using gamma counter

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A Reverse Genetic Screen in Zebrafish Identifies sec24b and Ipp as Genes Required for Convergent Extension

Sarah Debts, Crystal Davey, Dr. Cecilia Moeser
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The planar cell polarity pathway mediates several developmental processes in vertebrate embryos.

- Problem: Each year, over 300,000 babies worldwide are born with neural tube defects (NTDs) that can lead to permanent nerve damage or death.

- NTDs Causes: Mutations in the planar cell polarity pathway (PCP), the process by which cells are correctly oriented and localized during development.

PCP Pathway

Zebrafish facial branchiomotor neurons (FBMNs)

Mouse stereocilia polarization

Mouse NTD

Zebrafish CE

Hypothesis: Specific PCP genes will be required for distinct PCP processes.

Using the CRISPR/Cas9 system to conduct a reverse genetic screen in zebrafish:

1. Guide RNA (gRNA) binds DNA target
2. gRNA directs Cas9 to site
3. Cas9 cuts

Microinjection of gRNA & RNA encoding Cas9 enzyme into 1-cell embryo

Findings: sec24b disrupts CE and Ipp disrupts CE and fp polarity without disrupting FBMN migration.

Therefore, while core genes are conserved, different phenotypic processes recruit specific genes.

- Confirm sec24b CRISPR cutting with sequencing and qPCR.
- Raise mutant fish to establish stable mutant lines to confirm phenotype.
- Continue reverse genetic screen to elucidate additional key genetic players in specific PCP phenotypic processes.

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