I was able to learn about the importance of research through my position in the Department of Surgical Research at the University Of Cincinnati College Of Medicine. Prior to my experience, I knew very little about surgical research. I was motivated to pursue a position initially because I want to become a general surgeon. In the lab, I originally wanted to learn about the role research plays in surgical care and to gain a wider range of bench research skills. I knew that surgical residents from the University Of Cincinnati College Of Medicine work in the lab and I wanted to learn about the realities of their career. Once I was offered a position in the lab, I began to anticipate what my experience would be like. I thought that I would be given tasks of little importance like cleaning dishware, stocking equipment, or running errands. In addition, I thought that I would not understand the molecular and cellular mechanisms underlying the research.

At the beginning of my experience, Dr. Caldwell, the head of the Department of Surgical Research, was established as my advisor. I met with Dr. Caldwell to assign specific milestones for my research. The first milestone was to learn the process of gel-electrophoresis, the second milestone was, and finally the third milestone was to learn how to image the membrane from the western blot and analyze the densitometry. The milestones were targeted to teach me skills that would assist the research in the lab as a whole. Dr. Caldwell and I also assigned goals that would grow my research abilities beyond bench work. The first was to read scholarly articles that relate to the research of the surgical research lab, specifically, the immune system’s response to bacterial infection due to trauma. The second was to share my research in an academic setting either through a publication or a poster presentation. These goals were influenced my desire to become a general surgeon. To be a successful physician I will need to understand the methods and concepts of other scholars’ research discoveries. In addition, I will need to share my own discoveries in an understandable and efficient manner. Therefore, these goals were made so that I could be a valuable asset to the lab and to any medical position I pursue in the future.

My part-time, unpaid research experience began on September 5, 2015.Dr. Caldwell first taught me how separate proteins from neutrophils using gel-electrophoresis. After the first week I started to run gels on my own and I learned which detergents to use for the targeted protein’s molecular weight. In addition, I learned how to prepare protein samples and break apart the parent cell. Following this accomplishment, I learned how to transfer the proteins on the gel to a membrane using western blots. After the proteins were on the membrane, I learned how to determine which primary, secondary, and tertiary antibodies to use and in what concentration. The following step was to learn how to use an ultra-violet imaging machine to take a picture on the membrane. In March 2016, the tail end of this spring semester, I began to prepare my poster presentation. This process taught me the proper format and organization for a scholarly poster and also how to share my research in a clear and concise way.

My research over the past two semesters contributed to a two key discoveries. First, the concentration of bronchoalveolar, lung, microparticles (BAL MPs) vary between healthy and burn-injured mice. And second, BAL MPs improve the survival and decrease the bacterial load of burn-injured mice. These discoveries show that BAL MPs act as an immunomodulator and can be used as an alternative to antibiotics. Future treatment with BAL MPs would have a significant impact on societal problems. Antibiotics are sometimes ineffective against sepsis, burn-injury, and other similar traumas. BAL MPs could be used to lower the mortality rate for trauma-induced infections. Such a treatment would also be very useful in the military for soldiers who are burned and severely injured. Soldier’s increased survival would strengthen the military and its capacity to protect the nation. Treatment with BAL MPs, however, should not be limited only to the military. Many developing nations have a higher rate of infectious diseases like tuberculosis, malaria, and cholera. BAL MPs could potentially be used to treat these infectious diseases which will interrupt the health and poverty cycle. There is a social responsibility to treat patients both locally and abroad so that there are not institutionalized systems of power and privilege. Furthermore, each year across the globe more strains of bacteria are resistant to antibiotics. It is crucial, therefore, to find alternatives to antibiotics, like BAL MPs. The global society as a whole will benefit from alternative treatments to bacteria.

Throughout the course of my research experience, I realized that many of my preconceived expectations were inaccurate. Dr. Caldwell gave me work that was a valuable contribution to the lab. In addition, I was able to gain a deep understanding of the molecular and cellular mechanisms. The course content of many courses aided my learning. My experience in the surgical research lab changed also my perception of research. Before this experience I thought that medical research was very monotonous and that researchers could not also be doctors. Now I understand that medical research is dynamic and has a lot of variety: projects change, discoveries are made, and new techniques are tried. In the lab, I like the feeling that I am contributing to the future of medicine and that the work I am doing makes a difference. This elicited feelings of pride and achievement. However, I also learned that I dislike only working with mice and not with patients, which would sometimes illicit feelings of frustration. I know now that if I pursue research in the future, I desire more patient interaction.

This experience also helped to prepare me for the future because I was able to work alongside surgical residents in the lab, and one day I want to be a surgical resident. This experience showed me that general surgeons can also do research, and that the career paths are not mutually exclusive. The surgical residents were able to work in the lab for most of the day, and then cover shifts in the hospital at night. While this schedule may seem exhausting, I believe that I would be well suited. The surgical residents are very outgoing and they work together. I value these traits because I want to interact with others in my future career. In addition, I am passionate about both medical research and clinical care.

I saw that as a general surgeon, I will be trained as both a physician and a researcher. I also learned that I enjoy the hands-on nature of research and the constant movement. I do not, however, want to pursue a Ph.D. instead of an M.D. My mentor and other professionals in the lab are Ph.Ds and I was able to observe the significant contributions that they make through research. In light of this, I still believe that I am best suited for life as a physician. This experience has taught me that medical research requires the continuous pursuit of knowledge. Medical researchers are constantly learning from new publications, techniques, and discoveries. To prepare myself for my future career, I must commit to life-long learning. I have also gained a greater appreciation for the persistence and creativity that medical research entails and I will hone these skills as I prepare to become a general surgeon. As a whole, this experience has deepened my passion for medicine. I more fully understand the mutual importance of clinical care and medical research. I have truly enjoyed learning from my mentor and working alongside the other students in the lab. In the following year, I plan to continue my research in the surgical research lab and I look forward to the bounty of knowledge that is sure to come.

 The learning and growth from this experience can also be applied to other areas of my life. In the lab I learned how to communicate clearly with others who are working towards a common goal. In addition I learned how to appreciate both failure and success when experiments did and did not work. Finally, I learned how to communicate technical achievements in a way that can be appreciated by a larger audience. The ability to work on a team will assist me in my role as an RA because I will be better equipped to seek out the strengths of others and to learn from them. My new appreciation for both success and failure will aid me in all areas of life because I will be able to appreciate the times when things do not go my way and adapt for the future. Finally, the ability to communicate with a broad audience will aid me as a Young Life Leader, for a campus ministry, because I need to be able to share what I believe in a way that makes sense to people from a wide variety of backgrounds.