One day in the spring of my senior year, my Anatomy and Physiology teacher announced that Cincinnati Children’s Hospital had internships for graduating high-school seniors. In the part-time internship, each student would shadow a doctor for eight weeks, assist them in a research project, or both. I was unsure of what career path I would take, so this seemed a good way to get a broader view of work that goes on in a hospital. When I went online to apply, I realized that admission to the program was extremely competitive: only 16 students would be chosen, one per available field of study, from hundreds of applicants. I did not have high hopes, but I completed the application as best I could and kept it in the back of my mind as I waited for a reply.

Finally, it came: I was one of the selected few! I was ecstatic. I would work in the lab of Dr. John Bissler, a world-renowned doctor and researcher in the Division of Nephrology.

Immersion & Discovery
Many of the other interns in the program were more interested in clinical work, so they spent more time shadowing their mentors and participated less in research projects. For me it was the opposite; I spent most of my time working in the lab instead of shadowing Dr. Bissler.

On orientation day, I met with Dr. Brian Siroky, a post-doctoral researcher in Dr. Bissler’s lab. Dr. Siroky would mentor me and another intern on what turned out to be a research project. I was excited to work with him and learn as much as I could about the field of nephrology.
out to be a fascinating research project. New technology called High-Intensity Focused Ultrasounds (HIFUs) had become available to treat angiomyolipomas, tumors that form in the kidneys as a result of a rare genetic disease called tuberous sclerosis. Although benign, angiomyolipomas can grow in a way that impairs kidney function, and the blood vessels in these tumors can rupture and hemorrhage.

HIFUs would be able to non-invasively target a tumor as small as a grain of rice, applying intense heat to kill the cells. We would study this therapy in the lab using renal cells in culture. To make the cells more susceptible to the heat, we would first treat them with drugs that had known effects on tumors. The goal was to find the combination of drugs and heat that would kill the cells and cause the least scarring in the kidneys. This would be a vast improvement over the current surgical treatment for these tumors, which has inherent risks of complications and requires a long recovery time.

Before I could participate in this research, I had to learn a lot of basic skills, including feeding, passaging, and plating cells. I had dealt with chemical reactions in my high school lab courses, but I had never worked with living cells. The most important thing I had to learn was to keep everything sterile so that our cell cultures would not be contaminated by other organisms. Before I knew it, sterile technique was second nature to me.

Once we had cells plated out, we adjusted several variables. Our control group was kept at human body temperature (37°C), contained healthy renal cells, and was given no drugs. Our experimental groups included both healthy cells and tumor cells that were treated with various concentrations of drugs and HIFU of varying duration.

After we conducted these experiments, we conducted cell viability assays to determine the number of live and dead cells left in the samples. To do this, we added a fluorescent dye so that live and dead cells would light up in different colors. We used western blots, a technique for detecting proteins, to determine the exact protein expression in each sample to see how the cells were reacting to the experiments. This was my first exposure to protein expression. I hadn’t realized that there were so many possible proteins that could be expressed and how specifically they could indicate what was going on inside a cell. It was fascinating to say the least.

I was only supposed to work part time, but some experiments took a long time or a lot of waiting, so if I wanted to be there for the exciting parts, I had to stay a few extra hours. Unfortunately, even with those extra hours, eight weeks is just not enough time to see this kind of research through to the end. I did get to see some interesting results, though, and how to adjust our experiments to keep moving the research forward. For example, we adjusted the duration of our experiments, tested for different proteins, and changed the amount of a drug we were using.

I loved working there. The people were great, the research was interesting, and I learned how to use sophisticated equipment while developing valuable lab skills. Most important, it was a detailed introduction to some of the scientific fields I thought I might pursue in the future.

Opening Doors
I just finished my freshman year at Case Western Reserve University. I’m studying biomedical engineering, a decision that was heavily influenced by my internship experience. Last semester, I was fortunate to secure a position in the Alsberg Stem Cell & Engineered Novel Therapeutics (ASCENT) Lab, which focuses on developing biomaterials for tissue regeneration, especially for bone.

I was pleasantly surprised to learn that many of my skills did carry over. The cell culture technique we use with adipose-derived stem cells is very similar to the technique I used when handling the renal cells. The biggest difference is in how we assess our experiments. Because the research focuses on bone formation, we test for calcification and other bone markers rather than cell death. I also had to learn methods to assess gene expression in addition to protein expression. Thankfully, because I was already used to the general procedures of a lab, all of this was a fairly quick and easy adjustment.

I am so grateful for that internship at Cincinnati Children’s Hospital. In addition to giving me valuable experience in the lab, it showed me how one opportunity can open the door to so many more. I plan to work in Dr. Alsberg’s lab for quite a while longer, and I’m sure I will continue to learn new things through research.

Emma Headley is a sophomore at Case Western Reserve studying biomedical engineering. When she’s not in class or the lab, she enjoys spending time with her friends and watching her favorite TV shows.