

Robert Wozniak

Graduation Year: Junior

College: Science

Major(s): Science Preprofessional Studies, Spanish

Minors(s): N/A

Scholar Group Membership: N/A

Did you received other funding for this project?: College of Science

Could you have completed this project without CUSE funding? No

More details on CUSE funding assistance?

Project Title: Evaluation of Methodology in Monitoring, Controlling, and Treating Chagas Disease in Belize

Project Location: Belize, Central America

ND Faculty Mentor: Dr. John Grieco & Dr. Nicole Achee

Project Type: Research Assistantship

Why did you undertake this project/experience? Deepen your knowledge of a topic or issue, Research/experience necessary for senior thesis or capstone project, Prepare for graduate school (MA or PhD), Career discernment and/or preparation, Internationalize your Notre Dame experience

Did your funded experience help you:

[Deepen your understanding of your coursework or field of study]: Very Much

[Discern your interests and post-bac goals]: Very Much

[Become confident in your ability to set and achieve your goals]: Very Much

[Gain a more nuanced view of local, national, or global communities]: Very Much

[Improve your written and verbal communications skills]:Very Much

Tell us about your experience.

My work in Belize as a Research Assistant evaluating the control, prevention, and treatment of Chagas disease has been an absolutely unforgettable and unparalleled experience. Before landing in Belize, a Chagas endemic country, there were several unanswered questions regarding the current preventative measures used to combat Chagas and its transmission vectors, the ways in which Chagas patients could be treated, and how new treatment methods could potentially be introduced to the country via the Belize Ministry of Health. After arrival, our research team at the Belize Vector and Ecology Center (BVEC) began manual inspections of community homes in search of *Triatoma dimidiata* (commonly known as kissing bugs), one of the transmission vectors of Chagas disease. Odorant baited traps were set in several of these homes to determine if the odorants could successfully stimulate the bugs' olfactory system and improve capture efficiency. We also explored various caves across Belize, including the Rio Frio and Lamanai caves, and collected samples of wild type *T. dimidiata*. The cave collections proved to be much more successful than the manual house searches and traps, giving us a significantly larger sample of cave bugs that were then used in our laboratory research.

For the wet bench part of our work, we investigated the repurposing of a chemotherapeutic agent for Chagas disease treatment. The overarching purpose of this laboratory research was to determine miltefosine's potency against the parasite *Trypanosoma cruzi*, which is responsible for Chagas, and the *T. dimidiata* transmission vector, which carries the parasite. Miltefosine is a common pharmaceutical used to treat the neglected tropical disease leishmaniasis; due to the genomic similarities between the leish parasites and the *T. cruzi* parasites, it was presumed that miltefosine could also effectively treat Chagas. After determining the amount of miltefosine needed to successfully kill *T. cruzi* parasites before reaching Belize, an artificial membrane blood-feeding system was used to generate miltefosine dose-response curves for the laboratory-colonized and wild samples of triatomines collected in Belize. Although miltefosine proved to be ineffective in killing the bugs themselves at all concentrations, it is clear that the drug is effective in killing the *T. cruzi* parasites themselves. Once I return to Notre Dame, I plan on completing further research on determining whether miltefosine can effectively kill *T. cruzi* parasites that are within the bugs.

The final part of our research was to find how new treatment methods, such as miltefosine, could be implemented into the Belizean health system if it were to show proven success in treating Chagas after further research. After interviewing various health professionals, including pharmacists, physicians, and members of the Belize Ministry of Health and Department of Health Services, it was determined that there is no current treatment for Chagas disease or any sort of drug legislation within the country. In other words, those diagnosed with Chagas disease would have to seek treatment elsewhere, and it would be very difficult to introduce any new drugs into the country due to the lack of a drug registry. However, we did learn that the Ministry of Health is working on creating drug legislation and other proposals that would facilitate the treatment of Belizean patients suffering from several different neglected tropical diseases, including Chagas.

Describe the impact this project had, both on you as a student-scholar and on the people you worked with.

This research assistantship experience has been extremely influential in shaping who I am and who I want to be as both a student-scholar and human being. Having the opportunity to work in the global health field as an undergraduate student has expanded my overall perspective and inspired me to continue working toward becoming a physician that is also involved in global health initiatives across the world. Not only did this experience allow me to improve my laboratory and research skills as a student-scholar, but it truly opened my eyes to the realities and injustices of the world we are living in. Having the opportunity to speak with health care professionals and look at Belizean neglected tropical disease patients from the population level forced me to view the big picture and critically think about ways in which my work could make the most widespread and lasting impact. On the other hand, visiting homes, speaking to villagers about their personal experiences with Chagas, and seeing how neglected tropical diseases affect countless communities allowed me to put faces to the numbers and truly find inspiration in the work I am doing. Simply conversing with Belizeans and providing education on how to protect themselves against Chagas, among other diseases, served as an incredible opportunity to pass on critical information that has the potential to save lives.

This experience has also made a huge impact on the way I look at my own life and the world

around me. Living in Belize and visiting extremely rural areas has made me so grateful for the life and resources I have been given, as there are countless people in the world who are not so fortunate. The trip showed me how unforeseeable complications can impact the research process, and it taught me how to handle these implications with poise, critical thinking, and hard work. Before arriving, I took numerous things for granted; my experience has made me appreciate the small things that we tend to forget the importance of throughout or daily, “normal” lives in the United States and at Notre Dame. I am ceaselessly grateful for this opportunity and the way it has shaped me into a more aware and appreciative student-scholar and overall human being.

Describe how this experience is connected to your plans as a student or future professional.

Since the start of my experience in Dr. Grieco and Dr. Achee’s Notre Dame research laboratory and in Belize, I have been captivated by the work being done toward the control, prevention, and treatment of Chagas disease and several other infectious diseases in developing areas across the globe. As a Science Preprofessional and Spanish double major with a passion for medicine and a desire to work in the global health field, I found working in the lab and the summer research apprenticeship to be a perfect fit for my interests and academic goals. After becoming a Notre Dame graduate, I plan on taking a gap year before beginning medical school to spend time working for an international service organization, such as Partners in Health, or a research laboratory in the global health field. Ultimately, I want to participate in worldwide projects and programs, with my biggest dream being to work for Doctors Without Borders. I strive to utilize my knowledge and skills, possibly through a field like general or reconstructive surgery, to help as many people as I can from all corners of the world. My core values and principles are rooted in the foundation of global health, and I cannot think of a better way that I could have spent my summer than working toward the prevention of a devastating disease while experiencing its effects firsthand in a country that greatly broadened my pre-medical and human perspective.

What advice would you give other students who are planning to pursue similar projects?

Take advantage of this incredible opportunity and use it to your advantage as both a student-scholar and overall person. Work on something you are truly passionate about and let that passion drive you to continuously improve yourself, your academic abilities, and the ways in which you can positively impact the people around you. Whether you are staying in South Bend, working elsewhere within the country, or traveling internationally, remember that there are so many potential ways to help each field of study and corner of the globe.

One of the biggest things I learned was that the challenges you face and mistakes you make are going to be what eventually help you reach your end goal if you force yourself to embrace and learn from them. Resolving research complications, overcoming cultural challenges, or reworking your schedule when something does not go as planned will improve your ability to think on your feet and conquer the obstacles you face. Do not panic if something unexpected occurs, but think critically about what you can do to resolve the issue or approach your project from a different angle.

Enjoy every single minute of the process of your project, from the very start of your ideas and

