**Basic Information**  
Full Name: Megan Dunlevy

UC Email: dunlevme@mail.uc.edu

College: Arts and Sciences

Major: Biological Sciences- Biomedical Studies

Title of Project: UHP Biomedical Research and Mentoring Program

Thematic Area (choose only one): Research

Expected Project Start Date: 01/12/15

Expected Project End Date: 04/24/15

**Project Information**

1. Provide a detailed abstract of your proposed honors experiential learning project.

The UHP Biomedical Research and Mentoring Program (RaMP) is run though Honors and pairs first and second year students with mentors at UC College of Medicine or Cincinnati Children's. The purpose of the program is to give first and second year students lab experience and give the mentors a chance to teach an undergraduate. I have chosen to take a position in Benoit Lab at the University of Cincinnati. I will be directly working under Dr. Andrew Rosendale. I will be working 9 hours a week in the lab for 14 weeks.

I will be investigating the physiology of ticks, carriers of many vector-borne diseases, in relation to stress such as dehydration, starvation and overwintering. By examining the stress response of the tick new strategies to combat vector-borne illnesses could be discovered by targeting the ticks that carry the diseases. A better understating of the effects of climate change on ticks will also serve to increase awareness about vector-borne illnesses in regions that were not habitable to ticks previously. My research aims to identify the genes within the tick that are upregulated in response to stress that enable the ticks to survive in harsh conditions. By identifying these genes potential targets to reduce tick survival could be discovered.

Upon graduation I plan on entering medical school to earn my MD. My work in this lab could help me decide if I would like to pursue a specialty in infectious disease. As this is my second research experience I have already determined that I am not interested in making a career of research however I do enjoy research. By completing this project I wish to determine if a would like to make research a small part of my career and something I would like to continue with through my graduate work or if research is only something I enjoy doing as an undergraduate.

**Clearly and thoroughly address how each of the following elements will be exhibited in your work:**

1. Connection to Learning Outcomes within the Honors Thematic Area (identified above)

As this is my second research experience I primarily want to expand upon my existing knowledge to make me a more well-rounded lab member. For this reason I wish to address the **"Ability to identify and apply appropriate methodologies to design research study, and collect and analyze data"** learning outcome. I may have learned many basic lab skills in my previous lab experience however there are still many lab skills that I still haven't learned and many other skills that I wish to improve upon. For example in my previous research experience I did not have the chance to do much animal handling nor was I involved in the care of the animals. In this research experience I want to learn more the handling and care of lab animals was well as improving my basic lab techniques. I am going to continue to keep a detailed lab notebook with step-by-step guides on animal care as well as the protocols for the experiments I do in the lab.

I also want to address the **"Possess a well-developed awareness of literature in the field"** learning objective. I read more scientific papers now due to my academic laboratory classes however I still feel that I could improve my scholarly article reading abilities. Andrew gave me several papers to read when I first accepted my position and several other papers as the spring semester came near. Since the project I am working on is still in the planning stages there are several papers for me to read in order to help set up the experiment. In order to improve my scholarly article reading skills I am going to highlight and annotate the PDF versions of the articles as well as outlining any questions I have on a separate sheet of notepaper. Any questions I have I will investigate further until I can answer the question. The last learning objective I want to address is **"Formulate a theory, problem, or hypothesis for the proposed research project that is based on the literature review"**. The research project that I will be working on is still in the planning stages so a lot of what that needs to be done first is checking the literature for possible experiments to run and data to collect. The overall research project has already been chosen however the individual measurements for the experiment are still being planned. This means that before I can get into the lab to start my bench research I first need to become well versed in the literature to identify potential experiments to run to examine my research question. After the potential experiments are identified I will need to test the experiments to see if the experiments can be transferred from the literature to work for my purposes.

1. Connection to Goals and Academic Theories (include reference list, as appropriate)

For years now I have known that I want to earn my MD however until finishing my first research experience last year I was not sure whether or not I wished to include research as a part of my career. After completing my research experience last year I realized that I have no desire to enter a combined MD/PhD program. Even though I don't wish to purse a combined MD/PhD program I still enjoyed research enough to pursue a second research experience. Ideally I think I would like to combine my passion for research with a clinical career. I am not sure want I would to specialize in at this point but I think that I would like to pursue a career in either immunology, surgery or infectious disease. I hope by completing this experience I will have a better understanding if a career in infectious disease is something that I would be interested. I also want to determine if what I would be interested in taking my upper level biology electives. This experience will also allow me to improve my teamwork skills. Research tends to be a team effort as most times you will need help or have questions for other people with different strengths. Participating in research will make me collaborate with others in order to complete my research in a timely fashion. This experience will also improve my time-management skills both in and outside of the lab. Outside of the lab I will need to balance my lab work with my classes and other activities while in the lab I will need to balance multiple tasks assigned to me that all need to be completed during my lab time.

In order to prepare myself for my research experience and to give myself a conceptual background Andrew provided my with several papers to read. All of the papers I read where meant to give a board base of knowledge on which to base my research experience. The first paper *Drosophilia as a Model for Starvation: Evolution, Physiology, and Genetics* by Allen Gibbs and Lauren Reynolds details the experimental conditions for a starvation study using *Drosophilia* as a model organism. The paper also details the effects of starvation studies on the organism as well as the genetics and metabolism of the organisms after a organism is run through starvation conditions. Typically after an organism as been exposed to starvation conditions the amount of simple sugars in the bloodstream and a lack of complex sugars storing energy within the body. *A Primer on Insect Cold Tolerance* by Richard E. Lee, Jr. gives background knowledge on the effects on a cold tolerance study on the insect. This article shows the effects cold shock treatments on the organism as a whole as well as the effects of the cold shock on the metabolism of the insect. Under cold shock conditions the metabolism of the insect slows. The level of cold tolerance vary by organism due to the levels of anti-freeze like molecules that the organism naturally produces. *Effects of Climate Change on Ticks and Tick-Borne Diseases in Europe* by J. S. Gray, H. Dautel, A. Estrada-Pena, O. Kahl, and E.Lindgren details the effects of global climate change on the prevalence of tick borne illness in Europe. An increase in winter temperatures is allowing ticks with a lower cold tolerance to survive the winter and thus ticks carrying vector-borne illnesses are being observed further north than ever before. Finally the last paper I was given to read was *The Ecology of Tick Borne Illnesses* by Miriam Pfäffle, Nina Littwin, Senta V. Muders, Trevor N. Petney, This article provided me background knowledge on the mechanisms by which vector-borne illnesses are transmitted as well as the environmental conditions such as temperature and humidity that contribute to overall tick survival in the wild.

1. Initiative, Independence, and/or Creativity

In order to receive this position I showed initiative by writing several drafts and two final copies of a letter of interest and interviewing with each of the labs that I applied to. My initiative in writing the letters and interviewing is what got me this position with Andrew. Since I already have a semester of research experience and some knowledge of basic lab techniques, I will be fairly independent the fundamental lab practices. I will be fairly dependent on Andrew on the specific techniques used for our project and the care and handling of the ticks until I learn more about the handling of lab animals and the ticks specifically. Since this project is still in the planning stage, I will have a little creative input by reading papers to see if any of the methods described in the paper could be used in my own research.

1. Reflection

I will be reflecting on my experiences in the lab several ways. I will be keeping a lab notebook filled with all of the procedures and protocols that I learn to perform. I will also be keeping tips and procedures for tick care and handling in my lab notebook. In my last research experience I decided to keep a video blog to documented my more personal feelings as the project progressed. This turned out not to be such a great idea as finding time to record the blogs become a hassle since I had to ensure that there would be minimal background noise so I could be heard in the video. After attempting to video-blog for an entire semester I have decided that for this program I am going to keep a weekly written blog as this will be easier to fit into my schedule as I can blog from anywhere without having to worry about noise. The blog would follow a set pattern every week. I would start with a general overview of what I did that week and a short description of the skills needed to perform that task. Then I will check in on my progress on the learning outcomes I wish to address in this experience and state if there is anything that I can do to increase my progress on the learning outcomes. I will state if I feel that my understanding of the literature as increased any that week and state of the entire research project. Since the project is still in the planning stages my week to week activity could be different week based on the data gathered the previous week and what Andrew and I believe will be the best course of action. I will tailor the blog to include the hard science of what I am doing as well as the overall picture so my blog will be readable for people with varying knowledge of biomedical research. Toward the middle if my blog I want to compare this current experience with my last research experience in regards to new techniques that I can perform or old techniques that I have gained new proficiency with and a brief statement on how confidant I feel in the lab as my knowledge increases with time. Finally I will end my blog with any connections to my classes, my game plan for the next week, and a summary of how I feel the week went as well as any data that I have collected from the last week.

1. Dissemination

As a part of the UHP Biomedical Research and Mentoring Program every participant is required to give a short presentation about what they learned in their research experience. This presentation focuses more on the personal growth obtained by each participant of the program rather than the technical knowledge gained throughout the duration of the program. I also plan on continuing to be a RECON mentor through the office of Undergraduate Research, Scholarly Endeavors, and Creative Practice. The RECON mentoring process matches undergraduates that wish to become involved in research opportunities with undergraduates that have already been involved with research. After completing this experience I fell that I will be a better RECON mentor since I would have been involved in two different research experiences. My RECON mentees tend to be fellow biology majors or pre-med but depending on the majors of the students who attended the introductory workshops I can receive mentees from other majors. These mentees are the most difficult for me as I can pull from my personal experience and instead I have to speak about a research experience in general. I want to obtain a wider knowledge of research so I can be a better resource to those students by having a boarder knowledge of research.

1. Project Advisor (list the person’s name, title, and contact information)

Andrew Rosendale, PhD

Postdoctoral fellow

Rieveschl Hall

University of Cincinnati

[rosendaw@uc.edu](mailto:%20rosendaw@uc.edu)

1. Budget (if applicable)

I would be working 9 hours a week for 14 weeks. This will total 126 hours spent in the lab with additional hours spent reviewing and reflecting on what I did in the lab.

9. Citations

Gibbs, A.G and L.A Reynolds. "Drosophila as a Model for Starvation:Evolution, Physiology, and Genetics." Comparative Physiology of Fasting, Starvation,and Food Limitation (2012): 37-51.

Gray, J.S, et al. "Effects of Climate Change on Ticks and Tick-Borne Diseases in Europe." Interdisciplinary Perspectives on Infectious Diseases (2009): 1-12.

Lee, Richard E. "A Primer on Insect Cold Tolerence ." Low Temperature Biology of Insects (2010): 3-34.

Pharmaceutical Biotechnology (2011): 884-896.

Pfaffle, Miriam, et al. "The Ecology of Tick-Borne Diseases." International Journal for Parasitology (2013): 1059–1077.