

## Respective Contributions

### Preparing Proposal

I selected Dr. Sarah Ross as my thesis mentor after completion of two research rotations in the Pittsburgh Center for Pain Research. During medical school, I met with Sarah Ross periodically to discuss possible projects which would combine my research interests and experience with areas of growth and training opportunities to ultimately prepare me to become an independent researcher. Specifically, we were interested in the circuitry underlying the pain modulatory effects of the rostral ventromedial medulla. Through reviewing the literature and discussing with Dr. Ross, I developed the hypothesis that mu-opioid receptor-expressing neurons in the RVM facilitate pain through synapsing on interneurons in the dorsal horn. I then reached out to Dr. H. Richard Koerber, a renowned expert in electrophysiology. He was excited to collaborate on this project and agreed to be my co-sponsor, as his expertise would provide me with invaluable guidance and training.

I wrote the first draft of every section of this proposal, with the exception of Letters of Support and the Sponsor and Co-Sponsor Statement, which was written by Dr. Ross and Dr. Koerber. I then obtained feedback from Dr. Ross and Dr. Koerber, who all gave me impactful and valuable critiques which aided in the development of the final proposal. The process of preparing this proposal has provided experience and a wealth of knowledge in grant writing that I will benefit from greatly as I continue to write grants, publications and communicate science to a wider audience.

### Accomplishing Proposal

I have prior experience with immunohistochemistry and mouse behavioral experiments from my previous research experiences and have consulted a postdoctoral fellow in the Ross Lab, Dr. Tayler Sheahan (**Letter of Support**) for technical assistance in the completion of the stereotaxic injections required for **Aims 1-3** as well as the behavioral assays proposed in **Aim 3**. In addition to offering technical assistance, Dr. Sheahan will provide feedback on analysis of my behavioral data obtained from the pain behavioral assays proposed. In addition, I will also receive training in the FISH experiments proposed in **Aim 1** from Eileen Nguyen, an MSTP graduate student in the lab (**Letter of Support**). Eileen is an additional lab member who has experience with stereotaxic surgeries, specifically into the RVM and so will be an invaluable resource should I require additional technical assistance. For **Aim 2**, I will learn electrophysiology in slice by receiving direct training from Dr. Kelly Smith, a postdoctoral fellow in the Ross Lab (**Letter of Support**). When I begin my training, I will be using practice mice and working directly with Dr. Smith, with the goal that I will be conducting the proposed experiments independently. I will also have the support of my co-sponsor, Dr. Koerber, another principal investigator within the PCPR for additional assistance and training with electrophysiology. Additionally, **Aims 1-3** all require the *Oprm1<sup>cre</sup>* knock-in mouse, which has been generously provided by Dr. Richard Palmiter, a renowned expert in the development and use of genetic tools for the study of mouse behaviors (**Letter of Support**). Dr. Palmiter has provided valuable information regarding the development and validation of this mouse line. Should questions arise about the clinical manifestations or management of chronic pain, I have consulted Dr. Ajay Wasan, a specialist in chronic pain management who applies medical informatics to the investigation of pain treatment outcomes. He will serve as both a clinical consultant for my proposal and as a physician-scientist mentor for my career development (**Letter of Support**).

Throughout my training, I will continue to have weekly one-on-one meetings with Dr. Ross where we discuss the results of my project and troubleshoot experiments. In addition, I will be attending weekly lab meetings, during which I will present findings with the Ross Lab. I will be primarily responsible for writing up our findings as a manuscript, and plan to present our discoveries at research conferences, such as Society of Neuroscience, American Academy of Pain Medicine, and International Association for the Study of Pain. Manuscripts and posters will be drafted by me with guidance from Dr. Ross and Dr. Koerber in a collaborative process.

Finally, I have assembled a team of mentors including my sponsor, Dr. Ross, my co-sponsor, Dr. Koerber, my clinical consultant and physician-scientist mentor, Dr. Ajay Wasan, as well as my career advisor, Dr. Alan Sved. This involved group of mentors consists of accomplished investigators positioned at diverse stages of their careers who will provide me with outstanding academic and professional development.