BIOGRAPHICAL SKETCH

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NAME: Qingwei Niu

eRA COMMONS USER NAME (credential, e.g., agency login): QINGWEINIU

POSITION TITLE: Graduate Student Research Assistant

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Rutgers University-New Brunswick	BA	05/2018	Biological Science
Johns Hopkins Bloomberg School of Public Health	MS	05/2021	Molecular Microbiology and Immunology
Washington University of St. Louis	PHD	05/2026 (Expected)	Molecular Cell Biology

A. Personal Statement

My first scientific research started during my junior year at Rutgers University. I worked as research assistant to Dr. Ilya Raskin, exploring the molecular effects of plant-derived compounds in the quest to develop potential botanical anti-inflammatory therapeutics. The results were published on PloS One (Skubel et al. 2018) and presented in my senior honor thesis defense (George H. Cook Scholars Program). My first achievement in developing the RAMES technique allowed me to experience how progress in research could start with something small that might grow to have global ramifications. This gave me more confidence to become a scientific researcher. To build up a solid foundation for a Ph.D. program, I started my master's study at Johns Hopkins Bloomberg School of Public Health. I joined Dr. J. Marie Hardwick's lab to cultivate my knowledge in cellular and molecular fields. With the master's education, I have a deeper and more comprehensive understanding on being a qualified academic researcher. I learned the value of carefully analyzing every experiment result, even it is negative data. These habits always allow me to generate new ideas for my project, which honed my logical thinking ability and rapidly improved my experimental skills. My prior experiences have informed my current research goal, which is improving people's health from pathogenesis perspective to discover potential therapeutic targets of various human diseases. To achieve my research goal, I entered the fields of physiology and biochemistry during my graduate training at Washington University, where I study the potassium channel regulated phagocytosis in RPE cells under the mentorship of Dr. Polina Lishko, a renowned scientist known for her pioneering work in the field of electrophysiology, and Dr. Rui Zhang. With the recently adopted techniques of patch clamp and cryo-electron microscopy, I am exploring the role of Kir7.1 channel in RPE phagocytosis function through structural and electrophysiological perspectives. The academic education and research exposure I've received thus far have furnished me with a strong foundation in the fields of molecular biology and biochemistry. To translate my knowledge to fully help others, I also worked at the emergency department in Johns Hopkins Hospital by holding consultations with patients and families to propagate HIV/HCV knowledge and perform rapid HIV/HCV tests on patients. I also trained and mentored a summer undergraduate researcher in several techniques such as plasmids purification, western blot, mouse eye dissection, primary and immobilized cell culture. Overall, I believe that the mentors I have chosen, the research career I have pursued, and the guidance I have received through the grant will provide a solid foundation for my ultimate aspiration of becoming a scholar in academia.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2022 – Present	Pre Doc trainee, Washington University in St. Louis, Dr. Polina Lishko's laboratory
2022 – Present	Pre Doc trainee, Washington University in St. Louis, Dr. Rui Zhang's laboratory
2020 – 2021	Graduate Research Assistant (MS), Johns Hopkins University, Dr. Fidel Zavala's laboratory
2020 – 2021	Graduate Research Assistant (MS), Johns Hopkins University, Dr. J. Marie Hardwick's laboratory
2020 – 2021	Teaching Assistant, Johns Hopkins University, Immunology, Infection and Disease
2019.10 – 2019.12	Counselor, Johns Hopkins Hospital--Emergency Department, Generation Tomorrow-the HIV & HCV Training Program, Johns Hopkins Center for AIDS Research
2017 – 2018	Volunteer, Saint Peter's University Hospital
2017 – 2018	Undergraduate Researcher, Rutgers University, Dr. Ilya Raskin's laboratory

Honors

2020	Master's Tuition Scholarship, Johns Hopkins University, MD
2018	George H. Cook Scholar, Rutgers University, NJ

C. Contributions to Science

1. **Undergraduate Research:** My project tackled one major challenge limiting botanical research caused by degradation of plant bioactive metabolomes during the transport from collection fields to labs. This problem incurred huge wastes on time, labor, and research funding. Therefore, I worked to stabilize plants active metabolites by developing a new extraction method through simplifying the time-consuming operation, adjusting procedures fitting for single person processing, and increasing conservation time of plant extractions with limited decay. The ultimate technique, which named as RAMES, allows botanical extracts to be stored within filter disks at -20^{o}C for 12 months. Utilizing RAMES, I was able to screen various plant tissue extracts collected in South Africa, as well as spices from India, China, and Thailand to identify natural anti-inflammatory compounds.
    a. Skubel, S., Dushenkov, V., Graf, B., **Niu, Q.**, Poulev, A., Kalariya, H., Foxcroft, L., Raskin, I. [2018], Rapid, field-deployable method for collecting and preserving plant metabolome for biochemical and functional characterization. PLoS One, Vol. 13, No.9, article e0203569.
    b. **Niu, Q.** "Further Development of Screens-To-Nature Methods in Relationship to Plant Extracts" Undergraduate Thesis Defense (Submitted to Honors Committee, the George H. Cook Scholars Program). New Brunswick, New Jersey, April 12, 2018.

2. **Graduate Research (MS):** Lysosomes as key compartments in cells are associated with various cellular activities, including nutrient sensing and Ca2+ signaling. One of the crucial complexes active at lysosome is mTORC1. I was very fortunate to study a novel signaling pathway that has important influence on lysosomal acidification process and regulating autophagy. The main goal of my project focused is to explore the mechanism of a novel mTORC1 regulator by identifying interacting proteins based on our lab's work in yeast, utilizing both in vivo (mice) and in vitro (HeLa cell lines) methodologies. This project allows the identification of a novel mammalian nutrient-sensing pathway suppressing mTORC1, which could be a novel therapeutic target to inhibit mTORC1 activity and lead to the anti-cancer effect. Yeast Whi2 were proved to interact with phosphatases Psr1 and Psr2 to inhibit TORC1 kinase activity under low amino acid conditions. My project was initiated after discovering that the mammalian equivalent of Whi2, KCTD proteins, had a conserved function to regulate mammalian TORC1 (mTORC1) activity, with a family of proteins (C-terminal domain-containing phosphatases or CTDSPs) which were functionally similar to yeast phosphatases Psr1 and Psr2. Various cellular and molecular assays are performed to understand the biological function of KCTDs and CTDSPs, such as examining the activity of mTORC1 under various CTDSP overexpression or under nutrient starvation assays in HeLa cell extract. Biochemical methods, like co-immunoprecipitation (co-IP) assays, are also used to have a more comprehensive understanding of KCTDs and CTDSPs from their structural level. A major challenge is the weak interaction between target proteins. I adjusted co-IP assays through various perspectives, including adjusting plasmids construction, reducing transfection toxicity, testing different types of pull-down beads, and increasing washing volume to decrease the non-specific binding. Ultimately, I was able

to generate a solid reproducible protein interaction result with optimized co-IP method. Additionally, I have participated in an in vivo study, utilizing mice hippocampus dissection to study the mTORC1 activity under various target proteins knockout conditions. Finally, based on language advantage, I helped in screening various KCTD7 mutations in Chinese patients to uncover potential connections between patient KCTD7 mutations and their epilepsy symptoms.

a. **Niu, Q.** "Do mammalian cells have the novel Whi2-Psr1/2 mTORC1 signaling pathway recently identified in yeast?" Departmental Research Forum. Baltimore, Maryland, March 23, 2020.
b. **Niu, Q.** "Biochemical Interactions of the Human Epilepsy Protein KCTD7" Master Thesis Defense. Baltimore, Maryland, May 18, 2021.

3. **Graduate Research (PHD):** Age-related macular degeneration (AMD) is the primary cause of blindness among people over 55 years of age and is characterized by retinal pigment epithelium (RPE) degeneration. KCNJ13 gene encodes polypeptide that forms a tetramer, which in its turn acting as inwardly rectifying potassium ion channel Kir7.1. This potassium ion channel locates at the apical aspects of the RPE. It is vital for normal RPE function to maintain ion homeostasis, as well as to support and nurture retina photoreceptors. Dysfunctional Kir7.1 channels is associated with early onset of blindness such as Snowflake Vitreoretinal Degeneration (SVD) and Lebers Congenital Amaurosis (LCA16) in humans, mainly due to dysfunctional RPE. Intriguingly, progesterone was confirmed as a natural positive regulator of Kir7.1 channel on RPE cells in electrophysiology studies. My work focus on understanding the effect steroids impose on age-related changes in the RPE through investigating the cryo-EM structure of the human Kir7.1 channel conformation, developing high-throughput screen model to test activators of Kir7.1, and exploring the regulation mechanism of this channel on RPE phagocytosis function. Structural biology skills on how to purify membrane proteins via immobilized metal affinity chromatography and gel filtration with ÄKTA™ pure to unmask the 3D structure of Kir 7.1 under cryo-EM will be adopted in collaborator's lab. This boosts up my accumulation on biochemistry, allowing me to link the Kir7.1 studied protein function with its 3D structure. I believe my proficient skills in cell culture, protein purification, co-Immunoprecipitation, immunostaining, immunoblotting, gel electrophoresis will largely support my study on Kir7.1 channel.