



Name: Katie Beverley

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Major Professor: Bikash Pattnaik PhD.

Degree Objective: Ph.D. Endocrinology and Reproductive Physiology

Background: BS Biology, University of Indianapolis

Current Research Project:

Inwardly rectifying potassium (Kir) channels are responsible for maintaining cellular membrane potential hence play an important role in cardiac repolarization and epithelial transport. The channel is comprised of 7 family members that form a homo- or hetero-tetrameric structure on the plasma membrane. Amino acid sequence of the protein possesses two transmembrane, two cytoplasmic (N- and C-terminal) and an extracellular K⁺-selectivity filter. Within the Kir channel family, some Kir channels are strong inward rectifiers like the cardiac Kir2.1 channel, and others are weak inward rectifiers as the Kir7.1 channel in the retina we study in the lab. Heritable Kir7.1 mutations cause childhood blindness, and we are interested in the molecular mechanisms of blindness caused by a novel single amino acid change at position 153. At this position, a hydrophilic amino acid threonine is replaced with a hydrophobic amino acid isoleucine. Because the amino acid 153 is within the second transmembrane domain, we speculate that T153I mutation alters protein lipid interaction within the membrane milieu. To further explore this relationship we have developed single amino acid mutants to study the interaction between Kir7.1 and the cell membrane innerleaflet. Interestingly, we found through bioinformatic analysis that Kir7.1 T153 is highly conserved within species and among the Kir subfamily, except a few which have an isoleucine. Thus, we reason that the Kir7.1 T153 has functional significance that might determine channel's biophysical properties. We would like to use 3D epithelial cell culture, imaging, electrophysiology, and biochemistry to solve the structure function relationship of this disease mutation and determine its correlation to other Kir channels.

Honors:

American Physiological Society Research Recognition for Cell and Molecular Physiology 2021

Graduate School Travel Award 2020

Finalist for Poster Award, ERP Symposium 2019

Graduate School Travel Award 2019

Finalist for Poster Award, ERP Symposium 2017

Publications



Beverley K, Steffen J, Heyrman J, Shahi P, Pattnaik B. Kir7.1 Disease Mutation in the Inner Pore is Critical for K⁺ Permeation. FASEB. 2020 Apr;18.

Beverley K, Shahi P, Pattnaik B. Polarized Expression of Kir7.1 Channels in a 3D Organoid Culture Model. FASEB. 2019 Apr;1(33).

National Presentations:

Beverley KM, PK Shahi, BR Pattnaik (2021) Side-Chain Polarity of Amino Acids within the Kir7.1 Channel Pore Lining Determine Permeability and Function, Experimental Biology, Virtual, Oral Presentation.

Beverley KM, JT Steffen, JA Heyrman, PK Shahi, BR Pattnaik (2020) Kir7.1 Disease Mutation in the Inner Pore is Critical for K⁺ Permeation, Experimental Biology, Canceled Due to Pandemic, Poster and Oral Presentation.

Beverley, KM, PK Shahi, BR Pattnaik (2019) Polarized Expression of Kir7.1 Channels in a 3D Organoid Culture Model, Experimental Biology, Orlando, FL, 2019, Poster Presentation.

Beverley, KM, DA Wiseman (2016) Enhancement of Anti-Cancer Efficacy through Combination Chemotherapy of Ciprofloxacin with either 5-Flourouracil or Gemcitabine, Sigma Zeta National Convention, Lebanon, IL, 2016, Oral Presentation.

Other Presentations:

Beverley KM, PK Shahi, BR Pattnaik (2021) Side-Chain Polarity of Amino Acids within the Kir7.1 Channel Pore Lining Determine Permeability and Function, Pediatrics Research Day, Virtual, 2021. Poster Presentation.

Beverley KM (2020) Disease Mutation in Kir7.1 Channel Alters Pore Structure, Endocrinology and Reproductive Physiology Seminar, Virtual, 2020. Oral Presentation.

Beverley KM, JT Steffen, JA Heyrman, PK Shahi, BR Pattnaik (2020) Kir7.1 Disease Mutation in the Inner Pore is Critical for K⁺ Permeation, Madison Scholars Symposium, Virtual, 2020. Oral Presentation.

Beverley KM, JT Steffen, JA Heyrman, PK Shahi, BR Pattnaik (2020) Kir7.1 Disease Mutation in the Inner Pore is Critical for K⁺ Permeation, Endocrinology and Reproductive Physiology Annual Symposium, Virtual, 2020. Oral Presentation.

Beverley, KM, JT Steffen, JA Heyrman, PK Shahi, BR Pattnaik (2019) Single Amino Acid Change in Kir7.1 Reveals Pore Structure, McPherson Eye Research Institute Poster Session, Madison, WI, 2019. Poster Presentation.

Beverley, KM (2019) Kir7.1 Mutation in the Inner Pore Results in Channel Constriction, Biology Department Seminar, Indianapolis, IN, 2019. Oral Presentation.



Beverley, KM (2019) Kir7.1 Mutation in the Inner Pore Results in Channel Constriction, Endocrinology and Reproductive Physiology Seminar, Madison, WI, 2019. Oral Presentation.

Beverley, KM, JT Steffen, JA Heyrman, PK Shahi, BR Pattnaik (2019) Single Amino Acid Change in Kir7.1 Reveals Pore Structure, Pediatrics Research Day, Madison, WI, 2019. Poster Presentation.

Beverley, KM, JT Steffen, JA Heyrman, PK Shahi, BR Pattnaik (2019) Single Amino Acid Change in Kir7.1 Reveals Pore Structure, Endocrinology and Reproductive Physiology Annual Symposium, Madison, WI, 2019. Poster Presentation.

Beverley, KM, PK Shahi, BR Pattnaik (2018) Polarized Expression of Kir7.1 Channels in a 3-D Organoid Model, McPherson Eye Research Institute Poster Session, Madison, WI, 2018. Poster Presentation.

Beverley, KM (2018) Effects of Single Amino Acid Changes in the Kir7.1 Ion Channel, Endocrinology and Reproductive Physiology Seminar, Madison, WI, 2018. Oral Presentation.

Beverley, KM (2018) Studying LCA mutations in a 3D organoid culture model, Endocrinology and Reproductive Physiology Annual Symposium, Madison, WI, 2018. Oral Presentation.

Beverley, KM (2017) A Novel LCA Mutation in the Ion Channel Kir7.1, Endocrinology and Reproductive Physiology Seminar, Madison, WI, 2017. Oral Presentation.

Beverley, KM, PK Shahi, BR Pattnaik (2017) Changes in Structure and Function of Inward Rectifying Potassium Channel (Kir7.1) disease mutant, Endocrinology and Reproductive Physiology Annual Symposium, Madison, WI, 2017. Poster Presentation.

Beverley, KM, B Bangert, G Sandusky (2017) Use of Aperio whole slide digital imaging for quantitation of PD-1, PD-L1, and CD8 in Triple Negative Breast Cancer, Indiana Academy of Science, Indianapolis, IN, 2017. Oral Presentation.

Beverley, KM, DA Wiseman (2015) Selective Nitration of Munc18c Following Glucose Stimulation in Pancreatic Beta Cells. Buckeye Cell Biology Meeting, Columbus, OH, 2015. Poster Presentation.

ERP Service:

ERP Student Committee 2017-present

Recruitment 2017

Recruitment 2018

Recruitment 2019

Recruitment 2020

Recruitment 2021

Teaching/Mentoring:



Delta Program in Teaching and Learning Certificate Summer 2020

Sophomore Research Fellowship Mentor, Fall 2019, Mentee: Joseph Heyrman

Delta Program in Teaching and Learning Intern Fall 2019

Guest Lecturer Physiology 330/505 University of Indianapolis Fall 2019

Guest Lecturer Biology of Vision Fall 2019

Delta Program in Teaching and Learning Participant 2018-2019

Research Mentor Training Program 2018

Rural and urban Scholars in Community Health, Summer 2017, Mentee: Yasmeen Rayyan

Mentor to many Biology 152 students, undergraduate researchers, and high school students