BIOMEDICAL & VETERINARY SCIENCES
GRADUATE PROGRAM

ANNOUNCES

The Master of Science Seminar and Examination of

Rebecca M. Salgado

“West Nile virus vaccination protects against Usutu virus disease in mice”

Wednesday October 27, 2021
2:00 pm
Fralin Hall, Room 102
Zoom link: https://virginiatech.zoom.us/j/85107336399

Bio

Hometown: Lake Forest, CA
Undergraduate education: Point Loma Nazarene University (San Diego, CA)
Class of 2019, B.S. in Biology cum laude
Graduate education: Virginia Tech
Part of the interdisciplinary graduate program, Molecular and Cellular Biology (MCB)
Scientific interests: infectious disease, virology, public health, host-pathogen interactions, and immunology
Outside interests: baking, painting, nature walks, watching movies, and listening to Taylor Swift
Post-graduation plans: Virology Research Associate I, National Biodefense Analysis and Countermeasures Center (NBACC), Fort Detrick (Frederick, MD)

Funded by

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Virginia-Maryland College of Veterinary Medicine, Internal Research Competition (IRC)
Virginia-Maryland College of Veterinary Medicine, Office of Research and Graduate Studies

Lay Language Abstract

West Nile virus (WNV) and Usutu virus (USUV) are mosquito-borne viruses that were originally isolated in Africa during the 20th century. Both viruses are maintained through a transmission cycle between mosquito vectors and avian hosts. Mosquitos transfer the infectious agent (WNV or USUV) through feeding on a bird (usually a passerine species); once in the bird, the virus can replicate to high levels. Human infections of WNV and USUV can also occur, with symptoms ranging from mild febrile illness to severe encephalitis or meningitis. Over the past few decades, WNV and USUV have spread to Europe, most likely through infected migratory birds. Interestingly, mosquito surveillance studies in mainland Europe have found mosquitos that tested positive for both USUV and WNV. In Europe, antibodies for both viruses have been found in humans and birds, indicating a previous exposure to WNV, USUV, or both.

The neutralizing antibody response is a critical immune defense against viral infections. Neutralizing antibodies bind strongly to the outside of the virion (virus particle), preventing the virion from interacting with and infecting the host cell. For WNV and USUV, one of the targets neutralizing antibodies bind to is the outer envelope (E) protein of the virion. In clinical settings and experimental studies, cross-neutralization of WNV and USUV has been documented. During cross-neutralization, a serum sample containing neutralizing antibodies against WNV can also neutralize USUV, and vice versa. Although the neutralizing response against WNV has been characterized in humans and lab animal models such as mice, there is little research regarding the neutralizing response against USUV. Importantly, whether prior WNV exposure provides protection against USUV infection is currently unknown.

The main goal of this thesis was to characterize the disease outcome and neutralizing response against USUV after a WNV exposure. For the WNV exposure, we used a vaccine strain of WNV (D2/WN-V3) developed by our collaborators. We predicted that vaccinated mice would avoid USUV clinical signs of disease and generate neutralizing responses to WNV and USUV. To do this work, we used two laboratory mouse models: mice with an intact immune response system (CD-1) and mice with a stunted immune response (Ifnar1 -/-). We discovered that serum from vaccinated mice did

cross-neutralize WNV and USUV. In the Ifnar1 -/- model, vaccinated mice had higher survival rates and lower levels of virus in blood after USUV infection compared to unvaccinated mice.

Ultimately, this work highlights the importance of characterizing the immune response against similar viruses and will inform the development of human vaccines for both viruses.

Publications

Salgado R, Hawks SA, Frere F, Vázquez A, Huang CY-H, Duggal NK. West Nile virus vaccination protects against Usutu virus disease in mice. Viruses. 2021 (Under review)

Presentations

1. **Salgado RM**, Hawks SA, Frere F, Vázquez A, Huang CY-H, Duggal NK. Cross neutralization of Usutu virus after West Nile virus vaccination. Biomedical and Veterinary Sciences Graduate Program Research in Progress Seminar, 2021, Blacksburg, VA. Oral presentation.

2. **Salgado RM**, Hawks SA, Frere F, Vázquez A, Huang CY-H, Duggal NK. Cross neutralization of Usutu virus after West Nile virus vaccination. Molecular and Cellular Biology Summer Research Talks, 2021, Blacksburg, VA. Oral presentation.

3. **Salgado RM**, Hawks SA, Frere F, Vázquez A, Huang CY-H, Duggal NK. Vaccination against West Nile virus may offer protection against Usutu virus. Virginia-Maryland College of Veterinary Medicine 31st Annual Graduate Research Symposium, 2021, Blacksburg, VA. Oral presentation.

4. **Salgado RM**, Bates T, Weger-Lucarelli J, Duggal NK. Using molecular cloning to study Usutu virus pathogenesis. Molecular and Cellular Biology Summer Research Talks, 2020, Blacksburg, VA. Oral presentation.

Awards and Academic Achievements

1. Nominated to apply for the HHMI Gilliam Fellowship; application successfully submitted (December 2020)

2. Successfully submitted application for the NSF GRFP (October 2020)

3. Dean’s Diversity Assistantship, Virginia Polytechnic Institute and State University, Biomedical Sciences and Pathobiology department (2020)

Examination Graduate Committee

Major Advisor/Chair:

Nisha Duggal, PhD
Assistant Professor
Biomedical Sciences and Pathobiology department

Graduate Advising Committee Members:

Irving Coy Allen, MBA, PhD
Associate Professor of Inflammatory Diseases
Biomedical Sciences and Pathobiology department

Brandon Jutras, PhD
Assistant Professor
Biochemistry department

X.J. Meng, MD, PhD
University Distinguished Professor of Molecular Virology, VMCVM
Professor of Internal Medicine, VTC School of Medicine
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