UCDAVIS HEALTH | SCHOOL OF MEDICINE

Medical Microbiology & Immunology
MMI 291 Seminar Series
Emerging Challenges in Microbiology and Immunology

MMI 291 Seminar Series

Current Theme: Interdisciplinary Research
Spring Quarter 2022 – CRN 51421

Friday Seminar – 12:10-1 p.m.

"Investigating the role of E3 ligases in regulating NADPH oxidase stability"

April
22

Bardo Castro
Ph.D. Candidate
Gitta Coaker lab
Microbiology Graduate Group
University of California, Davis

April 22, 2022
12:10 – 1 p.m.
ZOOM Meeting

Medical Microbiology
& Immunology
School of Medicine

Seminar Contact:
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We hope to see you there!

Research / Bio

Plant pathogens and pests lead to 20%-30% of total crop loss worldwide. Plants can mount a multilayered immune response that can fend of pathogenic attacks. One pivotal immune mechanism post-pathogen recognition is the generation of reactive oxygen species (ROS) via NADPH oxidases (NOXs). ROS function as antimicrobials, can strengthen the plant cell wall and work signaling molecules that can lead to stomatal closure, production of antimicrobial molecules, and changes in gene regulation. Our understanding of ROS production and NOX regulation during pathogen infections have been greatly expanded through basic research using Arabidopsis as a model system. One recent discovery is the identification of the RING E3 ubiquitin ligase PIRE which negatively regulates ROS production in a phosphorylation dependent manner. The cross talk between phosphorylation of specific residues of RBOHD and ubiquitination by PIRE leads to endocytosis and vacuolar degradation. Importantly, Arabidopsis pire mutants exhibit enhanced ROS production and resistance to the foliar pathogen Pseudomonas syringae. Using comparative analyses, we have identified more than 100 PIRE homologs in multiple plant species including rice, potato, and tomato. Additionally, residues that regulate activity through phosphorylation in the C-terminal region of RBOHD are highly conserved in 112 plant species including crops. These findings suggest that PIRE's function is conserved in multiple crop species. The focus of my research is to elucidate the role of the two PIRE homologs in tomato, PIRE1a and PIRE1b, on NOX stability and ROS production. To this end I am utilizing CRISPR-Cas9 as a gene editing tool, to generate single and double mutants of both pire homologs in tomato. To test for NOX stability, I have generated phosphorylation mutants of RBOHB, a closely related homolog of RBOHD in tomato.

Publications

Castro Bardo, Citterico Matteo, Kimura Sachie, Stevens Danielle M, Wrzaczek Michael, Coaker Gitta. Stress-induced reactive oxygen species compartmentalization, perception and signaling. Nature plants. 2021

Lee DongHyuk, Lal Neeraj K, Lin Zuh-Jyh Daniel, Ma Shisong, Liu Jun, ***Castro Bardo****, Toruño, Tania, Dinesh-Kumar Savithramma P, Coaker Gitta. Regulation of reactive oxygen species during plant immunity through phosphorylation and ubiquitination of RBOHD. Nature communications. 2020*

Borges Adair L, **Castro Bardo**, Govindarajan Sutharsan, Solvik Tina, Escalante Veronica, Bondy-Denomy Joseph. Nature microbiology. 2020