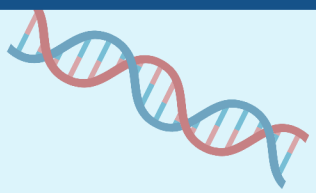
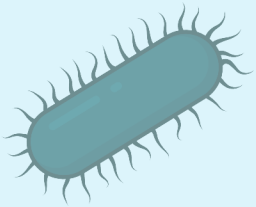
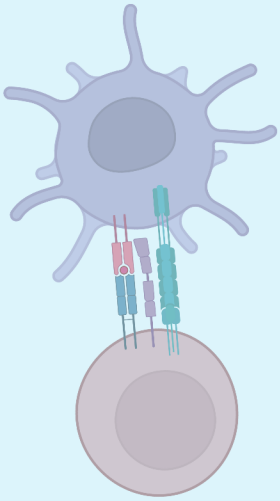




MICROBIOLOGY AND IMMUNOLOGY

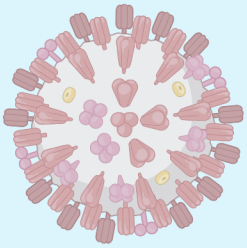
RESEARCH SYMPOSIUM

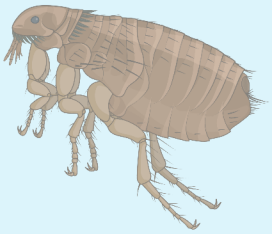


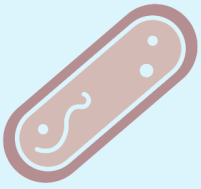
Frederick P. Whiddon College of Medicine
University of South Alabama

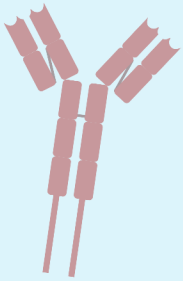


ABSTRACT BOOK









MAY 10, 2023

Order of Events

1:00pm	**Welcome and Opening Remarks**	**Dr. Allyson Shea**
1:05pm	**Keynote Speaker Presentation**	**Dr. Brian Fouty**
1:45pm	**Symposium Research Presentations**	
		Natthida Tongluan
		Killian Brewer
		Nam Suwanbongkot
2:30pm	**Intermission**	
2:45pm	**Symposium Research Presentations**	
		Amanda Tuckey
		Meagan Taylor
		Rachel Rodenberg
3:30pm	**Symposium Conclusion**	**Dr. Allyson Shea**

Symposium Planning Committee

Faculty Organizer—Dr. Allyson Shea

Student Members—Amanda Tuckey, Natthida Tongluan, and Rachel Rodenberg

Logistics—Meredith Moody

Roles of rickettsial outer membrane protein B (OmpB) in tick vector

Natthida Tongluan and Kevin R. Macaluso

Department of Microbiology and Immunology, University of South Alabama,
Frederick P. Whiddon College of Medicine, Mobile, AL, United States

Rickettsia parkeri, a member of spotted fever group *Rickettsia*, can be maintained and transmitted by Gulf coast tick, which geographic distribution has doubled in size in the United States. *R. parkeri* has recently been identified as emerging human pathogen. While there are several studies on *R. parkeri* infection in mammalian cells, less is known about rickettsial infection in the tick vector. In this study, *R. parkeri* wild-type (strain Portsmount) and *R. parkeri* mutant (non-functional-OmpB), tick-derived and mammalian epithelial cells were utilized to assess potential role of OmpB during attachment, invasion, and replication. Non-functional-OmpB revealed to alter adherence and invasion role but not growth kinetics in tick cells, while these outcomes were enhanced in Vero cells. *R. parkeri* OmpB mutant was less infectious, showing reductions of rickettsial loads and transmission in tick and rat hosts, respectively. Overall, this study suggests OmpB roles during rickettsial infection in tick-derived cells and tick vectors.

FPR-Mediated Signaling Attenuates Neutrophil Impairment in *mut-stat3* Mice

Killian Brewer and Robert Barrington

Department of Microbiology and Immunology, University of South Alabama,
Frederick P. Whiddon College of Medicine, Mobile, AL, United States

Hyper-IgE Syndrome (HIES) is a rare primary immunodeficiency caused by an autosomal dominant mutation in the signal transducer and activator of the transcription 3 (STAT3) gene. HIES patients suffer from recurrent lung infections that are characterized by impaired recruitment of neutrophils, contributing to delayed epithelial resolution, lung damage, chronic inflammation, and mortality. Although prophylactic antibiotics are the standard of care, prolonged use increases the risk of antibiotic resistance and does not address the underlying issue of impaired tissue repair. We hypothesize that rescuing neutrophil recruitment via formyl peptide receptor (FPR)-mediated signaling will facilitate tissue repair and reduce lung injury and inflammation. FPR are pattern recognition receptors that recognize both foreign and self-ligands, raising the possibility that FPR regulate inflammation in a ligand-dependent manner. Preliminary data from our lab shows that treatment with a bioengineered FPR ligand enhances chemotaxis of an immunophenotypically distinct neutrophil population that is reported to promote axon regeneration, suggesting the possibility of utilizing specific ligands to modulate neutrophil function. Future studies will address whether the distinct FPR-PMNs participate directly in wound repair.

Role of $\gamma\delta$ T-cells in *Rickettsia parkeri* infection at skin interface

Chanakan Suwanbongkot, Monika Danchenko, and Kevin Macaluso

Department of Microbiology and Immunology, Frederick P. Whiddon College of Medicine, University of South Alabama, Mobile, USA

Rickettsia parkeri, an emerging bacterial pathogen, is transmitted by *Amblyomma maculatum* via infected tick saliva. During feeding, ticks secrete numerous salivary factors manipulating the host's hemostatic and immune response to promote blood feeding. With the immunomodulation property, tick saliva inhibits and alters multiple immune cell functions, including neutrophils, macrophages, and dendritic cells, thereby facilitating *Rickettsia* transmission. To counteract the tick salivary and bacterial factors, the host cutaneous resident immune cells provide initial protection. Skin resident $\gamma\delta$ T-cells, a subset of the T-cell population, have been shown to have crucial roles in maintaining skin homeostasis and preventing skin infection. However, the role of γδ-T cells in controlling *R. parkeri* infection in vertebrate hosts remains unknown. Utilizing a murine model, wild-type and γδ-T cell-knockout mouse, the transmission of rickettsiae by nymphal ticks will be validated. Furthermore, single-cell RNA sequencing analysis will be used to identify the host immune response in the early phase of rickettsial infection.

Regulatory relationship between Amyloid-Beta and Caspase-1

Amanda N. Tuckey[1,2] and Jonathon P. Audia[1,2]

[1]Department of Microbiology and Immunology, University of South Alabama Frederick P. Whiddon College of Medicine; [2]Center for Lung Biology, University of South Alabama College of Medicine

Sepsis is defined as a dysregulated host response to infection, with an estimated 1.7 million cases per year in the United States according to the Centers for Disease Control. Compounding the problem, approximately half of survivors develop post-sepsis syndrome with inflammation-driven complications. Amyloid-β (Aβ) has recently emerged as a pleiotropic innate immune effector. Aβ functions as an antimicrobial peptide, and is a known activator of inflammation via the NLRP3-caspase-1 inflammasome. Intriguingly, our *in silico* analysis identified a putative caspase-1 cleavage site within Aβ, highlighting a possible novel regulatory relationship. Therefore, we sought to determine whether caspase-1 regulates the function of Aβ as both an initial effector of the innate immune response to infection and as a downstream activator of deleterious inflammation. *In vitro*, caspase-1 blocked spontaneous Aβ fibril formation. Subsequently, we synthesized the two peptide fragments predicted by the caspase-1 cleavage site. Interestingly, the smaller fragment ($A\beta_{1-7}$) alone was sufficient enough to block spontaneous Aβ fibril formation. We also identified an additional pro-inflammatory effect whereby Aβ activated cell surface receptor expression (ICAM-1) on vascular endothelial cells. Caspase-1 cleavage blocked ICAM-1 activation. Future studies are focused on examining other key functions of Aβ and how they are altered by caspase-1.

Chikungunya virus (CHIKV) infection in permissive mammalian cells

Meagan Taylor and Jonathan O. Rayner

Department of Microbiology and Immunology, Frederick P. Whiddon College of Medicine, University of South Alabama, Mobile, USA

Chikungunya virus (CHIKV), a mosquito-borne pathogen, is an emerging public health threat. While CHIKV tropism has been well characterized, no published studies have evaluated the replication dynamics of CHIKV in RIG-I-deficient H1-HeLa cells. To evaluate this, we infected both HeLa and H1-HeLa cells with culture-attenuated CHIKV (181/25) and evaluated titer levels at different time points. Compared to wild-type HeLa cells, CHIKV titers were consistently elevated in H1-HeLa cells. Interestingly, although the data did not show statistical significance, we expect this to be due to the use of culture-attenuated CHIKV rather than a wild-type pathogenic strain. These results suggest that a pathogenic strain (or symptomatic patient isolate) should be used to uncover the immune response associated with CHIKV infection in mammalian hosts. We hope to further characterize CHIKV replication in these cells, as well as others.

γδ T17 cells are master regulators of the acute antiviral response in the HSV-1 infected cornea

Rachel Rodenberg and Robert Barrington

Department of Microbiology and Immunology, Frederick P. Whiddon College of Medicine, University of South Alabama, Mobile, USA

Herpes Stromal Keratitis (HSK), caused by herpes simplex virus 1 (HSV-1) infecting the cornea, is the leading cause of infectious blindness in developed countries. The standard of care for HSK is topical administration of acyclovir, though the emergence of antiviral resistant HSV-1 strains has necessitated new therapeutic options to treat HSK. Our lab studies immune responses to HSV-1 with the goal of discovering immunotherapeutic targets for HSK. Published data from our lab demonstrates that γδ T17 cells, the early source of IL-17A, are necessary for protection against ocular HSV-1. How γδ T17 cells and/or IL-17A provide protection during HSV-1 infection is poorly understood. Herein, we report 3 key results that support γδ T17 cells promote antiviral activity of protective NK cells: 1) Mice lacking γδ T17 cells (TCRδ$^{-/-}$) have higher viral spread and lower NK cell numbers and activity; 2) Administration of IL-17A to TCRδ$^{-/-}$ mice restores NK cell numbers and activity; and 3) Neutralization of IL-17A in wild-type mice lowers NK cell numbers and activity. This study defines a novel mechanism that γδ T17 cells employ to provide protection against ocular HSV-1 infection.