BIOMEDICAL & VETERINARY SCIENCES

GRADUATE PROGRAM

ANNOUNCES

The Doctor of Philosophy Seminar and Examination of

James "Jimmy" Andrew Budnick

"Characterization of the VtlR Regulons in *Brucella abortus* and *Agrobacterium tumefaciens*"

Thursday, March 21st, 2019
9:00 am
Steger Hall (Biocomplexity Institute)
Room 145 (Conference Center)

Bio

James (Jimmy) Andrew Budnick was born in Tallahassee, Florida and raised in Northern Virginia where he was an accomplished youth bowler. He attended The Pennsylvania State University where he earned a Bachelor of Science Degree in Microbiology, was a tour guide for the university, and danced for 46 hours straight to raise funds and awareness for pediatric cancer treatment and research. Jimmy has spent the last 5 years in Dr. Clayton Caswell's lab studying the pathogenesis of the intracellular bacterium *Brucella abortus*. He was also a member of the outstanding Blacksburg town league softball team Kibbles on Main. Jimmy will continue his career in science as a Postdoctoral Fellow in the lab of James Bina at the University of Pittsburgh School of Medicine studying the pathogenesis of *Vibrio cholerae*.

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Lay Language Abstract

Brucella abortus and *Agrobacterium tumefaciens* are two highly related bacterial pathogens that infect mammals and plants, respectively. Although genetically related, both organisms survive and replicate in vastly different environmental niches with one living in the soil (i.e., *A. tumefaciens*) and the other living within immune cells of the infected host (i.e., *B. abortus*). In order to quickly adapt to changing environmental conditions, the bacteria must rapidly control gene expression through multiple regulatory mechanisms. The works presented in this dissertation will focus on further characterizing one of these regulatory systems and comparing the homologous systems shared by *B. abortus* and *A. tumefaciens*. This includes uncovering a putative sugar transport and metabolism system, as well as discovering the potential for host-pathogen signaling via the well-studied neurotransmitter GABA.

Publications

Budnick, J.A., Sheehan, L.M., Pitzer, J., Roop, R.M., Kang, L., Michalak, P., and Caswell, C.C. (2019) The role of GABA as a communication molecule during host-*Brucella* interactions. In Preparation

Budnick, J.A.‡, Sheehan, L.M.‡, Ginder, M.J., Pinto, J.F., Kang, L., Michalak, P., Luo, L., Heindl, J.E., and Caswell, C.C. (2018) Activation of small regulatory RNAs by VtlR during Transcriptional regulations of myriad genes in *Agrobacterium tumefaciens. Applied and Environmental Microbiology* Under Revision

McMillan, R.P., Stewart, S., **Budnick, J.A.**, Caswell, C.C., Hulver, M.W., Mukherjee, K., and Srivastava, S. (2019) Quantitative Variation in m.3243A>G Mutation Produce Discrete Changes in Energy Metabolism. *Sci Rep.* In Press

Budnick, J.A., Prado-Sanchez, E., and Caswell, C.C. (2018) Defining the regulatory mechanism of NikR, a nickel-responsive transcriptional regulator, in *Brucella abortus*. *Microbiology* 164:10. (PMID: 30062985)

Budnick, J.A., Sheehan, L.M., Kang, L., Michalak, P., and Caswell, C.C. (2018) Characterization of three small proteins in *Brucella abortus* linked to fucose metabolism. *J. Bacteriol*. 200:18. (PMID: 29967118)

Budnick, J.A., Sheehan, L.M., Colquhoun, J.M., Dunman, P.M., Walker, G.C., Roop, R.M. II, and Caswell, C.C. (2018) Endoribonucelase YbeY is linked to proper cellular morphology and virulence in *Brucella abortus*. *J. Bacteriol.* 200:12. (PMID: 29632093)

Budnick, J.A., and Caswell, C.C. (2017) Chapter 5: Nickel homeostasis in *Brucella* spp. In *Metals and the biology and virulence of Brucella*. New York, NY: Springer Science+Business Media LLC.

Caudill, M.T., **Budnick, J.A.**, Sheehan, L.M., Lehman, C.R., Purwantini, E., Mukhopadhyay, B., and Caswell C.C. (2017) Proline utilization system is required for infection by the pathogenic α-proteobacterium *Brucella abortus*. *Microbiology* 163:970-979. (PMID: 28691659)

Sheehan, L.M., **Budnick, J.A**., Blanchard, C., Dunman, P.M., and Caswell, C.C. (2015) A LysR-family transcriptional regulator required for virulence in *Brucella abortus* is highly conserved among the α-proteobacteria. *Mol. Microbiol*. 98:318-328. (PMID: 26175079)

Sheehan, L.M.‡, **Budnick, J.A**.‡, Roop, R.M. II, and Caswell, C.C. (2015) Coordinated zinc homeostasis is essential for the wild-type virulence of *Brucella abortus*. *J. Bacteriol*. 197: 1582-1591. (PMID: 25691532)

‡ - author contributed equally to these works

Presentations

Budnick, J.A., Sheehan, L.M., Pitzer, J., Kang, L., Michalak, P., Roop, M.R., and Caswell, C.C. (2019) Redefining GABA, from neurotransmitter to signaling molecule for bacterial pathogenesis: lessons learned in *Brucella abortus*. The Mid-Atlantic Microbial Pathogenesis Meeting, Wintergreen, VA.

Budnick, J.A., Sheehan, L.M., Kang, L., Michalak, P., Heindl, J.E., and Caswell, C.C. (2018) Insights into the VtlR regulon in *Agrobacterium tumefaciens*: Identifying a mechanism behind the madness. 62nd Annual Wind River Conference on Prokaryotic Biology, Estes Park, CO.

Budnick, J.A., and Caswell, C.C. (2017) The role of GABA in *Brucella* pathogenesis, a small molecule with big value. 61st Annual Wind River Conference on Prokaryotic Biology, Estes Park, CO.

Budnick, J.A., and Caswell, C.C. (2017) GABA, a well-studied neurotransmitter but an overlooked signaling molecule for bacterial pathogens: lessons learned in *Brucella abortus*. The Mid-Atlantic Microbial Pathogenesis Meeting, Wintergreen, VA.

Budnick, J.A., and Caswell, C.C. (2016) Transport of γ-aminobutyric acid (GABA) is essential for *Brucella abortus* virulence. Molecular Genetics of Bacteria and Phages Meeting, Madison, WI.

Budnick, J.A., and Caswell, C.C. (2015) Transport of the neurotransmitter GABA is essential for *Brucella abortus* virulence. 68th Annual Brucellosis Research Conference, Chicago, IL.

Budnick, J.A., and Caswell, C.C. (2015) Identification and characterization of three small proteins whose production is controlled by the virulence-associated regulator, VtlR, in *Brucella abortus*. Wind River Conference on Prokaryotic Biology, Estes Park, CO.

Budnick, J.A. and Caswell, C.C. (2015) Does size matter? Identification and characterization of three small proteins in *Brucella abortus*. Mid-Atlantic Microbial Pathogenesis Meeting, Wintergreen, VA.

Budnick, J.A., and Caswell, C.C. (2014) Characterization of highly conserved hypothetical proteins in *Brucella abortus*. 67th Annual Brucellosis Research Conference, Berlin, Germany.

Budnick, J.A. and Caswell, C.C. (2014) Characterization of *Brucella abortus* hypothetical proteins and their role in virulence. Wind River Conference on Prokaryotic Biology, Estes Park, CO.

Awards and Academic Achievements

2019-Third Place Poster Award, VCOM Research Day
2018-Oral Research Award, ASM Virginia Branch Annual Meeting
2018-Silver Award, Poster Research Presentation, Virginia Tech Graduate Student Research Symposium

2016-Gold Award, Oral Research Presentations, Virginia Tech Graduate Student Research Symposium
2016-Third Prize Award, Poster Research Presentation, Virginia Tech Microbiology Symposium
2015-Silver Award, Oral Research Poster, Virginia Tech Graduate Student Research Symposium
2014-First Prize Award, Oral Research Presentations, Virginia Tech Graduate Student Research Symposium

Examination Graduate Committee

Major Advisor/Chair:

Dr. Clayton Caswell, PhD
Assistant Professor
Department of Biomedical Sciences and Pathobiology

Graduate Advising Committee Members:

Dr. Birgit Scharf, PhD
Associate Professor
Department of Biological Sciences

Dr. Nammalwar Sriranganathan, MVSc, PhD, Diplomate, ACVM
Professor
Department of Biomedical Sciences and Pathobiology

Dr. Thomas Inzana, PhD
Associate Dean for Research
College of Veterinary Medicine
Long Island University

External Examiner

Dr. Cari Vanderpool, PhD

Professor of Microbiology
Department of Microbiology
University of Illinois

Seminar title: Diverse Mechanisms of Bacterial Small RNA Target Regulation
Thursday, March 21st, 2019
3:00 PM
VMIA Classroom 220

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