

**BIOMEDICAL & VETERINARY SCIENCES
GRADUATE PROGRAM**



ANNOUNCES

The Doctor of Philosophy Seminar
and Examination of

Dylan McDaniel

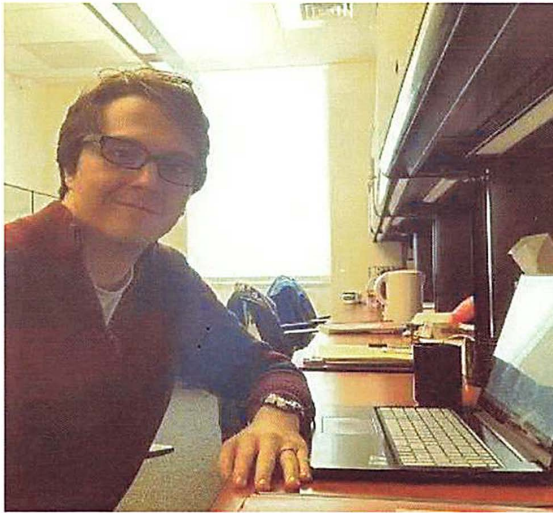
“Characterization of Biomedical and Incidental Nanoparticles in
the Lungs and Their Effects on Health”

Wednesday October 10, 2018

9:00 am

ILSB 1040

Bio



Before coming to Virginia Tech for his PhD, Dylan worked in an animal physiology lab studying how stress modulates the immune system. His required for this project required him to catch wild house sparrows in the Kroger parking lot at the crack of dawn in January. After receiving his bachelor's degree in biology, from Radford University in May of 2014 he joined Dr. Allen's lab in August of the same year. Upon starting his PhD journey, Dylan received a fellowship from the Institute for Critical Technology and Applied Science (ICTAS) at Virginia Tech. He then began his interdisciplinary work studying the interactions of various nanoparticles with the lungs and immune system. Dylan is a first author on four manuscripts and is a co-author on six others. He plans to continue his academic training as a post-doc studying stress-related diseases such as anxiety and depression at Virginia Tech.

Funded by

Graduate Fellowship and Dr. Allen's Junior Faculty Collaborative Grant
awarded by Institute for Critical Technology and Applied Science
(ICTAS)

NanoEarth

ICTAS Center for Engineered Health

Duke University Center for Environmental Implications of
Nanotechnology

Lay Language Abstract

Nanomaterials are defined as any material with at least one external dimension less than 100 nm. Over the years, nanomaterials have become more common in medicine, technology, and engineering. One reason for this is due to nanomaterials having unique properties that allow them to interact effectively with biological systems. However, promising nanomaterials such as carbon nanotubes have been shown to lead to disease, especially in the lung. The lung is an organ that is in constant contact with the outside environment. As such, it naturally encounters microorganisms and nanoparticles on a daily basis. Additionally, the lungs are a highly desirable site for drug delivery using nanoparticles. Indeed, inflammatory diseases such as asthma and emphysema could potentially benefit from nanoparticle-mediated delivery. Additionally, harmful nanoparticles can enter the lungs and cause or even exacerbate these diseases. Unfortunately, there is a lack of knowledge pertaining to this subject. Our work focused on characterization of both therapeutic and potentially harmful nanoparticles in the lungs. We found that fluorescently-labeled nanoparticles were taken up by macrophages in the lungs, which could be useful for treating inflammatory diseases. Furthermore, these particles did not induce cell death or inflammation in the lungs. We also characterized a rare form of titanium-based particles called Magnéli phases, which have been shown to be produced via coal burning. We found that while these particles are non-inflammatory in the lungs of mice, they lead to programmed death of macrophages as well as the increase in genes associated with fibrosis. Ultimately, this was shown to lead to a decrease in lung function parameters and airway hyperresponsiveness, indicating increased lung stiffness after long-term nanoparticle exposure. Overall, our data adds significant contributions to the field by assessing two nanoparticles with vastly different compositions in the lungs.

Publications

McDaniel DK and Allen IC. (2018). Using *Klebsiella pneumoniae* to Model Acute Lung Inflammation in Mice. *Mouse Models of Innate Immunity*. Ed. Irving C. Allen. New York: Springer

Roth KL, Epley CC, Novak JJ, McAndrew ML, **McDaniel DK**, Davis J, Allen IC, Morris AJ, and Grove TZ. (2018). Photo-triggered Release of 5-

fluorouracil from a MOF Drug Delivery Vehicle. *Chemical Communications*.

Rothschild DE, **McDaniel DK**, Ringel-Scaia VM, and Allen IC. (2018). Modulating Inflammation through the Negative Regulation of NF- κ B Signaling. *Journal of Leukocyte Biology*. PMID: 29389019.

McDaniel DK, Ringel-Scaia VM, Coutermarsh-Ott SL, Allen IC. (2018) Utilizing the Lung as a Model to Study Nanoparticle Based Drug Delivery Systems. In: Sirianni R., Behkam B. (eds) Targeted Drug Delivery. Methods in Molecular Biology, vol. 1831. Humana Press, New York, NY. PMID: 30051432.

Eden K, Rothschild DE, **McDaniel DK**, Heid B, and Allen IC. (2017). Noncanonical NF- κ B Signaling and the Essential Kinase NIK Modulate Critical Features Associated with Eosinophilic Esophagitis Pathogenesis. *Disease Models & Mechanisms*. PMID: 29259025.

Ringel-Scaia V, **McDaniel DK**, Allen IC. (2016). Goldilocks Conundrum: NLR Inflammasome Modulation of Gastrointestinal Inflammation during Inflammatory Bowel Disease. *Critical Reviews in Immunology*. PMID: 28322135.

McDaniel DK, Jo A, Ringel-Scaia V, Coutermarsh-Ott S, Rothschild DE, Powell M, Zhang Rui, Long TE, Oestreich K, Riffle JS, Davis R, and Allen IC. (2017). TIPS Pentacene Loaded PEO-PDLLA Core-Shell Nanoparticles have Similar Cellular Uptake Dynamics in M1 and M2 Macrophages and In Corresponding *In Vivo* Microenvironments. *Nanomedicine: Nanotechnology, Biology, and Medicine*. PMID: 28040495.

McDaniel DK, Eden K, Ringel V, and Allen IC. (2016). Emerging Roles for Non-canonical NF- κ B Signaling in the Modulation of Inflammatory Bowel Disease Pathobiology. *Inflammatory Bowel Diseases*. PMID: 27508514.

Williams TM, Leeth RA, Rothschild DE, Coutermarsh-Ott SL, **McDaniel DK**, Simmons AE, Heid Bettina, Cecere TE, Allen IC. (2015). The NLRP1 Inflammasome Attenuates Colitis and Colitis Associated Tumorigenesis. *Journal of Immunology*. PMID: 25725098.

Willams TM, Leeth RA, Rothschild DE, **McDaniel DK**, Coutermarsh-Ott SL, Simmons AE, Kable KH, Heid B, Allen IC. (2015). Caspase-11 Attenuates Gastrointestinal Inflammation and Experimental Colitis Pathogenesis. *Am J Physiol Gastrointest Liver Physiol*. PMID: 25414099.

Presentations

“Are Space Particles Made From Burning Coal and are They Bad For You?” **McDaniel DK**, Ringel-Scaia VM, Coutermarsh-Ott S, Council-Troche M, Angle JW, Hochella M, Allen IC. Poster Presentation at Institute for Critical and Applied Science Spring Poster Session. April 20, 2018.

“Are Space Particles Made From Burning Coal and are They Bad For You?” **McDaniel DK**, Ringel-Scaia VM, Coutermarsh-Ott S, Council-Troche M, Angle JW, Hochella M, Allen IC. Oral Presentation at Virginia Tech Graduate Student Association Symposium. March 29, 2018

“Characterization of a Rare Form of Titanium Suboxides in the Lungs: Are Space Particles Made From Burning Coal and Are They Bad For You?” **McDaniel DK**, Ringel-Scaia VM, Coutermarsh-Ott S, Council-Troche M, Angle JW, Leng W, Hochella M, Allen IC. Poster Presentation at Biomedical and Veterinary Science Graduate Research Symposium. March 15, 2018.

“TIPS Pentacene Loaded PEO-PDLLA Core-Shell Nanoparticles have Similar Cellular Uptake Dynamics in M1 and M2 Macrophages and In Corresponding *In Vivo* Microenvironments.” **McDaniel DK**, Jo A, Ringel V, Coutermarsh-Ott S, Rothschild DE, Powell M, Zhang Rui, Long TE, Oestreich K, Riffle JS, Davis R, and Allen IC. Poster Presentation at the 33rd Graduate Student Assembly Research Symposium. Virginia Tech. Blacksburg, VA. March 29, 2017.

“TIPS Pentacene Loaded PEO-PDLLA Core-Shell Nanoparticles have Similar Cellular Uptake Dynamics in M1 and M2 Macrophages and In Corresponding *In Vivo* Microenvironments.” **McDaniel DK**, Jo A, Ringel V, Coutermarsh-Ott S, Rothschild DE, Powell M, Zhang Rui, Long TE, Oestreich K, Riffle JS, Davis R, and Allen IC. Poster Presentation at Biomedical and Veterinary Science Graduate Research Symposium. March 16, 2017.

“TIPS Pentacene Loaded PEO-PDLLA Core-Shell Nanoparticles have Similar Cellular Uptake Dynamics in M1 and M2 Macrophages and In Corresponding *In Vivo* Microenvironments.” **McDaniel DK**, Jo A, Ringel V, Coutermarsh-Ott S, Rothschild DE, Powell M, Zhang Rui, Long TE, Oestreich K, Riffle JS, Davis R, and Allen IC. Poster Presentation at the Macromolecules and Interfaces Institute Conference. October 11, 2016.

“Characterizing PEO-PDLLA Core-Shell Nanoparticles Tagged with a Novel Dye in M1 and M2 Macrophages.” **McDaniel DK**, Jo A, Rothschild D, Heid B, Oestreich K, Davis R, and Allen IC. Poster Presentation at the Edward Via College of Osteopathic Medicine Annual Via Research Recognition Day. February 26, 2016.

“Characterizing PEO-PDLLA Core-Shell Nanoparticles Tagged with a Novel Dye in M1 and M2 Macrophages.” **McDaniel DK**, Jo A, Rothschild D, Heid B, Oestreich K, Davis R, and Allen IC. Poster Presentation at the 32nd Graduate Student Assembly Research Symposium. Virginia Tech. Blacksburg, VA. March 23, 2016.

“Characterizing PEO-PDLLA Core-Shell Nanoparticles Tagged with a Novel Dye in M1 and M2 Macrophages.” **McDaniel DK**, Jo A, Rothschild D, Heid B, Oestreich K, Davis R, and Allen IC. Poster Presentation at the Biomedical and Veterinary Science Graduate Research Symposium. March 17, 2016.

“M1 and M2 Macrophages Respond Similarly to Various Nanoparticles with Distinct Compositions.” **McDaniel DK**, Jo A, Rothschild D, Pekkamen A, Heid B, Oestreich K, Long T, Davis R, and Allen IC. Poster Presentation at the Institute for Critical Technology and Applied Science Student Symposium. Blacksburg, VA. April 1, 2015.

“M1 and M2 Macrophages Respond Similarly to Various Nanoparticles with Distinct Compositions.” **McDaniel DK**, Jo A, Rothschild D, Pekkamen A, Heid B, Oestreich K, Long T, Davis R, and Allen IC. Poster Presentation at the Macromolecules and Interfaces Institute Technical Conference and Review. Blacksburg, VA. April 20-22, 2015.

Awards and Academic Achievements

2018 Virginia Tech Graduate Student Association Symposium Silver Award for Oral Presentation

2018 Biomedical and Veterinary Science Symposium Outstanding PhD Poster Award

2014 Institute for Critical Technology and Applied Science Doctoral Scholar Award

Examination Graduate Committee

Major Advisors/Co-Chairs:

Irving Coy Allen, PhD, MBA
Assistant Professor
Biomedical Sciences and Pathobiology

Graduate Advising Committee Members:

Shawna L. Klahn, DVM
Clinical Associate Professor Oncology
Small Animal Clinical Sciences

Liwu Li, PhD
Professor of Biological Sciences- Inflammation Biology and
Immunology
Biological Sciences

Xin M. Luo, PhD
Associate Professor Immunology
Biomedical Sciences and Pathobiology

Lijuan Yuan, PhD
Associate Professor Virology and Immunology
Biomedical Sciences and Pathobiology

External Examiner

Jared M. Brown, PhD

Associate Professor of Toxicology
Pharmaceutical Sciences
University of Colorado Denver

