



## PUBLICATIONS IN PREPARATION

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1. **A. W. Simonson**, T. M. Umstead, A. Lawanprasert, B. Klein, S. Almarzooqi, E. S. Halstead, S. H. Medina. “Extracellular Matrix-Inspired Inhalable Aerogels for Rapid Clearance of Pulmonary Tuberculosis”. *In review*.
2. A. Lawanprasert, **A. W. Simonson** (*co-first author*), S. E. Sumner, M. J. Nicol, G. S. Kirimanjeswara, S. H. Medina. “Inhalable SARS-CoV-2 Plasmid Vaccine Induces Epithelial and Leukocyte Presentation of Viral Antigens and Heightened Immunity.”
3. Y. Ali, **A. W. Simonson**, A. Lawanprasert, J. Dalo, G. Hamner, S. H. Medina. “Inherently Antimicrobial Two-stage Biocapsules for Reversal of Gastrointestinal Dysbiosis through Probiotic Replacement”

## RESEARCH TRAINING AND EXPERIENCE

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2016 – **Precision Therapeutics and Bioresponsive Materials Lab**  
Dr. Scott Medina, Asst. Professor      Pennsylvania State University, University Park, PA

Thesis research covers microbiology, materials science, and supramolecular chemistry:

- **Designed biomimetic antimycobacterial peptide with high potency and specificity towards *Mycobacterium tuberculosis***
  - Antimicrobial effects maintained against virulent and drug-resistant strains
  - Characterized biochemical, biophysical and bioactive properties
  - Demonstrated killing of intracellular persisters in macrophage model
  - Coordinated multidisciplinary collaboration across departments and universities
- **Integrated this novel therapeutic into bioinspired polysaccharide-templated particle platform for direct delivery to lung in respiratory infectious diseases**
  - Allows for combinatorial treatment regimens of synergistic pairings, encapsulating clinically approved antibiotics facing pharmacokinetic or resistance barriers
  - Designed *in vivo* tolerability assessment in mice and evaluated dissected tissues

Additional projects include:

- **Adaptation of inhalable particles for use as a delivery vehicle for plasmid DNA-based vaccine against the SARS-CoV-2 and influenza viruses**
  - Targeting macrophage internalization and transfection through CD44 receptors
  - Formulation optimization and lead candidate identification
  - Encouraging heightened local immune response by direct delivery to respiratory tract
  - Monocyte differentiation and assessing material impact on macrophage polarization
- **Development of inherently antimicrobial biocapsules using GRAS compounds to transport probiotics while improving gastrointestinal recovery.**
  - Serving as Project Supervisor
  - Guiding and training junior graduate students and undergraduate researchers on experimental design, data analysis and visualization

Candidacy Proposal:      **“Bioresponsive Disulfide Particles for Temporal Delivery of Anti-microbials in Pulmonary Infections.”**

- Literature search and original research proposal (non-experimental)
- Aimed at treatment of *Pseudomonas aeruginosa* infections in cystic fibrosis patients

Mentorship of Undergraduate Researchers and Junior Graduate Students:

- Yasmin Ali      Undergraduate Student (Pennsylvania State University)
- Sarah Almarzooqi      Undergraduate Student (Pennsylvania State University)
- Matthew R. Aronson      Graduate Student (University of Pennsylvania)

*NSF GRFP Recipient*

- Jacob Halle Quality Control Analyst (Catalent Pharma Solutions)
- Bailey Klein Research Associate (Sanofi)
- Juan Dalo
- Agustey S. Mongia Associate Scientist (MilliporeSigma)
- Atip Lawanprasert Graduate Student (Pennsylvania State University)

2016

### **Medical Device Development**

Lawrence Weinstein, Vice President

Windtree Therapeutics, Warrington, PA

- Internship as Medical Device Technician at a clinical-stage biopharmaceutical company
- Helped investigate potential causes of errors in drug delivery system and worked to improve the efficiency of aerosolization device by making cost efficient, computationally-supported adjustments to instrument assembly and manufacturing
- Collaborated with the Pharmaceutical Analysis group to reduce waste and cost by altering clinically relevant variables in the dose preparation method of liposomal formulation through viscosity and particle size analysis
- Met weekly with Vice President of Medical Device Development for progress updates and planning sessions.
- Presented work to other Senior Management and Clinical teams for effective integration during future trials.

2014 – 2016 **Biomolecular and Biomimetic Materials Lab**

Dr. Yong Wang, Professor

Pennsylvania State University, University Park, PA

- As an undergraduate researcher, trained under senior graduate student
  - Decellularized bone and intestinal tissue
  - Characterized composition of remaining connective tissue via H&E and Masson's Trichrome staining
  - Used isolated extracellular matrix as structure of PEGDA hydrogels for recellularization
- Took on independent project, selected for presentation at 2015 BMES Annual Meeting
  - Optimized microparticle generation via electrospraying
  - Incorporation of KB cells into formulation process demonstrated viable cell encapsulation

2016

### **Senior Capstone Design – Group Project**

Dr. Brad Hanks, PhD

Pennsylvania State University, University Park, PA

Dr. Matthew Moyer, MD

Penn State College of Medicine, Hershey, PA

- 1st place for Best Project at the Penn State College of Engineering Design Showcase
- Design of a detachable endoscopic ablation probe to improve pancreatic cancer treatment
  - Combined radiofrequency ablation therapy and stereotactic body radiation therapy
  - Worked alongside gastroenterologists and engineers to create and test 6x and 3x prototypes of two selected designs

## **EXPERIENCE WITH TECHNIQUES**

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**Analytical:** HPLC/MS, MALDI, CD, SEM, TEM, UV/Vis, DLS, Confocal and Fluorescence Microscopy, Flow Cytometry, SPR, Histology

**Sample Preparation:** Bacterial/Mammalian Cell Culture and Toxicity Assays, Liposome Formation, Plasmid Expression/Purification and Transfection, Macrophage Infection, Solid Phase Peptide Synthesis, Tissue Sectioning and Staining, Electrospray, Antibody Blocking, Cell Fixation and Critical Point Drying

**Programming:** MATLAB, GraphPad Prism, Microsoft Excel, HTML/CSS, Minitab

**Applications:** COMSOL, SolidWorks, PyMol, Adobe Photoshop/Illustrator/Dreamweaver, WordPress

## ORAL PRESENTATIONS

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1. “The Poisoned Chalice: A Biomimetic ‘Trojan Horse’ Platform for Precision Killing of MDR Tuberculosis.” **American Society for Tropical Medicine and Hygiene (ASTMH) Annual Meeting**, November 2020. Virtual.
2. “Design of Pathogen Specific Antimicrobials via Membrane-Protein Biomimicry.” **Biomedical Engineering Society (BMES) Annual Meeting**, October 2019, Philadelphia, PA.
3. “Design of Bioresponsive Nanogels Inspired by Peptide-Glycan Interactions.” **Materials Research Society (MRS) Fall Meeting**, November 2018, Boston, MA.

## POSTER PRESENTATIONS

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1. “*De novo* designed tryptophan-zippered peptides with pathogen-specific antibacterial activity.” **American Peptide Symposium (APS)**, June 2019, Monterey, CA.
2. “Design of Bioresponsive Nanogels Inspired by Peptide-Glycan Interactions.” **Penn State Materials Research Institute Materials Day**, October 2018, University Park, PA.
3. “Formation of Alginate Microparticles for Cell Encapsulation Via Electrospraying.” **Biomedical Engineering Society (BMES) Annual Meeting**, October 2015, Tampa, FL.

## TEACHING EXPERIENCE

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- 2019 – 2020      **Teaching Assistant** – Biothermodynamics (*BME 313*)  
Department of Bioengineering, Pennsylvania State University, University Park, PA  
Hold weekly office hours and review sessions to reinforce topics covered in lectures.  
Grade and review homework assignments, quizzes and exams.
- 2018              **Teaching Assistant** – Biomechanics (*BME 429*)  
Department of Bioengineering, Pennsylvania State University, University Park, PA  
Led sections of Biomedical Mechanics and Techniques Laboratory. Instructed sections of 15 students through lectures, lab demonstrations and computational models. Supervised and guided students during experiments. Developed, graded and reviewed quizzes and reports.
- 2013 – 2015      **Teaching Assistant** – Physiology (*BIOL 142*)  
Department of Biology, Pennsylvania State University, University Park, PA  
Led and assisted sections of 20 students in Physiology Laboratory through lectures and lab demonstrations. Developed and graded quizzes and reports. Held office hours for questions and review sessions.

## RELEVANT COURSEWORK

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Mass Transport in Biological Systems / Bioengineering Transport Phenomena	BME 413 / BIOE 501
Analysis of Physiological Systems	BME 301
Thermodynamics for Biomedical Engineering	BME 313

Numerical Simulations in Biomedical Engineering	BME 401
Reaction Kinetics of Biological Systems	BME 423
Drug Delivery	BME 433
Polymers in Biomedical Engineering / Biomedical Materials	BIOE 446 / 508
Cell and Molecular Bioengineering	BIOE 512
Biomaterials Surface Science	BIOE 517
Engineering the Immune System	BIOE 597
Statistical Analysis / Applied Statistics	STAT 301 / 500
Medical Microbiology	MICRB 412
Organic Chemistry I / II / Lab	CHEM 210 / 212 / 213
Structural Analysis of Organic Compounds	CHEM 430
General Biochemistry	BMB 401

## HONORS AND AWARDS

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2016 – 2018	University Graduate Fellowship
2014	National Society of Collegiate Scholars

## OUTREACH AND EXTRACURRICULAR INTERESTS

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2019 – 2020	Treasurer	Engineering Graduate Student Council
2018 – 2020	Co-Chair	College of Engineering Research Symposium
2018 – Present	Graduate Student Rep	College of Engineering Academic Integrity Committee
2018	Judge, Biology	Covestro Pittsburgh Regional Science & Engineering Fair
2018	Judge, Biochemistry	Pennsylvania Junior Academy of Science State Competition
2018 – 2019	Lab Tours	Middle School, High School and College student programs
2018 – Present	Founder, President, Coach	Penn State Competitive Ballroom and Latin Dance Club
2011	Eagle Scout	Boy Scouts of America