



## 2018 Institute for Public Health Summer Research Program Participants

*(Courtesy: Emily Hickner)*

**Photos on front cover, from top:** Tour of St. Louis with Bob Hansman (courtesy: Emily Hickner), Lorcan O'Byrne with his mentor Dr. Rumi Price (courtesy: Jacaranda van Rheenen), Sharon-Rose Nartey working in the Stallings Laboratory (courtesy: Jacaranda van Rheenen), 2018 cohort at The Little Bit Foundation (courtesy: Emily Hickner)

The Summer Research Program is supported by the Institute for Public Health, Global Health Center, the Departments of Medicine, Molecular Microbiology, and Pediatrics in Washington University's School of Medicine, and Children's Discovery Institute of Washington University and St. Louis Children's Hospital, Mallinckrodt Pharmaceuticals Charitable Giving Program, Stephanie and Chris Doerr, and Dr. and Mrs. Mark Stephen Gold.



[publichealth.wustl.edu/resources/summer-research-program](http://publichealth.wustl.edu/resources/summer-research-program)

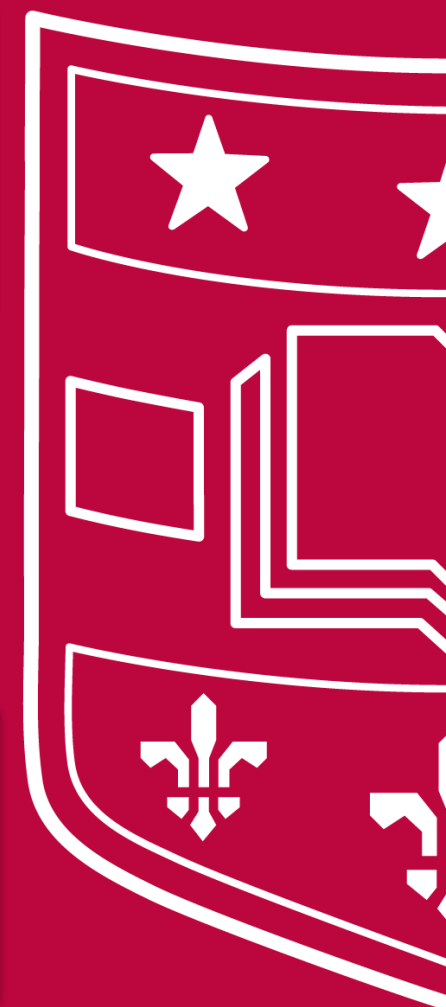
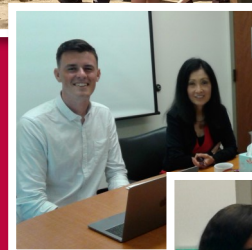
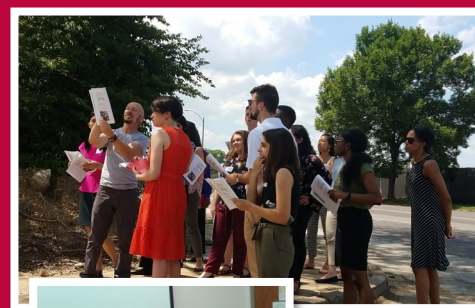


Washington  
University in St. Louis

INSTITUTE FOR PUBLIC HEALTH

Summer Research Program Symposia

July 30 & July 31, 2018



## Institute for Public Health Summer Program Symposium Monday, July 30 - Part 1 Agenda

**1:00 pm Welcome**

**1:10 pm Austin Smarsh, University of Michigan-Ann Arbor**  
*Opioid Use Disorder and HIV/HCV Risk Behavior Among  
Individuals Socially Networking Online About Opioids*

**1:25 pm Adjoa Cofie, Stockton University**  
*Neutrophil-Mediated Host Defense Against Herpes Simplex  
Virus*

**1:40 pm Marissa Rasgado, DePaul University**  
*Commercial Sex Work and HIV Stigma in Iganga, Uganda*

**1:55 pm Kricia Ruano Espinoza, Vanderbilt University**  
*Analysis of Body Mass Index in Simultaneous Pancreas and  
Kidney Transplants in Diabetes Type-2 Patients*

**2:10 pm Break**

**2:25 pm Adetutu Sadiq, University of California-Berkeley**  
*Comparison of a Novel Ready-to-Use Supplementary Food  
(RUSF) with Optimized Protein Quality to Standard Protein  
Quality RUSF for the Treatment of Moderate Acute  
Malnutrition in Rural Malawian Children*

**2:40 pm Sarah Wishloff, Amherst College**  
*Two Novel High-Oleic Ready-to-Use Therapeutic Foods (RUTF),  
Compared to Standard RUTF in Their Effects on Neurocognitive  
Status of Children with Severe Acute Malnutrition*

**2:55 pm Swetha Nakshatri, Washington University in St. Louis**  
*Characterization of Bifidobacterium longum Subspecies  
Infantis (B. infantis) Strains Isolated from the Fecal Microbiota  
of Healthy and Malnourished Children*

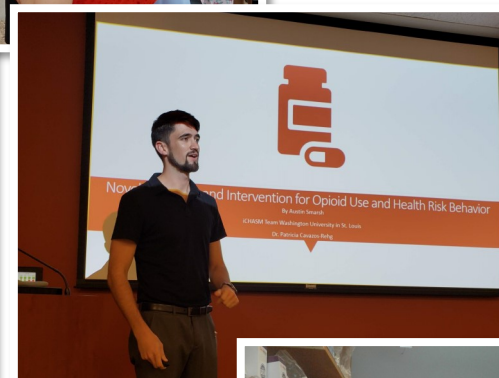
**3:10 pm Jelena Debelnogich, Kent State University**  
*Improving Antibiotic Use in Ventilator-Associated Tracheitis in  
Children*

**3:25 pm Closing Remarks**

## Acknowledgements

We would like to thank the Institute for Public Health Summer Research Program mentors for their guidance and support of the students.

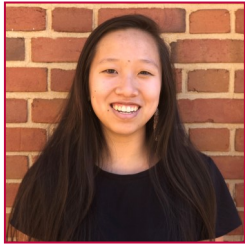
We are very grateful to the staff at the Institute for Public Health and the Clinical Research Training Center for their tremendous logistical support.



### Clockwise:

2018 Cohort on a tour of St. Louis with Bob Hansman (courtesy: Emily Hickner), Austin Smarsh at mid-program presentations (courtesy Emily Hickner), Adjoa Cofie in Dr. Shin's lab (courtesy: Jacaranda van Rheenen), Tiffany Xie and Sharon-Rose Nartey sorting books at The Little Bit Foundation (courtesy: Emily Hickner)





**Celia Zhou**, Undergraduate Student; Channa Yahathugoda<sup>1</sup>, Lalindi De Silva<sup>1</sup>, Upeksha Rathnapala<sup>1</sup>, Mirani Weerasooriya<sup>1</sup>, Ramakrishna Rao<sup>2</sup>, Gary Weil<sup>2</sup>, Philip J. Budge, MD, PhD<sup>2</sup>, <sup>1</sup>Filariasis Research Training and Service Unit, Faculty of Medicine, University of Ruhuna, Galle, Sri Lanka, <sup>2</sup>Department of Medicine, Division of Infectious Diseases, Washington University in St. Louis

### **Variability in Daily Limb Volume and Circumference among Patients with Filarial Lymphedema in Sri Lanka**

**Background:** LF is a debilitating disease that causes disfiguring limb lymphedema in millions of patients worldwide. Improving methods to accurately and reproducibly measure lymphedema severity and limb volume changes over time are essential in evaluating therapies. **Objective:** To investigate how limb volume and circumference varies from day-to-day, and morning-to-evening, in patients with lymphatic filariasis (LF) in Sri Lanka. **Methods:** We used portable 3-D infrared imaging device to measure limb volume among adults with LF-related lymphedema. We visited patients in their homes both morning (between 6:00-9:00 AM) and afternoon (between 3:00-6:00 PM), thrice during a single calendar week. Two examiners measured limb volumes at each visit. Replicate measurements at each time were averaged and compared among time points to determine differences in day-to-day and morning-to-afternoon volumes using paired, two-tailed t-tests.

**Results:** We enrolled 41 adult patients with legs of lymphedema stages 0, 1, 2, 3, 5, and 6 lymphedema (N= 18, 12, 18, 16, 8, 10 limbs, respectively). On average, afternoon limb volumes were 3.1% (95% CI 2.5% - 3.75) higher than morning limb volumes but varied widely (ranged from 0.6% - 8.7%). There was a trend towards higher percent differences in higher stage limbs (2.5% for stage 0, 4.8 for stage 6), but this was not statistically significant.

**Conclusions:** Limb volumes vary slightly but significantly from morning-to-evening in patients with LF-related lymphedema. Longitudinal studies of lymphedema progression should measure participants at the same time of day to minimize bias.



Using the LymphaTech Infrared Imaging System, a novel, portable, 3-D imaging device, to scan the legs of a patient.

## **Institute for Public Health Summer Program Symposium Tuesday, July 31 - Part 2 Agenda**

- 1:00 pm    Welcome**
- 1:10 pm    Colleen McNicholas, DO, MSCI, FACOG  
Washington University School of Medicine**  
*When Politics, Not Policy, is Prioritized: Advocating for Patients and the Profession*
- 2:10 pm    Taylor Ross, University of Missouri-Columbia**  
*Human B cell Responses to H3N2 Influenza Viruses*
- 2:25 pm    Laura Whitehill, University College Dublin**  
*Socio-Demographic Factors Related to Parent Engagement in the Neonatal Intensive Care Unit*
- 2:40 pm    Break**
- 2:55 pm    Margot Palmer, The University of Georgia-Athens**  
*Impact of Mucin-Degrading Enzyme EatA on Interaction of Enterotoxigenic Escherichia Coli with Intestinal Epithelia*
- 3:10 pm    Celia Zhou, Wake Forest University**  
*Variability in Daily Limb Volume and Circumference among Patients with Filarial Lymphedema in Sri Lanka*
- 3:25 pm    Sharon-Rose Nartey, University of Notre Dame**  
*Characterization of Mycobacterium Tuberculosis RNA Polymerase Binding Protein A (RbpA) Core Domain*
- 3:40 pm    Tiffany Xie, Indiana University-Bloomington**  
*Associations Between Racial and Socioeconomic Discrimination and Risk Behaviors among African-American Adolescents and Young Adults*
- 3:55 pm    Lorcan O'Byrne, University College Dublin**  
*Acceptability and Effectiveness of a Mindfulness App and Heart-Rate Monitor for U.S. Veterans*
- 4:10 pm    Certificate Ceremony and Closing Remarks**

**Keynote Speaker:****Colleen McNicholas, DO, MSCI, FACOG**

Assistant Professor, Department of Obstetrics and Gynecology, Division of Family Planning, Director, Ryan Residency Program, Assistant Director, Fellowship in Family Planning, Washington University

Dr. McNicholas completed medical school at the Kirksville College of Osteopathic Medicine and her OB/GYN residency and Family Planning Fellowship

at Washington University School of Medicine. She is Board certified in Obstetrics and Gynecology and is on faculty in the division of Family Planning at Washington University. Her clinical work includes general gynecology and family planning. Dr. McNicholas provides abortion services in a variety of geographic locations as well as practice settings including an academic practice, Planned Parenthood, and independent clinics. Geographically, her clinical work covers the state of Missouri, as well as Wichita, Kansas and Oklahoma City, OK. In addition to clinical family planning, Dr. McNicholas is also a clinical researcher and her research is focused on non-traditional provision of Long-Acting Reversible Contraception. Lastly, she spends a great deal of time on reproductive health advocacy, traveling to Jefferson City, Missouri's Capital, and Washington, DC to address the increasing incidence of legislative interference into the practice of medicine.

**Victoria Anwuri, MPH**

Associate Director, Institute for Public Health, Washington University

Ms. Anwuri is charged with implementing the strategic plan and programs of the Institute in collaboration with Institute leaders to achieve the overarching mission and vision of the Institute.

She has extensive experience in public health research and programming. Prior to joining the

Institute, Ms. Anwuri managed and coordinated program operations for multiple large-scale, nationally-funded health initiatives related to energetics and cancer, cancer health disparities, diabetes self-management and heart disease and stroke prevention.

Recently she worked on a university/hospital research, community engagement and training initiative that was focused on collaborations with community partners to develop solutions to reduce excess cancer burden in the St. Louis region, and on a university-wide initiative to foster transdisciplinary research exchange around energetics and cancer.

The primary outcome will be performance on the Malawian Development Assessment Tool at age 3. Secondary outcomes will include recovery from SAM, results from neurocognitive testing performed at week 6 of treatment, and blood plasma fatty acid levels taken after 4 weeks of treatment. **Results:** To date, 545 children have been enrolled in the study. Preliminary analysis of this data indicates there is no difference in week of recovery from SAM based on food group or sex. (p values 0.91; 0.11). **Conclusions:** The study design has been accepted by village communities.



**Tiffany Xie**, Undergraduate Student; Manik Ahuja, Kathleen Bucholz, MPH, MPE, PhD, Department of Psychiatry, Washington University

**Associations Between Racial and Socioeconomic Discrimination and Risk Behaviors among African-American Adolescents and Young Adults**

**Background:** Discrimination is a common stressor among African Americans and may increase vulnerability to risk behaviors, including early initiation of substance use, substance use problems, and physical aggression, but few studies have examined the influence of different types of discrimination on risk behavior.

**Objective:** This study utilizes latent class analysis to examine the relationship between racial and socioeconomic discrimination and risk behavior in African-American adolescents and young adults. **Methods:** We investigated associations between two discrimination types and risk behavior latent classes in a high-risk sample of African Americans (n = 803), adjusting for family clustering, age, gender, socioeconomic status, offspring psychopathology, and maternal discrimination. **Results:** Classes that exhibit general risk behaviors are significantly associated with racial and socioeconomic discrimination, even in the fully adjusted model. Latent class analyses identified four distinct patterns of risk behavior, defined as Aggressive Substance Users (10%), Moderately Aggressive Substance users (10%), Alcohol Users (17%), and Unaggressive Non-Users (63%). Relative to other classes, Aggressive Substance Users demonstrated an elevated likelihood of experiencing racial and socioeconomic discrimination.

**Conclusion.** Our findings support a link between racial and socioeconomic discrimination and risk behavior in African-American youth. Understanding the relationship between discrimination and risk behavior can inform future interventions to prevent substance and behavioral problems. Further study is needed to elucidate the relationship between discrimination and other risk behaviors.



Experiences of racial discrimination can have profound implications for health and well-being.



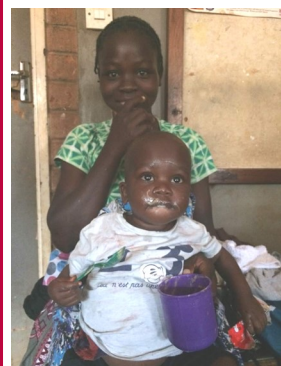
**Methods:** Sixty-four premature infants born  $\leq 32$  weeks gestation were randomized at birth to receive SENSE or standard of care. The SENSE intervention consisted of parent education about how to conduct specific types and doses of positive sensory exposures during hospitalization. Bedside logs were used to record parent presence and engagement across both groups. Engagement was defined as completion of specific doses of sensory exposures defined in the SENSE intervention, while presence was the number of days per week parents were present in the NICU. **Results:** Being married ( $p=0.026$ ) and having private insurance ( $p=0.004$ ) related to more parent engagement. Participation in the SENSE intervention increased engagement for young mothers ( $p=0.001$ ) and those living father away from the NICU ( $p<0.001$ ). **Conclusion:** This study identified unmarried mothers and public insurance holders as possible risk groups for low parent engagement in the NICU. The SENSE intervention led to increased parent engagement among younger mothers and those living farther from the hospital.



**Sarah Wishloff**, Undergraduate Student ; Mark Manary, PhD, Department of Pediatrics, Washington University

**Two Novel High-Oleic Ready-to-Use Therapeutic Foods (RUTF), Compared to Standard RUTF in Their Effects on Neurocognitive Status of Children with Severe Acute Malnutrition**

**Background:** RUTF is a food used for the treatment of children with SAM worldwide. However, RUTF contains high levels of the n-6 polyunsaturated fatty acid (PUFA) linoleic acid (LA), which inhibits the synthesis of Docosahexaenoic acid (DHA), a fatty acid required for neural membrane function and infant psychomotor development. In response, two novel RUTFs were developed using high oleic peanuts, which contain higher amounts of the monounsaturated fatty acid oleic acid and have consequently lower levels of LA. **Objective:** To determine whether high-oleic acid RUTF improves the neurocognitive performance of children recovering from SAM when compared to standard RUTF. **Methods:** A study team of nurses, research assistants, and volunteers will enroll 3700 children 6-59 months old at 20 feeding clinics in rural Malawi. Children presenting as severely malnourished based on a mid-upper-arm circumference (MUAC)  $<11.5$ cm, the presence of edema, or a weight-for-height z-score of  $<-3$  will be randomly fed either standard RUTF, high-oleic RUTF, or high-oleic RUTF with added DHA for 12 weeks or until recovered from SAM.



A Malawian mother holds her child as he eats Ready-to-Use Therapeutic-Food.



**Ericka Hayes, MD**

Associate Professor, Department of Pediatrics, Division of Infectious Diseases, Medical Director, Pediatric and Adolescent HIV Program, Medical Director, Infection Prevention, Washington University

A native of Mississippi, Dr. Hayes completed a BS in Chemical Engineering as well as her MD at Washington University (WU). She completed her pediatrics residency training at the University of California, San Francisco. She returned to WU School of Medicine for fellowship training in pediatric infectious diseases. In 2005, she joined the Department of Pediatrics as faculty and the WU Pediatric HIV program, which she currently serves as medical director.

Dr. Hayes's past research projects have focused on metabolic complications and drug dosing of HIV medicines in severely malnourished children; implementation and optimization of universal HIV testing programs for adolescents and young adults and sexually transmitted infection diagnosis and treatment in youth. She also serves Saint Louis Children's Hospital as medical director of Infection Prevention. Dr. Hayes's other passion is medical education and she is the co-course director of the second year pediatrics course at the School of Medicine and is the co-chair of the pediatric infectious diseases education committee.



**Jacaranda van Rheenen, PhD**

Manager, Global Health Center, Institute for Public Health, Washington University

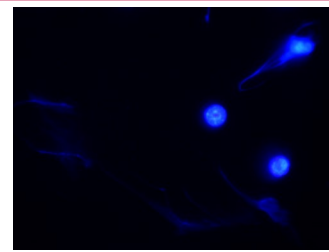
Dr. van Rheenen is the organizational lead on the Center's initiatives, including the visiting speaker series, the summer research program, global health advisory committees, and other research and educational activities. Prior to Washington University she worked at St. Jude Children's Research Hospital in Memphis, TN, recruiting postdoctoral fellows. A native of the Netherlands, she earned a master's of science degree in agricultural and environmental sciences at Wageningen University in the Netherlands and a doctorate in plant ecology from Utrecht University in the Netherlands. Her doctorate research was in the Bolivian Amazon rainforest, studying the role of seed trees and seedling regeneration for species maintenance in logged-over forests. Dr. van Rheenen's international background has made her passionate about global health.



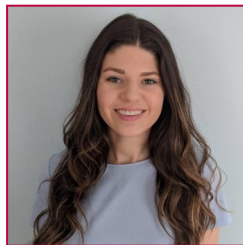
**Adjoa Cofie**, Undergraduate Student; Haina Shin, PhD, Department of Medicine, Infectious Diseases, Washington University

### Neutrophil-Mediated Host Defense against Herpes Simplex Virus

**Background:** Herpes Simplex Virus-2 (HSV-2) is the major cause of genital herpes. This study investigates whether dissemination of HSV-2 is affected by neutrophils in the vaginal tract. Neutrophils kill pathogens through Neutrophil Extracellular Traps (NETs), which are activated by enzyme PAD4 and lead to NETosis, a form of cell death. We hypothesize that deleting the PAD4 enzyme and preventing NETosis may result in neutrophil accumulation and worsen symptoms of HSV. Preliminary data suggests that neutrophils drive immunopathology without contributing to viral control. Understanding the inflammatory role of neutrophils against HSV may provide novel targets for therapeutics to decrease disease. **Objective:** Explore role of Neutrophil Extracellular Traps in the progression of Herpes Simplex Virus symptoms. **Methods:** We utilized two models of mice: wildtype (WT) controls and PAD4 knockout (KO), in which PAD4 enzyme is absent in neutrophils. All mice were infected vaginally with HSV-2 and observed for weight loss, HSV-2 symptoms, and neutrophil accumulation measured through collection of vaginal wash and blood. **Results:** PAD4KO mice showed significantly lower survival compared to WT. PAD4KO mice showed greater loss of body weight and developed symptoms at a faster rate, compared to WT mice. KO mice did not demonstrate an overall greater number of neutrophils present in both blood and vaginal wash compared to WT mice. **Conclusion:** Eliminating PAD4 enzyme, thus preventing NETosis increased the rate of symptoms development present in the infected mice. This finding implies that neutrophil depletion can delay symptoms and result in a greater survival after HSV-2 infection.



Neutrophil Extracellular Traps (NETs) formation by neutrophils stimulated by Herpes Simplex Virus (HSV).



**Jelena Debelnogich**, Graduate Student; Mirela Grabic, Cindy Terrill, Jason Newland, MD, MEd, Pediatrics, Washington University

### Improving Antibiotic Use in Ventilator-Associated Tracheitis in Children

**Background:** VAT antibiotic treatment duration previously had no established standard. Treatment durations as short as five days have been shown to be effective in adults. A SLCH clinical protocol was implemented to recommend only five days of antibiotic therapy for hospitalized children diagnosed with tracheitis.

This study uses Reddit (i.e., social media platform) to explore Opioid Use Disorder (OUD) symptoms, HIV/HCV risk behaviors, and interest in digital therapeutics among individuals networking about opioid use. **Methods:** Researchers surveyed 3 opiate-focused Reddit forums. Eligible participants had used opioids in the past month and were 15 years. Descriptive statistics were used to characterize demographics, OUD severity, HIV/HCV risk behaviors, and interest in digital therapeutics. **Results:** Among 319 participants, most were male (66%), white (83%), and mean age was 30. 92% met DSM-5 criteria for OUD, and 35% injected drugs in the past 6 months (Median HIV Risk Behavior score of 7 among IV-drug users, range 1-22). There was a small positive association between OUD severity and HIV Risk Behavior ( $r_s = 0.170$ ,  $p = 0.002$ ). Overall, 70% were interested in digital therapeutics. Those interested in digital therapeutics had higher OUD severity scores (median 7). ( $U = 7816.00$ ,  $p < 0.001$ ). **Conclusion:** This outreach strategy was successful in reaching a hidden population of individuals misusing opioids and engaging in HIV/HCV risk behaviors. Findings will inform digital therapeutics that can be linked to individuals socially networking about opioids to help reduce risk behaviors and encourage recovery.



New health problems require new health solutions, and that is what we are working toward.



**Laura Whitehill**, Medical Student; Roberta Pineda, PhD, Program in Occupational Therapy, Department of Pediatrics, Washington University

### Socio-Demographic Factors Related to Parent Engagement in the Neonatal Intensive Care Unit

**Background:** Preterm birth results in significant health complications, necessitating infant hospitalization in the NICU, which alters early sensory experiences. Early positive sensory experiences in the NICU are further impacted by challenges parents face engaging in care<sup>1</sup>.

**Objectives:** To 1) explore the relationships between sociodemographic factors and parent engagement in the neonatal intensive care unit (NICU), and 2) determine if participation in a parent delivered, positive sensory intervention program (SENSE) relates to increased parent engagement.



Logo for the overarching study, a randomized control trial evaluating a parent given positive sensory exposure interventions for infants in the neonatal intensive care unit.





**Adetutu Sadiq**, Undergraduate Student; Kenneth Maleta, Minyanga Nkhoma, Meghan Callaghan-Gillespie, Mark Manary, MD, Department of Pediatrics, Washington University

### Comparison of a Novel Ready-to-Use Supplementary food (RUSF) with Optimized Protein Quality to Standard Protein Quality RUSF for the Treatment of Moderate Acute Malnutrition in Rural Malawian Children

**Backgrounds:** Moderately acute malnutrition (MAM) as an important underlying cause of death accounting for 10.2% of deaths among children under five years of age worldwide. Children with MAM experience an increased number of infectious episodes and delayed cognitive development. **Objective:** To test the effectiveness of two ready-to-use supplementary foods (RUSFs) of differing protein quality in the treatment of moderate acute malnutrition (MAM).

**Method:** This is a randomized controlled, double blinded, clinical trial among MAM children in Malawi. The sample size is 1800 children and the primary outcome is recovery from MAM (achieving MUAC  $\geq$  12.5 cm by 12 weeks) or failure. Secondary outcome measures include rates of weight, height, and mid-upper-arm circumference (MUAC) gain, time to graduation, and adverse effects from the supplementary foods. Children are followed with fortnightly clinic visit where anthropometry is done. **Result:** The trial began in June 2018, and 20 children completed treatment by mid-July. **Conclusion:** Implementation of the study was successful, and the communities are actively participating.



Adetutu Sadiq with a child enrolled in the HiPro MAM study and his mother.



**Austin Smarsh**, Graduate Student; Melissa Krauss, Shaina Costello; Patricia Cavazos-Rehg, PhD, Department of Psychiatry, Washington University

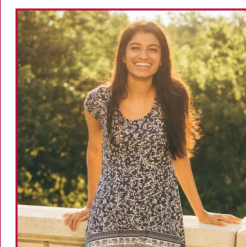
### Opioid Use Disorder and HIV/HCV Risk Behavior Among Individuals Socially Networking Online About Opioids

**Background:** Increased HIV/HCV rates in the U.S. are believed to be tied to the opioid epidemic, but opioid misusers are difficult to survey. **Objective:** Explore the potential for social media as an outreach tool to survey opioid misusers exhibiting Human Immunodeficiency Virus (HIV)/Hepatitis C Virus (HCV) risk behavior. Data gained will be used to develop a digital therapy tool.

**Objective:** To determine if clinicians follow the St. Louis Children's Hospital (SLCH) tracheitis protocol and clinical outcomes associated with the treatment of ventilator-associated tracheitis (VAT) in children. **Methods:** A retrospective cohort study was conducted among children  $\leq$  21 years in the pediatric intensive care unit who had been intubated for  $\geq$  48 hours and received antibiotic treatment for VAT from 10/2016 to 3/2017. Medical records were reviewed for duration of antibiotic therapy, and patients were divided into two groups:  $\leq$  5 days and  $>$  5 days. Descriptive statistics were used to characterize demographics and VAT treatments. The primary outcome was retreatment - re-initiation of antibiotics for VAT or pneumonia within ten days of completing the VAT treatment. **Results:** Of the 50 children evaluated, 66% were male. The median days of antibiotic therapy was 7.5 (IQR 6,9). Only 18% of patients treated for VAT met protocol standards. Preliminary data demonstrated that children treated for  $\leq$  5 days, 18% required retreatment while those treated for  $>$  5 days, 17% required retreatment ( $p=0.1$ ). **Conclusions:** Preliminary data suggests children with VAT treated with antibiotics for  $\leq$  5 days do not have worse outcomes than children treated for longer durations. Additional analysis is needed to determine if other factors influence the duration of therapy and clinical outcomes.



Dr. Jason Newland and his team investigate antibiotic use in animals at well-known barbecue establishments in St. Louis.

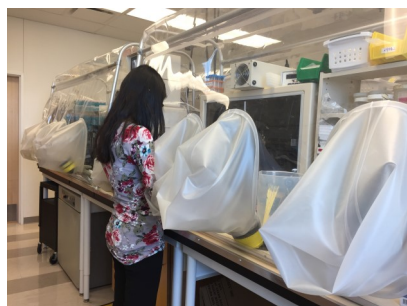


**Swetha Nakshatri**, Undergraduate Student; Janaki Guruge, Jeffrey Gordon, MD, Edison Family Center for Genome Sciences and Systems Biology, Washington University

### Characterization of *Bifidobacterium longum* Subspecies *Infantis* (*B. infantis*) Strains Isolated from the Fecal Microbiota of Healthy and Malnourished Children

**Background:** *B. longum* is a prominent member of the infant gut microbiota. *B. longum* subspecies *infantis* contains a 43-kb gene cluster encoding oligosaccharide transporters and glycosidases that break down human milk oligosaccharides. *B. infantis* is anti-inflammatory and is associated with better weight gain. **Objective:** This study tested enzymatic activity in *B. infantis* strains isolated from the fecal microbiota of healthy and malnourished children. **Methods:** Strains were cultured using brain heart infusion agar under anaerobic conditions. *B. infantis* isolates were identified by sequencing the full-length 16S rRNA gene. In vitro assays using the RapID Ana II and PYR systems tested isolates for enzymatic activity against 18 substrates. Growth curves were conducted in minimal medium with glucose and cellobiose.

**Results:** Screening *B. infantis* isolates against substrates revealed two notable differences that correlate with host nutritional status. Strains from malnourished donors (n=4) tested negative for b-glucosidase activity based on their ability to degrade p-Nitrophenyl-b,D-glucoside, while strains from healthy donors (n=3) tested positive. b-glucosidase converts cellobiose to glucose. Pyrrolidonyl peptidase activity, screened against L-pyrrolidonyl-b-naphthylamide, was detected in strains from malnourished, but not healthy donors. Pyrrolidonyl peptidase is typically found in Enterobacteriaceae; there is no literature on its activity in *B. infantis*. The genomic basis of these differences is being explored using bioinformatics. **Conclusions:** Malnutrition is associated with decreased b-glucosidase activity and increased pyrrolidonyl peptidase activity in *B. infantis*. These findings are rationale for further exploring substrate breakdown by *B. infantis* from healthy versus malnourished children and how differences contribute to growth and gut health.



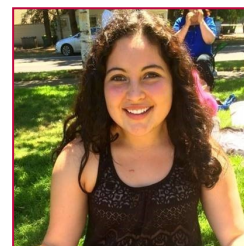
To culture anaerobic bacterial strains, work must be done in a Coy chamber that contains a mixture of gases and has a catalyst to remove oxygen.



**Sharon-Rose Nartey**, Undergraduate Student; Jerome Prusa, Dennis Zhu, Christina Stallings, PhD, Department of Molecular Microbiology, Washington University

#### **Characterization of *Mycobacterium Tuberculosis* RNA Polymerase Binding Protein A (RbpA) Core Domain**

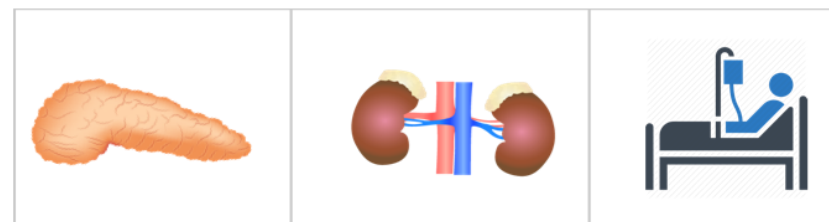
**Background:** *Mycobacterium tuberculosis* (Mtb) is a bacterial pathogen that has a tremendous burden on global health and is known to be a successful pathogen due to its ability to regulate gene expression via regulation of transcription. There are major gaps in the understanding of Mtb transcription because of key differences from the best studied model organism, *Escherichia coli* (E. coli). One difference is the presence of the RNA Polymerase binding protein A (RbpA) in Mtb. Previous studies indicate RbpA is an essential protein that associates with the RNA Polymerase (RNAP) complex and plays a role in Mtb transcription bubble formation. RbpA has four structural domains: The C-terminus contains the Basic Linker (BL) and Sigma Interaction domain (SID) and the N terminus contains the N-terminal Tail domain (NTT) and the Core Domain (CD). The function of the C-terminal domains have been identified but that of the N-terminal domains are still unknown.



**Kricia Ruano Espinoza**, Graduate Student; Devin Wall, MS<sup>1</sup>, Tarek Alhamad, MD, MS, FASN, FACP<sup>1,2</sup>, <sup>1</sup>John T. Milliken Department of Medicine, Division of Nephrology, Washington University, <sup>2</sup>Transplant Epidemiology Research Collaboration (TERC)

#### **Analysis of Body Mass Index in Simultaneous Pancreas and Kidney Transplants in Diabetes Type-2 Patients**

**Background:** The United Network for Organ Sharing (UNOS) limits time accrual for SPKT candidates on insulin based on an arbitrary c-peptide  $\leq 2$  ng/mL or c-peptide  $2 > \text{ng/mL}$  with a BMI  $\leq 30 \text{ kg/m}^2$  criteria, resulting in disproportionate limited access to DM-2 African, Mexican and Native American candidates. **Objective:** Understand outcomes of body mass index (BMI) on diabetes type-2 (DM-2) patients who've undergone simultaneous kidney-pancreas transplant (SPKT). **Method:** Retrospective analysis consisted of 771 DM-2 patients who underwent a SPKT between December 2000 and December 2016. Patients were categorized based on standard BMI classifications: normal ( $18.5\text{-}24.9 \text{ kg/m}^2$ , n = 281), overweight ( $25\text{-}29.9 \text{ kg/m}^2$ , n = 377), and obese ( $\geq 30 \text{ kg/m}^2$ , n = 113). Kaplan-Meier analysis and cox-regression analysis were used to investigate the survival probability function and adjusted hazard ratios (aHR) of donor, recipient and transplant factors for kidney failure, pancreas failure and patient death.



Outcome of pancreas allograft, kidney allograft and patient survival due to obesity in type-2 diabetes patients who've undergone a SPKT.

**Results:** There was no statistically significant evidence to indicate obese patients faced higher risks of pancreas failure (aHR, 1.11; CI, 0.70-1.77), kidney failure (aHR, 1.04; CI, 0.61 -1.78), or patient death (aHR, 1.00; CI, 0.53-1.86) post-transplants, and after a 1-, 3-, 5-, and 7- year follow up. **Conclusion:** Obese DM-2 SPKT patients do not face significant detrimental outcomes in pancreas, kidney and patient survival, requesting recall to the UNOS policy for time accrual. Amending this policy may ultimately decrease discard rate of pancreata and increase number of SPKT nationwide.





**Taylor Ross**, Medical Student, Masters Candidate; Ali Ellebedy, PhD, Department of Pathology & Immunology, Washington University

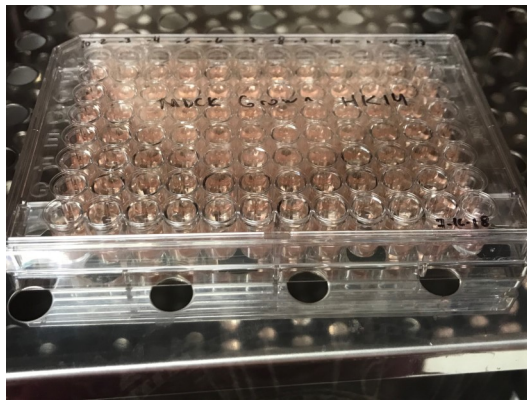
### Human B cell Responses to H3N2 Influenza Viruses

**Background:** The 2017-18 influenza season was the 3rd most severe since 2004, with the proportion of deaths at or above the epidemic threshold for 16

weeks. A key contributor to the season's severity was low vaccine effectiveness (VE)—estimated to be 36% overall, but only 25% against influenza A(H3N2), which caused an estimated 84.9% of cases. Vaccination or infection induces an immune response, part of which is the generation of antibodies. **Objective:** To Investigate the specificity and breadth of seasonal influenza vaccines-induced human B cell responses to H3N2 viruses.

**Methods:** We analyzed B cell responses in healthy volunteers who received the 2017-2018 seasonal influenza vaccine. Blood specimens were collected before vaccination and at multiple timepoints after vaccination. Vaccination-induced B cell subset responsible for antibody secretion, Plasmablasts, were then single cell sorted based on their specificity for influenza A(H3N2) Hemagglutinin (HA) protein. From these cells, we generated the corresponding monoclonal antibodies (mAbs). These mAbs were characterized for their ability to bind an array of influenza H3 HAs and their capacity to neutralize influenza viruses in vitro. **Results:** From the vaccinated subjects 31 HA-binding Antibodies have been isolated from 4 donors. Of the HA subtypes tested 4/31 antibodies were broadly cross reactive and 27/31 antibodies had specificity for select HA's.

**Conclusion:** Influenza vaccination can induce B cell responses that are directed against influenza A(H3N2) HA. The ability of the antibodies to bind the HA molecule is important because it can block the initial influenza infection, making the body more resistant to infection.

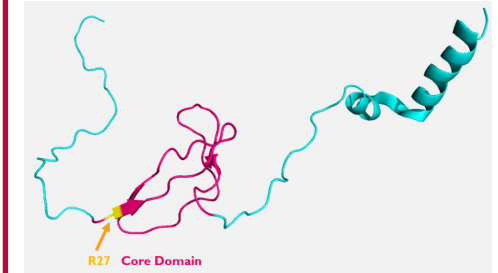


A 96-well plate holding MDCK cells that have been infected with the Hong Kong 2014 H3N2 influenza virus incubated with monoclonal antibodies cloned from vaccinated patients.

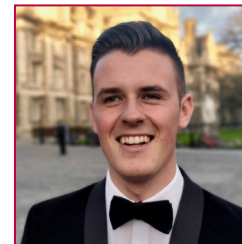
**Objective and Methods:** The purpose of this study is to identify the function of the RbpA CD by introducing a point substitution at the highly conserved RbpA R27 residue.

### Results and conclusion:

We have determined that the R27 residue is essential for normal Mtb growth and important for transcriptional homeostasis. In the future we will determine why the RbpA substitution slows *Mycobacterium smegmatis* (Msmeg) growth by analyzing the cellular levels of RbpA and determine if the R27E substitution affects the strength of RbpA interaction with RNAP.



The crystal structure of the RNA Polymerase binding protein A (RbpA), an essential protein involved in *Mycobacterium tuberculosis* transcription bubble formation. The residue of interest, R27, is highlighted.



**Lorcan O'Byrne**, Medical Student; Chase Latour<sup>1</sup>, Margaret McCarthy<sup>2</sup>, Ravi Chacko<sup>2</sup>, Elizabeth Russell<sup>2</sup> and Rumi Kato Price, PhD, MPE, MA<sup>2</sup>, <sup>1</sup>Department of Psychiatry, Washington University, <sup>2</sup>DataDog Health Inc.

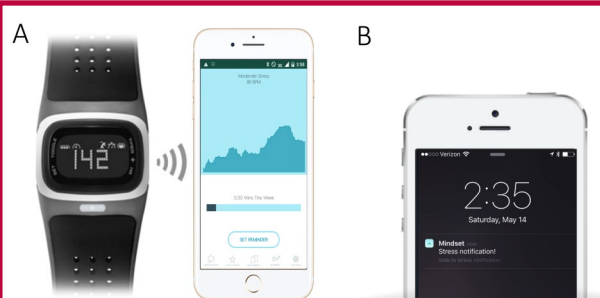
### Acceptability and Effectiveness of a Mindfulness App and Heart-Rate Monitor for U.S. Veterans

**Background:** Several barriers (stigma, financial concerns, geographic constraints and medication concerns) discourage U.S. Veterans from seeking effective posttraumatic stress disorder (PTSD) treatment. Thus, despite the availability of evidence-based treatments, rates of PTSD remain high in this population, highlighting a need for innovative management tools. Previous studies have shown mobile applications to be efficacious in treating PTSD symptoms. Mindset is a similar application, designed to help users manage their mental health symptoms; however, it is novel as it utilizes heart rate-related data via a smartwatch to monitor user's stress level and deploy app e-therapies. **Objective:** This pilot study evaluates the effectiveness and acceptability of Mindset and the applications capacity in managing PTSD symptoms. **Methods:** Twenty-four community-residing Veterans meeting inclusion criteria completed both baseline and follow-up interviews. Following baseline interview, participants used the Mindset app and related heart rate watch continuously for approximately one month until their follow-up interview. Interview assessments included pre- and post-deployment experiences, standardized screeners for PTSD (PCL-M), anxiety (GAD-7), depression (PHQ-9), alcohol use problems (AUDIT-10), and user experience with Mindset, among others.

**Results:** Using SAS 9.4, a significant decrease ( $p < 0.05$ ) was found in PCL-M, PHQ-9 and AUDIT-10 between baseline and follow-up interviews.

Respondents reported moderate to high acceptance and satisfaction with Mindset features.

**Conclusions:** Mindset use may be associated with decreasing symptoms of PTSD and alcohol abuse in this sample of U.S. Veterans. This study highlights a Mindfulness app, such as Mindset, as a useful tool to augment existing therapies.



The mindset app uses a Bluetooth enabled smartwatch to notify users in real-time in periods of elevated stress.

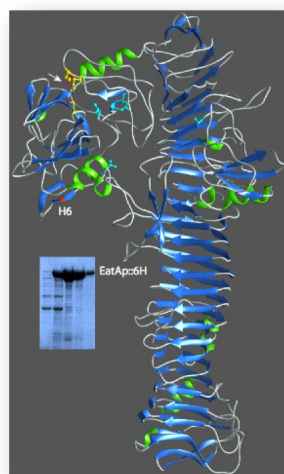


**Margot Palmer**, Undergraduate Student; Tim Vickers, Tamding Wangdi; James Fleckenstein, MD, Department of Medicine, Division of Infectious Diseases, Washington University

### Impact of Mucin-Degrading Enzyme EatA on Interaction of Enterotoxigenic *Escherichia Coli* with Intestinal Epithelia

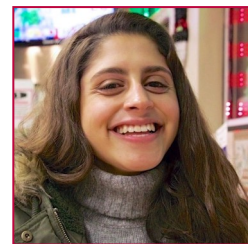
**Background:** Enterotoxigenic *Escherichia coli* (ETEC) is a diverse *E. coli* pathotype that causes diarrheal illness by production of enterotoxins, that trigger excessive fluid secretion from the small intestinal epithelium leading to diarrhea that may range from mild to cholera-like.

ETEC is a major cause of infant mortality due to diarrheal illness in developing countries. We have previously demonstrated that EatA, a secreted protease of ETEC, degrades the MUC2 mucin, which forms a potential protective barrier to prevent pathogen-host interaction. Because many strains associated with severe cholera-like illness produce EatA, we examined the impact of this protein in model intestinal epithelial monolayers. **Objective:** The studies reported here were designed to examine the impact of a recently discovered mucin-degrading enzyme on the interaction of enterotoxigenic *Escherichia coli* (ETEC) with intestinal epithelia.



EatA, a mucin-degrading enzyme of enterotoxigenic *Escherichia coli*.

**Methods:** Vector plasmids carrying the luciferase gene reporter, a bioluminescent enzyme derived from the firefly, will be transformed into ETEC cells. Mice will be infected with the luciferase ETEC strain, and the localization and migration of the cells will be visualized upon addition of a luciferin substrate. **Results/Conclusions:** While cloning efforts are still underway, preliminary and past data suggest that this method will aid in visualization and imaging of ETEC infection.



**Marissa Rasgado**, Undergraduate Student; Nick Murira, Ruth Nakaima, Ritah Namutamba, Shanti Parikh, PhD, Department of Anthropology, Washington University

### Commercial Sex Work and HIV Stigma in Iganga, Uganda

**Background:** In Uganda, the national adult HIV prevalence is 6.7%, sex workers are 37% (UAC 2016) and highway sex workers are as high as 75% (Vandenhoudt et al. 2013). Work-related stigma has increased risk and has served as barriers to HIV prevention and care.

**Objective:** This project is part of a larger study on commercial sex work and gendered engagement with HIV care. This summer's project investigates sources of social and self-stigma that female sex workers (FSWs) and their customers experience that increase their HIV risk and/or prevents them engaging in HIV care systems. **Methods:** Qualitative data on FSWs and their customers lives, participation in commercial sex work, and HIV-related experiences was collected through interviews. Data was analysed using pairwise ranking to show which sources of stigma discouraged FSWs and their customers from learning about their HIV status, seeking support, and/or receiving ART treatment. This research was investigated in the greater Iganga region, specifically at truck stops along the TransAfrica Highway that are considered hotspots for HIV transmission. **Results:** Preliminary results show that FSWs and their customers feel they are discriminated because of their HIV status but based on coded data it has been suggested stigma from being a sex worker or customer is a greater obstacle. Now became interested how HIV stigma is dependent on disclosure of status.

**Conclusions:** Novel aspects of factors such as discrimination, stereotyping, and misconceptions contributed to stigmatizing HIV. The current stigma caused fear of getting tested, lack of support, and poor adherence to ARTs.



A bar at Idudi Truck Stop with a mural showing the importance of using condoms when having sex to protect yourself from HIV.