Photos Contributed by the Students

Clockwise from top left corner: Colonies collected from vaginal bacteria (Courtesy: Maria Ruiz); Community walking event with Linnetta, Sheryll and Gina, St. Louis (Courtesy: Gina Phillips); Many exfoliated superficial and underlying cells (Papanicolaou stain) (Courtesy: Laura Bliss); Mt. Gay, Rathdune, Carleton House, St. Georges, Grenada (Courtesy: Yaneve Fonge); Transfected A549 cells (Courtesy: Michael Scolarici); Dr. Sharma, Sarah Bridge and Dr. Cox in front of AIIMS, Delhi, India (Courtesy: Sarah Bridge)

Photos on cover page from left to right: Dr. Manary’s Food Taste Testing Lab, St. Louis (Courtesy: Nneka Molokwu); Research in the field, Port Plume, Haiti (Courtesy: Caila Brander)

Student Research Symposium

July 31, 2014
1:00 pm—5:15 pm
McDonnell Pediatrics Research Building
Conference Room 8101

Presentations by Students in the Summer Research Program in Global Health

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Agenda

1:00 pm  Welcome  
Nancy L. Morrow-Howell, Washington University

1:15 pm  Keynote Address  
Global Health Challenges and the Need for Transdisciplinary Approaches  
William G. Powderly, Washington University

1:45 pm  Using CRISPR/Cas9 to Study Host Gene Activity During Influenza A Virus (IAV) Infection  
Michael J. Scolarici, Saint Louis University

2:00 pm  Cytological Analysis of Urinary Biomarkers as Potential Tool to Distinguish Between Bladder Disease Subtypes  
Laura A. Bliss, Washington University

2:15 pm  Culture and Identification of Reference Strains of Vaginal Bacteria  
Maria J. Ruiz, Washington University

2:30 pm  Making a List, Checking it Twice: An International Comparison of Safety Culture and the use of the WHO Surgical Safety Checklist  
Sarah C. Bridge, University of Utah

2:45 pm  Break

3:00 pm  Integrated Management of MAM and SAM in Sierra Leone with RUTF  
Nneka D. Molokwu, Washington University

3:15 pm  Substance Abuse Treatment in Grenada: A Continuum of Care Framework  
Yaneve N.E. Fonge, University of Rochester

3:30 pm  A Community-Based Participatory Research Approach to Improving Breast Cancer Services for African American Women Living in St. Louis  
Gina B. Phillips, Washington University

3:45 pm  Nutrition, Child Health, and Anthropometric Overview in Port Ploum, Haiti  
Caila E. Brander, Washington University

4:00 pm  Certificate Ceremony

4:15 pm  Closing Remarks

4:30 pm  Reception

Acknowledgements

We would like to thank the mentors for their guidance and support of the students.

We are very grateful to the Departments of Medicine, Molecular Microbiology, Pathology and Immunology and the Office of Medical Student Research for their generous support of this exciting new program. We would like to also thank the staff at the Institute for Public Health, the Clinical Research Training Center and the Division of Biology and Biomedical Sciences for their tremendous logistical support and advice.
Using CRISPR/Cas9 to Study Host Gene Activity during Influenza A Virus (IAV) Infection

Influenza A Virus (IAV) is an important pathogen causing annual epidemics of 3-5 million cases of severe disease and 250,000 to 500,000 deaths. Interferon Stimulated Genes (ISGs), IFIT1 and IFI35, are host genes that play distinct roles in viral infection when activated by interferon, a class of proteins which facilitate communication between cells. Their effects during IAV infection, however, have not been fully described. To understand their influence on host immunity and IAV pathogenesis, mice genes (respectively wild-type and knockout) were infected with IAV. IFIT1 knockouts showed no difference, but IFI35 knockouts presented reduction in disease. Since human and mouse immunity differs, human knockout models, lung epithelial (A549) cells, were produced with new genome editing technology, CRISPR/Cas9. A549 cells were prompted to express guide-RNA, targeting either IFIT1 or IFI35; Cas9; and antibiotic resistance. DNA sequencing verified genetic diversity of clonal cell lines at targeted ISG loci, and flow cytometry or western blotting determined the presence of targeted proteins. Using CRISPR/Cas9 produced relevant human IFIT1 knockout models to study IAV infection. Knockout status of IFI35 cells lines will be validated by analyzing individual copies of the IFI35 gene. To investigate ISG activity during IAV replication, knockout models will be treated with interferon-β and challenged with one of two strains of IAV. Dose response of IAV infectivity to interferon-β will be measured by flow cytometry. Detecting altered rates of infectivity would indicate ISG activity during IAV infection. This would not only give further insight to the interaction of host cells and IAV, but could potentially identify future targets for drug therapies.
Laura Bliss, Medical Student; Emily Ma; Indira Mysorekar, PhD, Departments of Obstetrics & Gynecology and Pathology and Immunology, Washington University

Cytological Analysis of Urinary Biomarkers as Potential Tool to Distinguish Between Bladder Disease Subtypes

Objective: The urinary bladder is afflicted by a number of chronic conditions and diseases, including Interstitial cystitis/bladder pain syndrome (IC/BPS), UTIs, and Overactive Bladder (OAB). These conditions affect millions of patients worldwide and are major cause for concern. Because patients suffering from IC/BPS, OAB, and symptomatic bladder UTIs often report similar symptoms, distinguishing between these disease subtypes can be difficult without the use of invasive techniques. Our objective is to use injury models developed by the Mysorekar lab to decipher the mechanisms by which the bladder repairs itself following injury, define markers of these processes, and test these in humans.

Study Design: Urine samples from women suffering from these bladder disease subtypes were examined using cytology and stratified into categories. De-identified samples were obtained from 4 cohorts of women: IC/BPS patients, OAB patients, symptomatic bladder UTI patients, and age matched controls. Samples were examined using cytology and given scores based on levels of inflammation, amounts of superficial cell sloughing, prevalence of crystals, and bacteria levels. These profiles were integrated with clinical data in order to obtain a comprehensive profile for each patient.

Results: Preliminary data has shown that urinalysis and inflammation scores distinguished the patient conditions. Controls had no inflammation while over 25% of women with UTI had high inflammation. Contrary to the current suppositions, most OAB and IC patients had inflammation scores of 1 or lower.

Conclusions: Cytological analysis is an effective non-invasive technique to assist urological clinicians in defining disease parameters. The use of urinary biomarkers may help lay the foundation for developing diagnostic and treatment strategies based on the underlying bladder pathophysiology.

Maria Ruiz, Undergraduate Student; Warren Lewis, PhD; Amanda Lewis, PhD, Department of Molecular Microbiology, Center for Women's Infectious Disease Research, Washington University

Culture and Identification of Reference Strains of Vaginal

Infections of the female reproductive system are an understudied area with global importance. Bacterial Vaginosis (BV) is an imbalance of the vaginal flora defined by polymicrobial overgrowth within the vagina. A normal vaginal flora predominantly consists of Lactobacillus. In BV, women have a more diverse bacterial composition, often dominated by Gram-negative anaerobes. Although often asymptomatic, BV is common, and increases the risk of contracting sexually transmitted infections (STIs), and experiencing adverse pregnancy outcomes such as preterm birth (PTB). The etiology of BV; however, remains elusive. There are few bacterial strains from the female reproductive tract that are available for laboratory studies of this condition. This lack of characterized cultured strains limits our understanding of female reproductive microbiology. To obtain an accurate representation of individual BV-associated bacteria, our study focused on isolation and identification of fastidious BV-associated anaerobic bacteria. Although the study is still in progress, we have cultured previously “uncultured” strains, and found interesting bacteria, including Megasphaera, Dialister, Fusobacterium, Peptoniphilus, and Bacillus coagulans. We will submit these strains for sequencing by the Human Microbiome Project, making them available for further analysis of the vaginal microbiome. In a Global Health context, we hope that our research advances Millennium goals four and five: to reduce child mortality, and to improve maternal health. By gaining a greater understanding of causes, pathogenesis, and health risks of Bacterial Vaginosis, we hope to improve future diagnosis and treatment; thereby, aiding the prevention of pregnancy complications that result in neonatal deaths.
recovery rate for MAM children in both treatment programs and a 74% recovery rate for MAM children in the integrated protocol compared with a 79% in the standard protocol, neither of these differences are significant. Whether an integrated protocol for the treatment of children with MAM and SAM in humanitarian emergencies has the potential to result in a more streamlined, cost-effective program will be determined with further analyses.

Gina Phillips, Undergraduate Student; Lailea Noel, MA; Sarah Gehlert, PhD; Department of Surgery, George Warren Brown School of Social Work, Washington University

A Community-Based Participatory Research Approach to Improving Breast Cancer Services for African American Women Living in St. Louis

Nationally, African American women have a 40% greater chance of dying from a breast cancer diagnosis than White women even though White women have a higher incidence of breast cancer than African American women (DeSantis, Ma, Bryan, & Jemal, 2014). Breast cancer mortality rates in the metropolitan St. Louis area are higher than those of Missouri as a whole or the United States. Similar to national trends, African American women in St. Louis have higher mortality rates than White women. Differences in the receipt of timely breast cancer treatment have been posited to be a factor that contributes to the disparity in breast cancer mortality between African American and Caucasian women. The current study was carried out to examine treatment delay in a cohort of African American women diagnosed with breast cancer in North St. Louis between 2000 and 2007. An analysis of qualitative data from 96 individual, semi-structured in-home interviews was conducted using grounded theory. Four themes were prevalent among women’s narratives that suggest reasons why African American women in the study may have delayed treatment recommendations: (1) Insurance, (2) Healthcare System Failure, (3) Family/Work, and (4) Fear/Denial. Patients are often required to maneuver within a complex system of healthcare facilities with limited health literacy and increased barriers to patient support resources. Future interventions could focus on the Patient Navigator Program to improve case management services in order to assist cancer patients in the context of their environments as they navigate through the healthcare system. This may increase patients’ self-efficacy and ultimately impact health outcomes.

Sarah Bridge, BS, Medical Student; Arbi Ben Abdallah, PhD; Anshuman Sharma, MD; Thomas Cox, MD; Department of Anesthesiology, Washington University

Making a List, Checking it Twice: An International Comparison of Safety Culture and the use of the WHO Surgical Safety Checklist

Background: Up to 10% of patients may be harmed by adverse events during their medical treatment. Approximately 50% of these events are

Caila Brander, Undergraduate Student; Sarah Brown, PhD, Department of Pediatrics, Washington University

Nutrition, Child Health, and Anthropometric Overview in Port Ploum, Haiti

Children in developing countries are the most vulnerable population afflicted by the global problem of undernutrition. Undernutrition can arise from a variety of cultural, socioeconomic, and ecological circumstances. Understanding the specific factors that contribute to undernutrition in a given community is essential to developing successful and sustainable interventions. The WHO recommends obtaining weight and height measurements in children to calculate anthropometric indices indicative of growth failure resulting from undernutrition. Examining dietary intake combined with biochemical analysis is recommended to detect specific micronutrient deficiencies in a population. This project involved obtaining basic health information and anthropometric data in rural Port Ploum, Haiti. A survey developed for undernutrition research in urban Cap Haiten and validated in the native language of Creole was administered to caregivers. Questions helped to determine food diversity, food and water accessibility, water quality, hygiene, and illness prevalence in children. With subject consent, height and weight data were collected from children and caregivers. A point of care device was used to determine hemoglobin from capillary blood. Challenges to adapting survey and research procedures from urban to rural settings were met and overcome. These data will inform further studies and interventions in Port Ploum, including public health education and nutritional interventions.

Noel, MA; Sarah Gehlert, PhD; 1Department of Surgery, 2George Warren Brown School of Social Work, Washington University
preventable. The WHO developed a surgical safety checklist (SSC) to improve patient safety by ensuring basic minimum safety standards in ORs. Use of this checklist was associated with reduction in morbidity and mortality at eight hospitals across eight different international cities. Hospitals in the developing world saw the most benefit. However, a Norwegian study observed limited impacts on safety culture perceptions in the OR after the checklist implementation, and a Canadian study showed no noticeable improvement in patient outcomes. Poor safety culture and organizational problems within hospitals can undermine the checklist’s efficacy. Thus, safety culture and attitudes relating to checklist utilization must be evaluated to assess the checklist’s efficacy.

**Hypotheses: **Our study aims to assess healthcare providers’ attitudes, beliefs, and expectations regarding the use of the SSC and its impact on teamwork and communication in hospitals in India and the US.

**Study design:** Cross-sectional observational study

**Participants:** Inclusion criteria: all OR healthcare workers

**Data:** Survey responses on paper and online questionnaires will be used. Descriptive statistics (frequencies and/or means ± SDs) will be computed for all Likert scales in each domain in the survey. To determine the impact of the SSC on teamwork and communication, measures of association were analyzed and compared between hospitals as well as within and across countries using t-tests, one-way Analysis of Variance (ANOVA), correlation, and regression. Additionally, interaction effects were tested.

**Yaneve Fonge, **Medical Student; ¹Shanti Parikh, PhD; ²Cecilia Hagerman-Younger, PhD, MPH; ³Shelly Rodrigo, MPH, PhD; ¹Department of Anthropology, Washington University; ²Department of Public Health and Preventive Medicine, St. George’s University, Grenada

**Substance Abuse Treatment in Grenada: A Continuum of Care Framework**

The Caribbean island of Grenada is currently evaluating and designing programs to address substance abuse with the aim of abating the social, economic, and health effects. Recent surveillance and survey data show that the country has the highest alcohol consumption per capita in the Caribbean, and youth have an early debut of high marijuana use. Healthcare professionals assert that these substances are gateways to crack cocaine, but current use is thought to be under-reported. Despite a government-funded treatment facility, anti-drug and alcohol campaigns, and attempts to reform drug and alcohol policies, substance use appears to be widely acceptable and on the rise. This 8-week project is a preliminary part of a larger effort by the Drug Control Office to examine the government’s allocation of monetary resources to substance abuse treatment. Through the collection and analysis of published reports, preliminarily examination of patient records, interviews with care providers, and observation of group therapies, this project has developed a "continuum of care" model through which economic costs associated with each step in the drug treatment process can be collected, assessed, and evaluated. Analysis of this preliminary data suggests that while Grenada’s current protocols for substance abuse treatment are appropriate, there are significant barriers to access and delivery of care. Earlier detection of substance abuse, establishing a treatment facility that is independent of the psychiatric hospital, and redefining care providers’ scopes of practice, with the goal of creating an integrated and patient centered approach to substance abuse treatment may help improve efficacy.

**Nneka Molokwu, **MPH Candidate; Mark Manary, MD, Emergency Medicine, Patient Oriented Research Unit (PORU) and Pediatrics, Washington University

**Integrated Management of MAM and SAM in Sierra Leone with RUTF**

Moderate Acute Malnutrition (MAM) and Severe Acute Malnutrition (SAM) share some pathogenesis and treatment in common. However, the treatment of MAM and SAM are currently overseen by different agencies using different foods for treatment. These standard treatments utilize inconvenient and varying anthropometric standards for determining eligibility and recovery criteria. The approach to breastfeeding, very important for maintaining infant health may be overlooked. The aim of this study was to implement an integrated protocol in Sierra Leone for the management of MAM and non-complicated SAM that uses a single anthropometric indicator as well as the same food. A cluster randomized, clinical controlled trial was conducted for a period of 17 months in children comparing the integrated treatment with the standard. Children aged 6-59 months, n = 1968, with MAM or non-complicated SAM were sampled from 10 villages in Sierra Leone. Of the 1968 children sampled, 1111 were enrolled in the integrated treatment program and 857 were enrolled in the standard program. Preliminary results showed a 90%