

## Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

### Online Proceedings

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#### SESSION 10

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##### CANCER BIOLOGY

Session Moderator: Hannele Ruohola-Baker, Biochemistry

MGH 389

12:30 PM to 2:15 PM

\* Note: Titles in order of presentation.

##### Outcomes among Merkel Cell Carcinoma Patients with Chronic Immunosuppression

Macleon Cook, Senior, Neurobiology

UW Honors Program

Mentor: Paul Nghiem, Dermatology

Mentor: Yolanda Tseng, Radiation Oncology, UW Medical Center

Merkel cell carcinoma (MCC) is a rare, aggressive neuroendocrine skin cancer, which primarily afflicts Caucasian and elderly patients. While MCC patients with intact immune systems have a 20-30% risk of recurrent MCC within 2 years of diagnosis, risk of recurrence or death is higher among immunosuppressed patients. However, it is unknown whether immunosuppression type affects progression-free and disease-specific survival. From a large data repository, we identified and retrospectively evaluated 95 MCC patients that were chronically immunosuppressed at the time of diagnosis and were treated with curative intent between 1988 and 2016. There were five types of chronic immunosuppression represented: chronic lymphocytic leukemia (CLL, 29% of immunosuppressed cases), solid organ transplant (SOT, 23%), autoimmune disorders (AD, 22%), other hematologic malignancies (OHM, 17%), and HIV/AIDS (9%). Progression free survival (PFS) and disease specific survival (DSS) were estimated by the Kaplan-Meier method. As part of curative-intent therapy, the majority of patients were treated with wide local excision (89%) followed by adjuvant radiation (82%). Immunosuppression was associated with poor outcomes among MCC patients: 72% of such MCC patients experienced recurrent disease at a median time of 7.4 months after diagnosis (range, 1-75 months). 45% of recurrences in immunosuppressed patients were distant, while 30% were regional and 25% local/in-transit. 2 yr-PFS and DSS by immunosuppression type was: CLL (PFS 20%/DSS 59%), SOT (0%/32%), AD (14%/52%), OHM (29%/43%), and HIV/AIDS (0%/0%). Immunosuppression is associated

with a high risk of recurrence and mortality in MCC patients. While these results are preliminary, they suggest that the type of chronic immunosuppression may affect outcomes in MCC patients.

#### POSTER SESSION 2

MGH 206, Easel 173

1:00 PM to 2:30 PM

##### What Is the Source of Microbial Contamination in the North Creek Wetlands of the Bothell Campus?

Vaughn Shepherd, Senior, Biology (Bothell Campus)

Mentor: Keya Sen, School of STEM, UW Bothell

The North Creek watershed in Bothell contains elevated levels of fecal coliforms, including *Escherichia coli*. This research is primarily concerned with the characterization of the *E. coli* present in the North Creek watershed and the determination of the sources of contamination. Contamination in these waters may increase the risk of infection due to contact. The North Creek Wetlands is a roosting destination for nearly 10,000 crows so, they may be major contributors to the contamination. *E. coli* isolates from water and feces have been obtained from the North Creek Wetlands where genotyping methods are employed to screen for extraintestinal pathogenic strains and intestinal pathogenic strains. The extraintestinal pathogenic strains are determined through the presence or absence of certain virulence genes. Some of these virulence genes include genes that encode for invasins, adhesins, toxins, and siderophores. The intestinal pathogenic strains are determined by the presence of Shiga toxin genes and the intimin adherence gene, *eae*. *E. coli* isolates obtained during June and July of 2016 tested positive for multiple extraintestinal pathogenic genes with 33% for *TraT*, 22.2% for *PAI*, 11.1% for *iutA*, 22.2% for *fyuA*, 25.0% for *KpsmII*, 2.8% for *sfafoc*, and 13.9% for *papEF*. Further virulence testing with more recent isolates are currently in process. None have tested positive as intestinal pathogenic strains. Additionally, amplified *iutA* PCR products from a few isolates have been sequenced and used in a BLAST search through NCBI to determine their source. The ones which had successful sequencing primarily point towards an avian origin but more source tracking methods will be utilized to make the source determination more precise and reliable. In future studies the complexities of the North Creek ecosystem should be explored as well as the interconnectedness of environmental, microbio-

logical, and human factors that affect the risk of infection.

## POSTER SESSION 2

MGH 206, Easel 172

1:00 PM to 2:30 PM

### **Pathogenicity and Virulence of *Campylobacter jejuni* from the American Crow *Corvus brachyrhynchos* in the Seattle Metro Area**

*Tanner Berglund, Senior, Biology (Bothell Campus),*

*Environmental Science - Bothell Campus*

*Mentor: Keya Sen, School of STEM, UW Bothell*

*Campylobacter jejuni* infection is the most frequent diarrhea causing bacterial infection in the United States (CDC, 2014). *C. jejuni* can be present in many different warm blooded species without causing diarrhea (*Griffiths and Park, 1990*). The ability to infect a host and severity of infection are a direct result of the presence of virulence genes in the bacteria. In previous studies virulence genes from *C. jejuni* were identified and were tested using PCR and gel electrophoreses (*LaPrade et al., 2016*). In this study *C. jejuni* was isolated from crows in the Seattle metro area. As crows move to and from a roost during the day it is important to know what possible risk to human health they can pose through their fecal droppings. The isolates obtained from the fecal droppings were tested for the motility gene *flaA*; the colonization genes *dnaJ*, *racR*, *ciaB*, and *pldA*; and the antibiotic resistance gene *tetO* using the method created by LaPrade et al. Twenty-three fecal isolates were tested; 100% tested positive for *flaA*; 100% tested positive for *dnaJ*; 60.87% tested positive for *racR*; 43.48% tested positive for *tetO*; 91.30% tested positive for *ciaB*, and 13.04% tested positive for *pldA*. Presence of other virulence genes such as toxin genes from the *cdtABC* gene cluster need to be determined. My preliminary results indicate that crows in the Seattle metro area that carry *C. jejuni* may carry a virulent or pathogenic form of the bacteria.

## POSTER SESSION 3

Balcony, Easel 121

2:30 PM to 4:00 PM

### **Public Health Communication Methods: Perspectives from those Living as Homeless**

*Ryan Michel (Ryan) Kouchakji, Senior, Environmental Health*

*Mary Gates Scholar, UW Honors Program*

*Mentor: Tania Busch Isaksen, DEOHS*

This study recorded the perspectives of people living as homeless and found some significant differences in environmental public health hazards and utilized communication methods between those living in city sanctioned encamp-

ments and non-sanctioned encampments. Seattle and King County, in Washington state, have had emergency levels of people living as -and becoming- homeless. In events such as extreme weather events, shelter food poisonings, changes in available resources, increased incidence of drug overdoses, or other emergent issues, public health departments will need tested communication infrastructure to distribute health related information to the homeless population. This study employed semi-structured interviews with question probes around environmental public health concerns and health communication methods in the local homeless population and amongst local agency leaders and health care practitioners. The study findings show that sanctioned encampments had better access to toilets, garbage disposal, and clean drinking water than non-sanctioned encampments. Additionally, the sanctioned encampments have security precautions and existing communication infrastructure such as camp meetings and camp phones that are not present in non-sanctioned encampments. Using the results of this study, there are some recommendations to improve communication between public health departments, homeless-focused organizations, and the homeless population.

## POSTER SESSION 4

Commons West, Easel 39

4:00 PM to 6:00 PM

### **The Effects of Electrode Geometry on Electrical Phantom Brain Stimulation**

*Brandon Yee, Junior, Pre-Sciences*

*Mentor: Larry Sorensen, Physics*

*Mentor: Jeneva Cronin, Bioengineering*

*Mentor: David Caldwell, Bioengineering*

During brain surgery for intractable epilepsy, clinicians utilize electrodes placed on the cerebral cortex to monitor seizure activity and map functional brain areas in patients so that the epileptic brain regions may be removed. This recording method is called electrocorticography (ECoG) and is essential to prevent the accidental removal of brain regions that are crucial for daily activities. To reduce tremors produced by Parkinson's disease, electrical stimulation is applied to electrodes implanted within the deep brain near the subthalamic nucleus. In both cases, to optimize treatment, a more detailed study of current flow during electrical stimulation than is currently done, due to surgical limitations of electrode placement, is needed. In addition, the time available to work with patients during brain surgery is extremely limited, necessitating a non-clinical research platform. I developed a saline-enriched gelatin phantom brain that mimics the electrical resistivity of the brain to study brain stimulation outside the surgery room, and I compared measurements taken with this model to analogous measurements of the brains of human patients made by my group. I found that my measure-

ments agree within 10-15% with those made by my group on human brains. Using the phantom brain will allow us to easily and safely study electrical brain stimulation. Also, an electrical phantom that can be used offline to determine the most effective measurements will be extremely valuable to inform future research questions while working with patients. We are utilizing the phantom brain model to study how various electrode geometries and the cerebrospinal fluid layer that covers the brain have an effect on the amount of current that flows into the brain. Findings in our phantom brain will help us more effectively treat neurological disorders like intractable epilepsy and Parkinson's and perform safer stimulations through optimized stimulation protocols.