



Undergraduate Research Symposium May 17, 2019 Mary Gates Hall

Online Proceedings

POSTER SESSION 1

Commons West, Easel 45

11:00 AM to 1:00 PM

Premature Termination in a Training Clinic and the Impact of Measurement-Based Care

Chia Li Yu, Senior, Psychology

Mary Gates Scholar, UW Honors Program

Mentor: Corey Fagan, Psychology

Mentor: Melissa Gasser, Psychology

High rates of early dropout or premature termination in university psychology training clinics adversely affect both patients and clinicians. Prior research suggests that among clients seen at training clinics approximately 70% terminate prematurely and approximately 55% do not report reliable change at the conclusion of treatment. To help assess the generality of this issue, we are investigating the rate of premature termination in a university-based clinical psychology training clinic in the Northwest. Using the Reliable Change Index (RCI) as a marker of recovery, we calculated the RCI for 3 outcome measures: the Patient Health Questionnaire (PHQ-9), Generalized Anxiety Disorder 7 (GAD-7), and the Brief Adjustment Scale-6 (BASE-6). Additionally, the training clinic in this study practices Measurement-Based Care (MBC) which involves the systematic administration of symptom rating scales known to increase treatment efficiency and effectiveness by assisting with clinical decision-making and informing patient progress. The hypothesis was that there would be a higher rate of reliable improvement and lower rate of deterioration at the end of treatment. Our examination of the test-retest reliability within 2 weeks of these outcome measures found the total scores of all three scales to perform adequately. Within the training clinic, 18.18% reliably improved using the GAD-7, 21.51% reliably improved using the PHQ-9, and 27.27% reliably improved using the BASE-6. These results did not support the hypothesis and instead found a lower rate of reliable improvement than the published norms. Potential reasons for the discrepancy will be discussed. This study will benefit those suffering from ineffective treatment outcomes and those struggling with untreated debilitating mental disorders. It will also add to the growing literature on the benefits and obstacles of MBC which has been gaining increasing recognition recently.

POSTER SESSION 1

MGH 241, Easel 162

11:00 AM to 1:00 PM

Circadian Patterns of Spontaneous Seizures in a Rat Model of Temporal Lobe Epilepsy

Stephanie Ai Mizuno, Junior, Pre-Sciences

Mentor: Melissa Barker-Haliski, Pharmacy

Epilepsy is a neurological disorder in which abnormal brain activity causes spontaneous seizures, and behavioral comorbidities including anxiety, depression, and cognitive deficits. Epilepsy can result from many different inciting events, including infection, genetic background, or neurological damage. For example, status epilepticus (SE) is a clinical emergency defined as continuous seizures lasting longer than five minutes, which can increase susceptibility to developing epilepsy. Clinical studies in patients with epilepsy have shown that seizures of different severity can occur at discrete times of day or night, suggesting that there may be circadian patterns of seizure incidence in humans. In this study, a post-SE model of temporal lobe epilepsy (TLE) was used to first establish whether there are any notable circadian patterns of seizure activity in a preclinical rat model of epilepsy that is commonly used for antiseizure drug development. Male Sprague Dawley rats were implanted with cortical electrodes one week prior to the systemic administration of the chemoconvulsant, kainic acid, to induce SE insult. The rats recovered from the SE insult and then went on to develop spontaneous recurrent seizures days to week later. The onset and severity of spontaneous seizures were then continuously monitored for 6 weeks, with seizure segregated by time of day in which they occurred: light vs dark cycle. Preliminary data suggest that rats from this model more frequently experience seizures during the dark phase, i.e. the active period of this nocturnal animal. Results from this study will establish the circadian pattern of spontaneous seizures in the post-kainic acid SE model of temporal epilepsy in rats. Further, this study provides the basis on which to then determine if chronic administration of prototype antiseizure drugs can be optimally administered prior to periods of peak seizure incidence to more effectively reduce long-term seizure burden in this model.

POSTER SESSION 1

MGH 241, Easel 161

11:00 AM to 1:00 PM

Acute Impact of Prototype Antiseizure Drugs on Exploratory Behavior of Inbred and Outbred Mice

Ali Memon, Senior, Neurobiology

Mentor: Melissa Barker-Haliski, Pharmacy

Epilepsy is a neurological disorder that affects over 65 million people globally. The initial identification of antiseizure efficacy and tolerability of any investigational agent is routinely defined in mouse and rat models of epilepsy. C57BL/6 mice are a commonly used inbred strain for antiseizure drug discovery, while CF-1 mice are a commonly used outbred strain. Although there is established data on the median effective anticonvulsant doses (ED50) of common prototype antiseizure drugs (ASD) in mice, there is limited quantitative data pertaining to the acute impact of anticonvulsant doses of ASDs on locomotor activity in an open field, which may inform on the potential for adverse effects in a clinical setting. This study aimed to provide a quantitative evaluation of the impact of ASDs on locomotor behavior to provide an added way to compare investigational agents to ASD standards-of-care. Male C57BL/6 or CF-1 mice (n = 8/treatment group/strain) were habituated to an open field 24 hours prior to the testing day. On the day of testing, mice were administered prototype ASDs (valproic acid, carbamazepine, levetiracetam, lamotrigine, phenobarbital, diazepam, ethosuximide, phenytoin, gabapentin) or vehicle by the intraperitoneal route. Mice were then allowed to explore the open field for the 30 minute period encompassing the time of peak effect of each ASD. Endpoints of locomotor behavior in the open field included time spent in the center of the field, vertical rearing, fecal boli, and total distance traveled. In CF-1 mice, diazepam generally reduced all measures of exploratory behavior whereas gabapentin increased the total distance traveled. This study establishes a comparative pharmacological profile of the effect of prototype ASDs on exploratory locomotor behavior of male outbred CF-1 and inbred C57BL/6 mice.

POSTER SESSION 1

Balcony, Easel 110

11:00 AM to 1:00 PM

Potential of MALDI/TOF Methodology to Predict Bacterial Virulence

Paul Andrew Mc Cleary, Senior, Neurobiology

Mentor: Melissa Kordahi, Pathology

In microbiology, matrix-assisted laser desorption/ionization time of flight (MALDI/TOF) is a method used for the identification of a wide variety of micro-organisms such as bacteria or fungi directly from the selective medium used to iso-

late them. The technique uses laser energy absorbing matrix to create ions from proteins with minimal fragmentation. It is a three-step process where first, the microbial sample is mixed with suitable matrix material and applied to a metal plate. Second, a pulsed laser irradiates the sample, triggering ablation and desorption of the sample and matrix material. Finally, the analyte molecules are ionized in the hot plume of ablated gases and accelerated into the mass spectrometer. The mass spectra generated are analyzed and compared to stored profile using a dedicated software. Species diagnosis by this procedure is much faster, more accurate and cheaper than other procedures based on immunological or biochemical tests. Consequently, MALDI/TOF is becoming a standard method for species identification in medical microbiological laboratories. *Bacteroides fragilis* and *Escherichia coli* are two bacterial species that MALDI/TOF can accurately identify directly from the media they are growing on. Certain strains of enteropathogenic *B. fragilis* and *E. coli* ETBF and EPEC respectively, cause severe enteric disease manifesting by watery diarrhea and colic. On the other hand, non enterogenic strains of *B. fragilis* and *E. coli* such as NTBF and DH5 alpha are completely benign. Using MALDI/TOF technology and virulent and non-virulent strains of *B. fragilis* (BFT and ???BFT) and *E. coli* (EPEC and DH5 alpha), we hypothesize that a correlation between peaks and virulence proteins can be made conferring to MALDI/TOF the potential to predict virulence of bacteria based on the expression of proteins mediating virulence.

SESSION 20

ECONOMIC ISSUES

Session Moderator: Michelle Turnovsky, Economics

MGH 389

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Newly Implemented Policy: Two-Child Policy — A Case Study of Taiwan

Zhiyi (Elaine) Yang, Senior, Economics, Mathematics

UW Honors Program

Mentor: Melissa Knox, Economics

The relationship between fertility and economic development can be modeled in many different ways. To microeconomists, fertility may determine the “quality” of children in one family, where quality is typically interpreted as a child’s level of education. These models of child quality are based on the classical quantity-quality tradeoff model by Becker, in which parents choose to substitute child quality for child quantity under some circumstances. The focus of this paper is to detect whether the quantity-quality tradeoff exists under the two-child policy in China, implemented in 2015. Since 2015,

Chinese families have been permitted to have two children, and this change in the quantity of children in a family may affect child quality as well. However, the two-child policy was implemented only three years ago, so data is lacking. Thus, I chose Taiwan as my case study. I use data from Taiwan to find some the effect of fertility and apply those results to circumstances in China. By using linear regression, I find that the results from Taiwan are consistent with the classical model. Once the quantity-quality tradeoff under two-child policy is clear, scholars can further research on the short-term and long-term influence of two-child policy in China.

POSTER SESSION 3

Commons East, Easel 45

2:30 PM to 4:00 PM

Financing of Noncommunicable Diseases: Socioeconomic and Health Indicators of Development Assistance for an Emerging Global Health Crisis

Caroline Anne Kasman, Senior, Economics, International Studies

UW Honors Program

Mentor: Melissa Knox, Economics

Noncommunicable diseases (NCDs) are responsible for the majority of all global deaths. They reduce quality of life on a mass scale and threatening the United Nation's 2030 Agenda for Sustainable Development while creating massive financial burden in the Global South and developed countries alike. However, in 2017, NCDs received only 2% of total development assistance for health (DAH) in 2017 despite causing 67% of global deaths. This is a significant lack of alignment between disease burden and funding. Researchers state that donor groups divert DAH to other causes because they are unaware of the impact of NCDs in low and middle income countries. In addition, curbing NCDs on a mass scale requires highly complex responses in comparison to the more cost-effective and evidence-based approaches for many infectious diseases. However, these claims are based on primarily anecdotal studies and there is limited quantitative research on how donor groups allocate foreign aid for NCDs. This report aims to understand how donor groups prioritize economic, political, social, and epidemiological determinants when deciding the level of DAH to provide to countries for NCDs. The master dataset is provided by RTI International and consists of grants for NCDs from 2010 to 2015. It is merged with demographic, economic, geographic, and epidemiological data extracted from publicly available sources. I model correlations between these factors and DAH received using a multiple linear regression. As foundations and NGOs provide the majority of global funding for NCDs, I concentrate on this donor group. I hypothesize that NGOs and foundations concentrate on health indicators and level of corruption when allocating aid for NCDs versus economic indicators,

such as level of trade openness. Further research of donor behavior and development assistance for health will contribute to greater transparency in funding processes to better address the emerging NCD pandemic.

POSTER SESSION 4

MGH 258, Easel 183

4:00 PM to 6:00 PM

Impact of Diet on Infection-Induced Seizures and Long-Term Comorbidities in a Mouse Model of Temporal Lobe Epilepsy

Hongyi Huang, Senior, Anthropology: Medical Anth & Global Hlth

Mentor: Melissa Barker-Haliski, Pharmacy

Infection of the central nervous system (CNS) greatly contributes to and increases the risk of developing epilepsy. Individuals who present with seizure during a CNS infection are 22 times more likely to develop epilepsy in their lifetime than individuals who do not present with a seizure. Infection of mice with the Theiler's murine encephalomyelitis virus (TMEV) is a preclinical model that is useful to understand the mechanisms underlying acute seizures and the development of epilepsy following CNS infection. In the present study, we aimed to determine how diet sterilization (autoclaved versus irradiated) impacts the development of acute seizures and chronic behavioral comorbidities. We infected C57BL/6J mice with an intracerebral (i.c.) injection of TMEV or sterile saline, and then fed the mice either an autoclaved or irradiated diet. Next, we monitored the mice for the incidence of acute handling-induced seizures 3-7 days post-infection. Under both dietary conditions, mice developed handling-induced seizures in the acute infection phase. There were 8/13 (61%) irradiated diet fed mice that developed acute seizures whereas 9/13 (69%) autoclaved diet fed mice developed acute seizures during this period ($p > 0.05$). We then assessed behavioral comorbidities associated with chronic epilepsy 4-5 weeks post-infection by evaluating anxiety-like behaviors in an open field test, working memory in a novel object recognition test, and electroconvulsive seizure thresholds. Mice fed an irradiated diet demonstrated preserved working memory function compared to mice fed the autoclaved diet, who demonstrated significant reductions in working memory and increased anxiety-like behavior, suggestive of worsened disease severity. At the conclusion of in-life testing, animals were euthanized, and tissues collected for histopathology and immunohistochemistry to assess the extent of TMEV-induced neurodegeneration and neuroinflammation. Our findings highlight the potential for the sterility of diet to modify disease severity in the TMEV model.

POSTER SESSION 4

MGH 241, Easel 130

4:00 PM to 6:00 PM

Effect of Symbiotic Indoleacetic Acid Producing Yeasts on Plant Growth

Forrest Hsu, Sophomore, Associates of Science, Biology, Seattle Central College

Mentor: Rusty Rodriguez, Biology, Adaptive Symbiotic Technologies

Mentor: Melissa Reinstra

Indoleacetic acid (IAA) is a common and well understood auxin class phytohormone that promotes plant growth by increasing cell division and elongation. IAA has also been shown to increase infectious adhesion and filamentation in certain strains of *Saccharomyces cerevisiae*. Increased IAA production by the plant's microbiome has been demonstrated to stimulate host and symbiont growth. The IAA production in multiple strains of *S. cerevisiae* from the USDA ARS library was quantified using the Salkowski colorimetric technique, then the highest IAA producing strains were treated onto corn to examine the effect on biomass growth. Preliminary results have shown greatly increased root mass and moderately increased shoot mass in treated corn. This symbiotic yeast treatment could have agricultural applications, increasing crop yields without increased application of fertilizer, pesticides, or other products that could have a negative ecological impact or detrimental effects on the crop.