UNIVERSITY of WASHINGTON

Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

Poster Session 1

MGH 241, Easel 162

11:00 AM to 1:00 PM

Perioperative Activity in Thoracic Surgery: Does Adherence to Daily Activity Monitor Use Predict Actual Activity?

Emilee Kauer, Senior, Biology (Molecular, Cellular & Developmental)
Mentor: Stephen Kaplan
Mentor: Richard Thirlby
Mentor: Michal Hubka

Recovery after thoracic surgery can be prolonged and fraught with complications if patients are not active after surgery. Postoperative recovery can strongly be influenced by preoperative baseline activity level and overall fitness. Surgeons have historically relied upon patient report to understand these variables; however, given the ubiquitous nature of activity monitors in today's society, a new opportunity is presented to objectively evaluate perioperative activity. As part of the Perioperative Activity and Outcomes study at Virginia Mason Medical Center, thoracic surgery patients begin wearing a Fitbit prior to surgery and return the device approximately three to five weeks after surgery. However, there are several patient factors that influence the data, such as simply forgetting to wear the device. The objective of this study is to understand whether or not days missed wearing a Fitbit is associated with objective measures of activity. I hypothesize there is a negative correlation between the number of days a patient does not wear their Fitbit and their average daily steps. I will stratify the analysis by preoperative and outpatient postoperative periods, both of which are times where it is incumbent upon the patient to wear the device. In essence, poor compliance with wearing the device may be a surrogate for low activity. The conclusions I draw from this research will contribute to a risk stratification model for improving patient outcomes. By identifying patients at-risk for slow recovery, tailored interventions can be employed to optimize recovery, prevent complications, and improve overall patient outcomes, satisfaction, and quality of life following thoracic surgery.

Session 1B

Techniques for Improving Quality of Medical Care

Session Moderator: Eric Seibel, Mechanical Engineering

MGH 228

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

The Role of Socio-Geographic Factors in Recovery after Thoracic Surgery among Rural and Urban Populations

Aneesha J. (Aneesha) Morris, Junior, Biochemistry
Mentor: Stephen Kaplan
Mentor: Richard Thirlby
Mentor: Michal Hubka

Social determinants of health are non-biologic factors that can strongly influence individual health status, healthcare access, and disease vulnerability. While this subject is well studied, limited data exists on the influence of these social factors on surgery, and more specifically, recovery after surgery. The burden of surgical disease remains taxing globally and disproportionately affects marginalized populations. Due to the limited access to higher level surgical care, patients often travel from eastern Washington and various other rural areas to Virginia Mason Medical Center for cardiothoracic procedures. Through this study I aim to identify social-geographic factors that contribute to this burden, and determine the discrepancies that generate variances in recovery. I hypothesize that among patients undergoing thoracic surgery at Virginia Mason Medical Center, distance from Seattle will be associated with measures of recovery in the postoperative period. I quantify the postoperative recovery of patients by measuring length of stay, postoperative complications, and readmission. Due to the burden of transport, inconvenience, missed work, increased personal costs, and other socioeconomic issues, I expected to see slower recovery, and possibly greater complications among patients coming from further distances. By first characterizing the problem, I then identify unique challenges that arise among various demographics of patients, creating a tailored perioperative education. This optimizes clarity in communication of postoperative planning and potential complications to create an improved set of guidelines, specified towards particular demographics of patients.

POSTER SESSION 2

Commons East, Easel 85

1:00 PM to 2:30 PM

Using a Recombinant TAG Protein to Sort Synapses through Magnetic Cell Sorting

Pearl Woo, Junior, Microbiology
Mary Gates Scholar
Mentor: Stephen Smith, Pediatrics

Synaptic plasticity influences many functions in the body, some of which include the mechanisms of learning and memory. However, isolating these cells for further study is inefficient as grinding up a portion of the brain yields a mixture that includes synaptosomes, neuronal and glial contaminants, and free myelin as well as mitochondria. One way to sort synapses from the mixture is to use FACS (fluorescence-activated cell sorting). However, this method is limited as it is very time consuming. Instead, our lab is developing methods to sort specific synapses based on immunology cell-sorting techniques that can isolate activity-dependent synapse species from the assortment of synapse types in the brain. We have created TAG proteins that targets glutamate synapses, therefore potentially enabling us to utilize the more efficient MACS (Magnetic Cell Sorting) method that is proven to isolate cell types at higher rate. My project is to develop a method to ensure that the TAG RNA is translated only in specific neurons. I utilized Cre-lox recombination methods so that the TAG RNA is translated only when a CRE protein removes the lox-stop-lox gene. To do so, I used a plasmid with an AS-LSL-TAG insert previously made by the lab. I then used HEK 293 cells, each with a different condition to evaluate how well the CRE protein will be able to remove the LSL portion of the tag construct: one with untransfected cells (control), another with the CRE-RFP plasmids only, a third with only AS-LSL-TAG plasmids, and the last with both CRE-RFP and AS-LSL-TAG plasmids. If I achieve HEK 293 cells with the AS-LSL-TAG and the CRE-RFP that express the both the green fluorescence from the AS-LSL-TAG and the red fluorescence from CRE-RFP, I will then insert the LSL TAG construct into neurons and analyze the results by western blots and microscopy.

SESSION 2A

POWER MADE VISIBLE: IMAGE, IDENTITY, NARRATIVE ACTIVISM

Session Moderator: Julie Villegas, English

MGH 171

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Embodying the Image: An Exploration of Identity, Intimacy, and Authenticity on Instagram

Vivian Demi (Vivian) Lu, Senior, Mathematics, Comparative History of Ideas
Mary Gates Scholar
Mentor: Stephen Groening, Comparative Literature, Cinema and Media

In the age of self-branding, viral memes, and the Kardashians, Instagram has played a critical role in developing the attention economy. Attention has become a form of capital itself, where value is assigned to the most popular, aesthetically-pleasing content on channels like Instagram. When users construct their online identities within the context of late consumer capitalism, they participate in a cycle of desiring and being desired, in order to generate attention. This process enforces the notion that you are what you post, where one's identity is represented by the signifiers one displays online. As a consequence, Instagram has radically reshaped the ways in which individuals conceive of themselves and interact with others in contemporary society.

POSTER SESSION 3

MGH 241, Easel 127

2:30 PM to 4:00 PM

Modulating the Nuclear Factor-kappa B Inflammatory Pathway with Natural Products Derived from Fungi

Sharon Papagayo, Senior, Medical Laboratory Science
Mentor: Stephen Polyak, Laboratory Medicine

Research has shown that chronic inflammation can facilitate the progression of certain diseases, including cancer and diabetes. One way to prevent inflammatory-linked diseases is to reduce the occurrences of inflammation. Since much of society uses nature-derived approaches of healing and disease prevention, we focus on how natural products (i.e. compounds from nature) alter cellular inflammatory status. Fungi and fungal extracts provide a rich source of novel natural products. Fungi have been shown to have beneficial health properties, exemplified by the antibiotic penicillin, derived from the fungus *Penicillium chrysogenum.* By studying many different fungal extracts and chemically separated fractions of fungal extracts, we hope to find novel anti-inflammatory compounds. In this study, novel fungal extracts and fractions were tested for anti-inflammatory activity against the cellular transcription factor, nuclear factor kappa B (NF-kB), a major mediator of cellular inflammation. Prior single-dose screening resulted in extracts and fractions that were shown to inhibit NF-kB activity. From these, eight were tested in dose-response assays that measured NF-kB activity and cytotoxicity. Human hepatoma Huh7.5.1 cells were transfected with a luciferase reporter gene under control of the NF-kB promoter. Twenty-four hours later, transfected cells were incubated with either extracts or fractions for 30 minutes prior

to activation of inflammation by tumor necrosis factor-alpha, (TNF-α). NF-kB activity and cellular ATP were measured by luminescence 3.5 hours later. The ultimate goal is to identify extracts, fractions, and pure compounds that inhibit NF-kB without causing cytotoxicity. Such compounds will be advanced for further study and possible application in chronic inflammatory disease states.

POSTER SESSION 3

Commons West, Easel 40

2:30 PM to 4:00 PM

Understanding and Describing Mass Political Movements

Anna Caroline (Anna) Mikkelborg, Senior, Political Science, Law, Societies, & Justice

Mary Gates Scholar, UW Honors Program

Mentor: Stephen Kosack, Evans School of Public Policy and Governance

What are the similarities and differences between mass political movements? In an important sense, all movements are unique. Yet movements as diverse as a series of protests that shut down one of the biggest cities in Bolivia over water utility privatization, an Arab ethnic-nationalist group in Sudan, and a peasant revolt against the Tsarist government in Georgia, also have important characteristics in common. This poster outlines the methods and process for identifying, understanding, and describing movements as part of the Mass Movements project. The Mass Movements project team is developing the first comprehensive, cross-national survey of the characteristics of mass movements with at least 1,000 participants from 1800 to 2012. Researchers have long studied questions about mass political movements by studying specific cases of mobilization; the data from the Mass Movements project will provide new analytical leverage for testing theories about where mass movements form, how they are organized, and their role in changing politics and policy. The project relies on extensive examination of secondary sources, and utilizes a consensus model for identifying movements and their characteristics requiring both in-depth independent fact-finding and close collaboration between researchers to determine how to describe movements. This method allows nuanced characterizations of and comparisons among diverse movements. The poster illustrates the process through the examples of the Cochabamba Water War in Bolivia, the Janjaweed militias in Sudan, and the Gurian peasant revolt in modern-day Georgia, three dramatically different movements that demonstrate the wide scope of the project and the ways in which researchers translate complex histories into reliable data.