

Undergraduate Research Symposium May 18, 2018 Mary Gates Hall

Online Proceedings

POSTER SESSION 1

Commons West, Easel 12

11:00 AM to 1:00 PM

Developing an Instrument to Assess Clinical Stability and Predictability within Nurse Delegation

Jordan Daniel Hardman, Fifth Year, Nursing

Howard Hughes Scholar, Mary Gates Scholar, UW

Honors Program

Mentor: Barbara Cochrane, Family and Child Nursing

Under Washington State law, nurse delegation is a process in which a registered nurse, known as a nurse delegator, provides training and management for delegated care tasks to be performed by long-term care workers (LTCWs) within in-home or community-based care settings. State law requires that clients who receive care through nurse delegation must be in a stable and predictable condition (SPC). In our previous study, we determined that nurse delegators need more specific criteria than the definition in Washington State law to assess SPC. The purpose of this project is to provide additional clarification to the determination of SPC by developing an instrument for nurse delegators to use for comprehensive assessment of SPC and describing the instrument's utility and applicability. Methods to reach those goals included: 1) reviewing published literature and policy reviews of federal and state-by-state laws on potential alternative definitions for SPC; 2) consultation with nurse delegation content experts (two Washington State Nurse Delegation Program Managers and a nurse researcher, whose work helped establish state regulations for nurse delegation in Washington State) regarding the clinical applicability of a SPC assessment instrument; 3) development of the instrument based on relevant clinical evaluation guidelines and instruments content expert feedback; and 4) collection and analysis (via phone interviews and qualitative content analysis, respectively) of feedback from nurse delegators on the utility and applicability of the developed instrument. We hypothesize that nurse delegators will view the instrument as a useful clinical resource for determining SPC within the nurse delegation process. The results of this study can be used to implement the instrument independently or in conjunction with other evaluation methods, as standardized practice to assess SPC and effectively meet this state requirement for clients to receive care under nurse delegation.

POSTER SESSION 1

Commons West, Easel 11

11:00 AM to 1:00 PM

Evaluating Competency in Insulin Administration Under Nurse Delegation

Nona Joyce Lynn Hunter, Senior, Nursing

UW Honors Program

Mentor: Barbara Cochrane, Family and Child Nursing

Insulin is a medication that requires training, safety, and care in administration due to potential serious outcomes if administered incorrectly. Under Washington State Law, long-term care workers (LTCW) are permitted to administer insulin in community-based and in-home care settings with the oversight of a nurse delegator, a registered nurse who is responsible for the nursing care of a client and supervises an unlicensed person to perform selected tasks for that client. The current model of training for LTCWs lacks a standardized method to assess their competency in administering insulin. The purpose of this research study is to explore methods of assessment to inform the development of a standardized, comprehensive tool for evaluating competency in insulin administration. The aims of this study are to determine the utility and feasibility of this tool. I developed the "Insulin Delegation: Competency Evaluation Tool" by researching methods of training and evaluation and through student-mentor collaboration. The tool incorporates entrustment scores, reflection, and competency-based education. Prior to testing, the tool was reviewed by content experts, including Washington State Nurse Delegation Program Managers and a nurse researcher who helped develop and evaluate nurse delegation regulations in Washington State. The tool was tested in the field by nurse delegators contracted with the Department of Social and Health Services to assess delegated LTCW competency of insulin administration. After that testing period, feedback on the utility and feasibility of the tool was obtained by an online survey with Likert-type scale and free-text items. I expect to find that the tool is effective in assessing competency in insulin administration and applicable to the workflow of nurse delegators. This tool has potential use as a standard resource for nurse delegation training and an ongoing safety and quality measure in community-based and in-home care practice.

POSTER SESSION 1

MGH 241, Easel 162

11:00 AM to 1:00 PM

Identifying the Role of RHY-1 in the *C. elegans* Response to H₂S

Colette Anne Felton, Senior, Biochemistry

Mary Gates Scholar, UW Honors Program

Mentor: Dana Miller, Biochemistry

Mentor: Frazer Heinis, Biochemistry

Hydrogen Sulfide (H₂S) has potent physiological effects. In large doses, it is a deadly toxin, but in small doses, it acts as a signalling molecule with a wide range of physiological effects. The worm *C. elegans* is a good model organism for the study of H₂S because of its short lifespan, ease of genetic manipulation, and ease of maintenance. In *C. elegans*, H₂S induces a stress response pathway, coordinated by the HIF-1 and SKN-1 transcription factors, that plays a role in extending lifespan and improves resistance to various stresses. A previous screen in our lab identified several mutations that suppress the requirement of hif-1 for survival in H₂S by increasing SKN-1 activity. One SKN-1-upregulated transcript, rhy-1, was sufficient to rescue hif-1 lethality in H₂S. RHY-1 is an integral membrane protein that is localized in the hypodermis, intestine, and some head neurons of *C. elegans*. It has predicted acyl transferase activity, but its specific molecular function is unknown. The role of RHY-1 as a hif-1 lethality suppressor indicates that it acts in a hif-1 independent H₂S response pathway. The goal of this study is to better understand the role of RHY-1 in this hif-1 independent response pathway. In order to identify its binding partners and elucidate its role in cellular signalling, we performed immunoprecipitation of RHY-1 for use in tandem mass spectrometry. This approach allows for the identification of its binding partners under baseline and H₂S stress conditions, which may further define the role of RHY-1 in the stress response to H₂S. Defining the role of RHY-1 will enhance our understanding of how the H₂S stress response leads to increased lifespan in *C. elegans*. Since several members of this pathway are well conserved in humans, this work may provide a mechanism for the therapeutic use of H₂S in human medicine.

SESSION 1C

BLURRED REALITIES, ETHICAL QUESTIONS AND MEDIA CRITIQUES

Session Moderator: Barbara Miller, Art History, Western Washington University

MGH 171

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Light Artists: A Potential Solution to *The Ecstasy of Communication*

Gabrielle (Gabby) Cagley, Senior, Art History, Western Washington University

Mentor: Barbara Miller, Art History, Western Washington University, Western Washington University

In *The Ecstasy of Communication*, Jean Baudrillard states that the invention of television and internet radically changed the perception of reality. As Baudrillard puts it, we no longer exist in three-dimensional space with clear boundaries separating one another. Reality is now a two dimensional plane, a flat reflective surface, within which boundaries have collapsed and the most intimate parts of our lives are exposed. This is what Baudrillard categorizes as obscene, an oversaturation of information and the all too visible. Many artists address similar concerns in their artistic practices. For example, through his unnerving puppet works and the series, Eyes, Tony Oursler explores surveillance. Blatantly exposing the increasing lack of privacy in current society, he highlights the realities of Baudrillard's claims. I contrast artists James Turrell and Olafur Eliasson to Oursler in their use of technology, showing the illuminating nature of electronic communication. Eliasson's Din blinde passager and Turrell's Ganzfeld, enhance the physical realm through light and color. Reinforcing a three-dimensional awareness, Eliasson and Turrell offer a solution to Baudrillard's obscenity. In comparing these artists, I show technology's ability to critique our society of increased surveillance through self-awareness, as well as demonstrate the potential positive relationships that technology can foster between individuals.

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BLURRED REALITIES, ETHICAL QUESTIONS AND MEDIA CRITIQUES

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Mishka Henner & Google Street View: Modern Surveillance Through New Media Art

Joshua (Josh) Hughes, Junior, Art History, English, Western Washington University

Mentor: Barbara Miller, Art History, Western Washington University, Western Washington University

Google Street View operates as a global surveillance system. While it periodically gets updated, GSV constantly remains a tool available for any and all individuals with access to the internet. This means that even though photo quality in-

creases, the scope of the database widens, and its various applications multiply. Over the last decade, various new media artists have explored the possibilities that come with GSV's all-encompassing database of images. Artist Mishka Henner has "appropriated" stills from GSV. Turning temporary online data into physical art, Henner subverts the notion that surveillance systems only serve as momentary fragments of information. In his series "No Man's Land", Henner documents roadside prostitutes captured by the GSV camera in rural Italy. His cropped images engage with the notion that as a public surveillance system, GSV captures bits of everyday life and turns them into data. In framing stills from GSV as aesthetic works of photography, Henner toys with concepts of privacy, detachment, and most importantly, modern surveillance. In this project, I explore the ways in which Henner uses Google Street View as a tool to make a commentary on the database system. Focusing on the globalization of public surveillance, Henner addresses worldwide issues of privacy in the internet age. His photography makes us think about the permanence of online data in an ever expanding information system. He suggests that through GSV we become data coded in 0s and 1s, forever part of the database.

SESSION 2D

MICROBIOME AND VACCINES

Session Moderator: James Mullins, Microbiology
MGH 234

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Gut Microbiome Dysbiosis After Zika Virus Infection is Associated with Increased Peripheral and Nervous System Inflammation Macaques

Claudia Allicia Evandy, Senior, Biology (Molecular, Cellular & Developmental)

Cindy Angelica Evandy, Senior, Biology (Molecular, Cellular & Developmental)

Mentor: Nichole Klatt, Pharmaceutics

Mentor: Charlene Miller

Originating from an outbreak in Brazil, with an estimated 440,000-1,300,000 Zika cases in 2015, Zika virus infection (ZIKV) has made its way into the United States. The objective of this study was to examine the changes in the gastrointestinal microbiota after ZIKV infection and investigate how this contributes to microbial translocation, immune activation and inflammation in the periphery and CNS. Eight pig-tail macaques (PTM) and eight rhesus macaques (RM) were infected with a Brazilian isolate of ZIKV. DNA extractions were carried out from PTM rectal swabs and were used to analyze microbial shifts through 16S rRNA analysis. Production of short chain fatty acids (SCFAs) in the gut were

measured by GC-MS. Expression of microbial translocation markers (LBP) were analyzed by ELISA in PTMs. Inflammation and immune activation were determined from neopterin production and kynurenine:tryptophan ratio (KTR) in the plasma and CSF of both species by tandem LC-MS/MS. We found that ZIKV infection results in microbial dysbiosis in the rectum of PTMs, including loss of beneficial Firmicutes phyla and an increase in opportunistic pathogen associated bacteria such as Proteobacteria and Spirochaetes. A significant decrease was seen in total SCFA production in PTMs 7 days post-inoculation (dpi) ($p=0.0125$). Plasma LBP was significantly increased 3 dpi in PTMs ($p=0.0305$). A statistical increase in neopterin and the KTR was detected in plasma and CSF of both species 7 dpi (all p values <0.0001). Moreover, the loss of Firmicutes *Solobacterium* in the male PTM after ZIKV infection was negatively associated with microbial translocation ($p<0.0001$, LBP) and inflammation ($p=0.0374$, KTR). These data indicate that microbial dysbiosis after ZIKV infection is associated with microbial translocation and inflammation, which may underlie the localized inflammation and immune activation occurring in the CNS during ZIKV infection and provide possible evidence for a mechanism on how CNS inflammation occurs in ZIKV infection.

SESSION 2G

ART HISTORY THROUGH THE AGES

Session Moderator: Julia Sapin, Art History, Western Washington University

MGH 248

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Psychedelic Art: From Mucha to the 1960s to Now

Jacob Knight, Senior, Art History, Western Washington University

Mentor: Barbara Miller, Art History, Western Washington University, Western Washington University

Throughout the 20th century, Alphonse Mucha's Job Cigarette Poster (1896) remained a touchstone for artists across disciplines. His highly influential poster, with its trademark sinuous lines, densely patterned surface and suggestive gestures, unsurprisingly became an inspiration for mid-century graphic artists — specifically the psychedelic and comic art of the 1960s. Within the LSD and hippie drug culture, numerous artists revisited Mucha's depiction and expanded on his sensuous representation. For this project, I look at the psychedelic comic and poster art of notables such as Victor Moscoso, Stanley Mouse, Wes Wilson, Martin Sharp, and Robert Crumb. I identify the degree to which Mucha's work remains palpably present. For example, Mouse's haunt-

ingly visceral lines, Moscoso's highly patterned surfaces, and Crumb's flippant poses reinterpret Mucha's Job Cigarette Poster. Over the subsequent decades, Art Nouveau inspired psychedelic art has only intensified. Recently resurfaced in psychedelic realism, Alex Grey, Cameron Gray, and Tokio Aoyama use influences of psychedelic art to create works of spiritual actualization. In this paper, I look at a century in which a distinct style of representation shifts. From the marketing of cigarettes (no less), to the characterization of counterculture and drug paraphernalia, to the representation of sensuous and spiritual interpretation.

POSTER SESSION 3

Commons East, Easel 58

2:30 PM to 4:00 PM

Effect of Cold Plasma Plume on Living Plants Tissue

Erika Simburger, Fifth Year, Pre Physical Therapy, Edmonds Community College

Erica Toikka, Sophomore, Bioengineering, Biology, Nursing, Edmonds Community College

Mentor: Jonathan Miller, Biology, Edmonds Community College

Plasma, the fourth state of matter, is created by introducing a gas - in this case, helium - to an electric field. This field ionizes the helium atoms, which in turn ionize other molecules, creating a wide variety of highly reactive species. Previous work at Edmonds Community College demonstrated the efficacy of an atmospheric pressure plasma jet (APPJ) in killing endospores of *Bacillus atrophaeus* for the purpose of spacecraft sterilization for NASA (Bernard et al., 2017). With increasing rates of antibiotic resistance, there is interest in using an APPJ in healthcare settings to eliminate harmful pathogens and therefore promote wound healing. However, given its destruction of endospores, it is unclear if the APPJ would damage living tissue. The purpose of this research was to analyze the effect of an APPJ on multicellular eukaryotic organisms. The impact of different exposure times of the APPJ upon both germinated and ungerminated *Zinnia elegans* seeds, and the effects on plant growth, was studied. The optimal exposure time for germinated seeds was between one and two minutes, while treatments greater than 2 minutes may increase germination rate.

POSTER SESSION 3

Commons East, Easel 67

2:30 PM to 4:00 PM

Microtubule Glutamylation Affect on Male Mating Deficiency in *C. elegans*

*, Senior, Molecular Bioscience, Bellevue College
Deanna Schiller*

Mentor: Jacqueline Miller, Bellevue College

Mentor: Jacqueline Drak, Bellevue College

A common post-translational modification of microtubules is glutamylation, which is a covalent bond between glutamic acid and a residue on the C-terminus of tubulin. Microtubule glutamylation is catalyzed by tubulin tyrosine ligase-like (TTLL) enzymes which modify microtubule functions such as, regulation of centriole stability, neuronal outgrowth, and cilia motility. How these enzymes regulate glutamylation remains unsolved. *Caenorhabditis elegans* (*C. elegans*) have five glutamylating enzymes (TTLL-4, -5, -9, -11, and -15) and lack glycylation, making them a good model for studying the function of TTLL enzymes. All five TTLL enzymes have an extended TTL domain suggesting glutamylation activity, TTLL-4, -5 and -11 have cation-enriched regions (cMTBD) which can make direct contact with microtubules, TTLL-9 and -15 lack cMTBDs and may require additional mediating factors to interact with microtubules. In a previous *C. elegans* study, ttl deletion mutations showed that the loss of an individual TTLL enzyme does not affect embryonic viability or spindle function, which is most likely due to redundancy. However, the triple mutation: ttl-4(tm3310); ttl-11(tm4059); ttl-5(tm3360), results in a male mating deficiency which suggests that glutamylation is required for proper microtubule function during male mating. To further investigate the role of tubulin glutamylation in male mating, we are generating mutant strains that contain deletions in multiple TTLL enzymes and a him-9 mutation to increase the incidence of males. Genetic crosses between hermaphrodites containing mutations in the TTLL enzymes and a male containing the him-9 mutation in the background will be performed. Phenotypic assays addressing the efficiency of male mating and other phenotypes will then be performed in the mutant strains.

POSTER SESSION 3

Commons West, Easel 20

2:30 PM to 4:00 PM

Testing a Protein Degradation System for Use during *Drosophila melanogaster* Spermiogenesis

Adriana Perez Solorio, Senior, Biology (Physiology)

Mary Gates Scholar

Mentor: Barbara Wakimoto, Biology

The acrosome is a sperm-specific organelle required for the fertilization of the ovum in most animals. However, the molecules required for its formation during development are largely unknown. Toward identifying the function of candi-

date proteins, we are testing a system known as deGradFP in *Drosophila melanogaster* which targets fluorescently-tagged fusion proteins for degradation. This system depends on the ubiquitin-tagged proteasomal degradation pathway. Currently, we are testing whether this system works at different stages of spermatogenesis by targeting Yellow Fluorescent Protein (YFP) tagged *Rabs*, a small GTPase required for vesicular trafficking. Our preliminary results suggest successful targeting of the YFP-tagged *Rab6*. We are currently testing additional YFP-tagged *Rabs*, as well as sperm-specific proteins. The results should reveal whether the proteasomal pathway is working in all stages of spermatogenesis and aid in the understanding of proteins required in the acrosome biosynthesis pathway. Overall, our findings will expand our knowledge of sperm formation and function.

risk recurrence information, provide diagnostic, carrier and prenatal testing, and delineate the biological mechanisms of JS that will be the targets of future precision therapies.

POSTER SESSION 4

Balcony, Easel 86

4:00 PM to 6:00 PM

Next-Generation Sequencing to Evaluate Segregation Pattern of Candidate Causal Variants for Joubert Syndrome

Yong Han Hank (Hank) Cheng, Senior, Biochemistry

Mary Gates Scholar, NASA Space Grant Scholar

Mentor: Dan Doherty, Pediatrics

Mentor: Megan Grout, Pediatrics

Mentor: Caitlin Miller, Pediatrics

Joubert syndrome (JS) is a rare recessive genetic disorder characterized by hindbrain malformations appearing as the “molar tooth sign” on axial brain imaging. Causal genetic variants for JS need to fulfill three criteria: They need to be 1) rare, 2) deleterious, and 3) present in both alleles in the patient. Patients in our cohort are sequenced for rare predicted-deleterious variants (RDVs) to identify variants that satisfy the first two criteria. To determine whether the segregation pattern of the variants satisfies the third criterion, we sequence both parents, each of whom should carry only one of the variants. My research uses Next-Generation Sequencing to determine the segregation pattern for families in whom RDVs have already been identified. Specifically, I performed targeted-sequencing of putative causal variants in the parents using molecular inversion probes, and then I used the sequencing data to determine the segregation pattern. In most families, one RDV will be present in each parent, indicating that they affect both alleles in the child, because these variants are robust candidates that have passed the filters for being rare and deleterious. If both RDVs are present in one parent, then they have to be on the same allele and cannot be the cause of JS in the family. In these families, we will have to consider other variants or perform additional sequencing to identify the causal variants. Ultimately, the goal of my research is to elucidate the genetic basis of JS to improve prognostic and