

Changing Presentation Rates For mTBI (Concussion) & Changing Imaging Rates

Kara Gallagher; Greg Barber; Jondavid Landon; Dave Milzman MD^{1,2}

¹Georgetown University and Georgetown University School of Medicine;

²Medstar Washington Hospital Center, Washington, DC

Minor traumatic brain injury (mTBI or concussion) has seen changes in resources devoted to education, and awareness as well as structured limitations on athletic concerns. Few studies to date have attempted to determine whether, increased occurrence is related to change in injury patterns or improvements in physician awareness and diagnosis.

MAPping the dephosphorylation of Microtubule-associated Protein 2 following neuronal activity *in vitro*

Ryan J. Bellmore¹; Kea Joo Lee²; Daniel T.S. Pak²;

¹Department of Human Science, Georgetown University, Washington D.C.;

²Department of Pharmacology and Physiology, Georgetown University, Washington D.C.;

The neuronal cytoskeleton and its associated proteins are increasingly implicated in learning and memory. Microtubule-associated protein 2 (MAP2), canonically known for its role in microtubule stability, has been shown to undergo changes in phosphorylation and intracellular location in response to neuronal activity. To demonstrate one such change in the phosphorylation of MAP2, cultured adult hippocampal neurons were treated with chemical reagents that approximate physiologic processes, including chemical long-term potentiation (cLTP), chemical long-term depression (cLTD), membrane depolarization, and network over-activity. These pharmacological activity paradigms were also performed in the presence of selective kinase or phosphatase inhibitors. Neurons were immunostained using antibodies recognizing total and phospho-MAP2 at the site Thr1620/1623, and immunoreactivity of the phospho-antibody relative to the total antibody was assessed via fluorescence microscopy. The phosphorylation of MAP2 at Thr1620/1623 was found to be rapidly and globally decreased after cLTP, cLTD, and depolarization and was found to be globally increased in response to increased network activity. Inhibition of Protein-phosphatase 2a (PP2a) prevented the dephosphorylation of MAP2 while the long-term inhibition of Glycogen synthase kinase-3 β (GSK-3 β) resulted in MAP2's dephosphorylation. After activity-induced dephosphorylation, neurons spontaneously recovered to normal levels of phosphorylation within 24 hours. The phosphorylation of MAP2 is maintained at high levels under basal conditions in cultured hippocampal neurons by the balanced activities of GSK-3 β and PP2a. Neuronal activity induced by pharmacological activation of post-synaptic receptors or by chemical depolarization results in the selective and reversible dephosphorylation of MAP2 at Thr1620/1623.

Parametric Excitations of Lattice Hard-Core Bosons in a Time-Dependent Harmonic Trap

Jennifer Brown, Marcos Rigol, Kai He

Department of Physics, Georgetown University

We study the time evolution of the density and momentum distribution functions of a lattice hard-core boson in the presence of a sinusoidally modulated harmonic trap. Since measuring density and the momentum distribution is significantly easier to measure in a laboratory setting, these results are relevant to the study of Mott insulators and Bose-Einstein condensates in optical lattices.

We show that a Fourier analysis of those observables allows one to accurately characterize the low-energy quasi-particle excitations, providing a general tool to probe the quasi-particle spectrum in many-body systems.

Fear Be Gone: Endocannabinoids Modulate Subsecond Dopamine Release During the Extinction of Fear Memories

Vivian C. Chioma¹; Dr. Erik B. Oleson, PhD²; Dr. Joseph F. Cheer, PhD²

¹University of Maryland, Baltimore County; ²University of Maryland, School of Medicine

Post-traumatic stress disorder (PTSD) is a debilitating anxiety disorder caused by experiencing dangerous situations. Environmental stimuli associated with such events are capable of independently producing persistent fear responses, a central feature of PTSD. Fear-conditioning models measure the ability to which a conditioned cue elicits a freezing response. These models are used to investigate the therapeutic potential of drugs for PTSD and the neural mechanisms responsible for their utility. Here, we investigate how the endocannabinoid and mesolimbic dopamine systems interact during the extinction of fear memories using a fear-conditioning model, pharmacology and fast-scan cyclic voltammetry. Rats were initially presented with three consecutive tones (20-s; ITI 3-min), each culminating with a 2-s foot shock and then, 24-hr later, presented with 18 iterations (20-s tone, ITI 3-min) of the conditioned tone alone in a novel context. Freezing behavior was assessed every 5-s and dopamine measurements were made every 100-msec. Prior to assessing conditioned fear responses, animals were pre-treated with either vehicle or the cannabinoid CB1 receptor antagonist rimonabant (0.3 mg/kg IV). In vehicle-treated rats, the conditioned tone produced freezing behavior that persisted through the first 10 trials and produced a sharp decrease in dopamine concentration. In comparison, rimonabant-treated rats were more resistant to the extinction of fear memories, as freezing behavior persisted through 15 presentations of the conditioned tone and the tone-induced decrease in dopamine was less apparent. These data suggest that there is a critical interaction between the endocannabinoid and mesolimbic dopamine systems in the extinction of fear memories.

Tyrosine kinase inhibition promotes parkin-mediated amyloid clearance in neurodegenerative diseases

Nicole Desforges¹; Irina Lonskaya; Michaeline Hebron; Dr. Charbel E-H Moussa, PhD¹

1. Department of Neuroscience, Georgetown University Medical Center, Washington, DC

The common feature of pathogenic protein accumulation links a subset of neurodegenerative diseases, including Alzheimer's disease (AD) and Parkinson's disease (PD). That such accumulation occurs implicates an inefficacious intracellular mechanism for the removal of damaged materials and debris. The E3 ubiquitin ligase parkin ubiquitinates target proteins, tagging them for proteosomal degradation, and has also been shown to promote autophagy, the process through which cellular debris are degraded via the lysosome. We previously showed decreased parkin solubility and accumulation of autophagic vacuoles containing amyloid in animal AD models, suggesting that altered parkin activity impedes amyloid clearance.

Performing histological analysis on human postmortem brain tissue, we demonstrate pathological parkin insolubility in the AD and PD brain, as well as co-localization of parkin with intraneuronal amyloid in the AD brain, suggesting that decreased parkin activity is associated with lack of amyloid clearance in the aging brain. Administration of FDA-approved tyrosine kinase inhibitors (TKI) to AD and PD animal models in which amyloid expression was induced through lentiviral injection promoted amyloid deposition and cell survival. Notably, parkin deletion prevented TKI-induced amyloid clearance, suggesting that functional parkin mediates amyloid degradation. These data identify TKIs as a potential treatment for neurodegenerative disease.

Soil Impacts of Leaf-cutter Ants (*Atta sp.*) in Northwestern Belize

Sara Eshleman¹; Dr. Timothy Beach, PhD²; Dr. Martha Weiss, PhD¹

¹Department of Biology, Georgetown University; ²Science, Technology and International Affairs Department, Georgetown University, Washington DC

Leaf-cutter ants (*Atta sp.*) are significant ecosystem engineers in the neotropics; they harvest large sections of forest and deposit the organic material in and around their nests. In tropical environments, leaf-cutter ants preferentially inhabit disturbed areas, and change the soil nutrient composition, which may facilitate forest regrowth (Farji-Brener and Silva 1995; Moutinho et al. 2003). In this study, I investigated the distribution and soil impacts of leaf-cutter ants in the subtropical moist forests of Northwestern Belize, a habitat in which these insects have not been studied. I surveyed mound location, and took soil samples and measurements from ant mounds associated with three levels of disturbance: forest edge, forest fragment, and mature interior forest. I found that leaf-cutter ants preferentially occupy disturbed forest sites (edge and fragment) in this region. Additionally, soil potassium, phosphorous, magnesium, and sulfur differed amongst each of the three sites, although only potassium showed a significant difference between mound and control soils, at the subsurface level (0-10 centimeters) studied here. In sum, the findings indicate that leaf-cutter ants likely harvest more foliage in disturbed areas than undisturbed ones, without inputting substantial nutrients that facilitate regrowth.

The Physician's Role: The Moral Weight of Culture for Children within the Clinical Encounter

Rex Huang¹; Dr. Edmund Pellegrino, PhD²

¹Department of Human Science, Georgetown University School of Nursing and Health Studies; ²Center for Clinical Bioethics

Cul•ture (*noun*)

Integrated pattern of human knowledge, belief, and behavior that is both a result of and integral to the human capacity for learning and transmitting knowledge to succeeding generations.

In this era of increasing multiculturalism, the weight of culture must be presented in a morally defensible manner. One area in which these conflicts may be resolved is the clinical encounter where we deal with the existential nature of illness and recognize the need to resolve confrontations in a timely manner. This paper will examine the practice of male genital circumcision for Orthodox Jews and Muslims and the conflicts that may arise between the professional ethics of the physician, the patient and family's culture, and the physician's culture.

We will first present the medical, historical-cultural, societal, and religious context of this procedure in the United States. Then, we will consider the moral complexities posed by a pediatric patient and the child's subsequent rights at varying levels of capacity. These individual cases are presented to establish the intricacies of the patient's, the physician's, and society's duty to this child. Finally, we will evaluate the demands of these morally defensible courses of action on physicians and the physician's ability to maintain his moral integrity as an individual.

Baseline characteristics of patients enrolled in the Wound Etiology and Healing (WE-HEAL) Study: Correlation with Clinical Outcome

Brandon Jackson³; Sean McNish¹; Shannon Woodward¹; Antony Artis¹; Dr. Christopher Attinger, MD²; Dr. Jane Fall Dickson, RN, PhD³; Dr. Victoria Shanmugam, MD

¹Division of Rheumatology; ²Division of Plastic Surgery, MedStar Georgetown University Hospital; ³School of Nursing and Health Studies, Georgetown University, Washington DC

Chronic wounds that have failed to heal after 3 months of appropriate wound care affect approximately 6.5 million people in the US with a prevalence of 1% and costs estimated at \$25 billion per year. The overall goal of the Wound Etiology and Healing (WE-HEAL) study is to investigate differences between chronic wounds that remain recalcitrant and those that ultimately heal.

Impacts of shellfish aquaculture on bottlenose dolphins (*Tursiops* sp.)

Ann-Marie Jacoby¹; Eric M. Patterson¹; Dr. Janet Mann, PhD^{1,2}

¹Department of Biology, Georgetown University; ²Department of Psychology, Georgetown University, Washington, DC

As wild fish stocks decline, aquaculture has become a viable means to cultivate marine resources while simultaneously alleviating pressure on natural stocks. However, little is known about how the increase in aquaculture will affect native wildlife, including small cetaceans. In this study, we examine the impact of pearl farm aquaculture on bottlenose dolphin (*Tursiops* sp.) activity budgets and ranging in Shark Bay, Australia. We expand on previous work (Watson-Capps & Mann 2005), which found that females and calves avoided a pearl farm area, by including dolphins of all age and sex classes sighted in the past 20 years within a pearl farm area and/or one of two adjacent control areas of equal size and similar habitat (a continuous CC, and a split control SC). Dolphin activity and individual sighting records in the pearl farm and both control areas were compared. We found no difference between the pearl farm and the CC for the number of surveys, sex ratio, age class ratio, and dolphin activity budget, but a greater number of individuals were observed in the CC. For the SC, we found a greater number of surveys and fewer individuals than in the pearl farm, but still no difference in the sex ratio and age class ratio. Additionally, in the SC, there was less foraging but more socializing and resting compared to the pearl farm. Thus, our results were dependent on the area selected for comparison, highlighting the importance of using several appropriate control areas when examining the impact of anthropogenic threats in marine systems.

Child Marriage Interventions to Advance Child and Maternal Health Metrics in Rural Bangladesh

Anika Khan; Dr. Heidi Elmendorf, PhD

Department of Biology, Georgetown University, Washington, DC

Child marriage, defined as marriage before the age of 18, affects between 20-70% of girls in most developing countries (IWHC, 2005). Child marriage, and the resultant early pregnancies, is negatively associated with the achievement of all eight Millennium Development Goals as it contributes to poverty, gender inequality, limits both education and earning opportunities for women, leads to increased rates of child and maternal mortality as well as HIV/AIDS morbidity. Yet child marriage is entrenched in many societies, particularly in rural regions, because of poverty, limited education and cultural and religious concerns. This paper will focus on how to improve child marriage interventions within the fifty-nine rural districts of Bangladesh, where 68% of girls are married before 18, and 59% of 15-19 year olds have at least one child (Sarkar, 2009). To explore possible interventions, I have conducted a meta- analysis of literature concerning current strategies. Secondary school stipend and cash transfer programs, specifically Bangladesh's nationwide Female Secondary School Stipend program, have been shown to increase enrollment of girls in secondary schools by dispensing cash to both the family and the girl on the condition that she remain unmarried and in school until the age of 18, but their relative long-term efficacy is still uncertain. Additional interventions should include engaging religious leaders to advocate for completion of secondary education and more effectively subsidizing costs associated with schooling for moderately to ultra poor families in order to limit the prevalence of childhood marriage.

Adolescent Smoking Prevention In the Primary Care Setting

Lindsey Mahoney¹; Dr. Darren Mays, PhD, MPH²; Dr. Kirsten B. Hawkins, MD, MPH³; Sarah E. Murphy²; Andrea Johnson, MPH²; Dr. Kenneth P. Tercyak, PhD²

¹School of Nursing and Health Studies, Georgetown University; ²Department of Oncology, Georgetown University Medical Center; ³Department of Pediatrics, Georgetown University Hospital, Washington, DC

The purpose of this research is to examine a novel method for preventing adolescent smoking in the pediatric primary care setting. Evidence suggests that patient-provider communication is a useful vehicle for conveying health-related information; however, over 40% of teens never have a conversation with their primary care provider (PCP) about tobacco use. Even when they do, not all patients are screened for tobacco use or advised on smoking avoidance. Multiple barriers hinder patient-provider communication about smoking in this setting. This study is designed to investigate a novel method to address to this problem by understanding how to engage teens ages 12-17 with an interactive online resource offered adjunct to PCP visits. The study has three objectives: first, to examine which teen patients report being screened or counseled by PCPs; second, to determine adolescents' interest in interactive web-based smoking prevention resources; and third, to examine the utilization of such resources when teen patients are offered an opportunity to use a website adjunct to PCP visits. Results suggest that white adolescents are more likely to report being screened about smoking than nonwhites ($p=0.013$) and adolescents who report being screened have higher perceived risks of smoking ($p=0.056$). Nearly one-third of adolescents reported visiting a smoking prevention website offered adjunct to their PCP visits, and those who did so endorsed more positive views on smoking ($p=0.019$). Although these results are highly preliminary, they suggest that interactive web-based resources offered adjunct to pediatric PCP visits may be an important strategy to prevent adolescent smoking.

Oncology Nurses' Knowledge of CAM for Cancer Pain

Lauren Manno; Jean Lynn MPH RN; Dr. Jane Fall-Dickson RN, Ph.D.; Dr. Mihrye Mete Ph.D.; Dr. Cathy Wu Ph.D.

¹Department of Nursing, School of Nursing and Health Studies, Georgetown University, Washington, DC; ²Coordinating Center for Clinical Trials, National Cancer Institute, The National Institutes of Health, Bethesda, MD;

³Department of Biostatistics and Epidemiology, MedStar Health Research Institute; University of Maryland, College Park, MD

There is a paucity of well-designed clinical trials testing efficacy of complementary and alternative medicine (CAM) for cancer-related pain. Research is needed exploring healthcare providers' knowledge and perception of CAM effectiveness for cancer-related pain. This study explored oncology nurses' knowledge and perception of CAM effectiveness in managing cancer-related pain.

Aims:1) To determine oncology nurses' knowledge level regarding CAM; 2) To describe oncology nurses' perception regarding effectively incorporating CAM into cancer-related pain management; and 3) To determine which CAM educational opportunities oncology nurses' perceive as most beneficial.

This study utilized a descriptive, exploratory survey design. Content experts validated the investigator-designed survey tool. Following IRB approval, the confidential survey conducted via Survey Monkey was emailed by Oncology Nursing Society (ONS) staff to a random sample of 1,000 ONS members practicing in the adult ambulatory care setting. Subjects (N=71; response rate 7.1%) had a median age 52 years (range= 26 to 68) and were primarily Caucasian females. 75.4% of participants ranked their general knowledge of CAM as fair or moderate. 97.2% of participants perceived CAM as effective in reducing cancer-related pain. Participants reported continuing education conferences as the most beneficial educational modality for CAM. Results suggest oncology nurses perceive CAM as effective, but may lack knowledge regarding its used to promote comfort and pain relief for cancer patients. Specific educational opportunities were reported as beneficial in increasing knowledge level of CAM.

Reconstruction of the AII Amacrine Network in the Mammalian Retina

Alex Markowitz¹; Subhashree Nayak¹; Alex Baden¹; Kevin Briggman²; Joshua Singer¹

Department of Biology, University of Maryland, College Park, MD¹; National Institutes of Health/National Institute of Neurological Disorders and Stroke²

To gain a complete understanding of a neural circuit's function, it is necessary to know both the properties of its component neurons and the connections between them. Here, we describe plans for large-scale, nanometer-resolution reconstruction the AII amacrine cell network of the mouse retina. Our purpose is to elucidate both sub-cellular and circuit-level anatomical determinants of function.

The AII network comprises three cell types: rod bipolar (RB) cells, AII amacrine cells, and ON cone bipolar (CB) cells. RBs make glutamatergic synapses onto AIIs, and AIIs are coupled electrically to each other and to the terminals of ON CBs. Thus, RB output is conveyed to ON CBs through a network of electrical synapses. Here, component neurons will be reconstructed manually from datasets generated using high-throughput, scanning block-face electron microscopy (SBEM) to guide three analyses: sub-cellular, cellular, and circuit-level.

One, we will use SBEM reconstruction of RB terminals and presynaptic active zones to construct models of presynaptic Ca^{2+} dynamics and vesicular exocytosis. Two, we will use SBEM reconstruction of AII dendrites to refine compartmental models of postsynaptic signal integration and electrical signaling by these cells. Three, we will use SBEM reconstruction to assess the synaptic inputs and outputs of AII amacrine cells to provide insight into their circuit function and to discover new synaptic partners for these cells.

A mixed-methods study of Internet use in a low-income health clinic in Rio de Janeiro, Brazil

Allyson M. Noyes¹; Alexandra C. Melo¹; Dr. Andre de Faria Pereira Neto, PhD²

¹Georgetown University NHS, Department of International Health, Washington, DC; ²Escola Nacional de Saúde Pública Sergio Arouca, Rio de Janeiro, Brazil

Background: Worldwide, the Internet has revolutionized how people communicate and access information. As this technology becomes increasingly more affordable and available, it is important to understand how and why people access the Internet and the role this plays in their daily life. Gaps in both Internet access and literacy may further polarize socioeconomic groups. This study sought to create a community profile on Internet use and health-seeking behavior in a low-income population.

Methods: This mixed-method study was conducted after careful ethnographic observation. Researchers conducted an oral questionnaire with 102 residents of Manguinhos as well as seventeen follow-up qualitative interviews with Internet users at a public primary health clinic in an urban slum in Rio de Janeiro during a two-week time period.

Results: Of all residents, 60.8% had ever used the Internet. This is higher than the national average of 53% of the population. The study found that Internet use for health-related information was present but not prevalent among participants.

Conclusion: According to this study, doctor-patient relationships in Manguinhos have only partially permeated the virtual sphere, yet knowledge of available online health information is widespread. Those who do not access the Internet may be socially excluded from the community and further research should explore reasons for not accessing the Internet and how to address these gaps.

KAP Survey on Water Safety and Sanitation of Students in Sungwi Village, Tanzania

Amanda Pascavis; Dr. Bernhard Liese, PhD

Department of International Health, School of Nursing and Health Studies, Georgetown University, Washington, DC; National Institute for Medical Research, Tanzania

The Millennium Development Goals (MDGs) include a target for access to improved water source and improved sanitation facilities.^{1,2} Tanzania is not on target to meet either of these goals.³ With a population that is 73.6 percent rural, the majority of the Tanzanian population does not have access to safe water and improved sanitation.⁴ In order to achieve the MDG targets for water and sanitation (as well as all other MDGs), the barriers to access safe water and improved sanitation must be addressed.

A multiple-choice survey was administered at Sungwi Primary School in Kisarawe, Tanzania in order to evaluate the knowledge, attitudes, and practices of students in regards to water safety and sanitation. Data was analyzed to determine the differences between grade levels, as well as differences between household classifications (study or control household). Results indicate that students have inadequate knowledge regarding water safety, sanitation, and hygiene. Students do not understand the pathways and transmission of diarrheal diseases, and the role that hygiene plays. Data also illustrates that students do not practice proper hygienic behaviors. It was determined that students in grade 5 and 6 had slightly more knowledge of issues regarding water and sanitation, in comparison to students in grade 4. There were no significant differences between students in study or control households.

DNA Methylation of Retrotransposons in *Giardia lamblia*

Elizabeth Schiavoni; Victoria Parr; Darryl Turakhia; Christopher Williams, PhD; Heidi Elmendorf, PhD

Department of Biology, Georgetown University, Washington, DC

DNA methylation, the addition of methyl groups to cytosines, is a heritable epigenetic modification to DNA, where the transcription of mRNA is reduced. DNA methylation plays a role in transcriptional regulation, allele specific expression, and retrotransposon silencing in eukaryotic cells. Retrotransposons are genetic elements that replicate and disperse themselves throughout a genome, potentially disrupting functional DNA regions and creating genome instability.

Giardia lamblia is a eukaryotic parasite with a minimal genome containing few non-coding regions. The Elmendorf lab has recently discovered DNA methylation at exceedingly low levels in *Giardia*. We hypothesize it plays a critical role in transcriptional regulation and/or genome stability because reducing methylation causes *Giardia* death. We are investigating if retrotransposon elements in *Giardia*'s genome are methylated because this is a commonly methylated region in other organisms.

We are examining methylation of three retrotransposons in *Giardia lamblia*, GilT, GilM, and GilD. Direct detection of DNA methylation at the low levels observed in *Giardia* is technically almost impossible. DNA methylation has been shown to reduce transcription of methylated genes, so we can indirectly gauge levels of retrotransposon methylation in *Giardia*'s genome by observing the levels of retrotransposon mRNA. We expose one group of *Giardia* to 5-aza-2'-deoxycytidine, to be incorporated into the genome in place of cytosine, effectively "demethylating" the DNA. Another group of *Giardia* is left untreated. If there is methylation of retrotransposons in *Giardia*, we would expect to see higher levels of retrotransposon mRNA transcripts in the group of *Giardia* treated with 5-aza-2'-deoxycytidine compared to the untreated group.

From Lab Bench to Globe: A structure to facilitate the distribution of regenerative medicine treatments and therapies to the developing world

Julia Shuster; Fr. Kevin Fitzgerald, SJ, PhD; Dr. Anne G. Rosenwald, PhD

Department of Biology, Georgetown University, Washington, DC

Modern medicine is pushing boundaries by advancing and discovering new ways to live longer, healthier lives. As part of this advance, a new field has emerged with immense promise known as regenerative medicine (RM), the process of engineering tissue to restore or establish normal function by replacing or regenerating human cells, tissue or organs (Mason and Dunnill, 2008). All over the world, organizations are attempting to create novel techniques in regenerative medicine everyday ranging from growing new lungs in a lab as a treatment for pulmonary disease to regenerating nerves as a cure for diabetic neuropathy. However, while regenerative medicine has the potential to prolong life and cure disease, its benefits may be unnecessarily limited because of extensive regulation and financial cost to the consumer. In response to these challenges, I have developed a new structure by which the treatments that alleviate global health problems would be approved rapidly and rigorously, and then widely distributed. I would like this program to serve as a template for evaluating regenerative medicine that benefits those who cannot afford it while maintaining robust health standards. I conclude that the integration of such a structure into the Food Drug Administration (FDA), European Medicines Agency (EMA), and other similar agencies would result in greater production of regenerative medicine techniques applicable to global health needs.

Knowledge, attitudes, and perceptions regarding desired family size among men and women in the Kassena-Nankana East and West Districts of Upper East, Ghana

Kirsty Sievwright; Dr. John Williams; Dr. Cornelius Debpuur

Department of International Health, Georgetown University, Washington, DC

High Fertility is among the top reproductive health concerns in Ghana, particularly in the Northern regions. Between 2000 and 2010, there was slowing decline in total fertility rate (TFR), it only reduced from 4.7 to 4.2; such stagnation indicates various socio-cultural practices and beliefs are inhibiting further decline in the TFR.¹ In an effort to both assess the status of fertility and the influences contributing to the observed stagnation in TFR in Ghana, this descriptive, cross sectional study explored the knowledge, attitudes, and perceptions of 20-34 year old men and women in the Kassena-Nankana East and West (KNEW) Districts of Upper East, Ghana regarding desired family size. It was found that gender, education, infant and child mortality, and family planning are influential factors regarding family size preferences. Participants also showed a limited sense of perceived efficacy in managing their family size, mainly attributing control of their reproduction to God, and demonstrated limited knowledge of MCH risks associated with high fertility: inappropriate birth spacing and childbearing at risky ages. Finally, a shift in the attitudes and motivations behind an individuals' ideal family size was observed as a majority of participants identified reasons such as *“to be able to take care of them”* and *“to take care of their education.”*

Using Electronic Clinical Data for Comparative Effectiveness Research: Common Challenges and Emerging Issues

Andrew Strunk; Dr. Mike Stoto, PhD

Department of Health Care Management and Policy, Georgetown University, Washington, DC

Background—Throughout the United States, clinicians and patients are faced with a plethora of options for the diagnosis, prevention, and treatment of disease when making decisions regarding health care. However, limited evidence for the relative effectiveness of alternative treatments hinders their ability to make truly informed care decisions. To address this lack of adequate information, the American Recovery and Reinvestment Act of 2009 (ARRA) provided \$1.1 billion for comparative effectiveness research (CER), with a substantial portion of the funding allocated towards enhancing the electronic clinical data (ECD) infrastructure needed to support such research.

Methods—This study is a review of the findings of the AcademyHealth Electronic Data Methods (EDM) Forum, established under a three-year grant from AHRQ with the goal of synthesizing the experiences and lessons learned from 11 other projects working to improve the electronic data capacity of health systems throughout the U.S. The review consists of a summary of several of the Forum's activities, including findings from a series of site visits, an initial stakeholder needs assessment, and a review of the literature on the intersection of ECD and CER.

Results—Developing appropriate governance, managing data quality, and developing methods to control confounding in observational data, among other issues, represent significant challenges in implementing CER with ECD. Project investigators emphasized the importance of interdisciplinary teams, composed of data programmers, clinicians, epidemiologists, biostatisticians, and other professionals, in developing inventive solutions for CER.

Conclusions—Despite some common challenges, researchers and other stakeholders are optimistic about the potential for ECD-based CER to address the limitations of traditional research studies and generate valuable evidence for patient and clinician decision-making.

Temperature Sensitive Tyrosinase: A Model for Glycoprotein Refolding

Scott Wisniewski¹; Alexander Hahn; Alexander Theos, Ph.D.¹

¹Department of Human Science, Georgetown University

At the core of many diseases from cystic fibrosis to Alzheimer's is an irreversibly misfolded protein within the secretory pathway. A well-characterized model for integral membrane protein folding is tyrosinase. This glycoprotein spends a significant time folding within the Endoplasmic Reticulum (ER), and after folding, it is efficiently targeted to the melanosome. At 37° C, wild type (WT) tyrosinase is able to fold and serve as an enzyme in melanogenesis. At the same temperature, however, a mutant allele of tyrosinase in mouse known as Himalayan is unable to exit the ER resulting in mice that lack pigmentation at the warmer core of its body. At a lower temperature in the extremities, the Himalayan protein can exit the ER resulting in normal coat color. It is hypothesized that this phenotype is due to temperature-dependent misfolding.

We have used C-terminally EGFP-tagged mouse tyrosinases to study the intracellular transport of Himalayan tyrosinase synthesized at 37° C after shifting down to 31° C, the permissive temperature. The sorting of our chimera faithfully replicates that of untagged tyrosinase as shown in sub-cellular localization experiments and the relative endoglycosidase-H (endo-H) sensitivity of the WT-EGFP and Himalayan-EGFP proteins. Our data in cycloheximide-treated cells also suggest that Himalayan-EGFP protein initially restricted to the ER may be able to refold and exit after shifting to the permissive temperature.

These results have important implications for our further understanding of the mechanism of quality control in the ER and the development of therapeutics aimed at facilitating the refolding of proteins to treat human disease.

NOVEL LANGUAGE FMRI PROTOCOL DESIGN: OPTIMUM BRAIN MAPPING

Jessie Yang¹; Chin-Shoou Lin, Ph.D.²

¹Department of Human Science, SNHS;²Department of Radiology, MedStar Georgetown University Hospital, 3800 Reservoir Road, Washington, DC

BACKGROUND: Researchers routinely use functional magnetic resonance imaging (fMRI) in cortical language mapping, whereas standard clinical practices utilize direct cortical stimulation (DCS) for preoperative neurosurgical mapping. The long operating time, risk of afterdischarge activity, and invasiveness of DCS render investigations in carefully designed fMRI language paradigm, to increase the concordance with DCS and its clinical utility¹. We present a pilot study describing a novel protocol design in subject recruitment, language paradigm, scan setup, task learning, and data processing procedures.

METHODS: Six right-handed, healthy L1 English, L2 Chinese late bilinguals were given visually-triggered covert sentence generation (SG) preceded by extensive verbal and non-verbal task learning. Cortical language activation was quantified using ImageJ's RGB split and grey-level histogram.

RESULTS/DISCUSSION: The activation maps of a female subject of age 21 who acquired L2 at age 18 were examined. Numbers of total active voxel in the language-supplementary motor area (L-SMA) and language-premotor area (L-PMA) corresponding to L1 and L2 SG demonstrated notable cortical activation^{2,3}. The utility and limitations of covert SG and task learning were considered.

CONCLUSIONS: The fMRI protocol being presented produced satisfactory results. Carefully designed fMRI protocol has potential laboratory and clinical utility, and its combination with DCS can optimize neuronal engagement and minimize the invasiveness of language mapping.

The Role of EphA7 in Dendritic Spine Extension

Wardah Athar¹, Carrie E Leonard², Meredith A Clifford², Xiumei Zhao¹, Maria J Donoghue^{1,2}

¹Department of Biology and ² Interdisciplinary Program in Neuroscience, Georgetown University

Cerebral cortical development relies upon a sequence of precisely choreographed molecular interactions and cellular movements. Once division ceases, neurons migrate from the germinal ventricular zone and settle into their appropriate layers in the overlying cortical plate. Upon occupancy in this differentiated zone, neurons must form connections with appropriate synaptic partners in order to create functional neural networks. In the cortex, most excitatory synapses occur between presynaptic axon terminals and postsynaptic dendritic spines (protrusions extending from dendritic branches). It is known that the EphA family of intercellular signaling molecules plays a role in assigning the molecular designations of these excitatory synapses. This work focuses specifically on the roles of two splice variants of the EphA7 tyrosine kinase receptor, EphA7FL (full-length, kinase active form) and EphA7TR (truncated, enzymatically inactive form).

The role of EphA7 in dendritic spine formation was first analyzed using Golgi staining. Cortices of wild-type (control) and EphA7 loss-of-function (EphA7^{-/-}) mice were examined. At postnatal day 10, when spines are just forming, EphA7^{-/-} animals exhibited increased dendritic protrusions as compared to control animals. In contrast, at postnatal day 22, when dendritic spines are mature, EphA7^{-/-} animals showed decreased spine density, but an increased proportion of mature spines as compared to control animals. Thus, EphA7 appears to limit initial dendritic protrusions during early postnatal life and promote mature spines during later postnatal life. Furthermore, q-RT-PCR revealed that EphA7FL predominates early and EphA7TR late during cortical maturation. From this, we conclude that EphA7FL acts early to limit extension of protrusions, while EphA7TR acts later to promote spine stabilization and maturation.

Pre-Existing Familiarity with Objects as a Determinant of Exploration and Categorization

Abhilasha Banerjee¹; Dr. Clay Mash, PhD²; Dr. Marc H. Bornstein, PhD²

¹Department of Biology, Georgetown University, Washington, DC; ² The Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, MD

Previous research with infants aged 6, 9, and 12-months has shown that particular types of manipulative behavior can be used to detect certain aspects of novel objects. Fingering, for instance, may be useful in attaining information about object texture while banging the object can be used to find the weight [1,2]. However, what has rarely been addressed is if infants can use pre-existing familiarity with objects to guide their exploration. Likewise, it is not known whether pre-existing familiarity may allow infants to engage in more thorough processing of objects such as categorization. The current study examines whether exploratory behavior and categorization differ between 5-month-old infants shown 2-dimensional stimuli every day for 2 months prior to the laboratory experiment (home experience cohort) and those who were not (no home experience cohort).

In this experiment, total tapping and total banging were significantly greater in the home experience cohort. These findings suggest that infants in the home experience cohort stored and retrieved visual memories of the stimuli seen 2 months prior and used them to guide their exploration of 3-dimensional objects in the laboratory. Categorization, on the other hand, did not differ significantly between cohorts, suggesting that prior familiarity is not necessary for categorization of novel objects at 5-months. Moreover, neither total tapping nor total banging was significantly positively correlated with the ability to categorize, suggesting that categorization is not dependent on manual exploration when familiarity is constant.

Determining the Structure of the HIV-1 Matrix and Native PI(4,5)P₂ Complex

Nadine Bucca; Peter Mercredi; Dr. Michael F. Summers, PhD

**Department of Chemistry and Biochemistry, University of Maryland,
Baltimore County**

The HIV-1 matrix domain (MA) of the Gag polyprotein targets Gag to the plasma membrane. This targeting is mediated by the membrane marker phosphatidylinositol(4,5) bisphosphate [PI(4,5)P₂]. PI(4,5)P₂ binds to MA permitting an N-terminal myristate, a saturated 14 carbon chain, group on MA to switch from a sequestered to an exposed conformation. The myristate group anchors Gag to the plasma membrane and permits Gag oligomerization for viral assembly. Structural work on MA:PI(4,5)P₂ binding using two truncated saturated carbon chains of PI(4,5)P₂, has shown that the 2' chain binds to MA. However this work still needs to be verified with the native PI(4,5)P₂. To test this proposed model, we have constructed a membrane like environment using lipid mixtures that form a discoid bilayer with and without native-PI(4,5)P₂ molecules. These constructs are known as bicelles and will be analyzed using nuclear magnetic resonance (NMR) to characterize the interaction between MA and native-PI(4,5)P₂. Preliminary data show that our lipid constructs do not denature MA and display native-PI(4,5)P₂ for MA binding.

Accounting for Sexually Antagonistic Genetic Variance

Michelle Cassidy¹; Dr. Manus Patten, PhD¹

¹Department of Biology, Georgetown University, Washington, DC

Alleles that raise a male's fitness may lower a female's fitness, and vice versa. When males and females have different evolutionary optima for traits, conflict emerges at the underlying genes. This intralocus conflict can, in theory, maintain genetic variation, and a growing number of empirical studies find a role for this selection pressure in the maintenance of natural variation. What remains to be seen is whether this intralocus conflict escalates like so many other genetic conflicts. In a population that is polymorphic for two sexually antagonistic alleles we introduce a third antagonistic allele and examine how its fate depends on its effect on male and female fitness. According to this model, a third allele cannot establish itself in a population when negative fitness effects for one sex are greater in magnitude than fitness benefits for the other. As a consequence, fitness variance in the population, on average, does XYZ. Our model suggests that sexual antagonism tends to de-escalate over time, as fitness variances decrease after the introduction of the third allele. In other words, other factors influence the maintenance and growth of genetic variation. Additionally, this model generalizes previous theoretical work on multi-allele polymorphism to the case where the sexes are selected differently.

Effect of estrogen on ROCK expression in the vaginal muscularis

Connors, K.M., Poiset, S.J., Wallach, A.S., Basha M.E.

Department of Human Science, School of Nursing & Health Studies

The RHOA/ROCK pathway is involved in calcium independent regulation of smooth muscle contraction. ROCK, a downstream effector of Rho, phosphorylates the myosin subunit of myosin phosphatase, inhibiting myosin phosphatase activity¹. This effect promotes smooth muscle contraction independent of cytosolic calcium levels (See Fig. 1). Estrogen has been shown to regulate this pathway in bladder and vascular smooth muscle, but its effects have yet to be determined in vaginal smooth muscle²⁻³. The goal of this study is to determine the effect of estrogen on isoform expression of ROCK in the proximal vaginal muscularis using a rodent model of menopause. Female, adult Sprague-Dawley rats were either sham-operated or bilaterally ovariectomized (OVX). Two weeks post surgery, subcutaneous osmotic pumps containing either vehicle (0.9 % saline) or 17 β -estradiol were surgically implanted between the scapulae of rats. One week following pump placement, animals were euthanized and the vaginal tissue was collected. Western blot analysis of ROCK I & II expression was performed and analyzed using Bio-Rad Image Lab technology. In vitro measurements of isometric force of the proximal vagina were also performed. Preliminary studies show changes in expression of ROCK II in ovariectomized rats, an affect reversed by estrogen treatment. No changes were detected in ROCK I expression. In vitro studies of vaginal contractility demonstrate that ROCK inhibition with Y-cmpd inhibits carbachol-induced force, demonstrating functional significance of ROCK expression. Our data provides evidence of estrogenic regulation of the RHOA/ROCK pathway within the vagina and suggests that vaginal changes with menopause may include alterations in calcium independent contraction.

The Role of Nitric Oxide Synthase (NOS) in Hormone-Independent Breast Cancer

Samuel Dowling¹; Geoffrey Storchan²; Brandy Huderson³; Dr. Heidi Elmendorf, PhD¹; Dr. Mary Beth Martin, PhD^{2,3}

¹Department of Biology, Georgetown University; ²Department of Biochemistry and Molecular & Cellular Biology, Georgetown University; ³Department of Oncology, Georgetown University, Washington DC

A well-established cause of breast cancer is lifetime exposure to estrogen, whose effect is mediated through the estrogen receptor (ER). 75% of breast cancer cases are ER-positive, and endocrine therapy targets the ER by blocking receptor binding with an antagonist or by depriving the tumor of estrogen. Nevertheless, common intrinsic and acquired resistance limits this approach (Osborne CK and Schiff R, 2011). One mechanism proposed in hormone-independent activation of ER suggests that the protein kinase Akt mediates crosstalk between the insulin-like growth factor 1 (IGF-1) pathway and ER- α (Martin MB *et al.*, 2000). It has been shown that Akt activates endothelial nitric oxide synthase (eNOS), producing nitric oxide (NO) (Vanhaesebroeck B and Alessi DR, 2000). In turn, nitrite, which is rapidly formed from NO, has been shown to have estrogenic effects by binding to the ligand-binding domain of ER- α (Veselik DJ *et al.*, 2000). To test our hypothesis that nitrite is responsible for the proliferation of hormone-independent breast cancer, I measured the expression of NOS isoforms and estrogen-regulated genes using real-time quantitative RT-PCR and found an upregulation of eNOS and estrogen-regulated genes, human trefoil protein (TFF1) and progesterone receptor (PgR), in hormone-independent breast cancer cells (MCF7/LCC1) compared to hormone-dependent (MCF7) breast cancer cells. I also treated MCF7/LCC1 cells with L-NAME, L-NNA, and DPI to inhibit production of nitrite and observed a downregulation of estrogen-regulated genes, gene regulated in breast cancer 1 (GREB1) and PgR. The data suggest that eNOS plays a role in the proliferation of hormone-independent breast cancer.

Leveraging Organizational Design in Los Angeles Hospitals: A Response to the Affordable Care Act

Joseph Friedrich

The McDonough School of Business, Georgetown University, Washington, DC

The Patient Protection and Affordable Care Act is affecting the nature of patient care in the United States. This research explores the extent to which the Los Angeles County Department of Health Services (LACDHS) has altered its organizational structure and core operating procedures in response to the Affordable Care Act. Research for this organizational audit was conducted between January and April of 2012. Primary source material was gathered through direct interviews with LACDHS personnel and internal LACDHS correspondences. The LACDHS is an expansive network of inpatient and outpatient healthcare providers in Los Angeles, CA. Specifically, it is comprised of four major hospitals, two multi-service Ambulatory Care Centers, 17 disparate Health Centers, and 161 community associated partner sites.

Three recent and significant changes in organizational design were observed across all aspects of LACDHS' services: First; a notable flattening of organizational structure has resulted in an increased span of power for hospital administrators. Coupled with this trend was an observed rise in the number of Medical Doctors tasked with administrative and managerial responsibility. Second; there has been a complete overhaul of supply chain management across all LACDHS services, shifting from a materials management structure to a more centralized supply chain management system. Third; it was noted that a great proportion of operational units have transitioned to a management by objective system to tackle complex issues surrounding patient care.

Aggression predictors in wild Indian Ocean bottlenose dolphins (*Tursiops* sp.)

Ian Gaston¹; Vivienne Foroughirad¹; Dr. Janet Mann, PhD^{1,2}

¹Department of Biology, Georgetown University; ²Department of Psychology, Georgetown University, Washington DC

The juvenile period in male bottlenose dolphins is high-risk, evidenced by 43% mortality between weaning and age 10 (Stanton & Mann 2012) and elevated rates of conspecific scarring (Scott et al. 2005). Previous work suggested that the development of bonds during infancy might reduce mortality risk (Stanton & Mann 2012). Thus, juvenile males might respond to, or prevent attacks, presumably from juvenile and adult males, by maintaining or establishing bonds with others. This study investigates whether juvenile male bottlenose dolphins (*Tursiops* sp.) are buffered from or alternatively, incite conspecific aggression as a result of either strong male-male bonds or associations with female groups. We hypothesized that juvenile males would either be least or most susceptible to conspecific aggression if they had strong bonds with other juvenile males. Additionally or alternatively, juvenile males who spent time with adult females from their natal network might also be less vulnerable. By examining the prevalence of tooth rake scars on juvenile males in relation to weighted social network metrics, we sought to determine if there was an association between social bonds and vulnerability to aggression in a wild animal. Our final GLMM included degree and strength with the juvenile male age-sex class as significant predictors of toothrake coverage. The results of this study show that among surviving males, those that had strong bonds with other males also had lots of scars, suggesting that these conflicts may be an essential part of a juvenile male working into a long-term alliance.

The Role of SOX4 in Cortical Progenitor Fate Restriction

Caitlin Gilbert¹; Chao Chen¹; Dr. Maria Donoghue, PhD^{1,2}

¹Department of Biology, Georgetown University;²Howard Hughes Medical Institute, Georgetown University, Washington, DC

The development of the adult mammalian cerebral cortex, implicated in many high-order functions like memory, language, and consciousness, requires complex and coordinated gene regulation. To generate the multilayered cortex, various transcription factors help to establish a balance between cellular proliferation and neuronal differentiation. The transcription factor family of Sox C genes has recently been suggested to promote neuronal fates during development. Indeed, we have shown that two Sox C members, Sox 4 and 11, promote a morphologically elaborate and mature neuronal identity. Having also established the nearly identical nature of their *in vivo* expression patterns, we observed that Sox 4 is uniquely expressed in a discrete subset of cortical cells. Through layer staining, a BrdU/Ki67-based cell cycle paradigm, and *in/ex utero* electroporation, we sought to understand how Sox4 restricts the fate of neural progenitors to a distinct neuronal population. We found that Sox 4 promotes cell cycle re-entry, i.e. proliferative division, and an intermediate progenitor cell (IPC) fate in the subventricular zone (SVZ) of the cortex. Moreover, Sox4 overexpression promotes the maturation of radial glial cells. These results suggest that Sox4 promotes proliferation at early embryonic ages, while also inducing neuronal maturation and differentiation, at later ages. The dynamicity of Sox4's expression and unique IPC population support the importance of Sox4 expression for proper cortical development.

Implementation of an Enteral Nutrition Protocol for Low Birth Weight Infants

Margaret Horak; Melissa Miller RD¹; Dr. Nancy Williams-Horak, MD²

¹School of Nursing and Health Studies, Georgetown University; ²Washington Hospital Center Washington, D.C.

There is evidence that shared protocols will improve clinical outcomes in many areas of medicine. There is published evidence supporting certain clinical practices with regard to enteral feeds for premature infants, specifically ideas about early enteral feeds, bolus versus continuous feeds, feeds with umbilical lines and with certain medications and protein and other nutrient intake. In view of some of these potentially better practices, the neonatal team at Washington Hospital Center has implemented a new enteral feeding protocol for NICU infants with birth weight less than 2000 gms.

The use of the protocol is being tracked with respect to acceptance of the guidelines as well as clinical outcomes. Safety issues are also being tabulated – incidence of episodes of feeding intolerance, necrotizing enterocolitis and central line/parenteral nutrition complications. Growth parameters (weight gain and head circumference changes), length of stay, age at initiation of feeds and attainment of full feeds, use of continuous feeds (bolus feeds preferred) and use of GI medications (Zantac, Prevacid and Reglan) and special formulas to treat symptoms of feeding intolerance are also being tracked. A chart review comparison between the different protocol cohorts is being conducted.

It is our hypothesis that an evidence-based, shared feeding guideline will improve clinical outcomes relating to enteral nutrition. We expect that we will see stable to decreased incidences of gastrointestinal complications seen in premature infants (necrotizing enterocolitis, cholestasis and central line complications).

Knocking out ADI in *Giardia lamblia*: Potentiality for Treatment of Giardiasis in Humans

Lorena Infante Lara; Dr. Steven Singer, PhD

Department of Biology, Georgetown University, Washington, DC

Giardia lamblia is a protozoan parasite that infects a variety of hosts and colonizes the small intestine. Giardiasis has high prevalence in both developing and developed countries, making it highly relevant but often neglected. Available treatment options include drugs that have strong and adverse side-effects or incomplete efficacy. The *Giardia* enzyme adenosine deiminase (ADI) has been identified as a potential drug target. ADI metabolizes arginine both intracellularly for ATP production and extracellularly, depleting available arginine for host immune defenses. Given that ADI is not present in higher animals such as humans and that ADI has been shown to be the preferred source of energy for the parasite, it qualifies as a potential drug target. I hypothesized that inhibiting ADI in the parasite would increase the host's ability to fight the infection. However, it was unclear if ADI was essential for ATP production and the survival of the parasite and as such, I attempted to create an ADI *Giardia* knockdown by transfecting it with a plasmid containing a truncated copy of the ADI gene, expressed in an antisense orientation from the highly active OCT promoter. High levels of antisense transcripts should inhibit translation by binding of the sense mRNA strands (Davis-Hayman et al., 2002). Parasites containing antisense constructs can be used to test expression of ADI, parasite viability *in vivo* and *in vitro*, and effects on host immune responses. Results will help determine whether ADI is a drug target worth pursuing.

NEW INSIGHTS INTO CYTOSTATIC VERSUS CYTOCIDAL QUINOLINE DRUG PHARMACOLOGY AGAINST *PLASMODIUM FALCIPARUM*

Lauren M. Jacobs¹; Dr. Paul D. Roepe²; Dr. Steven Singer³; Dr. Alexander P. Gorka⁴

¹Department of Biology, Georgetown University; ²Department of Chemistry, Department of Biochemistry and Molecular and Cellular Biology, and Center for Infectious Disease, Georgetown University; ³Department of Biology, Georgetown University; ⁴Department of Chemistry, Georgetown University

Recent evidence has suggested that, for drugs such as quinolines, activity against the malarial parasite *Plasmodium falciparum* is highly dependent upon the dosing condition applied. That is, cytostatic or growth inhibitory activity is, in many ways, distinct from cytotoxic activity or the ability to promote cell death. However, efficacy, mechanisms of action of, and resistance to antimalarial drugs have historically been defined only from the former perspective. It becomes important then, to define both new and established aspects of these parameters from the standpoint of cytotoxic activity.

Cytostatic activity arises from drug interacting with multiple pre-crystalline forms of heme that then prevents crystallization to hemozoin (Hz). It is debated, however, whether ability to inhibit Hz formation is correlated with IC₅₀-based drug potency, and completely unknown whether such a correlation exists with LD₅₀-based potency. Alternatively, is potent inhibition of Hz formation requisite for drugs to have potent cytostatic or cytotoxic antiplasmodial activity?

Using several high-throughput drug screening assays, we directly test whether ability to inhibit Hz formation is correlated with antiplasmodial cytostatic and cytotoxic activity. For a series of quinoline drug analogues, we find cytostatic activity to be correlated with Hz inhibition but not cytotoxic activity. We also probe for differences in activity of antimalarial drug combinations, which currently form the frontlines of malaria chemotherapeutics, under these dosing conditions, and find significant distinctions in antiplasmodial response. Collectively, this work provides additional insight into cytostatic and cytotoxic quinoline drug pharmacology and assists development of new, efficacious drugs in the fight against resistance.

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An Acute Stressor Enhances Striatal-based Implicit Learning

Marcie L. King¹; Dr. Katherine R. Gamble, PhD¹; Dr. James H. Howard, Jr., PhD^{1,2,3}; Dr. Darlene V. Howard, PhD¹

¹Department of Psychology, Georgetown University; ²Department of Psychology, The Catholic University of America; ³Department of Neurology, Georgetown University Medical Center

Stress has widespread implications on cognitive processes such as memory and learning. Studies show that in response to stress, animals and humans often switch from hippocampal-based spatial learning strategies to striatal-based stimulus-response learning strategies. While there is evidence that performance on striatal-based tasks is not impaired by stress, and in fact, may be optimal under stress when other strategies could be used, no studies have examined how stress affects implicit learning, specifically tasks that rely on the striatum. In this study, we used the Triplets Learning Task (TLT) to examine the effects of stress on implicit learning. The TLT is an implicit sequence-learning task in which participants learn to respond more quickly and accurately to patterns occurring at higher frequencies without being aware of the pattern. In the TLT, young adults rely on the striatum for learning, which makes this an ideal task to investigate the effects of stress on implicit learning. To induce stress, we used the cold pressor task (CPT), which causes a physiological stress response similar to that of a mild daily stressor. Twenty-five young adults were randomly assigned to either the Control group (n=13) or the Stress group (n=12). There was a significant Triplet type (high vs. low) x Condition (control vs. stress) interaction ($p=.025$) for accuracy, indicating that participants in the stress group learned more than controls.

The Accountable Care Organization Summit: Key Findings, Outcomes, and Challenges

Caitlin Koury; Lucas Iannaccone; Andrew Strunk; Ali Udelson; Alexis Boaz; Carly Cianci; Suzanne Huszagh; Margot Keale; Dr. Michael Stoto, PhD

Department of Healthcare Management and Policy, School of Nursing and Health Studies, Georgetown University, Washington, DC

In order to explore the implications of the Patient Protection and Affordable Care Act's (ACA) establishment of Accountable Care Organizations (ACO), the Department of Health Systems Administration's Academy Health Chapter selected healthcare leaders to discuss best practices and issues in implementation for ACOs. The healthcare leaders participated in the ACO Summit 2012, where they were asked to consider the challenges, benefits, and strategies to ACO implementation. Workshop participants discussed each component of the ACO, using case studies as examples and providing primary evidence based on their experiences. We collected details of conference proceedings, analyzed them for common themes, and shared the themes with the participants afterwards. Furthermore, we identified key challenges and opportunities that organizations are experiencing in implementing the ACO model.

ACOs are at the forefront of healthcare reform. It is essential for emerging ACOs to establish well-devised transitional plans employing established quality and financial metrics. Our research indicates ACOs will be challenged by organizational and structural challenges that include changes to clinical and financial models, managing change and transitions, as well as improvements in quality, price, and performance metrics. Participants identified promising solutions and tools for implementing care coordination and management as well as utilizing health information technology.

We are able to conclude ACOs must address four critical dimensions of quality: patient-caregiver experience, preventive health measures, care coordination and patient safety, and identifying at risk populations. Without these common objectives, the central goals of ACOs, quality improvement, care efficiency, and cost management, will not be achieved.

The Meaning and Measurement of Linkage Disequilibrium

Gabriela Liévano; Dr. Manus M. Patten, PhD

Department of Biology, Georgetown University, Washington, DC

Linkage disequilibrium (LD), defined as the nonrandom association of alleles at two or more loci, is a fundamental measurement in population genetics that emerged from separate derivations (Kimura 1956; Lewontin and Kojima 1960). We find that the originators of LD were defining different quantities because they were measuring allele associations at different stages of the life cycle. While Kimura¹ measured LD in diploid zygotes, Lewontin and Kojima² measured LD in haploid gametes. We show that these two measures of LD can be incongruent, suggesting that LD has yet to be satisfactorily defined. This incongruence is pronounced when populations of males and females have different allele frequencies, which occurs when the two sexes face different natural selection pressures.

Independent of its definition, LD is captured by the statistic D , which measures the extent to which two alleles are nonrandomly associated. Because D is sensitive to allele frequencies, a standardizing statistic, D' , must be used to compare D between different populations³. We show theoretically that D' is not suitable for the comparison of populations in which males and females have different allele frequencies. We propose a new statistic that accommodates sex-specific allele frequencies, capturing the extent of non-random association between loci and overcoming the shortcomings of D' .

Genomic Alterations In Triple Negative Breast Cancer Cell Lines

Kamil Lupicki; Dr. Luciane R. Cavalli, PhD

Lombardi Comprehensive Cancer Center, Georgetown University, Washington, DC

Triple-negative breast cancer (TNBC) is a heterogeneous group of cancers. TNBCs can be studied using cell line models. Recently, 27 TNBC cell line models were categorized into basal-like-1 (BL1), basal-like-2 (BL2), immunomodulatory (IM), mesenchymal (M), mesenchymal-stem-like (MSL), and luminal androgen receptor (LAR) subtypes. In this study, we aim to further characterize the genomic alterations in 18 TNBC cell line models available from the Tissue Culture Shared Resources from Lombardi Comprehensive Cancer Center. Array-comparative genomic hybridization (CGH) analysis will be used to characterize global DNA copy number changes. These data will provide information regarding the relative number of amplifications and deletions and which genomic regions may be involved in tumorigenesis in each TNBC model. Fluorescence *in situ* hybridization (FISH) analysis will be used to investigate DNA copy number changes in the BP1 (BETA PROTEIN 1) and HER2/NEU genes as findings suggest that these genes may play a role in breast tumorigenesis and DNA copy number may play a role in their regulation. The data from the global genomic and BP1 and HER2/NEU copy number analysis will be correlated with data from clinical TNBC cases in order to determine if these cases can be associated with the TNBC cell line model subtypes. The identification of diverse TNBC subtypes and molecular drivers in these cell line models can provide great insight into the heterogeneity of the disease and provide platforms for preclinical experiments.

The Requirements of Maternal Thyroid Hormones in the Development of Larvae Zebrafish

Alfred Mabika; Dr. Victoria Connaughton

Department of Biology, American University

Hyperthyroidism is a curable condition in which the thyroid gland produces excessive amount of thyroid hormones. The present study aims to investigate the effects that methimazole, which is an thyroid inhibitory drug used to treat hyperthyroidism, has on the development of larva zebrafish. In particular, this experiment will compare the total body length, pupillary distance, curvature and eye' size of larva zebrafish that were incubated in methimazole with respect to that of larva zebrafish that were placed in a water solution. According to the preliminary data collected, methimazole increases the pupillary distance, spinal curvature and the size of the eye of larva zebrafish by 9.89%, 1.58%, and 4.5%, respectively. Hence, this research project suggests that providing alternative drugs such as propylthiouracil hyperthyroidism patients during the time of pregnancy might help protect the fetuses from birth defects.

A Rhodium-Catalyzed Imine Formation Reaction for the Synthesis of Polyfunctional Organic Molecules

Michael D. Mandler; Dr. Phong Truong, PhD; Dr. Michael P. Doyle, PhD

University of Maryland, College Park, MD

A general method for the synthesis of imines by rhodium(II)-catalyzed reactions of α -diazocarbonyl compounds and organic azides was developed. This approach represents a novel and mild method for the introduction of an imine functionality into complex organic frameworks, where alternative condensation routes would not be possible. The reactions of enoldiazo compounds with azides provide direct access to azadienes, which were applied in Diels-Alder cycloaddition reactions to yield functionalized pyrimidine analogues. Pyrimidine derivatives are important heterocyclic compounds that have been found to demonstrate biological activity.

Fibromyalgia and Bullying: A Comprehensive Review of the Literature

Fabianna Pergolizzi¹; Robert Taylor Jr., PhD²; Joseph V. Pergolizzi Jr., MD³

¹Department of Psychology, Georgetown University and Project Anti-bully, Naples, FL; ²Association of Chronic Pain Patients, Naples, FL; ³Adjunct Faculty Department of Anesthesiology, Georgetown University School of Medicine

BACKGROUND: Fibromyalgia is a chronic pain condition in which a person has wide spread bodily pain and tenderness in the joints, muscles, tendons, and other soft tissues. The causes of fibromyalgia are not fully understood, but research has indicated that physical and/or emotional trauma may promote the development of fibromyalgia. Recently, bullying has garnered much attention in the media due to its long lasting effects on a person's psychological and physical well-being. Children and younger adults who experience bullying have both an acute and chronic increased risk to experiencing depression, anxiety, changes in sleep patterns, and poor health.

METHODS: To gain a better understanding of the association between bullying and the development of fibromyalgia, a comprehensive review of the literature was performed. Databases were searched during the time periods of database inception to December 2012. The main search terms used included "fibromyalgia", "bullying", "childhood stress" and/ or "chronic pain".

RESULTS: Analysis of the literature revealed that fibromyalgia patients were generally associated with more stressful, negative lifetime events as a result of childhood or adult victimization and trauma. In addition, the literature tended to support that female victims were more likely to develop fibromyalgia.

CONCLUSION: Experiencing trauma may reshape the neurotransmitter and endocrine circuits, resulting in the development of increased anxiety, stress, and pain perception. Understanding the consequences of bullying and its association with chronic pain development is important for developing effective therapeutic regimens.

Bivariate associations between the cingulum, executive attention tasks, and APOE and DAT1

Hillary Raab¹; Benson Stevens²; Megna Raksit³; Adam Green³

¹Department of Biology, Georgetown University; ²Interdisciplinary Program in Neuroscience, Georgetown University; ³Department of Psychology, Georgetown University, Washington, DC

Investigating variations in genes that affect neuronal development and communication may lead to insights into the neural basis of intelligence. Previous work has indicated positive correlations between structural connectivity (SC) and IQ.¹ Therefore, the neural basis of intelligence may depend on genetic variants, influencing the integrity of white matter connections in the brain. We aim to generate a gene-brain-cognition path-analytic model, bridging genetics and intelligence with diffusion tensor imaging (DTI) data.² Taking a candidate gene approach, we investigated the relationship of genetic polymorphisms, APOE and DAT1, to measures of executive attention and SC obtained via DTI. Fifty-six healthy young adults participated in cognitive tasks, provided DNA, and underwent DTI.

Results indicated that individuals *without* the APOE4 allele, a risk factor for Alzheimer's disease, had significantly greater SC in the cingulum, which is crucial for executive attention. However, participants *with* the APOE4 allele had quicker response times, suggesting better cognitive performance associated with the APOE4 allele. For the DAT1 polymorphism, 10-repeat homozygotes had greater SC values than 9-repeat homozygotes or 9/10 heterozygotes in numerous tracts. However, the 10-repeat allele was associated with significantly slower response times. The fact that DAT 9-repeat carriers and homozygotes and APOE4 carriers had lower connectivity values despite their better performance on executive function tasks suggests that greater SC in the identified tracts may be associated with overconnectivity that may interfere with efficient executive attentional function. However, in the case of APOE, this effect may reverse with age, consistent with the antagonistic pleiotropic account of APOE4.

The role of *arnt2* in the regulation of oxytocin expression in developing zebrafish

Katherine Schertz¹; Runjia Cui²; Vivianne Greenwood³; Eric Glasgow³

¹School of Nursing and Health Sciences, Georgetown University, Washington, DC; ²Department of Biochemistry and Molecular Biology, Georgetown University, Washington, DC; ³Department of Oncology, Lombardi Comprehensive Cancer Center, Georgetown University, Washington, DC

In zebrafish, the aryl hydrocarbon receptor nuclear translocator (ARNT) is a helix-loop-helix –PAS heterodimeric protein, which is a basic transcription factor that dimerizes with other helix-loop-helix-PAS proteins to mediate biological response. Specifically, *arnt2* and its heterodimer, *sim1*, work to promote the differentiation and development of oxytocin cells in the hypothalamus. In addition to the *sim1*, *arnt2* heterodimer, two additional transcription factors, OTP and Pou47/Brn1.2 have been shown to be required for oxytocin cell development as well. The current “cascade” model implies that *arnt2* is necessary for Pou47 to function (Eaton and Glasgow, 2006). However, this study uses In Situ Hybridization of *arnt2* null mutants, followed by genetic analysis to demonstrate that the *pou47* gene is still expressed, even in the absence of *arnt2*. These results support the “combinatorial” model, which describes each protein pathway as parallel, but independent of each other.

The Role of EPHA7 in Cortical Synapse Formation

Marie-Sophie van der Goes¹; Carrie Leonard²; Meredith Clifford²; Xiumei Zhao¹; Maria Donoghue¹; Stefano Vicini³

¹Department of Neurobiology, Georgetown University; ²Interdisciplinary Program in Neuroscience, Georgetown University; ³Department of Physiology and Pharmacology, Georgetown University Medical Center, Washington, DC

The development of the brain cortex is a finely regulated process, which relies on the action of several signaling molecules, including the Ephs-ephrins (Pasquale et al, 2005). After migration to the appropriate layer, cortical cells extend filopodia to create connections and give rise to synapses. Failure to accomplish this task could result in cognitive and/or motor deficits.

Of particular interest is the development of the excitatory post-synaptic sites, the dendritic spines, in cortical pyramidal neurons of layers IV and V as mediated by EphA7 receptor signaling upon binding to its ligand EphrinA5 (Miller et al, 2006). We asked what effect this receptor has on synapse maturation during cortical development in mice, by performing in vitro single, whole-cell patch clamp recordings, measuring miniature excitatory post-synaptic currents at different time points. We found that EphA7^{-/-} cortical neurons have an altered synaptic strengthening pattern from control, suggesting a role for the receptor in this process.

Next we hypothesized that the coordinated actions of two alternative splice forms of EphA7, one full length (FL) and one lacking the intracellular catalytic domain (TR) (Ciossek et al, 1999), regulate the formation of synapses. It has been shown that the FL has a repulsive effect upon binding to EphrinA5, the TR an adhesive (Holmberg et al, 2000). We performed in-utero-electroporation with cDNA of either form in *EphA7*^{-/-} mice to compare the physiological phenotypes. We found that the TR accelerates the strengthening of the synapses, and we expect the FL to restrict this process.

The effect of menstrual cycle on pain thresholds in Vulvodynia patients and healthy controls

Andrea Wallach¹; Dr. Lara Burrows, MD., M.Sc.²; Shaunaugh Browning, RN³; Amber Surian, RN³; Maureen Basha, PhD.¹

¹Georgetown University Department of Human Science;²Center for Vulvovaginal Disorders;³Georgetown University Hospital Clinical Research Unit

Vulvodynia is a poorly understood chronic pain condition affecting up to 25% of women during their lifetimes that involves vulvar pain with an unknown cause (1). Provoked Localized Vulvodynia (PLV) is characterized by localized, vestibular pain in response to light touch. There is considerable evidence that PLV involves innervation of the vestibule (2).

The effects of many chronic pain conditions in women have been shown to vary with menstrual cycle stage. Animal studies have demonstrated that low estrogen levels change both the morphology and the degree of innervation of vaginal tissue (3). As shown in Figure 1, Ovariectomy has been linked to increased vaginal innervation, which is associated with decreased pain thresholds to mechanical stimuli.

These findings may indicate a difference in vulvovaginal pain sensitivity between follicular phase and luteal phase of the menstrual cycle due to differing levels of ovarian hormones.

HIV Knowledge and Sexual Risk Among Female Sex Workers and Their Clients in China who Report Methamphetamine Use: Results from a Behavioral Survey

Zaccaro H¹; Thura N¹; Zhang N²; Huang, ZJ¹

¹Department of International Health, School of Nursing and Health Studies, Georgetown University, Washington, DC; ²Jiaozhou Xincheng Clinic, China

Background: Prevalence of syphilis, HIV, and other sexually transmitted infections (STIs) soared in China in the last decade. Most current prevention programs target female sex workers (FSW), even though the research literature shows that male clients determine sexually risky behaviors and substance abuse¹. This study aims to provide comparisons of HIV knowledge and STI related risk behaviors between FSW and clients.

Methods: Data on methamphetamine use patterns, condom use, HIV transmission knowledge, and syphilis prevalence were obtained through a survey of 408 FSW and 135 male clients at an STI clinic in Jiaozhou, Shangdong, China. Chi-square, T-tests, and logistic regressions were used to compare these variables between FSW and their clients.

Results: Male clients were older, more likely to be married, and migrated to the area. While male clients were more likely to use condoms with their regular partners (88.9% vs. 59.8% for FSW, $p < .001$), FSW were more likely to report using condoms at their last sexual encounter (67.4% vs. 15.6%, $p < .001$). Additionally, FSW had better knowledge on HIV transmission routes. Male clients reported a significantly longer duration of methamphetamine use than FSW (25.9 months vs. 18.9 months, $p < .001$) and methamphetamine use was associated with syphilis prevalence among the clients.

Conclusions: This study confirms that both FSW and their clients are high-risk “bridging” populations for transmission of STIs from high risk group to general population. Prevention strategies on STIs should target both FSW and their clients.

Mandible Fractures: Does the Presence of Third Molar Impact the Fracture Type and Incidence Rate?

David Weiner, M.S.; Brian Will; Neil McGroarty; Mike Morris; Dave Milzman MD, FACEP

¹Georgetown University; ²Georgetown University School of Medicine; ³Dept. Emergency Medicine and Trauma, Washington Hospital Center Washington, DC

Facial trauma is a common cause of Mandible fracture. The majority are young men, and the mechanism of injury is often due to assault, vehicular accident, or falls. Typically happen at the parasymphysis, condyle, and/or angle of the mandible

Objective: To determine if the presence of third molars particularly, impacted teeth create a increased risk for mandible fracture compared to persons with an already extracted third molar due to ossification and stronger mandible in that region.

Peak troponin in NSTEMI: Do patient characteristics have an effect?

Mallory P. Barnett¹; George B. Hughes-Strange MD²; Christos Polymeropoulos; James Steel Howard; Ciarra Sanchez; Caitlin Mahoney; Andrew Harkins; Dave Milzman, MD FACEP

¹Georgetown University and Georgetown U. School of Medicine; ²University of Illinois College of Medicine at Chicago; ⁴Washington Hospital Center
Department of Emergency Medicine

OBJECTIVE: Cardiac troponin (cTnI) elevation is central to the diagnosis of non-ST elevation myocardial infarction (NSTEMI). The objective of this study was to determine whether patient demographics including age, sex, race, and BMI are associated with the peak cTnI level recorded during an NSTEMI event.

METHODS: In a cross-sectional study of 591 patients with an ED admission diagnosis of NSTEMI, we examined the association between age, sex, race, and BMI, and peak cTnI. The study population consisted of all patients who presented to the Washington Hospital Center (WHC) ED from 11/15/2009 to 12/31/2011 with an admission diagnosis of NSTEMI. Patients were identified through the Amalga EMR system using an ICD-9 code search criterion of 410.71 (NSTEMI).

RESULTS: 635 patients matched our search criterion for an ICD-9 code of 410.71. Of these, 44 patients were excluded from further analysis. 22 were excluded for cTnI levels that were either not recorded or were too low for detection and 22 were excluded for missing height or weight. Linear regression analysis for mean peak cTnI was completed for age, sex, race, and BMI. Age was the only patient characteristic found to be significantly associated with peak cTnI, where each increase in one year of age was accompanied by a decrease of .366 ng/ml cTnI. Age remained a significant predictor of peak cTnI in a multivariable regression analysis that adjusted for all patient characteristics (MD = -.146, p = .021). Obese patients, females and African Americans had lower peak cTnI; however the association was not significant.

CONCLUSION: Age is negatively correlated with peak troponin in patients presenting to the ED with NSTEMI.