Online Proceedings

Poster Session 2

MGH 241, Easel 142

1:00 PM to 2:30 PM

Further Investigation into the Influence of UGT1A4*3 Genotype on The Glucuronidation of 25-Hydroxyvitamin D_3

Huanbin Huang, Senior, Physics: Biophysics
Mentor: Kenneth Thummel, Pharmaceutics
Mentor: Tim Wong, Pharmaceutics

Uridine diphosphate glucuronosyltransferase 1A4 (UGT1A4) is a phase II drug metabolizing enzyme that plays an important role in the conjugation of various xenobiotics and endogenous compounds. In the context of vitamin D metabolism, conjugation of 25-hydroxyvitamin D3 (25(OH)D3), the main circulating form of vitamin D, may function as a pathway to help facilitate the enterohepatic circulation of vitamin D. Allele variants of the UGT1A4 gene are reported to contribute to inter-individual differences in enzyme activity, with the UGT1A4*3 variant gene product exhibiting increased glucuronidation activity. Previous work in our lab evaluated the polymorphic glucuronidation of vitamin D using human liver microsomes isolated from liver samples that were procured by St. Jude Children's Research Hospital and University of Washington. The study found that carriers of the UGT1A4*3 allele showed increased 25(OH)D3 glucuronidation activity. While the samples used in this previous work was limited to a smaller subset of livers with the UGT1A4*3 genotype, we sought to further our investigation to include gene expression data obtained through RNA-Seq analysis and UGT1A4 protein quantification in LC-MS data. In addition, the current analysis was expanded to include a significantly greater portion of both the St. Jude and UW liver banks. From this study, we hope to gain greater insight into the impact that the *3 allele may have on the RNA and protein expression of UGT1A4. In addition, by assessing the relationship between UGT1A4*3 genotype and 25(OH)D3 glucuronidation, we may develop a better understanding of factors that may contribute to the variability in the biliary excretion and/or plasma levels of vitamin D glucuronides.

Session 2L

Water, Waste, and Monkeys

Session Moderator: Stevan Harrell, Anthropology

MGH 284

3:30 PM to 5:15 PM

* Note: Titles in order of presentation.

Waste Management in the Remote Developing Communities of Las Piedras: A Case Study in Lucerna, Peru

Danielle Bogardus, Junior, Environmental Studies
UW Honors Program
Mentor: Tim Billo, Program on the Environment
Mentor: Samantha Zwicker, School of Environmental and Forest Sciences

The migrant community of Lucerna is located in the last pristine frontier forest of the Madre de Dios region of Peru, and has a fluctuating population of approximately 65 residents. To date, their waste management practices include burning, burial, and dumping waste in the river, which is causing both environmental and human health risks. The aim of this study was to understand the amount of waste and its composition, the levels of water contamination, and the mentalities towards waste management within this remote river town. Data collected during both the dry and wet field seasons and seven waste audits suggest that each family produces 3.5 kilos of waste per week on average. The composition of this waste includes plastics (bottles and bags), cans, glass, and miscellaneous waste. Organic waste is primarily reused as food for livestock and was therefore excluded from this study. The amount of waste acquired per family remained constant between seasons. Thorough water sampling was completed that will later supplement waste audits to correlate water contamination and the current burning, burial, and dumping of waste near water sources. Mentalities towards waste management were measured through informal interviews and observation. The option to transport waste to the closest city of Puerto Maldonado was impractical due to the cost and needed organization within the community. Instead, garbage pits were constructed in January of 2017 to ensure proper waste management and the mitigation of contamination until the necessary infrastructure is in place at the municipal level. This case study will serve as a replicable waste management frame-

work for other remote developing communities within the Las Piedras region, and Amazonia as a whole.

SESSION 2N

FOREST ECOLOGY AND EVOLUTION

Session Moderator: Gregory Ettl, Forest Resources
MGH 288
3:30 PM to 5:15 PM
* Note: Titles in order of presentation.

Measuring Parent Cacao Seedling Growth in Hoja Nueva's Experimental Plots: A Case Study in the Lowland Peruvian Amazon
Megan Schenck, Senior, Environmental Science & Resource Management
UW Honors Program
Mentor: Tim Billo, Program on the Environment
Mentor: Samantha Zwicker, School of Environmental and Forest Sciences

Cacao (*Theobroma cacao*) is a perennial crop grown in the tropics to produce chocolate worldwide. In the home country of cacao- Peru- wild varieties have been domesticated, cropped, and crossbred to create the optimal plant for specific climates. A study in the Valle Rio Apurímac-Ene (VRAE) region of Peru investigated 120 different varieties of cacao with diverse aromas and tastes, several of which have won awards for producing the best chocolate in the country. When members of these communities fled civil conflict five years ago and came to the Amazon, they brought several varieties not bred for this climate. My study measured the growth of one-year-old cacao seedlings in the experiment plots of Hoja Nueva, a nonprofit working in the lowland Peruvian Amazon. Although VRAE varieties are sun-grown, Hoja Nueva is growing these culturally significant varieties sustainably by keeping native shade trees, using biochar and biopesticides, and implementing reforestation programs that offset deforestation. This study is one of the first to be carried out in the field, since most growth studies have taken place in greenhouses. Environmental and abiotic factors play a pivotal role in seedling development. For 6 weeks abroad, I measured the temperature, light, overstory canopy cover, soil, and micro-climate within Hoja Nueva's cacao farms, along with the growth of individual parent cacao seedlings. Preliminary results show significantly more seedling growth in areas of higher light intensity and lower overstory canopy cover. This study will serve as the foundation for a replicated study next January, looking at one-year-old grafted cacao plants. Once grafted, it is hypothesized that seedlings will display equal growth in the shade and sun plots. The goal of this study long-term is to produce the same quality and yield of cacao per year as the community is currently, to limit deforestation, and eventually introduce shade-grown cacao varieties to the region.

POSTER SESSION 3

MGH 206, Easel 168
2:30 PM to 4:00 PM

Assessing the Taxonomic Utility of Grass Silica Short Cells Using 3-D Morphometrics
Ashly Marie Senske, Senior, Biology (Ecology, Evolution & Conservation)
Brian Desmond, Freshman, Pre-Sciences
Claire Rose Marvet, Senior, Biology (Ecology, Evolution & Conservation)
Sultan Akbar, Senior, Biology (Physiology)
Mentor: Caroline Stromberg, Biology
Mentor: Timothy Gallaher, Biology

Our research involves microscopic deposits of silica within the leaves of grasses, called phytoliths. Grasses produce distinctive phytoliths which can be diagnostic at various taxonomic levels. Phytoliths are particularly important in paleobotanical work because they can help us reconstruct earth's past vegetation and climate history. Currently, there is a severe lack of quantitative data on phytolith morphotypes and relative abundances within Poaceae, the grass family. We used confocal microscopy to create 3D images of phytoliths in the Bambusoideae, the Bamboo subfamily, and applied geometric morphometrics in order to quantify shape variation. The 3D objects will contribute to a family wide digital reference collection for use by paleobotanists and grass taxonomists worldwide.

POSTER SESSION 4

MGH 241, Easel 161
4:00 PM to 6:00 PM

Single Nucleotide Polymorphisms in SULT1A1 and Their Impact on SULT1A1 RNA and Protein Expression in Humans
Gregory Tong, Senior, Biology (Molecular, Cellular & Developmental)
Mentor: Tim Wong, Pharmaceutics
Mentor: Kenneth Thummel

Sulfate conjugation is an important metabolic pathway which has been shown to play a vital role in modulating the biological activity and disposition of drugs and endogenous compounds. Studies have shown that sulfotransferases (SULTs) have a broad substrate selectivity that includes hormones, neurotransmitters and xenobiotics. SULT proteins are expressed ubiquitously in human tissue, but is largely expressed in the gastrointestinal tract, liver and bone marrow. Numerous SULT isoforms exist in humans and the most predominate of

these isoforms in the liver is SULT1A1. In this study, we evaluate the impact of various single nucleotide polymorphisms (SNPs) present in the SULT1A1 gene using samples obtained by St Jude Children's Research Hospital and the University of Washington. Of particular interest is the effect these SNPs have on the RNA and protein expression of SULT1A1. In total, 17 SNPs within the SULT1A1 gene was identified. A subsequent analysis using RNA-seq data found that 7 out of the 17 SNPs were common variants with an allele frequency greater than 5%. To assess the effects of these SNPs on the protein expression of SULT1A1, samples of human liver cytosol was analyzed using a mass spectrometry based protein quantification method. While this protein analysis continues to be an ongoing effort, we expect results from this analysis to be consistent with genotypic trends observed in our RNA-seq dataset. By evaluating the relationship between various SNPs in the SULT1A1 gene and their effect on SULT1A1 RNA and protein levels, we hope to expand on our knowledge of the impact SNPs have on the disposition of substrates that undergo sulfonation.

POSTER SESSION 4

MGH 241, Easel 160

4:00 PM to 6:00 PM

Influence of Single Nucleotide Polymorphisms in SULT2A1-mediated Sulfonation of 25-Hydroxyvitamin D_3

Sara Soofian, Senior, Public Health-Global Health
Mary Gates Scholar, UW Honors Program
Mentor: Tim Wong, Pharmaceutics
Mentor: Kenneth Thummel, Pharmaceutics

Vitamin $D_3$is an essential hormone involved in the regulation of calcium and phosphate homeostasis. The major circulating form of vitamin D_3 is 25-hydroxyvitamin D_3 ($25(OH)D_3$) which is the biomarker often used as a measure of vitamin D status. In addition, the sulfonated form ($25(OH)D_3$-sulfate) has also been found to be a major metabolite, often circulating in plasma at concentrations comparable to, and at times exceeding, levels of the unconjugated form. Sulfate conjugation occurs primarily in the liver and is catalyzed by the enzyme sulfotransferase 2A1 (SULT2A1). In this study, we evaluated allele variants of the SULT2A1 gene in an effort to better understand factors that may contribute to the inter-individual variation of plasma vitamin D sulfate concentrations. Using liver samples obtained by St. Jude Children's Research Hospital and the University of Washington, our analysis revealed the presence of three common single nucleotide polymorphisms (SNPs). Of the three SNPs, only one SNP (rs296361) was found to be significantly associated with SULT2A1 mRNA and protein expression as well as vitamin D sulfonation activity. Specifically, we found that homozygous carriers of the mutant allele had significantly reduced expression of SULT2A1 both at the RNA and protein level as well as significantly reduced sulfonation activity. The results of this study provide valuable insight into the role that genetics plays in the disposition of vitamin D, and allows us to better understand factors that may impact inter-individual differences in plasma vitamin D levels.