

**ABSTRACTS: SUMMER 2005 RESEARCH PROGRAM
OF THE NATIONAL INSTITUTE OF DIABETES AND DIGESTIVE AND KIDNEY DISEASES,
and the CHARLES R. DREW SCHOOL OF MEDICINE AND SCIENCE**

INVESTIGATING THE RELATIONSHIP BETWEEN INTERLEUKIN-6 AND TYPE 2 DIABETES

Student Researcher: Samone Able

Mentor: Michele Sale, PhD; Wake Forest University School of Medicine, Winston-Salem, North Carolina

Researchers have shown that the Interleukin-6 (IL6) gene is connected to a risk of diabetes. The IL6 gene is an immune protein which protects from tissue damage and is a candidate gene for diabetes. The principal objective of this study is to test the hypothesis that Interleukin-6 (IL6-634 C/G) is a genetic factor predisposing to diabetic nephropathy in the African American population.

In order to test IL6-634 C/G the polymerase chain reaction method (PCR) is used to amplify the original DNA. Gel verification using an agarose gel electrophoresis is performed to determine if the PCR was successful. Using the resulting PCR product and a BsrB1 a restriction digest is performed in order to determine the genotype of the person. The restriction enzyme locates a particular part of the gene to determine if the recognition sequence is absent or present at the site.

We compared the DNA of 384 African American diabetes cases and 269 African American controls to see if the cases or controls have a majority of the "C" allele or "G" allele. This result showed that more cases were prone to diabetes because they have the "G" allele. The "G" allele has a greater inflammatory response. Finding out if a person has a "G" allele related to the IL6 gene can determine if they are at risk of having diabetes.

INFLAMMATORY CYTOKINE GENE POLYMORPHISMS IN HASHIMOTO'S THYROIDITIS PATIENTS WITH OR WITHOUT DEPRESSION

Student Researcher: Jennice M. Alers-Rosario

Mentor: Idhaliz Flores, PhD; Ponce School of Medicine, Ponce, Puerto Rico

Hashimoto's thyroiditis (HT), the most common form of thyroiditis, is defined as an inflammation of the thyroid gland. Although the cause of HT is unknown, it has been classified as an autoimmune disease in which antibodies attack the thyroid gland. Some patients with HT develop depression, while some do not. The aim of this study is to determine the relationship between inflammatory cytokine gene polymorphisms (eg, interleukin-1B [IL-1 β] and IL-1 receptor antagonist [IL-1RN]) and depression in patients with HT. Genomic DNA was extracted from peripheral blood of 25 subjects, categorized in four groups: HT without depression ($n=8$), HT with depression ($n=10$), depression only ($n=4$), and normal controls ($n=3$). Polymorphisms in IL-1 β and IL-1RN genes were analyzed by polymerase chain reaction–restriction fragment length polymorphism. The polymorphic sites studied include promoter regions of IL-1 β at positions +3954 and IL-1RN variable number tandem repeats and position +2018. Our hypothesis is that patients with HT that have polymorphisms in the IL-1 β and IL-1RN genes have a higher predisposition to develop depression. These studies will provide clues that may result in the use of these polymorphisms as markers of predisposition to depression in HT patients.

TEEN PREGNANCY IN URBAN COMMUNITIES

Student Researchers: Monique Gaines; Brittni Smith

Mentor: Eric Ayers, MD; Wayne State University, Detroit, Michigan

According to research conducted by Allen Guttmacher Institute (AGI), teens that live in low-income communities are more likely to become pregnant. The purpose of this project was to determine why teens who live in more impoverished communities are more likely to engage in sexual intercourse, as well as to determine more effective ways to inform teens about sex to prevent intercourse at early ages.

In order to address the research question, a questionnaire was created that assessed the perceptions and attitudes of adolescent mothers in teen pregnancy clinics. The questionnaire was distributed to 50 adolescent females 13–18 years of age. Sixty-five percent of teens feel most comfortable talking to their friends about sex, 27% are comfortable talking with parents, and 8% chose other. Most teens (80%) believed that their community influenced their decision to have sex, while 20% said that it did not. In addition, 84% of teens believe that the media plays a role in the way teenagers perceive sex. In conclusion, all hypotheses were supported by the data.

AMELIORATION OF RENAL OXIDATIVE STRESS BY PHYSICAL CONDITIONING IN CHRONIC ALCOHOL-INDUCED HYPERTENSION: MECHANISM AND PREVENTION

Student Researcher: Ricardo Carrero-Vallé

Mentor: Kazim Husain, PhD; Ponce School of Medicine, Ponce, Puerto Rico

Populations throughout the world perform regular aerobic exercise to keep good cardiovascular health. Epidemiologic studies have shown that chronic, high-dose alcohol consumption increases mortality and causes cardiorenal diseases, including hypertension. We do not know whether aerobic physical activity ameliorates the oxidative stress to the kidney and hypertension caused by chronic alcohol consumption. Therefore, our project tested the hypothesis that physical conditioning abrogates the hypertension and oxidative renal injury caused by chronic alcohol ingestion in rats.

Male Fisher rats were divided into three groups of seven animals each and treated as follows: 1) control rats orally fed 5% sucrose daily for 12 weeks; 2) rats orally fed ethanol daily at a dose of 4 g/kg for 12 weeks; and 3) rats orally fed ethanol daily at a dose of 4 g/kg for 12 weeks and given exercise training on a treadmill. The blood pressure (BP) was recorded weekly by the tail-cuff method. At the end of the treatment, rats were sacrificed and kidneys were isolated and analyzed for oxidative stress parameters.

Chronic alcohol administration caused a profound increase in mean BP 6 weeks after treatment. The increase in BP was correlated with a significant increase in malondialdehyde (MDA) levels, NADPH oxidase activity, and increased antioxidant enzyme activities of superoxide dismutase, catalase, and glutathione peroxidase in the kidney of alcohol-treated rats. Exercise training for 12 weeks significantly lowered the blood pressure and ameliorated the changes in renal oxidant and antioxidant system in chronic alcohol-treated rats.

The study concluded that regular aerobic exercise activity ameliorates the hypertension and related renal oxidative injury caused by chronic ethanol ingestion in rats.

CROSS SENSITIZATION OF VISCERAL DORSAL ROOT GANGLION NEURONS

Student Researcher: Erica L. Clark

Mentor: Victor V. Chaban, PhD; Charles R. Drew University of Medicine and Science, Los Angeles, California

Estrogen modulates nociception and behavioral responses to noxious stimuli. Defining the sites and mechanisms through which sex steroids modulate nociception are important steps in understanding and treating pain. The incidences of pain disorders known as functional pain syndromes are two to three times more prevalent in women than in men. Functional syndromes lack a specific pathology, and estrogen has been reported to either ameliorate or exacerbate nociception associated with these syndromes. Clinical observations of functional pain syndromes are congruent with experimental results that suggest estrogen has both anti-nociceptive and pro-nociceptive actions at the level of dorsal root ganglion (DRG). We examined the role of estrogen on peripheral modulation of nociception in a model of viscerovisceral cross-sensitivity. In this model of cross-sensitivity, inflammation of the reproductive tract increases sensitivity in DRG neurons innervating the colon through the release of nociceptive transmitters in the same DRG.

Our experiments suggest that estrogen may modulate cross-sensitivity in vivo. This hypothesis was tested by comparing vanilloid receptor (TRPV1) expression in uterine and colonic DRG in ovariectomized, estrogen-treated and untreated rats. Our data suggest that the same TRPV1-positive DRG neurons innervate both organs: uterus and colon. Estrogen may enhance cross-sensitization by lowering nociceptive thresholds of colonic afferent neurons producing allodynia and hyperalgesia in response to colon distension, without an inherent pathology, thus mimicking a functional pain syndrome such as irritable bowel syndrome. Together, these experiments will increase the understanding of the modulatory role of estrogen and suggest peripheral sites for therapeutic intervention.

CORTISOL LEVELS, DEPRESSION, AND DIABETES: CORRELATION BETWEEN CORTISOL LEVELS AND DEPRESSION IN PEOPLE WITH TYPE 2 DIABETES

Student Researcher: Erika Cordova

Mentors: Diana Echeverry, MD, MPH; Cynthia Gonzalez; Charles R. Drew University of Medicine and Science (DE); University of California, Los Angeles (CG); Los Angeles, California

Cortisol is a hormone produced by the adrenal glands and is known as the “stress hormone.” Cortisol secretion is part of the hypothalamic-pituitary-adrenal (HPA) axis, in which cortisol is secreted by the adrenals in response to physiologic stress. This hormone is higher in certain disease states such as depression and diabetes. Cortisol or alterations in the HPA axis may worsen diabetes; however, we do not know whether depression increases cortisol levels or cortisol causes depression. What is definitely known about the negative effects of cortisol are in the disease state called Cushing syndrome. Cushing syndrome is a disease of overproduction of cortisol. Patients with Cushing syndrome can suffer from both depression and diabetes. Hence, cortisol becomes an interesting parameter to examine in depression and diabetes. No studies have been conducted to determine patterns of cortisol secretion after treatment of depression in patients with diabetes.

This study will treat patients who have depression and diabetes. The aim of this project will be to observe cortisol patterns in the patients with depression and diabetes and to determine if treatment of depression with a selective serotonin reuptake inhibitor (SSRI) will affect cortisol levels.

This study will be a randomized, placebo-controlled trial treating and following subjects for six months using an SSRI to treat depression in subjects with diabetes. The main outcomes are glycemic control and quality of life, but for this portion of the study the aim will be to determine how cortisol levels are affected by the treatment of depression and to observe patterns of cortisol secretion in this patient population.

EFFECTS OF CRUCIFEROUS INDOLES ON LIPOGENIC GENE EXPRESSION IN HEPG2 CELLS

Student Researcher: Ashley Nicole Gagabi

Mentors: Joan Kuh; Andre Theriault; John A. Burns School of Medicine, University of Hawaii at Manoa, Honolulu, Hawaii

Gene expression of sterol regulatory element binding proteins (SREBPs) plays an important role in plasma lipid secretion, a factor associated with coronary heart disease and atherosclerosis. Previous laboratory studies have shown that indole-3-carbinol (I3C), a compound derived from cruciferous vegetables (eg, broccoli, cauliflower, radish, and cabbage), was able to reduce the production of lipids from a well-characterized human liver cell line, HepG2. This study investigated the mechanism of I3C in decreasing lipids by examining the gene expression of SREBP-1c in HepG2 cells. I3C is hypothesized to reduce lipid production by decreasing SREBP-1c gene expression. Cells were treated for 24 hours, and gene expression of SREBP-1c was analyzed by real-time quantitative polymerase chain reaction (PCR). Briefly, total RNA was isolated from the cells and quantified by using an ultraviolet spectrophotometer. First-strand cDNA was synthesized and analyzed by real-time PCR. The copy number of cDNA strands was determined by comparing threshold cycle number to that of a commercially available, serially diluted plasmid of known copy number that contained human open reading frames (ORFs). Evidence was provided that indole-3-carbinol did not reduce SREBP-1c gene expression. This finding may indicate that other transcription factors may be involved in lipogenesis. Moreover, with an increase of SREBP-1c, produced by the positive control, lipid secretion remained similar to the lipid secretion of the untreated group, which suggests that SREBP-1c may be regulated on a posttranscriptional level.

EXPLORATION OF ATTITUDES TOWARDS HIV AMONG MINORITY ADOLESCENTS

Student Researcher: Gabrielle Griffin

Mentor: Marcel Curlin, MD; University of Washington, Seattle, Washington

In the United States, HIV disproportionately affects individuals belonging to minority groups and persons of young age. Although the overall incidence of HIV infection has leveled or is declining in the general population, it continues to rise in selected groups. Knowledge, attitudes, and risk behaviors affect the rate of interpersonal transmission of HIV infection and may contribute to these epidemiologic trends. Most studies in this area were performed in the 1980s and early 1990s and may not accurately reflect current attitudes and popular knowledge about HIV in minority youth. To assess state of knowledge, attitudes, and self-perceived risk concerning HIV among adolescent minorities in the Seattle area, we interviewed a group of students by anonymous survey. Among 19 high-school-aged minority adolescents, fear of acquiring HIV ranged widely from no concern to great concern. However, nearly all participants perceived their risk of infection to be extremely low or zero. Perceived parental availability for discussion was high in most respondents, although the frequency of such discussions with parents was, on average, rated as very low. Correlates of social stigmatization with respect to HIV disease were relatively low. Reduced barriers to communication regarding HIV between at-risk youth and parents and peers and improved self-risk assessment may be important in reducing HIV transmission among at-risk youth. These questions should be systematically examined in larger studies.

IDENTIFICATION OF TARP INTERACTORS

Student Researchers: Carly D. Johnson, Emma Hayes

Mentor: Dane M. Chetkovich, MD, PhD; Northwestern University the Feinberg School of Medicine, Chicago, Illinois

Glutamate receptors are proteins that mediate excitatory communication between neurons in the brain. One type of glutamate receptor, α -amino-3-hydroxy-5-methylisoxazolepropionate receptor (AMPA), is moved to and from the synapse to control the strength of synaptic transmission, and this movement is critical for the synaptic changes that underlie some forms of learning and memory. Abnormal targeting of AMPARs can cause epilepsy and learning disorders. The mechanism of synaptic targeting of AMPAR depends on a class of proteins called TARPs (transmembrane AMPA receptor interacting proteins). One TARP, TARP-8, is enriched in the hippocampus, an area in the brain that is critical for memory. To better understand how the TARPs affect AMPAR function in memory, we are seeking to identify novel proteins that interact with TARP-8. Using an assay of protein-protein interaction, the yeast two-hybrid system, we are screening a cDNA library of brain proteins using the TARP-8 protein as bait to obtain interacting clones. By reintroducing these clones into yeast containing the TARP-8 protein, we will confirm specific interaction with TARP-8. We will perform restriction digest and DNA sequencing of interacting clones to identify the interacting proteins. By identifying TARP-8 interacting proteins, we will shed light on the mechanism by which TARPs facilitate AMPAR delivery to the synapse.

EFFECTIVENESS OF MAMMOGRAPHY DEPARTMENT PROCEDURE TO INITIATE RECALL FOR DIAGNOSTIC MAMMOGRAPHY AND ULTRASOUND FOR ABNORMAL SCREENING MAMMOGRAMS TO REDUCE THE LENGTH OF TIME TO DIAGNOSTIC RESOLUTION FOR BREAST MASS

Student Researcher: Beatrice Johnson

Mentors: Nancy Easterday, RN; Women's Services; Albemarle Hospital; Elizabeth City, New Jersey

Identification of breast disease on a screening mammogram produces high levels of anxiety for patients, therefore minimizing waiting time to a diagnostic resolution is imperative; the standard benchmark is two weeks. The purpose of this study was to determine whether, by changing the process for call backs in the diagnostic process, waiting time could be reduced. At Albemarle Hospital the length of time between the identification of a breast abnormality to the diagnostic workup (extra views, ultrasound, and/or needle/stereotactic biopsy) and final diagnostic resolution ranges from 2 to 58 days. This range demonstrates instability and inconsistency in the process. The mammography department implemented a new procedure in which a patient with an abnormal screening mammogram is recalled immediately for extra views and/or breast ultrasound, and the procedures are done at the same visit. The average length of time between first knowledge of breast abnormality to diagnostic resolution was 19.4 days before the change and 14.6 days after, a 4.8-day reduction (24.8% decrease). Significant improvement was demonstrated, especially if a patient did not require a biopsy to determine a definitive diagnosis. However, a patient requiring a stereotactic biopsy waited an average of 29 days, compared to 37 days before the process change. This research has identified opportunities to further reduce the waiting time for patients who require a biopsy for diagnostic resolution of an abnormal screening mammogram.

SEXUAL DYSFUNCTION IN WOMEN WITH TYPE 2 DIABETES

Student Researcher: Bernice Juarez

Mentors: Diana Echeverry, MD, MPH; Cynthia Gonzalez; Charles R. Drew University of Medicine and Science (DE); University of California, Los Angeles (CG); Los Angeles, California

Low-income minority populations have higher rates of depression and minimized control of their diabetes. Diabetes mellitus is a major health problem; the incidence in the United States is 500,000 each year, and diabetes is a leading cause of male erectile dysfunction. Sexual dysfunction in women with diabetes is less known. Depression also affects a person's sexual function, but no studies have examined sexual dysfunction in depressed people with diabetes.

This study will be a randomized, placebo-controlled trial treating participants with a selective serotonin reuptake inhibitor and following them for six months. The main outcomes are glycemic control and quality of life, but for this portion of the study the aim will be to determine the prevalence of sexual dysfunction in a low-income minority population with diabetes and to determine whether treating depression will improve sexual dysfunction along with quality of life. The methods employed to collect relevant data will be use of the Diabetes-39 Quality of Life Questionnaire.

WHERE DO UNDER-SERVED WOMEN WANT TO GET INFORMATION ABOUT THEIR BREAST HEALTH?

Student Researcher: Rachel Kessy

Mentor: Pamela Ganschow, MD and Arthur Evans, MD, MPH; John H. Stroger Hospital of Cook County, Oak Park, Illinois

In this study, we examined the information needs and preferences of indigent women attending a breast care program. We want to determine the kinds of literature that influence a woman's knowledge of breast cancer and breast health. Using convenience sampling, we performed face-to-face, structured interviews with 100 women at any one of three clinics in a breast care program at Cook County Hospital. The three clinics include a screening clinic, a high-risk clinic, and a diagnostic breast clinic. Most women attending these clinics are African American (60%) and Hispanic (30%), are between the ages of 20–70 years, have a low health literacy level, and are uninsured.

We found preferences for information based on age and ethnic background: women older than 70 were not likely to turn to the internet or magazines for breast health information and Hispanic women expressed interest in receiving materials in their native language. Our research points to a need to develop culturally appropriate and access-appropriate information to help women implement safe breast health measures.

FISH GENE AMPLIFICATION OF METAPHASE CELLS FROM BREAST CANCER CELL LINES

Student Researcher: Melissa Lecator

Mentor: Jan K Blancato, PhD; Georgetown University Medical Center, Washington, DC

Breast cancer is a common malignant disease that originates in the mammary tissue. Genetic changes are nonrandom and associated with the grade of the tumor. *c-myc* is a commonly amplified oncogene found in breast cancer and has been associated with poor prognosis. Located on chromosome 8q, *c-myc* can induce growth, aggravate cell cycle withdrawal and differentiation, and in some circumstances, stimulate apoptosis. Fluorescence in situ hybridization (FISH) is a method that uses fluorescent-labeled DNA probes to detect abnormalities found in chromosomes. Commonly used on metaphase cells, FISH identifies the amplification and levels of expression in cancerous genes. In this study, we used the FISH technique to examine breast cancer cell lines and breast cancer tissue arrays to see if other amplified oncogenes border the *c-myc* region. Other genes that flank *c-myc* are hypothesized on chromosome 8q because it is a gene-rich region, and past data have implicated larger amplifications than with *c-myc* alone. The results showed that *pvt-1*, an oncogene in the *c-myc* cluster, was co-amplified with *c-myc*. Unfortunately, the tissue array study showed no result because it was new to the lab and the proper protocol had not been established. Follow-up studies will be done on tumor tissue arrays.

EFFECT OF INCREASING BODY MASS INDEX (BMI) IN CHILDREN ON DIFFUSION CAPACITY IN THE LUNGS

Student Researcher: Laurel Macey

Mentor: Hiren Muzumdar, MD; SUNY Downstate Medical Center, Brooklyn, New York

Earlier studies have had conflicting results: increasing body mass index (BMI) has been associated with an increase or decrease in lung diffusion capacity (DL_{CO}). We studied the lung functions of obese children with BMI z scores ranging from 1.695 to 3.508. DL_{CO} was measured and adjusted for alveolar volume (DL_{CO-VA}) and correlated with increasing BMI z score. Over the range of BMI z scores that we studied, no correlation was seen between BMI z score and DL_{CO} . However, we found a weak but significant correlation between z score and DL_{CO-VA} . We conclude that obesity is a minor determinant of diffusion capacity over the range of BMI z scores that were studied.

TURNIP YELLOW MOSAIC VIRUS AS A SCAFFOLD FOR IN VIVO IMAGING OF TUMORS

Student Researcher: Kimberly McIntee

Mentor: Qian Wang, PhD; University of South Carolina, Department of Chemistry, Columbia, South Carolina

In this project, we attempt to employ the turnip yellow mosaic virus (TYMV) as a carrier of image contrast agents for tumor targeting to improve the sensitivity and success of early detection. Turnip yellow mosaic virus (TYMV) was gathered from the turnip plant through purifications, providing us with both empty and filled capsids of TYMV. A chemical modification was done by adding dyes, and the virus samples showed that near infrared fluorescent dye, a terbium metal complex, and a gadolinium complex can be attached to the virus for imaging studies. These attachments as well as the use of empty capsids formed by TYMV can later be used as early detection and drug delivery vehicles for cancer.

NUMEROUS BACTERIAL CHROMOSOMAL LOCI MANIPULATIONS: IMPROVEMENT UPON THE FLP-FRT SYSTEM BY CREATING DISTINCTIVE FRT SEQUENCES

Student Researcher: Tyler Mizumoto

Mentors: Yun Kang; Tamotsu Hirai; Tung Hoang, PhD; University of Hawaii at Manoa, Honolulu, Hawaii

With the ubiquity of bacterial infectious diseases and the completion of numerous bacterial genome sequences, the development of an efficient gene excision system is extremely pertinent. We improved upon the existing Flp-*FRT* gene excision system by creating distinctive *FRT* sequences for numerous bacterial chromosomal loci manipulations. The yeast 2- μ m plasmid Flp recombinates two identical *FRT* (flip-recombination-target) sites and excises the sequence in between. The *FRT* sequence is characterized by an asymmetrical 8-bp spacer region being flanked by two inverted 13-bp repeats. The existing Flp-*FRT* system is far from ideal, as multiple *FRT* sites on bacterial chromosomes can result in undesirable chromosomal rearrangements in the presence of Flp. The purpose of this research is to create alterations in the spacer region by multisite-directed-mutagenesis via polymerase chain reaction with an oligonucleotide primer, which reflects the spacer region change. This process should allow recombination of *FRT* sites with identical spacer regions but prevent recombination of *FRT* sites with different spacer regions; therefore, multiple chromosomal loci manipulations can be performed without unwanted chromosomal rearrangements. This improvement upon the Flp-*FRT* system will aid research of bacterial pathogens.

INTESTINAL MORPHOLOGY OF NORTHERN RED-BACKED VOLES (*CLETHRIONOMYS RUTILUS*) ON TWO DIFFERENT PHOTOPERIODS

Student Researcher: Lorena A.I. Nay

Mentors: April M. Brennan, MS; Ian G. van Tets; University of Alaska at Anchorage, Anchorage, Alaska

Photoperiod can affect body and organ mass in small mammals. These changes are most likely to be seen in arvicoline rodents because they do not hibernate and endure an extremely challenging energetic environment during winter in the arctic and subarctic ecosystems in which they are most often found. The onset of winter in high latitudes is characterized by an extreme change in photoperiod. Our aim was to test whether such a change in photoperiod alone could lead to a change in the mass or the length of the digestive organs of an arvicoline species known to reduce organ mass in winter in the wild: the northern red-backed vole (*Clethrionomys rutilus*). We measured the lengths and masses of stomachs and intestinal segments of 24 voles kept under different light regimens (12 voles, 6 male, 6 female, at 18 h light : 6 h dark and 12 voles, 6 male, 6 female, at 24 h dark). We compared the means for male and female voles under each light regimen using analyses of variance and found no significant differences in any of the categories due to photoperiod. We conclude that photoperiod alone is insufficient to lead to a reduction in organ mass in this species.

THE FUNCTION OF TAGGED PROTEIN SSA1 HIS-6X WITH CHAPERONE SSE1 IN IN VITRO BIOCHEMICAL STUDIES

Student Researcher: Timothy Patuwo

Mentors: Lance Shaner; Kevin Morano; University of Texas Medical School, Houston, Texas

Protein molecular chaperones are an essential component of the cellular stress response, as well as key players in protein biogenesis and regulation during normal growth. The chaperone Hsp90 facilitates the function of a number of intrinsically labile key regulatory protein "clients," such as growth control kinases (CDK, Raf) and steroid hormone receptors and protooncogenic regulators including the Src family of tyrosine kinases and the tumor suppressor p53. Because of its pivotal involvement in cell cycle progression, growth control, and signaling, understanding Hsp90 function and regulation is of critical importance. Using the powerful genetics of the single-celled eukaryote, *Saccharomyces cerevisiae*, the protein kinase Sch9, related to the protein kinase A and B (Akt) families of growth control kinases, was identified as a repressor of Hsp90 chaperone activity, indicating that a regulatory pathway controls Hsp90 function. We are investigating Hsp90 regulation by the Sch9 kinase and the signaling network that governs this pathway to coordinate stress response with cell growth and proliferation using both biochemical and genetic approaches.

The components of the heat shock response are highly conserved in all major kingdoms, making it one of the most ancient cellular regulatory systems. Yeast is an ideal microbial model system in which to investigate these questions because of its facile genetics, genomics and ease of manipulation. These studies will improve our understanding of how all eukaryotes, including humans, respond to stress at the molecular level. In the laboratory, we have focused on building a yeast with the gene phenotype SSA-1 attached with the vectors P414TEF and P416GPD and tagged with His6. The four main aspects of the research thus far have been to use PCR to incorporate the 6X HIS tag, clone the SSA1-6X HIS into PRS414, transform PRS414SSA16HIS into SSA1-45 (ts), and assay binding to Ni-resin.

FRICITION ANALYSIS ON OIL SHEEN

Student Researcher: Diamond F. Pearson

Mentors: Robert W Peters, PhD, PE, and Jim Martin, PhD; University of Alabama at Birmingham, Birmingham, Alabama

This bench-scale feasibility study involves treating an oil sheen with titanium dioxide as the photocatalyst. This project involves frictional experiments performed under various conditions such as florescent light and simulated rain water on a plywood surface treated with vegetable oil, 10W40 motor oil, and a titanium dioxide coating for the 10W40 motor oil.

TRANSMISSION OF ANTIBODIES FROM MOTHER TO CHILD IN THE PREVENTION OF DIARRHEA

Student Researcher: Mohammed Abid Razvi

Mentor: Kunle Kassim, PhD; Howard University, Washington, DC

Diarrhea is a leading cause of death among infants in developing countries. To survive, infants must have antibodies and other protective factors to fight off the enteric bacteria that cause diarrhea. These bacteria include *Escherichia coli*, *Klebsiella pneumoniae*, and *Salmonella enteritidis*. In many cases the necessary antibodies are transferred to the child from the mother by breast milk.

Our project tested the hypothesis that antibodies necessary to fight off enteric, diarrhea-causing bacteria are transferred from mother to infant through breast milk. To test the hypothesis, we grew and cultured enteric bacteria and then created antigens from the culture with a tissumizer to break the bacterial cell walls and a centrifuge to separate the cell remains from the antigens. The antigens were then combined with samples from a mother's serum and breast milk and from her child. We then determined whether the antibodies formed a complex with the antigens by using an enzyme-linked immunosorbent assay (ELISA). The optical density (OD) of the wells of the ELISA plate was measured at a wavelength of 410 nm. The ODs for the child and milk samples were close, which indicated that antibodies were transferred from mother to child through breast milk. The second part of the experiment was the bactericidal assay, which tested bacterial sensitivity to several milk proteins, including lysozyme, lactalbumin, and lactoferrin. All three proteins appeared to inhibit bacterial growth best at the dilution of .1 mg/mL. Lysozyme was the only protein that was affected by the amount of incubation time, working best with just 30 minutes of incubation. Combinations of the milk proteins did not inhibit bacterial growth because they cancelled each other out.

VARIANTS IN THE GENE ENCODING SOLUTE CARRIER FAMILY 12 MEMBER 3 (*SLC12A3*) AND DIABETIC NEPHROPATHY IN AMERICAN INDIANS

Student Researcher: Sanjana Seelam

Mentor: Johanna K. Wolford, PhD; Translational Genomics Research Institute, Phoenix, Arizona

Diabetic nephropathy is the leading cause of end-stage renal disease (ESRD) and accounts for significant morbidity and mortality among diabetic individuals. Both environmental and genetic factors underlie the pathogenesis of diabetic nephropathy, and variants in *SLC12A3* were found to be significantly associated with the disease in Japanese individuals with type 2 diabetes mellitus. We hypothesized that *SLC12A3* variants may also account for susceptibility to diabetic nephropathy in American Indians, who have high rates of this disease. The goal of this investigation was to identify variants in this gene and test them for association with diabetic nephropathy in Pima Indians. Primers were designed to amplify all exons, exon-intron boundaries, and upstream regulatory sequences to identify variants within the gene. All variants will be genotyped by using allelic discrimination in a case-control study group and a family-based sample and tested for association with diabetic nephropathy. The results of this study may provide further support for a role for *SLC12A3* in susceptibility to diabetic nephropathy.

EFFECT OF PROCAINAMIDE ON THE OXIDATION OF A THIOL BY HYDROGEN PEROXIDE

Student Researcher: Larhondé Sealey

Mentor: Donald A. Gerber, MD; State University of New York Health Science Center at Brooklyn (Downstate Medical Center), Brooklyn, New York

This project is a continuation of research begun last year on drug-induced lupus (DIL). Once again it tested the hypothesis that procainamide causes lupus by altering the reactivity of endogenous hydrogen peroxide, thus causing the denaturation of cellular proteins. A chemical reaction was studied by using procainamide, an antiarrhythmic drug, and a control (water). The chemical inventory included procainamide, hydrogen peroxide, a phosphate buffer, dithiobisnitrobenzoic acid (DTNB), ethylenediaminetetra acetic acid (EDTA), and cysteine. To increase reactivity in each solution, a portion of each (that included the phosphate buffer, EDTA, and hydrogen peroxide) was heated for 20 minutes at 120°F. We hoped that the heat would create a stronger oxidant and, therefore, a more apparent difference in absorbance levels. The two sets of chemicals were then put into cuvettes, and their absorbance levels at 420 nm of light from a spectrophotometer were measured. The purpose of this study was to determine the conditions under which the chemicals in the cuvettes interacted to cause drug-induced lupus.

THE EFFECT OF STRONG IONS ON THE BEHAVIOR OF HYDROGEN IONS IN SOLUTION

Student Researcher: Maxwell Shellabarger

Mentor: Robert A. Furilla, PhD; University of Alaska Anchorage, Anchorage, Alaska

Many physicians resuscitate their patients with 0.9% isotonic saline. Although the sodium concentration is close to normal plasma values, the solution is hyperchlorimic relative to plasma. Hyperchlorimia will reduce the strong ion producing an acidosis in the patient. The purpose of this study was to investigate the affects of strong ions (Na^+ and Cl^-) on the behavior of hydrogen ions in solution. To examine this affect sodium hydroxide and/or hydrochloric acid (HCl) will be added to water. Sodium concentration, chloride concentration and pH will be measured. The solution was either diluted by adding distilled water or concentrated by evaporation. Then in a second set of experiments, CO_2 was added to the solution in the presents of carbonic anhydrase. Sodium hydroxide was calculated from pH and PCO_2 . The in vitro data were compared with a computer model based on physical chemistry. The combination of these studies demonstrated that strong ions, not weak ions, determine the pH of an aqueous solution.

HIV/AIDS KNOWLEDGE AMONG MIGRANT FARM WORKERS

Student Researcher: Jason Vasquez

Mentor: David Acosta, MD; University of Washington, Seattle, Washington

More than 4 million migrant farm workers live in the United States. The rate of HIV infection in migrant farm-working communities is 10 times the national average. Most migrant farm workers are not knowledgeable about sexually transmitted diseases (STDs). Many studies have been conducted on HIV/AIDS knowledge in the migrant farm-working community. However, the literature on the effect of HIV/AIDS on the behavior of this community is limited. My research is a systematic review of the literature on migrant farm workers' knowledge of HIV/AIDS and the effect it has on their behavior. I found that 10% of migrant farm workers believe that condoms are an excellent source of protection against HIV/AIDS. Thirty-five percent believe that condoms are only for prostitutes, and 54% believe condoms are only for homosexuals. Not enough migrant farm workers know how to protect themselves from HIV/AIDS. Farm workers must know this information to decrease the rates of HIV/AIDS in their communities.

EXPRESSION PATTERNS OF DISTINCT ISWI COMPLEXES IN *XENOPUS LAEVIS*

Student Researcher: Crystal Worl

Mentors: Elvin Brown; Jocelyn Krebs; University of Alaska at Anchorage, Anchorage, Alaska

Twenty different ISWI protein complexes have been discovered in yeast and mammals. In *Xenopus* alone, 4 different ISWI complexes exist. Complexes that contain an ISWI protein are attached to either of the following proteins: Acfl, WSTF, and p17. Each of these complexes has its own function. Proteins are expressed in response to activated DNA in a cellular system. These proteins are found in eukaryotic cells. This experiment will specifically find a p17 protein sequence, which will be copied with a labeled probe that we will make ourselves. This probe will be inserted into a cell to copy the specific protein sequence code. Samples will then be isolated by using restriction enzymes specific to the p17 protein. We will cut the plasmid and place the p17 sequence into it. We will determine where the p17 protein shows in an embryo and its role in embryo development. The goal of this experiment is to find out when and where it activates and its functions.

VARIATION IN HOT FLASH EXPERIENCE BETWEEN JAPANESE AND CAUCASIAN WOMEN LIVING IN HILO, HAWAII

Student Researcher: Lisa M. Yang

Mentor: Daniel Brown, PhD; University of Hawaii at Hilo, Hilo, Hawaii

We studied a random sample of women in Hilo, Hawaii, through a mailed survey. This survey asked for information on basic demographic background, brief medical history, daily activities, and personal menstruation and menopause experiences. Previous studies supported that Japanese women report symptoms of hot flashes less frequently than do US women, but linguistic differences may account for this. Our survey included Japanese Americans who are native English speakers and examined whether ethnic differences in these frequency of symptoms exist in Hawaii.

The frequency of hot flash was slightly lower in Japanese Americans than Caucasians, although the difference was not significant. When controlling for menopausal status, though, we noted a statistical trend between the two groups. We found a significant difference in the times of the day hot flashes were occurring. Japanese women reported a significantly lower frequency of night sweats, and the results did not change when menopausal status was controlled. We conclude that the difference in the Japanese study was either due to linguistic or cultural differences. The Japanese Americans in Hawaii may have been so "Americanized" that their personal menopause experience has changed.

CLASSIFICATION OF SOILS ACCORDING TO PARTICLE SIZE DISTRIBUTION PROPERTIES

Student Researcher: Vanisha Yarbrough

Mentor: Robert Peters, PhD, PE; University of Alabama at Birmingham, Birmingham, Alabama

Soil contamination is one of the hardest types of contamination to manage. Each soil type responds differently to a contaminant because each has different physical properties. In order to clean the soil of its contaminants, the properties of the soil must be investigated. Eleven samples were collected from eight areas across Alabama. The samples underwent a sieve analysis that separated the soil into five different sizes according to their diameter. By massing the soil in each sieve size, the size distribution of each sample was established. The results were plotted on a graph with particle diameter versus percentage finer. The uniformity coefficient and the coefficient of curvature were calculated by using values found on the graph. In addition, the percentage sand, clay, and silt were determined by using the data table from the results. From these properties, the samples were defined as well graded or poorly graded. Using these properties identified during the investigation, further studies can be conducted on soil's reaction to different contaminants.

CHARACTERIZATION OF A BACTERIAL PHAGE TO ELIMINATE *PSEUDOMONAS AERUGINOSA*

Student Researcher: Jennifer J. Yu

Mentor: Hongwei D. Yu, PhD; Joan C. Edwards School of Medicine, Marshall University, Huntington, West Virginia

Pseudomonas aeruginosa is a ubiquitous bacterium that can infect individuals with a genetic defect such as cystic fibrosis (CF) and those undergoing cancer chemotherapy. One of the clinical hallmarks of diseases caused by this pathogen is the difficulty of treatment due to the hyperresistance to a wide range of antibiotics. In particular, *P. aeruginosa* biofilms, which are characterized with the overproduction of an exopolysaccharide, which produces a mucoid colony under laboratory growth conditions, are even more resistant to antibiotics than cells with little production of this polysaccharide. Therefore, the need is urgent to develop a new generation of anti-*Pseudomonas* drugs. The goal of this project is to test the efficacy of a bacterial phage on the killing of *P. aeruginosa*, which we have found to be resistant to antibiotics. Therefore, we are using phages hoping that one day we can eliminate CF.

Our project tested the hypothesis that the mucoid *P. aeruginosa* (biofilms) can be annihilated by a bacterial phage in the same fashion as non-mucoid *P. aeruginosa*. Various strains of *P. aeruginosa* were grown in ANB broth overnight at 37°C. A bacterial phage, E79tv-2, was serially diluted in TMN buffer. Determination of the plaque-forming units (PFU) was carried out with *P. aeruginosa* in a top agar mixing with serially diluted phage stocks. Such plates were incubated in an incubator overnight at 37°C for determination of PFU.

Our results show that the E79tv-2 phage can kill both mucoid and non-mucoid *Pseudomonas*. The mucoid phenotype alone has no impact on the penetration of bacterial virus into the cells. This suggests that phage has potential to be used as an effective therapy to eliminate chronic bacterial lung infections.
