7-26-2012

2012 UAB Summer Research Expo

University of Alabama at Birmingham

UAB Summer Research Expo

July 26, 2012

WELCOME

Welcome to the **2012 Summer Research Expo**. This year's students have completed a wide array of projects, and we are confident that their work this summer will prove to be a step toward a promising future. Many thanks go out to the mentors who have overseen this summer's projects, as well as the judges who must select award recipients from the work presented today.

The undergraduate programs represented are UAB Summer Research Experience, UAB Honors Academy Prime Time Leadership Course, UAB Chemistry Research Experiences for Undergraduates (REU), UAB Department of Physics Research Experiences for Undergraduates (REU), Summer in Biomedical Sciences (SIBS) Undergraduate Research Program, and UAB Ronald E. McNair Post-Baccalaureate Achievement Program.

In all, there are 81 student participants from a variety of academic backgrounds. We hope that today's competing scholars continue their excellent work throughout their academic careers and beyond.

SCHEDULE

Thursday, July 26, 2012
Campus Recreation Center—Center Court

Poster Set-up	8:00 - 8:25
Judging of Posters	8:30 - 10:30
Open Poster Session and Awards	10:30 - 12:00
(poster removal—noon)	
Guest Speaker	1:00 p.m.

Dr. James McClintock—Professor of
Biology, University of Alabama at Birmingham
"The ecological impacts of climate change on the
Antarctic Peninsula"
(Heritage Hall Room 102)

2011 Summer Research Expo Award Recipients

Life Sciences I

QueenDenise Okeke 1st Place	Meredith Hubbard 2nd Place	Lorren Rice 3rd Place	BreeOna Ebrecht Honorable Mention

Life Sciences II

Aneesh Tyle 1st Place	Rebecca Garrett 2nd Place	Olamide Alakija 3rd Place	Valentine Nwachukwu Honorable Mention

Life Sciences III

Josh Freda 1st Place	Andrea Loes 2nd Place	Vincent Crump 3rd Place	Melissa Walters Honorable Mention

Social & Behavioral Sciences and Public Health – Session I

Ayushi Amin 1st Place	Eva Trinh 2nd Place	Melissa Crook 3rd Place	Ashley Michelle Jones Honorable Mention

Social & Behavioral Sciences and Public Health – Session II

Vinetra King 1st Place	Adrian Jones 2nd Place	Shannon Denny 3rd Place

Physical Sciences and Engineering I

Kaitlin Bruegenhemke 1st Place	John C. Owens 2nd Place	Evan Black 3rd Place	Rashidra Walker Honorable Mention

Physical Sciences and Engineering II

Rose Kathryn Sackuvich 1st Place	Jeremy Sheppard 2nd Place	Alex Skinner 3rd Place	Hannah Whitaker Honorable Mention

Honors Academy Leadership Projects

Danielle McDavid Stephanie Arana Rosalind Boonarkat 1st Place	Alexandria Sheppard 2nd Place	William C. Anderson 3rd Place

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Life Sciences I—Exhibit 1

Valentine Nwachukwu
University of Alabama at Birmingham
McNair Scholars Program
Mentor(s): Dr. Inga Kadish

Small ischemic infarcts increase αβ deposition in C57BL/6J mice

Vascular problems such as hypertension and cerebral amyloid angiopathy (CAA), contribute significantly to the development of aging-related cognitive deficits and to Alzheimer's disease (AD). Further, it's been demonstrated that many AD patients have significant numbers of small, ischemic infarcts, especially in the white matter. However, the literature is unclear on whether infarcts modulate amyloid deposition or increased αβeta contributes to infarct-related cognitive impairment. The following study is designed to test the hypothesis that limited islands of neural/vascular damage, which reproduce age-related small ischemic infarcts, will accelerate αβ deposition and will lead to cognitive impairments in wild-type (WT) young and aging mice. We anesthetized the mice, infarcted a small part of the parietal cortex using the Rose Bengal method, and 6 weeks later the animals were tested in the water maze. After behavioral testing was completed, the brains were processed for immunohistochemistry. The behavioral analysis shows that all animals with the infarcts perform modestly worse than intact control mice. The immunohistochemical analysis of the rodent αβeta load demonstrates early a significant increase in αβeta deposition around the ischemic infarct and significant upregulation of intracellular αβeta levels. Later, these rodent αβeta deposits disappear and rodent αβeta deposits develop in the thalamic nuclei linked with the lesioned cortical areas. These results show that small ischemic infarcts will increase amyloid deposition and can lead to cognitive deficits in WT mice, therefore early treatment of hypertension and vascular stress may delay the onset of cognitive deficits related to normal aging and AD.

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Life Sciences I—Exhibit 2

Stephan Real
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Dr. Jamil Saad

The Role of FLNa in Gag Trafficking

Human immunodeficiency virus type-1 (HIV-1) is accountable for over 34 million AIDS related deaths (UNAIDS report 2011). Due to its genetic diversity and ability to mutate, eradication of the virus has been problematic with current antiretroviral therapy (ART) drugs which interfere with various phases of the virus life cycle. Previous studies have shown that HIV-1 heavily depends on the constituents of its host cell for replication. Given that host cell constituents are much less mutagenic, insight into key virus-cell interactions could provide new targets for more effective ART. In the late phase of HIV-1 infection the polyprotein Gag is trafficked to the plasma membrane (PM) for the assembly and release of new virions. The mechanism by which Gag reaches the PM for assembly and release is not clearly understood, although prior studies have shown that actin filaments may play a role. Filamin A (FLNa), an actin binding protein, has been shown to co-localize with Gag in membrane pseudopod structures during the late phase of HIV-1 infection. In addition, previous studies have shown that the 3' end of FLNa interacts with the capsid (CA) domain of Gag. Currently, our aim is to verify the direct interaction of FLNa with the Capsid (CA) domain of Gag, determine the structural requirements of the FLNa-CA complex, and define the role this plays in Gag trafficking. Structural studies using Isothermal calorimetry (ITC), and nuclear magnetic resonance (NMR), will be used to determine interactions and define the FLNa-CA binding interface. Elucidating these interactions and structural requirements could provide a foundation for new studies on more efficient antiretroviral drug intervention.

Life Sciences I—Exhibit 3

Dominique Shane Tull
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Dr. Gwendalyn King

Retinal Dysfunction in Klotho Knockout Mouse

Klotho (KL), a gene that acts as a suppressant to aging when over-expressed; however, in mice without the gene, lifespan is shortened and phenotypes resembling human aging are exhibited at an accelerated rate. These phenotypes include atherosclerosis, emphysema, skin thinning, infertility and cognitive decline. Data shows that the expression of KL is highest in the kidney where it is critical in calcium/phosphate/Vitamin D homeostasis. However, while the kidney expresses the highest levels of KL, numerous other organs such as the brain express KL to lesser degrees and the knowledge of its function in these organs is limited. Our lab found a role for KL in the basic synaptic function of the brain and sought to determine whether KL exists in eye and affects synaptic function of the retina. Low level KL expression was found in the retina and, importantly, profound retinal dysfunction was measured by electroretinogram (ERG) in KL knockout mice. To attempt to characterize the proteins involved in retinal dysfunction, immunocytochemistry was used to compare protein expression in wild-type (WT) and knockout retinas. Antibodies against Glial Fibrillary Acidic Protein (GFAP), Synaptophysin, Nadph Oxidase (NOX) ,Transient Receptor Potential Vanilloid 2 (TRPV 2), Transient Receptor Potential Melastatin 1 (TRPM 1) and IBA 1 were all tested. While studies are ongoing, oxidative stress indicator NOX was found to be up-regulated in the KL mice and this result was validated using an independent marker, dihydroethidium. These suggest that oxidative stress has a role retinal dysfunction of KL knockout mice.

Life Sciences I—Exhibit 4

Chandler Stisher
University of Alabama at Birmingham
Ronald E. McNair Program
Mentor: John L. Hartman, IV, MD

Exploration of the Ribonucleotide Reductase Gene Interaction Network

Ribonucleotide Reductase (RNR) is essential for DNA replication, and thus the cell growth and division cycle. As such, RNR is an important target for anti-cancer therapy. RNR is a tetrameric enzyme that catalyzes reduction of ribonucleotides to deoxyribonucleotides, converting substrates for RNA synthesis to those for DNA synthesis. My project is to identify genes that cooperate with RNR, which could serve as targets to augment the efficacy of drug treatments that kill cancer by mechanisms relating to ribonucleotide reduction. I will define the RNR gene interaction network using quantitative high throughput cell array phenotyping (Q-HTCP) to analyze a genomic collection of deletion strains in which the level of RNR can be modulated. A tetracycline-regulated system has been engineered where addition of doxycycline to the growth medium reduces RNR expression, which inhibits growth. Since Q-HTCP provides growth curve analysis for over 50,000 cultures in parallel, it can be used to measure the strength of gene interaction as a function of cell proliferation. I aim to understand, by virtue of the interacting genes identified, how cellular pathways are organized globally with respect to RNR function. Thus, characterizing the RNR gene interaction network will help us infer how drugs that inhibit RNR kill cancer cells, and how cells resist killing by such drugs. Targeting additional genes in the RNR interaction network could augment the anti-cancer therapeutic efficacy of RNR inhibition. This genome-wide phenotyping strategy complements other approaches to understand cancer gene networks and to help guide rationale development of anti-cancer treatments.

Life Sciences I—Exhibit 5

Vincent McKitt and Steven J. Pittler, Department of Vision Sciences, University of Alabama at Birmingham, Birmingham, AL 35294-0019

Gene therapy restores structure in rod photoreceptor cGMP-gated cation channel b-subunit knockout mice

A cGMP-gated (CNG) cation channel is required for phototransduction in both rods and cones. In addition to its critical role in phototransduction, the rod channel through its β-subunit is also required to maintain rod outer segment (ROS) structural integrity. Knockout of the b-subunit and GARPs results in loss of structure and function. To assess the role of different regions of the b-subunit we generated transgenic mice that express an N-terminally truncated form of the b-subunit that was shown to be functional in a heterologous expression system. Using histologic analysis and optical coherence tomography we show that the truncated b-subunit provides significant restoration of ROS structure. Rod photoreceptors appear more cylindrically uniform and overall retinal stratification appears normal. While the rod photoreceptor layer survives significantly longer than in the knockout mouse, a slower degeneration is apparent that was not yet complete up to 10 months postnatal. In knockout mice, rods are lost within 7.5 months postnatal. Expression of a truncated b-subunit on a b-subunit knockout background partially restores structure, but cannot completely compensate for the absence of the b-subunit N-terminal region. Thus, this region is essential for structure of the ROS.
Supported by NIH grant R01-EY018143-5 and P30-003039-34 Vision Science Core Grant to SJP.

Life Sciences I—Exhibit 6

Ariella Jackson
University of Alabama at Birmingham
McNair Scholars Program
Laurie Harrington, PhD.

Dendritic cell subsets and function in the absence of B cells

CD4 T-cells are critical for the eradication of many pathogens and are causative in various autoimmune disorders. Dendritic cells (DCs) play a crucial role as antigen presenting cells (APCs) to CD4 T-cells. In the absence of B cells, CD4 T-cells mount suboptimal responses. A critical question is whether B cells regulate the function of DCs. The purpose of this experiment is to determine if the number, subsets or function of dendritic cells is defective in the absence of B cells. The DCs of both wild type and B cell deficient mice were phenotyped. Cells were evaluated for their location, the presence of DC subsets, ability to activate CD4 T-cells as well as the ability to be activated by toll like receptor (TLR) ligands. The DCs in B cell deficient mice were anticipated to have a decreased response to LPS and heat killed *Listeria monocytogenes*. It was also predicted that the interaction between DCs and CD4 T-cells would be abrogated in the absence of B cells.

Life Sciences I—Exhibit 7

Laura Aristizabal, [a]Angelina I. Londoño-Joshi,[b] Donald J. Buchsbaum, PhD[a]

Inhibition of Wnt co-receptor LRP6 sensitizes basal-like breast cancer stem cells to TRA-8 anti-DR5 monoclonal antibody

Basal-like breast cancers (BLBC) display aggressive clinical behavior with tumors being generally resistant to chemotherapy, radiation, and hormonal agents. Recent studies have demonstrated that Wnt co-receptor LRP6 is an indispensable element of the Wnt/B-Catenin signaling pathway. This study examines how anti-LRP6 (Niclosamide) sensitizes CSC from BLBCs to death receptor mediated apoptosis. We have previously described that TRA-8, a monoclonal antibody specific to death receptor 5, kills both the CSC and non-CSC population of BLBC, however a subset of these cell lines are resistant to treatment with TRA-8. We hypothesis that combination a Wnt specific inhibitor with TRA-8 will further sensitize the resistant CSC population. TRA-8 resistant BLBC cell lines HCC1187 and HCC1143 were examined for cytotoxicity and inhibition of tumorsphere formation and changes in CSC maker expression after treatment. Cells were treated with TRA-8 in combination with Niclosamide and analyzed for viability using ATPlite analysis. Interestingly, tumorspheres were more sensitive than attached cell lines. Secondary tumorsphere inhibition was also observed following combination treatment. Flow cytometry results showed that ALDH+ and CD44+ expression in both cell lines was maintained indicating combination treatment does not enrich for CSC characteristics. Similar results were obtained using a LRP6 specific inhibitor, Mesd. These results indicate inhibiting Wnt/B-Catenin pathway via the LRP6 receptor reduces CSC viability and tumorsphere inhibition in combination with TRA-8. With a better understanding of a possible correlation between death receptor 5 (DR5) and the Wnt/B-Catenin pathway, combination drug treatments can be tested that will significantly eliminate CSC populations in patients with BLBC.

Life Sciences I—Exhibit 8

Ashruta Patel and Dr. Rita M. Cowell

PGC-1α-mediated induction of parvalbumin requires estrogen-related receptor α

The expression of the calcium buffer parvalbumin (PV) is reduced in numerous psychiatric and neurological disorders, yet little is known about its transcriptional regulation. Previous work from our laboratory has shown that the expression of parvalbumin in the mouse brain is dependent on the transcriptional coactivator peroxisome proliferator activated receptor g coactivator 1a (PGC-1a) and that overexpression of PGC-1α in neuroblastoma cells is sufficient to robustly induce PV. To investigate potential mechanisms by which PGC-1α drives PV expression, we performed luciferase reporter assays with modified regions of the PV promoter in neuroblastoma cells and determined that expression required a region upstream of the human PV transcription start site encompassing a consensus binding site for members of the estrogen-related receptor transcription factor family. Considering that estrogen-related receptor α (ERRα) has been shown to interact with PGC-1α in peripheral tissues, we investigated the influence of ERRα inverse agonists XCT790 and kaempferol on PGC-1α-mediated gene expression. Both XCT790 and kaempferol blocked PGC-1α-mediated upregulation of PV in addition to other previously identified PGC-1α-dependent genes. Furthermore, knockdown of ERRα with siRNA also blocked PGC-1α-mediated induction of PV. These experiments suggest that PGC-1α influences PV expression by increasing the activity of ERRα. Further elucidation of the mechanisms by which PGC-1α influences gene expression (i.e. by direct interactions with ERRα) will promote the development of approaches to influence PV expression and interneuron function in vivo.

Life Sciences I—Exhibit 9

LaShaundra Dangerfield[1], Roderick Fullard[2], Landon Wilson[3], Steven Barnes[4]
UAB Minority Health and Health Disparities Summer Enrichment Program[1], UAB School of Optometry[2], UAB Targeted Metabolomics & Proteonomics Laborotory[3], UAB Department of Pharmacology & Toxicology[4]

Measurement of Allergy-Associated Cytokines in Tear Fluid

Interleukin-4 and Interleukin-9 are key inflammatory biomarkers for allergy. IL-4 is involved in the development of allergic responses, including ocular allergy, while IL-9 is commonly associated with atopic asthma.
In a study of 50 patients, tears were collected and analyzed using 27-Plex Bio-Rad cytometric bead-based assays (CBA). Both a polystyrene and a newer magnetic bead version of the CBA were used. Tear IL-4 results differed between CBAs. A possible reason may be CBA interference by tear sample components in either or both CBA types. Non immune based methods, such as mass spectrometry (MS), do not suffer from interference and can therefore help determine which CBA type is producing the more valid tear IL-4 results.
Prior to MS, tears were fractionated to isolate cytokines from major tear proteins. Laemmli SDS-PAGE produced insufficient separation between low molecular weight (MW) major tear protein and the cytokines of interest. Tris-Tricine peptide gels produced better separation and subsequently proved successful in isolating several cytokines. IL-4 and IL-9 were more difficult to isolate because they have very similar molecular weights to the protein lysozyme (14.4 kDa), which is found at much higher levels in tears than cytokines. In order to quantify IL-4 and IL-9, multiple reaction monitoring MS (MRM-MS) was used. This enabled the targeted quantitation of tear IL-4 and IL-9, while ignoring all lysozyme-derived peptides. MS results demonstrated that the polystyrene CBA was producing more accurate tear IL-4 levels than the magnetic CBA.

Life Sciences I—Exhibit 10

Deborah Craddock and Brian Sims, MD**,** PhD

Neuroprotective Effect of Theophylline in the Prevention of Bilirubin-Induced Neurotoxicity

Background: Elevations in bilirubin levels are often seen in infants after birth and commonly result in jaundice. If those levels of bilirubin become excessive, hyperbilirubinemia, bilirubin neurotoxicity can occur. The extent of damage caused by bilirubin-induced neurotoxicity is unknown but it has been shown to be toxic to nerve cells. Theophylline, a drug used to treat patients with respiratory diseases, may have some neuroprotective properties. Previous experiment found theophylline was effective in decreasing cell death.
Objective: To further investigate the mechanism of theophylline induced neural protection
Methods: *Cell Culture and Sample Collection*

Neural stem cells (NSC) were grown in flask coated with polyornithine-laminin, plated with neural stem cell expansion medium and supplemented with fibroblast growth factor (bFGF), epidermal growth factor (EGF), and heparin. Cells were passaged every 3-5 days or until 80% confluence and then split 1:3 in T-25-cm flasks.

Protein Analysis

A Bradford Protein Assay was completed for all samples to determine their respective protein concentrations. Samples were then prepared and loaded into a 10% Tris-HCl gel for Gel Electrophoresis, ran and equilibrated in a 1X Transfer Buffer. They were then transferred onto a nitrocellulose membrane using a semi-dry transfer apparatus and probed for various proteins using the SNAP i.d.^{TM} Protein Detection System. Probed blots were then developed in a dark room using western blotting detection reagents.
Results and Conclusion: Our anticipated results include a direct increase in antioxidant enzymes such as Nrf2 and a potential inhibition in PARP. These proteins are critical in cell survival and, by preliminary experiments, appear to be regulated by theophylline.

Rebecca Duron
Auburn University, Auburn, AL
Summer in Biomedical Sciences (SIBS)
Mentors - Junqin Chen and Anath Shalev

Identifying the pathway by which glucose induces cardiomyocyte TXNIP expression

Thioredoxin-Interacting Protein (TXNIP) has been shown to have harmful effects on the cardiovascular system by inducing oxidative stress, cardiomyocyte inflammation, and subsequent cardiomyocyte apoptosis. Because TXNIP is upregulated under conditions of high glucose, this protein is critical in causing diabetic cardiomyopathy. In this study, we explored the molecular mechanism of glucose-induced TXNIP expression in cardiomyocytes. H9c2 rat cardiomyocytes were cultured at a low (5mM) or elevated (25mM) glucose concentration and in the presence or absence of a P38 MAP kinase inhibitor, to analyze whether or not the inhibitor will stop TXNIP from being upregulated. We found that the inhibitor caused a significant dose-dependent reduction of TXNIP suggesting that P38 MAP kinase signaling is involved in the regulation of cardiomyocyte TXNIP expression. Transient transfection studies are now under way to determine the TXNIP promoter region responsible for these effects.

Life Sciences II—Exhibit 12

Morgan Jackson
Villanova University, Wilmington, DE
Summer in Biomedical Sciences (SIBS)
Mentor – Karen Iles

Vitamin E supplementation as a strategy for preventing nosocomial infections

Pseudomonas aeruginosa infection is the most prevalent nosocomial infection in intubated patients, resulting in pulmonary edema which may culminate in lethal pneumonia. Several studies have established through *in vitro* and *in vivo* experiments that Vitamin E confers some protection against *P. aeruginosa* infection. Vitamin E is often termed an "antioxidant", but its protective effects in *P. aeruginosa* infection extend beyond those of a simple antioxidant. The mechanisms whereby Vitamin E impacts the *P. aeruginosa* infectivity remain unclear.

Vitamin E may have a dual effect on the infection cascade. We hypothesize that it negatively impacts the ability of *P. aeruginosa* to invade the cell. Vitamin E may also exert a protective effect by enhancing the cell's antioxidant system as a Phase II gene inducer.

In vivo and *in vitro* model systems will be used to determine the effects of Vitamin E treatment on *P. aeruginosa* (K-strain, PAK) infectivity. With our collaborators, mice will be treated with Vitamin E or vehicle 18 hr before the instillation of 5 $X10^7$ CFU of PAK and differences in survival will be recorded. MTT assays will be used in order to determine the effect of Vitamin E pretreatment on the viability of rat micro-vascular endothelial cells infected with PAK. Time courses (6-24 hrs) will be performed to determine if pretreatment with Vitamin E increases expression of several cyto-protective proteins (Western Blotting). Shorter time course incubations (0-6 hrs) with PAK will be performed in order to identify which cell signaling pathways are involved.

Life Sciences II—Exhibit 13

B. J. Ammons
Lurleen B. Wallace Community College, Andalusia, AL
Summer in Biomedical Sciences (SIBS)
Mentor - Timothy Kraft

Circadian clock influences ketone body metabolism

Introduction: Circadian clocks are cell autonomous molecular mechanisms that confer the selective advantage of anticipation. Critical to circadian clock function are two transcription factors, CLOCK and BMAL1. Through use of two distinct genetic mouse models of cardiomyocyte clock disruption (cardiomyocyte-specific CLOCK mutant [CCM] and cardiomyocyte-specific BMAL1 knockout [CBK] mice) we have begun to highlight novel roles for this mechanism in both myocardial physiology and pathophysiology. Recent gene expression microarray and proteomic studies using CCM and CBK models identified β-hydroxybutarate dehydrogenase 1 (BDH1) as being cardiomyocyte circadian clock regulated. Whether changes in BDH1 gene and protein expression translate to functional changes in β-hydroxybutarate dehydrogenase activity is currently unknown.

Hypothesis: The cardiomyocyte circadian clock regulates myocardial ketone body metabolism through direct regulation of β-hydroxybutarate dehydrogenase activity.

Methods/Results: Spectrophotometric assays for both β-hydroxybutarate dehydrogenase and citrate synthase (control) were initially established and validated (e.g., substrate dependence). Hearts were isolated from adult CCM and CBK, as well as littermate wild-type, mice. β-Hydroxybutarate dehydrogenase activity was found to be markedly lower in both CCM and CBK hearts, relative to their respective littermate wild-type hearts. In contrast, citrate synthase activity was not significantly different in either CCM or CBK relative to their wild-type controls.

Conclusions: The cardiomyocyte circadian clock directly regulates cardiac CCM and CBK β-hydroxybutarate dehydrogenase activity. These data are consistent with the concept that the cardiomyocyte circadian clock confers the selective advantage of anticipation of prolonged fasting, when the animal in the wild is unsuccessful in its forage for food during the active period.

Life Sciences II—Exhibit 14

Cala Marie Penn
University of Alabama at Birmingham
McNair Scholars Program
Dr. Spencer Melby

Inflammatory Mechanisms of Postoperative Atrial Fibrillation in Cardiac Surgery Patients

Postoperative atrial fibrillation is a common and expensive problem after cardiac surgery. The understanding of the disease and treatments of it are limited. The timing of the disease suggests an inflammatory etiology. Multiple studies have corroborated this with serum elevations of inflammatory cytokines and leukocytes which have correlated with post-operative AF. Past investigations evaluated blood serum cytokine levels for general information about cardiac inflammation after cardiac surgery. Significant rises in interleukin-6 and IL-8, as well as tumor necrosis factor have been demonstrated in pericardial fluid in patients with coronary ischemia, but these factors have not been evaluated in the pericardial fluid during the postoperative period. Our hypothesis is that inflammation is responsible for postoperative AF and that the pericardial fluid contains factors involved in the mechanisms of inflammation. Our objective is to determine the involvement of specific mechanisms of cardiac inflammation including the kinetics of inflammation-associated soluble factors and functional analysis of inflammatory cells in the pericardial fluid during the post-operative period. Pericardial fluid samples at several time points after cardiac surgery will be evaluated for electrolyte content and cytokine concentration. Cells will be analyzed for surface markers and cytokine production. The time-related risk for post-operative AF will be determined using a three-phase hazard model. This model will help identify separate risk factors for AF as a function of time. Delineation of the chemical composition, the time-course of factors/cytokines of inflammation, and the cellular composition of pericardial fluid will provide understanding of the specific pathways of inflammation during postoperative AF.

Life Sciences II—Exhibit 15

Olamide Alakija

Assessment of Connexin 43 and its role in the Treatment of Left Ventricular Arrhythmogenic Heart Failure

Heart failure affects nearly 2 million Americans and is most commonly caused by arrhythmia. Arrhythmia is characterized caused by uncoordinated cardiac muscle contraction (contractile dysfunction) leading to inefficient cardiac output and cardiac stress. However, advanced ventricular arrhythmogenic heart failure leads to the onset of ventricular fibrillation which has caused sudden death in nearly 50% of non-ischemic and ischemic patients. Decrease of activated gap junction proteins is the main cause of uncoordinated cardiac contraction in arrhythmogenic heart failure and fibrillation. Analyzing ventricular arrhythmogenic heart failure and fibrillation allows greater understanding of the regulation of proteins involved in cardiac contraction in healthy and heart failure hearts. Protein expression and activity of Connexin 43 (Cx43), Protein Phosphatase Type 2A (PP2A), and Protein Phosphatase Type 2A inhibitor (I_1PP2A) was measured and analyzed via western blot. Higher Cx43 expression and activity in healthy heart tissue sample will antagonize with lower expression and activity in heart failure tissue sample. Lower colocalized PP2A (deactivator of Cx43) expression and activity in healthy heart tissue sample will antagonize with higher expression and activity in heart failure tissue sample. I_1PP2A (deactivator of PP2A) will also show higher expression and activity in healthy heart tissue sample with lower expression and activity in heart failure tissue sample.

Life Sciences II—Exhibit 16

Lena Black, Elizabeth City State University,
Research Experience for Undergraduates (REU),
Dr. Veena Antony (Mentor), Department of Medicine - Pulmonary/Allergy/Critical Care,
Dr. Ranu Surolia and Dr. Suman Karki (Postdoctoral Graduate Student Collaborator),

The Biomarker of Malignant Mesothelioma

Receptor EphA-2 is over expressed in the aggressive growth of malignant tumors. Malignant mesothelioma (MM) is a highly aggressive tumor that arises from the mesothelial lining of pleural cavities. The expression of receptor EphA-2 was investigated in MM cell line (CRL-2081), normal human pleural mesothelial cells (NH-PMC) and non-malignant transformed mesothelial cells (Met-5A). The NH-PMC and Met-5A were used as control. The expression of EphA-2 was studied by quantitative PCR, Western blot analysis, and immunofluorescene. The receptor EphA-2 was highly expressed in CRL 2081 compared to normal mesothilial cells. The data concluded that EphA-2 was overexpressed in MM compared to normal mesothelial cells and hence possibly a biomarker for MM. Targeting the EphA-2 receptor may provide a possible therapeutic approach in the treatment of MM.

Life Sciences II—Exhibit 17

Zach Lemley
University of Alabama at Birmingham
Mentor: Dr. Judy Creighton

AMP-activated protein kinase (AMPK) enhances endothelial mediated vascular repair in endotoxin-induced pulmonary edema

Pulmonary complications resulting from sepsis are a serious community acquired threat to human health. While development of vascular pathology associated with sepsis involves interactions of multiple vascular cell types, at all anatomic levels of the vessel wall, endothelial cell dysfunction plays an integral role in increased permeability and fluid accumulation. AMPK is a molecular sensor for detection and mediation of cellular adaptations to vascular disruptive stimuli. Yet, little is known about AMPK function in lung endothelium. We hypothesized that AMPK enhances endothelial repair and resolves lung edema associated with vascular exposure to the bacterial derived endotoxin, lipopolysaccharide (LPS). Time-lapse microscopy data indicate AMPK activation is necessary for wound resealing in capillary endothelial monolayers and restores repair in the presence of LPS. Indeed, the rate of gap resealing in LPS treated monolayers is similar to control levels following AMPK activation using the pharmacological tool 5-aminoimidizole-4-carboxamide riboside (AICAR). We next used the clinically relevant AMPK activator metformin in our time-lapse studies. The addition of metformin to LPS treated cells restored the rate of gap resealing similar to the AICAR studies. These data identify AMPK as a new target for treating lung vascular disease and suggest a new clinical use for metformin. Supported by HL102296.

Life Sciences II—Exhibit 18

Pauleatha Diggs, Nick Cochran, and Erik Roberson

Tau Isoform Differences Affect the Strength of the Interaction Between Tau and Fyn

The primary pathological characteristics of Alzheimer's disease (AD) are plaques of amyloid-beta (Aβ) and tangles of hyperphosphorylated tau, a microtubule-associated protein. Tau pathology appears to occur downstream of Aβ, and it has been shown in mice that tau reduction produces beneficial effects and protection against Aβ toxicity. Furthermore, the interaction of tau with the Src-family non-receptor tyrosine kinase Fyn also has been implicated in AD pathology. Thus, better understanding determinants of the interaction between tau and Fyn may be highly relevant to understanding AD. Tau exists in the human brain as six different isoforms, and some disease-associated tau mutations appear to act primarily by shifting the normal isoform ratio, suggesting important isoform differences. The extent to which these isoforms each interact with Fyn could prove to have significant clinical relevance. To test whether a tau isoform effect exists with the interaction between tau and Fyn, we developed an AlphaScreen® assay to measure the strength of their interaction. Each isoform of tau and the SH3 domain of Fyn were tagged with molecules that bind to light-excitable beads that release light when brought in close proximity, which occurs when the two bind. The magnitude of the interaction is determined by the amount of light released. Using this assay, we found a higher affinity between Fyn and the 3R isoforms of tau versus the 4R isoforms of tau. In future investigations, we will examine the impact of various structural modifications of tau on the tau-Fyn interaction.

Life Sciences II—Exhibit 19

Shibli M. Rahman[1], Dong-Jin Lim[1], Adinarayana Andukuri[1], Patrick TJ. Hwang[1], John A. Corbett[3], and Ho-Wook Jun[1, 2]

A biomimetic self-assembled peptide amphipile nanomatrix to regulate MIN6 cell behaviors

Pancreatic beta cell lines that possess the same native characteristics as insulin producing β-cells within islets of Langerhans have widely been used to evaluate newly developed scaffolds for the ultimate purpose of improving pancreatic islet transplantation (PIT). However, the morphological and functional characteristics of pancreatic beta cell lines in use are generally overlooked despite that changes are gradually observed with each subsequent subculture of cells. Long-term cultured MIN6 β-cells that have differences in morphology and function can lead to poor evaluation of newly proposed scaffolds. To determine the influence of aged MIN6 β-cells in properly assessing a given scaffold, self-assembled nanomatrix substrates formed by peptide amphiphiles (PAs) that mimic native extracellular matrix (ECM) were made, and MIN6 β-cells of different subcultures were cultured for up to 7 days. Compared to young MIN6 β-cells, old MIN6 β-cells showed reduced sensitivity in function to the self-assembled nanomatrix platform containing RGDS ligands. Young MIN6 β-cells displayed higher normalized insulin values than old MIN6 β-cells, indicating that the apparent functional performance of ECM-mimicking platforms depends not only on the ECM-mimicking ligands present but also on the conditions of the cells used to evaluate the scaffold. Moreover, the morphological differences observed between young and old MIN6 β-cells were irrespective of the platforms used. Overall, this study describes the importance of using suitable pancreatic beta cell lines not only for evaluating an ECM-mimicking platform for PIT but also for choosing ECM-mimicking ligands that make the ECM-mimicking platform closer to the native islet microenvironment.

Life Sciences II—Exhibit 20

Mercedes Rutledge

Affecting 1 in 40,000 people, Fabry disease is an X-linked disorder caused by deficiency in the lysosomal enzyme alpha-galactosidase A, resulting in extensive deposition of the lipid globotriaosylceramide (GB3) in the lysosomes of endothelium, pericytes, and smooth muscle cells in blood vessels. Fabry disease also exerts its pathology on the central and peripheral nervous systems with GB3 accumulation in neurons and glial cells. Parkinson's disease (PD) is an adult neurodegenerative disorder caused by depletion in tyrosine hydroxylase (TH) positive dopamine neurons in the substantia nigra and is associated with the accumulation of Lewy bodies made up of alpha synuclein in the midbrain. Our lab has obtained preliminary data using alpha-galactosidase A deficient mice, which models Fabry disease, demonstrating accumulation of alpha synuclein in the brain; therefore, suggesting a potential link for alpha-galactosidase A deficiency to the onset and/or progression of PD. However, whether TH-positive midbrain dopaminergic neurons exhibit such increases in alpha synuclein has not yet been determined. We hypothesize that alpha-galactosidase A deficiency promotes the accumulation of alpha synuclein in the midbrain, more specifically the substantia nigra, in alpha-galactosidase A deficient mice. Experiments will be conducted using immunohistochemisty to detect the presence of alpha synuclein in TH-positive neurons and by western blot analysis to assess total alpha synuclein levels in midbrain homogenates. Levels of alpha synuclein in Fabry mice will be directly compared to healthy control mice. Together these studies will attempt to validate the alpha-galactosidase A deficient mouse as a useful pre-clinical model for PD.

Life Sciences II—Exhibit 21

Khadijah Aleem
University of Alabama at Birmingham
McNair Scholars Program
Debasish Chattopadhyay

Structural and Functional Analysis of *Cryptosporidium parvum* Pyruvate Kinase, a Potential Drug Target

Cryptosporidium parvum, a protozoan parasite, is one of the major causes of waterborne diseases and a deadly threat to immunocompromised patients who have limited access to treatment. Because there is no effective therapy for cryptosporidiosis, there is an urgent need for discovering drugs to treat *C. parvum* infection. Since the metabolic pathways of Cryptosporidium are poorly characterized, studying enzymes that are important for the survival of the parasite is necessary for identifying potential drug targets.

Cryptosporidium relies on anaerobic oxidation of glucose for the production of ATP molecules. Pyruvate kinase (PyK), an enzyme of the glycolytic pathway, is the major regulator of glycolytic flux and it is considered an attractive drug target for developing an antiparasitic drug. Pyruvate kinase of *C. parvum* (CpPyK) is a particularly interesting target because it is the only parasitic PyK enzyme that has been reported to lack allosteric activity. Previously, crystal structure of CpPyK has been determined in our laboratory. These crystals were grown in the absence of any substrate or inhibitor, and at a low pH (4.0).

Goals:

To crystallize CpPyK in complex with substrates to visualize the active site of the enzyme.

To crystallize CpPyK at a higher pH to understand the effect of pH on the structure of the enzyme

Moreover, we will re-examine the allosteric activity of the purified parasitic enzyme using an *in vitro* enzyme assay.

P. Patrick, Dr. John Ruby, and Dr. Noel K. Childers

Comparing five selective media for growth and enumeration of *Streptococcus mutans* and *Streptococcus sobrinus*

Dental caries is the most prevalent infectious disease in the world. The mutans streptococci (MS), comprised of *Streptococcus mutans* and *Streptococcus sobrinus* are found to be isolated from human carious lesions. Studies aimed at caries risk assessment focus on quantitating these organisms from oral samples. The purpose of this study was to compare the sensitivity and selectivity of five different media for growing laboratory strains of *S. mutans* and *S. sobrinus*. The five media used were MSB, MSKB, GSTB, TYS20B, and TYCSB. One prototype representing *S. mutans* (UA159) and *S. sobrinus* (6715) were used for controlled growth of broth cultures to standard log phase comprised of approximately 10^9 colony forming units (CFU) per ml of broth. Ten-fold serial dilutions were obtained for distributing onto each test agar media for culture overnight anaerobically at 37°C. Colonies were counted on agar plates that had a reasonable number. The results showed that when the cultures received a 1×10^{-3} dilution, the recovery of the strains was too dense to enumerate the CFUs. However, the 1×10^{-5} dilution resulted in countable colonies to enumerate the CFUs on the plates. For *S. mutans,* mean counts for TYS20B>GSTB>MSB>TYCSB>MSKB while *S. sobrinus* mean counts for TYS20B >MSB>TYCSB>MSKB>GSTB. These findings indicate that different media that other laboratories use have different patterns of inhibition. Continued work for this project will[250] focus on confirmation of these initial findings and further analysis of the selectivity as well as sensitivity with prototype strains and also initiate testing from clinical isolates.

Life Sciences III—Exhibit 23

Meg Apperson
The University of Alabama, Tuscaloosa, AL
Summer in Biomedical Sciences (SIBS)
Mentor - Laura Timares

The Role of Langerhans Cells in Carcinogenesis of the Skin

Langerhans cells are dendritic cells located in the epidermis of the skin, where they serve as skin-specific antigen presenting cells after migrating to skin-draining lymph nodes. The specific role of these cells has been further investigated after the development of murine models designed to ablate Langerhans. Transgenic mice have been developed in which diphtheria toxin (DT) is expressed under control of the human langerin gene promoter, affecting the subset of langerin expressing cells in the epidermis. This murine model has allowed for better understanding of the Langerhans cells' role in immunity, including that they seemingly have the ability to both activate and suppress immune responses. An area of interest is how these Langerhans cells participate in UV and chemical-induced carcinogenesis of the skin, possibly by regulating immune responses. To validate the mouse phenotypes, with respect to Langerhan cells in the skin, we mated Langerin DTA expressing heterozygous male with wild-type (C5713L6) females and the progeny was genotyped for the Langerin DTA gene. Mice that did not express the gene served as wild-type controls. We found that the mice that expressed langerin DTA gene lacked Langerhan cells, as indicated by MHC Class II stains of the epidermis. Langerin DTA mice showed exaggerated ear swelling response against dinitrofluorobenzene as compared to WT mice. Since IL-12 and IL-23 are two important cytokines in DC activity, we indicated there was a difference in Langerhan cell density with cytokine ablation. The findings showed there was a lower Langerhan cell density when both cytokines were absent.

Life Sciences III—Exhibit 24

Devanshu Kaushik
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Dr. Andra Frost, M.D.

Primary Cilia in Ovarian Neoplasms: An Immunofluorescence Survey

Kaushik DD, Havard BJ, Yuan K, McKenzie MD, Nunez AL, Frost AR

Introduction: Primary cilia (PC) are solitary, microtubule-based organelles that extend from cell surfaces into the extracellular space. PC are found on most cell types and serve sensory functions that are cell-type specific. Clinical trials are currently underway for agents targeting the Hh pathway in cancers, specifically antagonists of the Hh pathway member Smoothened. PC are required for canonical Hh signaling and their presence or absence in specific cancers could be a predictive factor for response to Hh inhibitors. The presence of PC is known to be decreased, compared to corresponding normal epithelium, in carcinomas of several organs, specifically carcinomas of the breast, pancreas, and kidney. However, their presence in normal ovary and ovarian neoplasms has not been previously assessed. **Methods:** Deparaffinized, formalin fixed sections of ovarian neoplasms and benign ovary were labeled with antibodies to pan-cytokeratin and acetylated α-tubulin, a marker of PC, with nuclear staining by DAPI. The percentages of cells with PC were determined by assessing a minimum of 200 cells per cell type per case. **Results:** PC are frequent in ovarian stroma and granulosa/theca cells of histologically normal ovary, but were not identified on ovarian surface epithelium. PC were also frequent in granulosa tumors and papillary serous carcinomas, less frequent in endometrioid carcinomas, and rare in mucinous carcinomas. **Conclusions:** The presence of PC varies by carcinoma/tumor type. These results suggest that there is little canonical Hh signaling in mucinous carcinomas and endometrioid carcinomas, which may have implications for responsiveness to smoothened antagonists.

Life Sciences III—Exhibit 25

Selena Brown
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Chenbei Chang, Ph.D.

Title: Domain Requirement of PIAS 1 during Xenopus Development

Protein inhibitors of activated STAT (PIAS) are shown to control activities of a number of different proteins and various processes such as cancer formation and immune response. PIAS have the capacity to bind directly to phosphorylated signal transducer and activator of Transcription (STATs) and reduce DNA-recognition and binding. The function of PIAS during vertebrate embryogenesis is far less understood. Therefore, in summer 2010, the full length copies of Xenopus PIAS 1-4 genes were attained using RT-PCR method and the expression patterns of the PIAS genes were analyzed using in-situ hybridization. It was found when PIAS levels were elevated through microinjection of RNA, the mesoderm formation was disrupted. The next phase of this research project was to examine the effect of reduced expression of PIAS proteins on early frog development. In summer 2011, frog embryos were injected with antisense morpholino oligos to obstruct endogenous PIAS 2 protein production, and the defects in early frog development were observed. In addition, the sumoylation pattern was analyzed by Western blot assays to distinguish if PIAS2 can alter protein modification. However, the pattern was similar. This summer, the goal will be to construct mutant PIAS 1 genes with specific deletion of individual domains (SAP, SP-RING, and SIM), then to examine the function of these mutant genes in early frog embryo development and compare them with the wild type PIAS genes. The following steps will be involved: PCR -mediated deletion, ligation of PCR products into the correct vector, transformation, and plasmid mini-prep. Restriction enzyme digestion to examine the plasmid, maxi-prep of the correct plasmid, RNA synthesis, and injection into the early frog embryos will also be used. The effect of the mutant PIAS1 genes on early frog development will then be examined.

Life Sciences III—Exhibit 26

Tanu Patel

University of California-Berkeley, Berkeley, CA
Summer in Biomedical Sciences (SIBS)
Mentor - Eddy S. Yang

GSK3β inhibition protects healthy cells by repairing irradiation induced DNA damage

Cranial irradiation (IR) therapy often results in eventual neurocognitive deficits in memory and learning, especially for pediatric patients. These effects may be due to IR induced double-strand breaks (DSBs) in DNA in hippocampal neurons. DNA damage has been found to increase the amount of GSK3β expressed in normal irradiated cells. This accumulation of GSK3β ultimately leads to an increased amount of cell apoptosis. It has been found that inhibition of GSK3β increases DSB repair, and consequently decreases cell death in hippocampal neuronal cells but does not inhibit cell death in glioma cells. (Yang, 2011) This specificity in protection makes GSK3β inhibition an ideal therapeutic strategy for neuroprotection. In order to further understand the universality of the role that GSK3β inhibition plays in DNA repair mediated protection, we looked at this phenomenon in kidney cells. Our preliminary results suggest that there is indeed a protective effect on cells treated with GSK3β as opposed to cells treated with a control. However, further study is needed to confirm these preliminary results. Additionally, it has been hypothesized that the DNA repair and consequent cell survival seen with the inhibition of GSK3β is related to the subcellular localization of BRCA1. BRCA1 assists in non-homologous end joining (NHEJ) repair of DSBs if localized in the nucleus. However, radiation causes BRCA1 to shuttle from the nucleus to cytoplasm and results in cell apoptosis. (Yang, 2010) The results from our experiments testing the link between GSK3β and BRCA1 are pending.

Life Sciences III—Exhibit 27

Lindy Pence
Wofford College, Spartanburg, SC
Summer in Biomedical Sciences (SIBS)
Mentor - Charles Landen

Inhibition of the mTOR/PI3K Pathways to Enhance Sensitivity of Ovarian Cancer Cells to Chemotherapy Treatment

The American Cancer Society estimated for 2012 that 15,500 women in the United States would lose their lives to ovarian cancer. In addition, the 5-year survival rate for ovarian cancer is a disheartening 46%. This low rate is the result of ovarian cancer being frequently diagnosed at advanced stage, and having a high rate of recurrence and development of chemoresistance. To improve survival in ovarian cancer, many biologic therapies have been developed, but have shown disappointing results when used alone. Therefore this study investigates whether biologic pathways can be targeted in combination with chemotherapy in order to kill the resistant population that survives after primary therapy. The mTOR and PI3K pathways have been recognized as being frequently overactive in ovarian cancer cells, and these two pathways have been targeted individually with inhibitors. However, the redundancy and crosstalk between these pathways have limited the success of single-target inhibitors. Recently, inhibitors have been developed that concurrently target both mTOR and PI3K, potentially eliminating this feedback loop.

In this study one such inhibitor, PF-04691502, was tested on both chemoresistant and chemosensitive ovarian cancer cell lines for decreasing cell viability with and without the presence of chemotherapy agents paclitaxol and carboplatin. The chemosensitive cell lines are highly sensitive to the dual inhibitor, but no synergy was seen when combined with chemotherapy. Chemoresistant lines are less sensitive to PF-04691502 alone. Whether PF-04691502 sensitizes these resistant cells to chemotherapy is pending. Thus far PF-04691502 appears to be a promising agent in chemosensitive ovarian cancer.

Life Sciences III—Exhibit 28

Rachael Sarrett
Samford University, Birmingham, AL
Summer in Biomedical Sciences (SIBS)
Mentors – Timothy Kraft, Run-Tao Yan and Shu-Zhen Wang

Making New Photoreceptors from Retinal Pigment Epithelium

The retina contains photoreceptors that transform light into electrical signals that are passed on to, and interpreted by the brain. The two types, rods and cones, mediate night vision and daytime vision respectively. Mammalian photoreceptors cannot regenerate, thus photoreceptor death can permanently impair vision, even leading to complete blindness. This project aims to identify a viable source and feasible means of generating de novo, functional photoreceptors for replacement therapy. We propose that the retinal pigment epithelium (RPE), a pigmented layer of tissue located directly behind the photoreceptors can be stimulated to differentiate into photoreceptor cells genetically.

Transgenic animals were examined for the presence of new cells, the morphology of the new cells, and for cell specific protein markers identifying them as photoreceptors. We used immunohistochemistry to ensure that these newly created cells contained key cone proteins. Then, using an electroretinogram (ERG), we tested the photoreceptors in these transgenic mice to determine whether or not the extra layer of photoreceptors functions properly (i.e. creates an electric response in response to light) and compared these results to wild-type mice. The ERG measures the summed electrical response of all retinal cells responding to a change in light. Photoreceptor cells' electrical response to light, the negative a-wave of the ERG, was disproportionately larger in ngn-3 transgenic animals under both light- and dark-adapted conditions suggesting that the new cells formed were indeed functional photoreceptors.

Life Sciences III—Exhibit 29

Samantha Scanlon
Harding University, Searcy, AR
Summer in Biomedical Sciences (SIBS)
Mentors - John S. Jarboe and Christopher D. Willey

Investigation of the Mechanism of Regulation of Proliferation and Radiation Sensitivity by the MARCKS Protein in Glioma Cells.

Glioblastoma multiforme (GBM) represents the most common and deadly form of glioma, with the median post-diagnosis survival being 12 months. In xenograft models, GBM has been shown to be more radiation resistant when the phosphatidylinositol-3-kinase (PI3K)/Akt pathway is active, since it promotes increased cell growth, DNA damage repair, and survival. In this pathway, phosphatidyl inositol bisphosphate (PIP2) is converted to the triphosphate (PIP3) by PI3K, which leads to Akt activation. Myristoylated Alanine Rich C-Kinase Substrate (MARCKS) is a potential regulator for the availability of PIP2 to the PI3K/Akt pathway as it is capable of sequestering PIP2 at the membrane via electrostatic interactions. Our objective is to further elucidate the mechanism of this regulation, which is anticipated to occur through a reversible sequestration of PIP2 at the membrane of the cell by MARCKS. This will be investigated through the over-expression of various MARCKS mutants in three glioma cell lines (U87, U373, and U251) and subsequent observation of its effects on the PI3K/Akt pathway, proliferation, radiation sensitivity, DNA damage repair, and apoptosis.

Life Sciences III—Exhibit 30

Paige Souder
Samford University, Birmingham, AL
Summer in Biomedical Sciences (SIBS)
Mentors - Robert Mans and Lori McMahon

The role of ERK phosphorylation in BQCA-mediated LTD in CA1 hippocampal neurons

Therapeutic targets for Alzheimer's disease (AD) are currently being studied in various aspects. One such target, the M1 muscarinic G-protein coupled acetylcholine receptor (mAChR), has been found in previous studies to modulate multiple hallmarks of AD pathology. Agonists of the M1 mAChR decrease cognitive deficits as well as tau and Aβ aggregation. A novel pharmaceutical agent, 3-(4-bromobenzoyl)-2-quinolinecarboxaldehyde (BQCA), acts as an allosteric potentiator of M1 and has been found to successfully reverse AD pathology in mice. Further studies of BQCA have found it induces long-term depression (LTD), a vital form of synaptic plasticity, in rat hippocampal slices. The current study investigates the intracellular signaling events mediating BQCA-induced LTD in the CA1 subfield of the hippocampus, a region necessary for normal learning and memory. M1 receptor activation is known to trigger phosphorylation of extracellular-signal-regulated kinase 1/2 (ERK 1/2) Here we test the prediction that a 15 min treatment with BQCA, a duration known to induce LTD in CA1, will increase the amount of phosphorylated (activated) ERK in CA1 synapses.

Life Sciences III—Exhibit 31

Carly Twarog
Pittsburg State University, Pittsburg, KS
Summer in Biomedical Sciences (SIBS)
Mentor - Sunnie Thompson

Extra Ribosomal Functions of RPS25

The vast majority of mRNAs are translated through a cap-dependent mechanism that requires a 5' cap and 10-13 initiation factors in order to recruit the 40S ribosomal subunit. However, some viral and cellular mRNAs use an alternative mechanism of initiating translation that requires an internal ribosome entry site (IRES) in the 5' untranslated region (UTR). Ribosomal protein S25 (Rps25) is required for IRES translation, but not for cap-dependent translation, ribosome biogenesis, or ribosome function. Thus, it is reasonable to assume usual cellular processes could proceed in the absence of Rps25. However, previous studies have shown that ribosomal proteins can have specialized functions apart from their function on the ribosome. Since Rps25 is located on the surface of the 40S ribosome it may be able to associate or disassociate from the ribosome under certain cellular conditions. The goal of our study is to determine if there are any ribosomal free copies of Rps25 in the cell. Polysomes will be separated on a sucrose density gradient, fractionated, and protein will be looked at by Western Blot Analysis to determine where Rps25 associates. Considering some viruses, such as the Hepatitis C virus, require host Rps25 for translation of their genome, it is possible that Rps25 could be a target for drug or gene therapy if proven not to play a vital role in host cells.

Life Sciences III—Exhibit 32

Musa Williams, Romone M. Fancy, Yuhua Song, Ph.D.
Department of Biomedical Engineering
University of Alabama at Birmingham
Birmingham AL, 35294

Biological Significance of CaM/DR-5 Interaction in DR5-Mediated Apoptosis in Breast Cancer.

Breast cancer is one of the most commonly diagnosed cancers accounting for 23% of new cancer cases (*1, 2*). Conventional treatments have increased survival rates. Unfortunately, resistance, toxicity, and poor drug response still hinder effective treatment of breast cancer (*3-5*). Targeting DR-5 to induce breast cancer cell apoptosis is a potential strategy for breast cancer treatment (*6-8*); however, many breast cancer cells have low to no sensitivity to DR-5 mediated apoptosis (*9*). Calmodulin (CaM) has been shown to regulate breast cancer cell survival and proliferation (*10, 11*). CaM Inhibition has also been shown to sensitize cancer cells to DR-5-mediated apoptosis in cancer (*12-14*), thus CaM could play an important role in DR-5-mediated apoptotic signaling. Further characterization of the role of CaM/DR-5 binding in DR-5 mediated apoptosis in breast cancer may lead to the identification of the key regulator for DR-5 mediated apoptosis in breast cancer. The objective of this study is to characterize the biological significance of CaM and DR-5 interaction in DR-5 mediated apoptosis in breast cancer. To implement the objective, experiments will be performed for breast cancer cells with the following variations: (1) no treatment; (2) CaM antagonist triflouperazine (TFP) treatment only; (3) DR-5 agonist TRA-8 treatment only; or (4) TFP and TRA-8 treatment. CaM/DR-5 interaction will be evaluated using immunoprecipitation followed by western blot analysis. To evaluate CaM/DR-5 interaction regulation of DR-5 activation of caspase signaling, breast cancer cells will be pretreated as previously described, followed by western blot analysis of cell lysates.

Kendra J. Royston [1], Tabitha M. Hardy [2] and Trygve O. Tollefsbol [2,3,4,5,6]

Effects of Dietary Compounds Sulforaphane and Epigallocatechin-3-Gallate on MDA-MB 157 and MDA-MB 231 Breast Cancer Cells

Breast cancer is one of the leading causes of death of women in the United States. Many studies have been launched with the intentions of better understanding this fatal disease. Estrogen receptor alpha negative (ERα-) breast cancer is of particular interest because current chemotherapies are ineffective against it, thus making it more difficult to treat. Chemopreventative dietary compounds are currently being studied as possible treatments for breast cancer because of their ability to inhibit DNA methyl transferases (DMNTs), act as histone modifiers and alter the epigenome of cancer cells through chromatin remodeling. Studies show that epigallocatechin-3-gallate (EGCG), a polyphenol found in green tea, and sulforaphane (SFN), an isothiocyanate found in broccoli, are capable of reactivating ERα expression in ERα- breast cancer cell lines. Preliminary data revealed that after treating ERα- MDA-MB 157 and MDA-MB 231 breast cancer cells with EGCG and SFN, notable changes in cellular morphology and cell viability were observed. These data support the belief that an optimal dose of EGCG and SFN may serve as a treatment for breast cancer. These observations are significant because naturally chemotherapeutic dietary compounds may have a sunstantial impact on improving conditions in breast cancer patients and provide treatment options for ER negative breast cancers.

Physical Science and Engineering I—Exhibit 34

Joshua Wetuski
University of Alabama Birmingham
McNair Scholars Program
Mentor: Andrei Stanishevsky, Ph.D

Electrospun Inorganic Materials for Renewable Energy and Industrial Use

Electrospinning is a process in which a polymer solution containing various elements is exposed to an electric field. Droplets of a solution form a Taylor cone due to the exposure of an electric field. After a critical point is reached, this releases a long thin jet that elongates through the electric field until it hits the collector where it dries and forms in to nano-sized fibers. These fibers have been used in many areas such as various biomedical in tissue engineering. Technique of creating nanofiber materials has picked up in recent years, and this research aims to create a cheap and efficient way to produce ceramics with this method containing titanium, hafnium, and zirconium. This first part of the experiment is to creating a solution with proper precursors in order to make the ceramics at a desired size and still economically feasible manner. These kinds of materials have a wide range of possible uses such as a factor in producing more efficient energy sources or through electrical engineering. The solutions for these fibers will be tested through the most typical style of of electrospinning; this involves filling a syringe with the solution that slowly ejections the fluid through a charged syringe at a determined flow-rate to be collected on a collector of an opposite charge. Once collected, the of the material will examined for quality.

Physical Science and Engineering I—Exhibit 35

Phillip Wall, Davidson College
Research Experiences for Undergraduates (REU)
Dr. Mary Ellen Zvanut (Mentor), University of Alabama at Birmingham, Department of Physics
Ustun Sunay (Physics Graduate Student Mentor), University of Alabama at Birmingham
Physical Sciences

Investigating Point Defects in Iron-Doped Gallium Nitride

This project examines point defects in iron-doped gallium nitride (GaN:Fe) through electron paramagnetic resonance (EPR) spectroscopy. GaN is a wide band gap semiconductor with properties useful in lighting and laser applications such as LED's and laser diodes. Doping GaN with a dopant such as Fe^{3+} increases the electrical resistivity making the semiconductor a semi-insulator. However, three additional point defects appear in the GaN:Fe that we investigate in this project. These defects may have properties relating to Fe^{3+}. Specifically, we use EPR spectroscopy to observe the thermal properties, chemical properties, angular dependence, and reaction to light of the defects in GaN:Fe. The two primary samples studied have volumes of about $2.3x10^{-2}$ cm^3 and $9.9x10^{-3}$ cm^3 and iron concentrations of 500 sccm and 250 sccm respectively. Through EPR spectroscopy, we can clearly see differences in behavior between various sample conditions through changes in signal intensity. These conditions include annealing the samples at temperatures ranging from 400ºC to 800ºC and in nitrogen and oxygen gas ambient. The anneals have produced significant changes to the 500 sccm signal intensities while the 250 sccm sample's signal intensities have remained relatively unchanged. Analyzing the point defects in these ways will give us insight into important characteristics that will hopefully lead to their identities and the reason why they are formed in growth.

Physical Science & Engineering I—Exhibit 36

Luke McClintock, University of Alabama at Birmingham,
Research Experiences for Undergraduates, (REU),
Dr. David Hilton, Department of Physics,

Simultaneous Transmission/Reflection Terahertz Time-Domain Spectroscopy

We have constructed a terahertz (THz) time-domain spectrometer that is capable of simultaneous reflection and transmission measurements. THz time-domain spectroscopy (TTDS) is an ultrafast sampling technique that utilizes non-linear optics to generate and detect the electric field reflected and transmitted THz radiation. This unique sampling technique allows us to probe the dynamics of materials that have absorption features in the THz frequency range at picosecond time scales. We will demonstrate the determination of optical constants of gallium arsenide using this spectrometer in both the reflection and transmission geometry, which will show that this design overcomes many of the experimental difficulties traditionally associated with coherent terahertz measurements in the reflection geometry.

Physical Science & Engineering I—Exhibit 37

Patrick Marino, University of Notre Dame
Research Experiences for Undergraduates (REU)
Dr. Renato Camata (Advisor), Department of Physics,
P. J. Marino, T. Konak, Z. R. Lindsey, V.V. Fedorov, S.B. Mirov, R. P Camata

Development of Cr^{2+}:ZnSe-based and ZnSe-based Electroluminescent Devices

Affordable laser devices operating in the mid-infrared (mid-IR) spectral range are in high demand for laser spectroscopic applications in fields ranging from law enforcement to environmental science. Transition metal doped II-VI semiconductors are promising candidates for these sources, exhibiting tunable middle infrared lasing behavior in the 2-5 μm spectral range. Optically pumped devices utilizing these materials have been fabricated, successfully emitting light in the mid-IR range. It is imperative, however, that electrically pumped devices are developed so that use in the field becomes practical. In this study, we explore the fabrication of ZnSe and Cr^{2+}:ZnSe-based thin films with potential for lasing under electrical excitation. Thin films of ZnSe or Cr^{2+}:ZnSe are deposited onto ITO-coated glass substrates by pulsed laser deposition (PLD). Next, copper electrical contacts are deposited on the surface of the thin films, also by PLD. PLD is carried out using ZnSe, Cr^{2+}:ZnSe, and Cu targets. Targets are ablated by a KrF excimer laser at 2 J/cm^2 at pressures below 1 x 10^{-5} Torr. Parameters including deposition rate, laser energy density, and deposition temperature are varied in order to optimize film and contact characteristics for electrically excited lasing. Current-voltage curves measured through our samples show promise for electroluminescent behavior.

Physical Science & Engineering I—Exhibit 38

Maurice Asouzu
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Dr. Pengfei Wang

Production of Innovative Carbonyl Photo-cleavable Protecting Group

Stimuli-responsive polymers or "smart" polymers are high-performance polymers that change in response to various environmental changes. These smart polymers show sharp responses to a number of environmental changes such as pH, temperature, light intensity, redox, electrical or magnetic field, or chemical changes. The use of light as a stimulus has attracted much interest because of its distinct advantages. Light characteristics can be remotely and accurately controlled, quickly switched, and easily focused into targeted areas. Also, these specific responses can be brought about and controlled from outside the system without the use of chemicals. The current study focuses on using carbonyl photo-cleavable protecting groups (PPGs) based on a photo-linker. A photosensitive carbonyl PPG was synthesized in a simple reaction using an inexpensive, commercially available material. Once synthesized, the PPG was then purified using column chromatography and characterized by thin-layer chromatography (TLC), NMR analysis, IR analysis, and mass spectroscopy (MS). The purified product was incorporated into a polymer skeleton and then thermal, mechanical, and other such properties were analyzed. The carbonyl PPGs prove to be very stable and can be utilized in models for purposes such as drug release. This photochemical release of carbonyl PPGs can be applied in several fields such as biological research and biomedical engineering.

Physical Science & Engineering I—Exhibit 39

Walter Malone, University of Portland,
Research Experiences for Undergraduates (REU),
Dr. Yogesh K. Vohra, Dr. Georgiy M. Tsoi, Department of Physics,

Search for Superconductivity in Ba0.5Sr0.5Fe2As2 under High Pressures and Low Temperatures

In an effort to explore its superconducting behavior, the electrical resistance of $Ba_{0.5}Sr_{0.5}Fe_2As_2$ sample was measured to low temperatures down to 10 K and high pressures up to 20 GPa in a diamond anvil cell. A designer diamond with embedded electrical probes was used to measure electrical resistance using a four-probe technique. A ruby pressure sensor was placed with the sample and provided pressure calibration both during cooling and heating cycles at various pressures. Three different samples cut from the same crystal were tested under a broad range of pressures. The first two were loaded into a traditional gasket, while the third was loaded into a gasket that used steatite as an insulator. Common to all samples was that the electrical resistance reached a local maximum around 20 K and then decreased at lower temperature. Pressure suppressed this behavior and eventually wiped out this hump in electrical resistance all together, and the sample showed a semiconducting or insulating behavior above 10 GPa. The exact pressure needed to completely suppress this behavior varied again with sample, indicating that the results could be noticeably dependent on the sample or perhaps on the method or style of loading. Further experiments are needed to confirm that the decrease in electrical resistance under high pressures of 7 GPa and low temperatures is linked to the superconductivity in $Ba_{0.5}Sr_{0.5}Fe_2As_2$. It is clearly established by our studies that at higher pressure above 10 GPa, the sample transforms to a semiconducting or insulating phase and is non-superconducting.

Physical Science & Engineering I—Exhibit 40

Zachary Palchak, Juniata College,
Research Experiences for Undergraduates (REU),
Dr. Eugenia Kharlampieva (Mentor), Department of Chemistry, University of Alabama at Birmingham
Xing Liang (Graduate Student Collaborator), Department of Chemistry, University of Alabama at Birmingham

Functionalization and Analysis of Temperature-Responsive Poly(N-vinylcaprolactam)

There has been in recent years, an increasing interest in the area of nanolayered polymer films made with polymers soluble in aqueous solutions. One of such polymers is poly(N-vinylcaprolactam) (PVCL) which is nontoxic, biocompatible and exhibits distinctive thermoresponsive behavior with LCST around 37°C. In our study we produce thermosensitive PVCL-containing ultrathin films by using layer-by-layer (LbL) assembly technique. The LbL films were converted to hydrogels by selective cross-linking of the PVCL layers in the LbL films. We found that these hydrogel films were able to expand or contract by varying degrees depending on their temperature environment. Several types of PVCL-copolymers containing crosslinkable functional groups were synthesized and used for the film construction. Degree of crosslinking was controlled by varying amount of functionalized N-vinylcaprolactam (VCL) monomers in the copolymers. VCL was altered at the alpha position to the carbonyl to have one of three substituents such as 1-butene oxide (EP), 2-propyl-1,3-dioxolane (DOE), and a methyl substituent (ME). The first two were chosen for their known reactivity and ability to induce cross-linking in other functionalized polymers. The methyl was chosen under the hypothesis that it would help in the construction of micelles made of PVCL given its slight hydrophobic nature. It was found that both EP-PVCL and DOE-PVCL were highly capable of crosslinking. In fact, with EP-PVCL it proved difficult to hinder crosslinking of the polymer during its initial synthesis. Analysis of ME-PVCL showed that the polymer demonstrated high hydrophobicity. We believe that produced copolymers hold significant promise for developing new types of biocompatible thermoresponsive coatings for potential applications in drug delivery and sensing.

Physical Science & Engineering I—Exhibit 41

Aditi Naik, Cornell University,
Research Experiences for Undergraduates (REU),
Dr. Aaron Catledge (Mentor), *Department of Physics*,
Jake White (Undergraduate Collaborator)

Development of Dot Array Biosensor using Dip-Pen Nanolithography of Polyacrylamide Inks

The goal of this project was to determine the optimal conditions for printing an array of sub-picoliter polyacrylamide hydrogel "dots" to be used for molecular recognition. A biosensor will be developed using a molecularly imprinted polymer approach for protein capture, with dispersed nanodiamonds providing signal transduction via fluorescent quenching. Polymer concentrations ranging from 3%T– 30%T with 3%C of acrylamide monomer and crosslinker were analyzed to observe changes in visible gelation, viscosity, and porosity. Gels created with the addition of the porogen polyethylene glycol showed a higher initial viscosity allowing for greater stability of polymer dots. An array of a 15%T 3%C monomer solution with 18wt% polyethylene glycol and initiator was successfully printed on a silicon dioxide substrate using dip-pen nanolithography (DPN). Individual dots were examined using optical and atomic force microscopy and found to exhibit the well-defined surface structure of a polymerized gel. Nanodiamond particles (0.1wt%) of 0.375 μm were incorporated into the polymer matrix on glass slides and shown to be evenly distributed throughout the gel. The addition of nanodiamonds resulted in an increased gelation time, which will facilitate the DPN printing process.

Stephanie Jacobs[1], Theresa Bayush[2] and Selvum Pillay[3]
[1]*Miles College, Department of Natural Science and Mathematics, Research Experiences for Undergraduates (REU)*
[2]*University of Alabama at Birmingham (Mentor), Department of Materials Science and Engineering*
[2]*University of Alabama at Birmingham (Graduate Student Collaborator), Department of Materials Science and Engineering*

Recycling Thermoset Composites

Due to growing environmental concerns and increasing government regulations, several industries are under increasing pressure to recycle and/or reuse materials from scrap, trim-offs and end of life components. Thermoset composite materials provide excellent strength to weight ratios compared to traditional materials like steel, however the downside is that it is not recyclable. Scrap material from manufacturing and end of life components are sent to landfill, which is environmentally hazardous and expensive. The aim of this research is to investigate the feasibility of recycling thermoset composites through novel manufacturing methods. The machining residue of an E-glass/epoxy composite, 65% by weight of fiber, was received from Gordon Composites, Denver, Colorado. Approximately 100,000 lbs/year of this waste material is sent to landfill from Gordon Composites alone; combined with other companies this number would exceed several million pounds/year.

The material received was in a granulated, fine powder form with traces of fiberglass strands. The average size of the fine particles was 0.005 mm while the average fiberglass lengths were 1.43 mm for the visible fiber and 0.02 mm after ultrasonic probing of the powder material. 30% by weight, of this material was compounded with 65% polypropylene (PP) and 5% of maleic anhydride grafted PP (MAPP), using a twin screw extruder. The 'new' composite was then processed through a low shear plasticator and compression molded into plates for mechanical characterization. There was an increase in tensile strength and modulus of elasticity of 15 % and 50 % respectively, compared to neat PP. The flexural strength and modulus of elasticity increased by 20% and 30%, respectively compared to neat PP. These results are very preliminary, however shows that a previously scrap material could be used to enhance the properties of PP.

Physical Science & Engineering II—Exhibit 43

Roman Garcia, University of Alabama at Birmingham,
Research Experiences for Undergraduates (REU),
Dr. Vinoy Thomas (Mentor), *Department of Physics*

Development of HuBiogel Enriched Electrospun Nanofibrous Scaffolds

Previous experiments involving electrospun scaffolds for tissue regeneration have involved the use of natural and synthetic materials to replicate the structural, morphological, and mechanical characteristics of the native extracellular matrix. In many instances, a compromise between the biocompatibility of natural materials, of nonhuman origin, and the structural rigidity of synthetic materials negatively affects in vivo viability. An electrospun scaffold comprised of human-derived components has yet to be developed. HuBiogel^{TM} is comprised of collagen and proteoglycans from human amnions. Therefore, HuBiogel^{TM} may be an ideal component of an electrospun scaffold from which to test the biocompatibility and soft tissue mechanical properties necessary for vascular tissue regeneration. This experiment aims at developing a HuBiogel^{TM} enriched nanofibrous scaffold through the use of electrospinning and testing its comparability to the native extracellular matrix, primarily that of vascular tissue.

Solutions of PCL/HFP and PCL:PGC/HFP were electrospun while HuBiogel^{TM} was sprayed onto the scaffold concurrently. Fiber characterization was determined by atomic force microscopy and scanning electron microscopy. The mechanical properties of the scaffolds were determined by uniaxial tesile testing.

Physical Science & Engineering II—Exhibit 44

Nkele Davis, University of Alabama at Birmingham, Washington University in St. Louis
Research Experiences for Undergraduates (REU)
Dr. Alan Eberhardt, Mr. Joe Schwertz Department of Biomedical Engineering

Mechanical Characterization of Bone in Diabetic Murine Models

Type 1 and Type 2 Diabetes Mellitus (DM) affect more than 25 million people in the United States and almost 300 million people worldwide. Diabetes has adverse effects on bone health leaving individuals more susceptible to bone fracture. The present study uses three point testing and shear testing on tibiae from diabetic murine models to test the strength of cortical bone and the growth plate, respectively. All of the bones tested are from mice that were around 2 ½ months old. The three point test was performed across the diaphysis of each tibia to determine toughness, stiffness, ultimate stress, and Young's Modulus. Afterwards, a shear test was performed on the proximal end of the tibia at the growth plate to determine toughness, stiffness, and shear strength. Micro-CT scans were performed to determine the cross sectional moment of inertia of the mid-diaphysis, and trabecular bone volume at the proximal epiphysis. Preliminary results showed that the average maximum bending force was 4.43 +/- 0.47N, the average stiffness was 10.63 +/- 0.36 N/mm, and the average toughness was 1.42 +/- 0.42. In preliminary shear testing, the average shear force was 6.45 +/- 0.49N, while the average stiffness was 13.55 +/- 0.93 N/mm. Ongoing efforts include the testing of additional mouse tibiae from Type 1 and Type 2 DM models and the incorporation of micro-CT data in strength and modulus calculations.

Physical Science & Engineering II—Exhibit 45

Jerome Arceneaux
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Dr. Jacqueline Nikles

Determining the Drug-Loading Capacity for Polymer Micelles Used in a Targeted, Magnetically Triggered Drug-Delivery System for Cancer Therapy

Chemotherapy not only kills cancer cells, but it also kills healthy cells, producing harsh and well-known side effects such as hair loss, nausea, and systemic pain, to name a few. With a targeted, drug-delivery system, the drug would only attack the cancer cells, minimizing the harsh side effects. The drug-delivery system consists of polymer micelles with the cancer drug trapped in the hydrophobic core of the micelle. The polymer micelles were made from poly (ethylene glycol-*b*-caprolactone) a diblock copolymer (PEG-PCL) or poly(ethylene glycol-*b*-caprolactone-*b*-lactic acid) a triblock terpolymer. The PEG molecular weights are either 2000 or 5000, and the PCL has lengths of 20 or 40. The poly(caprolactone) in the micelle core is semicrystalline, and it is expected that the crystalline core will trap the cancer drug, preventing its release until the core has melted. In this project, the encapsulation efficiency of loading the cancer drugs into the polymer micelles was determined by fluorescence spectroscopy. The objective was to determine which polymer is the most efficient in encapsulating and retaining the cancer drugs. Another objective was to determine the best method for loading the cancer drug into the polymer micelle. A fluorescent molecule, 9-(methylaminomethyl) anthracene, was examined as a surrogate for the more expensive cancer drugs and found to give encapsulation efficiencies of less than 1%. For the diblock copolymer, the best method was to load the drug at high temperatures, 90° C, when the poly(caprolactone) core had melted. The encapsulation efficiency of dibucaine, an anesthetic and a UV-Vis molecule, will also be tested. Finally, once the best-performing micelle has been determined, doxorubicin, a chemotherapeutic agent, will be tested.

Physical Science & Engineering II—Exhibit 46

Faith Roberts, Cali Fidopiastis, Ph.D, Pankaj Mahajan

Exploratory Study: The Best Way to View 3D/Virtual Imagery

According to the Nation Spinal Cord Injury Statistical Center, approximately 270,000 people alive in 2012 report having spinal cord injuries. About 65% of spinal cord injured patients report chronic pain. Some patients experience pain so extreme that it prevents them from working and functioning in their daily routines. Current research attempts to understand the origin of neuropathic pain and its underlying biological mechanism. The virtual walking study approach has great potential to elucidate the connections of spinal cord injury and pain responses. The visual illusion represented by the virtual walking process could correct the motor command and sensory feedback mismatch thought to be the cause of certain pain. The purpose of this exploratory study will investigate how best to present virtual walking stimuli using 3D imagery. We will conduct a repeated measures study where participants will view virtual walking stimuli using either SONY 3D glasses or red and blue anaglyph glasses to create the 3D imagery. Participants will rate the effectiveness of each 3D glasses headset. We will also evaluate changes on brain states using electroencephalography. Virtual walking could be a feasible treatment for patients suffering pain. This investigation could help determine the best way to present the virtual walking stimuli to patients using a 3D setup.

Physical Science & Engineering II—Exhibit 47

Sean Severson, Washington State University
Research Experiences for Undergraduates (REU)
Dr. Uday Vaidya (Mentor), *Department of Materials Science and Engineering,*
Benjamin Geiger-Willis (Materials Engineering Graduate Student Collaborator),
Eric Kerr-Anderson (Materials Engineering Graduate Student Collaborator)

Temperature Effects on the Ballistic Performance of Self-Reinforced Polypropylene Composite Laminate

Self-reinforced polypropylene (SRPP) has been shown to be an effective armor against shrapnel and small arms projectiles. Widespread use of SRPP requires the characterization of ballistic performance at elevated and suppressed temperatures that would be witnessed in any combat environment. SRPP is a thermoplastic, which has excellent energy absorbing mechanisms and impact resistance compared to other composites composed of glass, carbon, or thermoset polymers due to the higher strain-to-failure of SRPP. Thermoplastic composite materials are an attractive choice due to the low weight and ease of production. The properties of thermoplastic materials are strongly dependent on temperature, and few studies have been conducted on the ballistic performance of SRPP at suppressed and elevated temperatures. Dynamic Mechanical Analysis (DMA) was conducted to determine the glass transition temperature (T_g), the softening temperature, and the melting temperature. To determine the effect of temperature on the ballistic performance of SRPP, a sample set was cooled below the T_g at -78° C and another sample set was heated just below the softening temperature at 80° C. The ballistic performance at suppressed and elevated temperatures was compared to room temperature ballistic performance. Ballistic testing was conducted using a single-stage light-gas gun which propelled a 12.7 mm diameter spherical steel projectile at velocities from 50 ms^{-1} to 350 ms^{-1}. Energy absorbing mechanisms that were observed after impact at the three temperatures were cone formation on the back face, deformation of secondary yarns, tension in primary yarns, and shear plugging. Deformation was greatest at 80°C, near the molding temperature range.

Physical Science & Engineering II—Exhibit 48

Deondra Scott[1,2], Dong-Jin Lim[1], Shibli M. Rahman[1], Adinarayana Andukuri[1], Patrick TJ. Hwang[1], John A. Corbett[4], and Ho-Wook Jun[1,3]
[1]Department of Biomedical Engineering, [2]Research Experience for Undergraduates (REU) Program, [3]Comprehensive Diabetes Center, University of Alabama at Birmingham, Birmingham, AL, [4]Department of Biochemistry, Medical College of Wisconsin, Milwaukee, WI

Self-Assembled Peptide Amphiphile Nanomatrix as an Extracellular Matrix Mimic for MIN-6 Pancreatic β Cells

Pancreatic islet transplantation (PIT) has regained attention as a promising treatment for type 1 diabetes by rendering precise blood glucose level control without insulin injections as well as preventing secondary complications of diabetes. However, a variety of challenges such as the required number of islets for initial success, immune response, and progressive engraftment failure have been addressed. Especially, disruption of islet-ECM (extracellular matrix) microenvironment is attributed to reduced islet functionality over time. To study the potential of self-assembled peptide amphiphiles (PAs) as an ECM mimic, self-assembled PA-based nanomatrices that present various laminin-1 derived cell -adhesive ligands were synthesized and studied. Using MIN6 β-cells showing functional activities similar to those of normal islets, the ability of PA-driven nanomatrices for the support of β-cell function was evaluated. All bioactive PAs inscribed with laminin-1 derived cell-adhesive ligands exhibited elevated insulin responses to glucose, demonstrating that the cell-adhesive ligands contributes to enhanced MIN6 β-cells function. ECM mimics that hold different laminin-1 derived cell-adhesive ligands tethered to the PA were successfully synthesized and studied using MIN6 β-cells. All bioactive PAs inscribed with laminin-1 derived cell-adhesive ligands exhibited increased insulin secretion response to glucose compared to the control, implying that the laminin-1 derived bioactive domain may contribute to enhanced MIN6 β-cell functions. The PA-driven nanomatrices capable of creating a biomimetic ECM microenvironment may be utilized for improving the survival of transplanted islets, thereby leading to successful pancreatic islet transplantation for treating type 1 diabetes.

Physical Science & Engineering II—Exhibit 49

Christian Rogers, Alabama State University
Research Experiences for Undergraduates (REU)
Dr. Derrick Dean (Mentor), Department of Materials Science and Engineering
Alyssa Terry (Graduate Student Collaborator).

Degradation of PLGA Nanospheres

In this project Poly (lactic- co -glycolic acid) (PLGA) nanoparticles were synthesized for a degradation study to be used in conjunction with a release study of PLGA encapsulated drug particles. The particles were synthesized using the solvent evaporation method. Chemical structure changes were observed using FT-IR spectroscopy; Differential Scanning Calorimetry (DSC) (not sure exactly what is being measured with DSC); and Scanning Electron Microscopy (SEM) to observe the physical structure of the particles. Bulk PLGA was utilized as a baseline for this degradation experiment. It has been found that PLGA degrades in two phases, the first is characterized by an increase in the hydroxyl group, followed by a decrease in the carbonyl group coinciding with mass loss. The changing in the chemical structure of the polymer may also lead to changes in thermo-kinetics. Finally, as the polymer degrades we expect to find changes in the overall physical structure of the nanoparticles.

Physical Science & Engineering II—Exhibit 50

Lauren Guimond, University of Florida,
Uab Research Experiences for Undergraduates (REU),
Dr. Joel Berry, (Mentor) Department of Biomedical Engineering

Production Parameters and Mechanical Properties of Electrospun PCL Fibers for Synthetic Tissue Scaffolds

Electrospinning is a versatile technique used to create synthetic tissue scaffolds. These scaffolds are used in tissue engineering to mimic the fibrous characteristics of the natural extracellular matrix. In order to understand how production parameters influence fiber diameter in biodegradable polycaprolactone matrices, the effects of electric field strength and flow rate were studied. By varying the electric field strength and flow rate of PCL solution, aligned and randomly oriented fibers of different diameters were produced. In order to create an aligned orientation, a rotating mandrel was used as a collector with a tangential surface velocity of 20 m/s. The randomly oriented fiber diameters ranged from 0.60 microns to 2.24 microns. In order to characterize the mechanical properties of the material, tensile testing of aligned and randomly oriented electrospun PCL fibers was performed using a custom micro-tensile testing device. When tested along the axis of alignment, it was found that the aligned fibers exhibited a high degree of anisotropy with a modulus of 530 ± 126 mN/mm compared to 8.48 ± 2.32 mN/mm for fibers tested perpendicular to alignment. The modulus for random fibers was found to be 38.3 ± 12.0 mN/mm. The viscoelastic stress relaxation behavior was characterized and fitted to a two term Prony series with a slow time constant of 73.94 ± 5.94 seconds and a fast time constant of 5.63 ± 0.463 seconds. Relaxation time constants were independent of fiber orientation. These results indicate that electrospun PCL scaffolds can be modified to contain fibers of a specific diameter and to exhibit desired mechanical properties by altering the production parameters used to create the fibers.

Satyam Patel
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Dr. Krishan K. Chawla

Processing of titania-coated glass microballoon foam for environmental cleanups

The objective of this project is to produce a light foam which is able to breakdown the organic pollutants in water under th e action of ultraviolet radiation. The foam consists of titania-coated glass microballoons (GMBs). Titania acts as a photo catalyst under the action of ultraviolet radiation. Foams made of titania-coated GMBs will be able to float on water; thus providing a cost-effective method for the cleanup of contaminated water under the action of ultraviolet radiation. The samples will be coated using a sol-gel technique which involves dipping the GMBs into a titanium isopropoxide sol, conversion into gel and then into titania by calcination. These titania-coated GMBs will be sintered causing the coatings to be fused, resulting in a floatable foam.

Public Health and Social & Behavioral Sciences I—Exhibit 52

Stephanie Hudman
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Dr. William Cockerham

The Changing Role of Women and its Effect on Mental Health Coping Skills

Traditionally, the mental health coping skills of women have been characterized by internalizing disorders (Rosenfield, 1999). However, research is arising which states that the roles and mental health of women are now changing and becoming more externalized. One example of the externalization is the increased rate of women drinking (Zhong and Schwartz, 2009.) As well, women are now taking on the role of breadwinner in families (Meisenbach, 2010.) Women are not only moving into the workforce, but they are also still the primary domestic caregiver working a "second shift," (Corrigall & Konrad, 2006.) The goal of the study is to investigate the new roles women play in society and the impact these roles have on their mental health. The importance of the research is so that mental health professional will be better informed on the current mental health issues women face. A literature review was conducted in order to review the development of the roles of women in society and the changes of their mental health. The results of the literature review shows that women are now taking the place of men as the primary breadwinner of the family. As well, the review shows that women are now turning to forms of externalizing behaviors as opposed to their traditional internalizing coping strategies. Based on these results, future considerations should be made about the different roles women play in society and their new mental health coping strategies.

Public Health and Social & Behavioral Sciences I—Exhibit 53

Anne Tolene
University of Alabama at Birmingham
McNair Scholars Program
Mentor: David J. Rhodes

Evaluating Scientific and Operational Management Processes within a Large National Cohort Study: The REGARDS Study

The Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study is a nationwide, observational cohort study focused on evaluating stroke risk factors. The study recruited 30,000 participants from 2003-2007 with the purpose of assessing the reasons for a higher number of strokes within certain geographic areas and racial populations. There are several ancillary studies also conducted within REGARDS that evaluate stroke risk factors such as physical activity and childhood socio-economic status. The objective of this project is to evaluate management processes, such as quality control and loss to follow-up, within a large cohort study.

Public Health and Social & Behavioral Sciences I—Exhibit 54

Sierra Nicely
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Dr. Shelia Cotton

Differences in Quality of Life Between Intervention and Non-Intervention Groups

While much research has been done on technology's effect on people, little research has been done on the effect of internet and computer technology on the elderly. The current world is home to a growing digital divide. This divide is marked by two groups, on one side are the digital natives and on the other, digital immigrants. While many people are part of the digital divide some of these digital immigrants are the elderly. The study will observe whether a computer training intervention will help these senior citizens join the digital revolution and improve their quality of life by expanding their world size. The project looked at the change between the initial pre-intervention survey and a survey given after the intervention as well as difference between the three arms of the study (ICT, TC, and AC). By looking at the time one (T1) and time two (T2) surveys it became easier to observe the change over time and the effectiveness of the intervention. The Hypothesis anticipates a statistically significant change in computer usage after the intervention. If the intervention was successful the computer class will result in an increased perception of world size in the lives of the older adults.

Public Health and Social & Behavioral Sciences I—Exhibit 55

Clint Strickland
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Michael Crowe

Depressive Symptoms in Older Hispanics with Diabetes

Clinton Strickland[1], Alberto García Gurucharri[2], Olivio J. Clay[1], Ana Luisa Dávila[2], & Michael Crowe[1]

Objective: Higher rates of depression in older adults are associated with various chronic illnesses, especially diabetes. However, research is lacking on predictors of depression within those who have diabetes, and among minority populations at high risk of diabetes, such as Hispanics. We examined predictors of depressive symptoms in a population-based sample of older Puerto Ricans with diabetes.

Methods: There were 998 participants from the Puerto Rican Elderly: Health Conditions (PREHCO) study who reported having late-onset diabetes (onset ≥age 30). Depressive symptoms were measured using the 15-item Geriatric Depression Scale (GDS). Self-rated health, diabetes-related complications and religiosity were examined as predictors of depressive symptoms. Diabetes-related complications were comprised of a summed score of the following items: circulation problems/neuropathy, vision problems, foot ulcers, amputations, and kidney-related complications. Religiosity was measured on a 3-point scale ranging from very religious to not religious at all. Multivariate regression models were used to examine the association of these factors with depressive symptoms while controlling for demographic factors.

Results: Average age of the sample was 70 years old (range=60-95). Poorer self-rated health and greater number of diabetes-related complications were associated with higher depressive symptoms ($p<.05$). Greater religiosity was related to fewer symptoms of depression. Self-rated health, diabetes-related complications, and religiosity were all independently associated with depressive symptoms.

Conclusions: Indicators of health and religiosity were linked to depressive symptoms in this sample of older Hispanics with diabetes. These findings have implications for both treatment and prevention of depression in this population.

Public Health and Social & Behavioral Sciences I—Exhibit 56

Joshua Harris McNair Scholar
Professor Vladimir Vantsevich

A Static and Dynamic analysis of Vehicle Rollover

Vehicle Rollover accidents are one of the leading causes of death in highway accidents due to their very high fatality rate. This research experiment investigates the effect of various vehicle parameters on rollover propensity using a physical simulation and a computer simulation through Matlab in which the vehicle rollover prediction algorithm that is based on a kinematic analysis of vehicle motion. The computer simulation's accuracy is verified by comparing it to experimental data from NHTSA's Phase IV testing on rollover of high center of gravity vehicles. As for the physical model we found that key challenge in preventing rollover via chassis control is that the prediction of the onset of rollover can be quite difficult. This concept is introduced in terms of a lower-order model of vehicle roll dynamics to measure the vehicle rollover propensity, and the resulting prediction allows a direct measure of a vehicle rollover threat index. The physical model results show the effectiveness of the proposed algorithm under varying static rollover conditions. The vehicle model used in the computer simulation study considers the non-linear, transient dynamics of both yaw and roll motion as well as longitudinal acceleration, weight, angle at which the vehicle is raised. Some other factors that contribute to rollover are wheelbase, tire forces, and ultimately the driver with the ability to over steer or under steer. In conclusion a correlation between the vehicle parameter of center of gravity location and rollover propensity is found using the validated vehicle simulations.

Public Health and Social & Behavioral Sciences I—Exhibit 57

Shannon Denny
University of Alabama at Birmingham, Ronald E. McNair Post-Baccalaureate Achievement Program
Mentor: Despina Stavrinos, PhD
Co-Authors: Benjamin McManus, Melissa Walters

Distracted Driving Impacts Merging Onto an Interstate for Teen and Young Adult Drivers

Statement of Purpose: To examine the ability to merge onto an interstate while engaging in secondary tasks.
Background: Distracted driving is a primary contributor of crashes impacting drivers by taking their attention away from the primary task (driving) and placing it onto a secondary task (e.g., cell phone). Research suggests that a large number of crashes occur while merging onto an interstate. However, little is known about how distraction affects merging. We hypothesized that engaging in a secondary task would impede merging performance as compared to not engaging in a secondary task.
Method: 74 participants (16 to 25) drove in a simulator three times while engaging in one of three secondary tasks (texting interaction, cell phone conversation, and no secondary task). Merging performance was measured by number of cars that passed the participant, and start and end speed.
Results: Repeated Measures ANOVAs revealed two significant main effects of distraction. Post-hoc tests indicated that drivers' initial speed was significantly slower in the texting condition. A similar pattern emerged for drivers' end speed and number of cars passed.
Discussion: Texting is one of the worst forms of distracted driving because it requires one to take their mind and eyes off the road, and take their hands off the wheel. Participants may have decreased their speed to compensate for texting while driving, not realizing that merging at a slower speed could further increase their risk of crashing. However, those in the cell phone and no distraction condition may not have needed to compensate due to lower visual demands.

Public Health and Social & Behavioral Sciences I—Exhibit 58

Genta Camel[2], Donald H. Lein, Jr.[1], and C. Scott Bickel[1]
[1]Department of Physical Therapy; [2]Summer Enrichment Program, Minority Health & Health Disparities Research Center, University of Alabama at Birmingham.

Effects of neurmuscular electrical stimulation on skeletal muscle force and fatigue after spinal cord injury

After spinal cord injury (SCI), affected skeletal muscle becomes small and fatigable. Neuromuscular electrical stimulation (NMES) is used to activate these muscles to produce functional activities and increase opportunities for exercise by using electrical current to facilitate contractions. **PURPOSE:** To examine the impact of NMES parameters on muscle force production and fatigue in people with and without SCI. **METHODS:** Study participants were fifteen able-bodied (29 ± 8 years; 175 ± 9 cm; 74 ± 14 kgs) and fourteen people with SCI (38 ± 13 years; 175 ± 11 cm; 76 ± 20 kgs). Muscle force was recorded during NMES-induced muscle contractions using different combinations of pulse durations (200, 300, 400, and 600 μsec) and frequencies (20, 30, 40, and 60 Hz). Additionally, two muscle fatigue protocols (20Hz/500μsec and 50Hz/200μsec) were utilized (1 sec on/ 1 sec off x 3 minutes). **RESULTS:** Individuals with SCI had greater muscle fatigue during both protocols ($p<0.05$). For 50Hz/200 μsec, there was a 62% drop in force for able-bodied people compared to an 82% drop for SCI. For 20Hz/500μsec, there was a 48% drop from able-bodied people compared to a 76% drop from SCI. The total charge of stimulation was significantly related to force production in able-bodied ($R^2= 0.734$) and those with SCI ($R^2= 0.650$). **CONCLUSIONS:** This study demonstrates that people with SCI fatigue more than able-bodied people at both high and lower frequency stimulation and NMES parameters will impact muscle force production in people with and without SCI.

Public Health and Social & Behavioral Sciences I—Exhibit 59

Alicia Kilgore
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Dr. Fred Biasini
Department: Developmental Psychology

Parental age, prenatal complications, and maternal health during pregnancy as risk factors for Autism

Autism is a neurodevelopmental disorder defined by deficits in social interaction and communication often coupled with restricted interest and repetitive behaviors. The Center for Disease Control and Prevention reports the current national estimated rate for Autism Spectrum Disorder to be 1 in 88 children with the state of Alabama reporting the lowest national average of 1 in 210.

The etiology of autism is unknown but research is consistently pointing to the fact that the cause is likely to be an interaction between genetic and environmental factors. A mounting body of autism research demonstrates neurological and biochemically based differences whose origins are due to complications that occurred in utero. Another large group of research is focusing on parental age in correlation to diagnosis of autism and has shown this as a probable risk factor as well.

The purpose of this study is to look at the correlation of prenatal complications, maternal health during gestation and parental age at the time of conception as possible risk factors for autism. Particular emphasis will be placed on evaluating paternal age in relation to deregulation of spermatogonial cell behavior and its effects.

Data were collected between January 2006 and December 2009 and will be retrieved from a database in an interdisciplinary clinical setting, the Civitan-Sparks Clinic at UAB. Nonparametric and correlational analyses will be used to assess the nature of these relationships. For the analyses subjects will be divided into 2 groups, those with and without a diagnosis of Autism.

Public Health and Social & Behavioral Sciences I—Exhibit 60

J.E. Miller, R.C. Roberts, K.A. Barksdale
University of Alabama at Birmingham Department of Psychiatry and Behavioral Neurobiology
Minority Health and Health Disparities Research Center Summer Enrichment Program

The Investigation of Synaptic and Metabolic Proteins in the Schizophrenic Brain

Schizophrenia is a severe mental disorder characterized by a wide range of symptoms affecting cognition and emotion, some of which include: hallucinations, cognitive problems, and delusions. The purpose of this research was to investigate how synaptic and metabolic proteins change in the schizophrenic brain. Research was done to explore whether a person's ability to respond to treatment contributes to these changes. The area of interest was the anterior cingulate cortex (ACC) which is a functionally heterogeneous region involved in diverse cognitive and emotional processes that support goal oriented behavior.

Mitochondria are integrally involved with cellular metabolism, as well as cell survival signaling. Impaired mitochondrial function might lead to a disruption of normal interference of normal neural plasticity and decrease cellular resilience, which could lead to the development of mood and psychotic disorders. Immunohistochemistry and Western blotting for synaptophysin, mitofusion, and other related proteins were done in order to determine the changes of the human ACC homogenates.

We hypothesize that, compared to controls, treatment responsive schizophrenia subjects will have a decrease in the number of mitochondria per synapse in the ACC. Responsive subjects will have decreases in this measure compared to treatment resistant subjects Since treatment responders have fewer mitochondria per synapse than controls, while the treatment resistant subjects have similar results to that of controls, fewer mitochondria per synapse may be related to treatment response.

Public Health and Social & Behavioral Sciences I—Exhibit 61

Jarvis Johnson*, R. Ryley Parrish, Michal Matyjasik, Robin Davis, Levi Miller, Dr. Farah Lubin at the University of Alabama at Birmingham, Ronald E. McNair Scholars Program

The Epigenetic Regulation of the *BDNF* during Memory Consolidation in the Epileptic Model Compared to the Normal Model

Over 50 million people worldwide are struggling with epilepsy. This neurological disorder is characterized by seizures which causes emotional and memory deficits. Behavioral evidence indicates that *BDNF* (brain-derived neurotropic factor) gene expression is induced in the hippocampus after contextual and spatial learning. The gene expression of the *BDNF* mechanism is believed to be essential for learning and memory formation. Epigenetics is the study of heritable changes in cellular phenotype or gene expression, and has now been established as a transcriptional mechanism in the central nervous system. We hypothesize that epigenetic modifications can regulate *BDNF* gene expression in the epileptic hippocampus. It is possible that *BDNF* gene expression is altered during a fear conditioning test because animals form fearful memory of a certain context. After fear conditioning the rats are sacrificed to study *BDNF* mRNA expression in epileptic and normal rats. After evaluating the data, normal fear condition rats showed a decrease in percent methylation compared to naïve rats at the *BDNF* gene. However, the epileptic rats did not show an increase or decrease in the percent methylation at the *BDNF* gene which leads us to the idea that along with the percent methylation other epigenetic mechanisms are playing a role in memory consolidation of an epileptic brain.

Public Health and Social & Behavioral Sciences II—Exhibit 62

Arcacia Butler[1], Michael Crowe[2], Olivio J. Clay[2]
[1]Division of Preventive Medicine, Minority Health and Health Disparities Summer Enrichment Program, University of Alabama at Birmingham
[2]Department of Psychology, University of Alabama at Birmingham

The Association of Race and Indicators of Socioeconomic Status with Health in Older Adults with Diabetes

Objective: Previous studies have shown individuals with diabetes are at-risk for poor health outcomes, particularly those of African American race and lower socioeconomic status (SES). This study examines the associations of race and SES with health in older adults with diabetes.
Methods: The Diabetes and Aging Study of Health (DASH) is an observational study of African Americans and Caucasians age 65 and older with diabetes. Participants completed a telephone interview administered by trained technicians. Demographic factors included age, race, gender, years of education, and self-reported quality of education. Participants were also asked questions concerning their ability to access medical care. The outcome measure, self-rated health (SRH), was assessed using a single item that asked participants to rate their health as Excellent, Very Good, Good, Fair, or Poor.
Results: Average age of the 235 participants was 73 years. The sample was 47% African American and 47% male. Bivariate analyses revealed that there were no racial or gender differences on SRH. Individuals who did not seek medical care because it was too expensive had worse SRH than their counterparts, $p=.02$. There were significant associations between fewer years of education, poorer quality of grade school education, lower income, and difficulty getting health care with lower levels of SRH, p's $< .01$.
Conclusion: A multimethod approach was used to assess SES and a relationship between indicators of low SES and poor SRH emerged within older adults with diabetes. Further research is needed to determine mechanisms for these associations, which would inform strategies for intervention.

Public Health and Social & Behavioral Sciences II—Exhibit 63

Douglas Smith, Paul A. MacLennan, Ph.D.

Race and Alcohol Impairment among Fatally Injured Pedestrians

Background: The National Highway Traffic Safety Administration (NHTSA) reports that in 2008 approximately 4,400 pedestrians were killed and 69,000 injured in traffic crashes. Recent research has reported increased mortality among minority pedestrians struck by motor vehicles. Additional research shows that after accounting for background alcohol consumption estimates, alcohol related injuries are higher than expected for Native Americans, Hispanics and African Americans. Currently, little is known about pedestrian impairment and race/ethnicity among those struck by motor vehicles. The present study aims to investigate the prevalence of alcohol and drug impairment among pedestrians fatally struck by motor vehicles. Results will be useful in the development of pedestrian injury prevention programs with relevance to injury disparities.
Methods: The study will be cross-sectional in design and rely on data obtained from NHTSA's 2000 through 2010 Fatality Analysis Reporting System (FARS). FARS includes basic demographic information as well as subject, vehicle and crash event characteristics. The current study will use chi-square tests to examine significant differences by race/ethnicity group, i.e., African American, Hispanic, Native American, Asian, and white, in their alcohol and drug impairment as well as demographic, event, and EMS response among fatally injured pedestrians.
Expected results: Based on previous research, significant differences in the prevalence of impairment by race/ethnic group may be seen. Secondary analyses may suggest other factors related to race/ethnicity differences, e.g., mean emergency medical system response times and pre- and post-hospital mortality. Understanding the causes of pedestrian fatalities is important in identify and evaluating safety interventions.

Public Health and Social & Behavioral Sciences II—Exhibit 64

Shameka Rodgers
University of Alabama at Birmingham
McNair Scholars Program
Mentor: Candace Knight, PhDc, RN

The Consequence of Being a Teen Mom: The Experience of Stress during Adolescent Pregnancy

There is a decent amount of research pertaining to the effects of psychosocial stress on pregnancy in adult women. Some effects of stress include gestational hypertension, preterm birth, and low birth weight. However, there has not been an ample amount of research in the effects of stress on pregnant adolescents. Adolescents deal with potential complications in their health throughout their development without the addition of pregnancy. Therefore, there is an importance to define the stressors for pregnant adolescents, and how they can be eliminated or reduced. Participants from various geographical and cultural origins will be asked open-ended questions pertaining to the past, present, and future. These interviews will then be used to produce transcriptions that will be analyzed via qualitative analysis. At the conclusion of this project, stressors relevant to adolescents and possible techniques to diminish their responses shall be determined.

Public Health and Social & Behavioral Sciences II—Exhibit 65

Shaneka Hutchinson UABSON, Student Nurse, MHRC Intern
Glenda L. Smith, PhD, RNC, NNP-BC, PNP-BC, MDiv, Assistant Professor of Nursing, Family/Child Health & Caregiving, University of Alabama at Birmingham

Perspectives of African Americans and Healthcare Providers on the use of Herbal Remedies

Background: Little research has been documented to identify perceptions healthcare providers and African Americans have on use of herbal remedies. This focused ethnography identifies perceived risks from African Americans and providers' perspective in using herbal therapy. The purpose of this project is to describe the viewpoint of providers towards African Americans using herbal remedies and gain insight as to how African Americans feel about using herbal remedies for health and illness. Lack of communication between African Americans and healthcare providers can result in distrust and herbal-drug interactions which can eventually lead to misdiagnosis.

Methods: This pilot study will be conducted using one-on-one interviews with both a provider and an African American who uses herbal remedies. Two research questions guide this project. First, does the use of herbal remedies by adult African Americans place them at greater risk of misdiagnosis by providers than those that do not use herbal remedies? Second, what are the perceptions providers have toward African American patients who use herbal remedies? The interviews will be audio taped and reviewed for common themes.

Results: This project hopes to understand the perceptions of African Americans and providers herbal remedies used for healthcare. Once perceptions are identified, strategies to develop effective communication between provider and patient can be developed.

Conclusion: Health care providers and African American patients have history of miscommunication and distrust. By developing effective communication strategies related to use of herbal remedies, both the patient and the provider can improve the management of health and illness.

Public Health and Social & Behavioral Sciences II—Exhibit 66

Briauna Knott, UAB School of Nursing, MHRC Year 3 Intern, UAB Alumna
Comfort Enah, PhD, RN, UAB School of Nursing, MHRC SEP Mentor

HIV Knowledge in African American Adolescents in the Black-Belt

Introduction: Despite the available HIV prevention interventions, African Americans in the South continue to experience a disproportionate increase in HIV/AIDS infections. The number of HIV/AIDS infections among adolescents in Alabama and in the rural population is rapidly rising. Although there are interventions developed for African American adolescents, only a few focus on this rural population. The goal for this program of research is to develop and test theory -based culturally relevant interventions for HIV prevention in African American Rural Adolescents (AARAs). **Specific Aims:** This report focuses on HIV prevention knowledge assessed as part of a larger study to evaluate the relevance and acceptability of a gaming intervention with AARAs. Identifying HIV prevention knowledge needs will inform the development of an HIV prevention game prototype. **Methods:** Forty-two adolescents aged 12-16 participated in one 90 minutes long focus group session. The groups included: male, age 12-14, male, age 15-16, female, age 12-14, and female, age 15-16. Criteria for participation in the focus group discussions included being an African American adolescent between the age of 12 to 16, residing in a state-designated rural county, and being HIV negative or having an unknown status. **Results:** Only 14.3% of adolescents provided accurate responses to all 10 HIV knowledge questions. Accuracy of HIV prevention knowledge tended to increase with age. Most participants received information about HIV/AIDS prevention from their parents. **Discussion:** Since 85.7% of the participants did not accurately answer all 10 questions and rising infection rates, there is a need for, HIV prevention efforts targeting AARAs.

Public Health and Social & Behavioral Sciences II—Exhibit 67

Logan C. Holmes
Talladega College
Ronald E. McNair Scholars Program
Mentor: Dr. Nitesh Saxena

Passwords May Not Suck Anymore!
Exploring Hidden Objects Games for Secure and User-Friendly Authentication

User authentication is a classical and one of the most important problems in computer security. The increasing popularity of personal devices, internet web sites and the sensitivity of information they might store prompts the need for efficient, secure and user-friendly authentication mechanisms. Unfortunately, none of the existing authentication primitives provide a good balance among the security, usability and efficiency of authentication. In particular, almost universally deployed text-based passwords and PINs are highly efficient, but are either difficult to use (if the password is long and random), or insecure (if the users can choose their own password).

In this research project, we investigate a game-based approach to user authentication, which may improve the security and usability of passwords. The idea is to extrinsically motivate the users so that their passwords are easy to memorize and recall as well as "hard-to-guess" by an attacker. Specifically, we explore the use of Hidden Objects games, whereby certain objects carefully hidden within an image – consisting of many other objects -- serve as the user's password. This approach improves user experience because human brain can process visual information (object images) much easily than textual characters, and because the game motivates and entertains the user. It also improves security because the password objects are hidden from the attacker and the object space is huge. We are developing the hidden objects password game using Stencyl, an intuitive online application, used to create flash games.

Public Health and Social & Behavioral Sciences II—Exhibit 68

Kelsi Pickens
University of Alabama at Birmingham
Ronald E. McNair Scholars Program
Mentors: Reggie Lutenbacher, MS, OTR/L, Stephanie DeLuca, Ph.D

Pre to Post Changes in 5 children Going Through Constraint-Induced Movement Therapy

Introduction: Constraint Induced Movement Therapy (CIMT) is a therapeutic protocol for children with hemiparetic Cerebral Palsy (CP) that has a goal of gaining increased skills in the child's weaker upper extremity (UE). CIMT is a technique that involves wearing a cast for 24-hours a day on an individual's stronger UE in order to increase spontaneous use and quality of movements with the child's weaker UE. In addition, therapy is intensively provided in natural environments for 3-6 hours per day.

Method: This study examines the changes noted in spontaneous use and quality of movements of the weaker UE of 5 children with CP. Measures were taken pre-treatment and post-treatment, and were developed based on the Assisting Hand Assessment (AHA). In this study the standardized Logit scores for the AHA are presented. In addition, three items from the AHA were scored separately on an independently developed set of ratings. Scores reflect the averages of the quality of movement across on a 1-4 scale, plus the total number of initiations for the weaker UE was counted.

Results: Initiation and quality of movement scores did not significantly correlate with the standardized AHA scores, and children did significantly change on the developed measures, However children did individually change in a positive direction, and individual scores will be presented.

Public Health and Social & Behavioral Sciences II—Exhibit 69

Michelle Ocampo
University of Alabama at Birmingham
Ronald E. McNair Scholars Program
Mentor: Sylvie Mrug, Ph.D.

The Role of Religion and Anger Control in Protecting Victims of Bullying from Depression and Reactive Aggression

Bullying, defined as repeated negative physical or verbal aggression against an individual with less power—the victim, has become a common and serious problem among youth. Research with early adolescents demonstrates that being a victim of bullying can lead to depression and reactive aggression. Research also suggests that greater religiousness is associated with fewer depressive symptoms. Anger has been found to be a predictor of aggressive behavior among early adolescents, but there is no research on the relationship between anger control and reactive aggression. The present study examined whether religiosity and /or anger control skills moderate the relationship between being a victim of bullying and greater report of depressive symptoms and reactive aggression.

Participants include 603 early adolescents (M=13.2 years, SD=.09), who participated in Wave 2 of the Birmingham Youth Violence Study. Adolescents include 52% males, 78% African Americans and 20% Caucasians. Adolescents completed questionnaires on bullying-victimization, depression, reactive aggressive behavior, anger control skills, and religiosity.

Consistent with previous research, results revealed that victims of bullying were more likely to report reactive aggression (b=.99, p<.01) and depressive symptoms (b=1.08, p<.001) than those who were not bullied. Adolescents who reported more anger control skills (b= -1.52, p<.01) and higher levels of religiosity (b= -.80, p< .001), independently, were less likely to express reactive aggression. However, neither religiosity nor anger control skills moderated the relationship between being a victim of bullying and reactive aggression and depression. Future research should explore alternative moderators and consider longitudinal research of these relationships.

Melissa Walters
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Mentor: Despina Stavrinos, PhD
Co-Authors: Benjamin McManus, Shannon Denny, Soojin Kim

Self-Reported Risky Driving Behavior Predicts Faster Speed During Merging

Statement of Purpose: To examine whether self-reported risky driving predicted speed when merging onto an interstate
Background: Risky driving is a leading cause of death among young drivers. One way of assessing risky driving is the Driving Behavior Questionnaire (DBQ), a self-report measure that validly predicts poor driving. The association between DBQ and merging behavior is unknown. We hypothesized that higher levels of self-reported risky driving would predict faster driving speed when beginning and completing a merge onto an interstate segment.
Method: As part of a larger study, we administered the 11-item violation subscale of the DBQ to seventy-five individuals 16 to 25 years of age to assess drivers' ratings of their risky driving behavior. Participants drove in a simulator three times which yielded a measurement of their initial and ending speed while merging onto an interstate. A linear regression was conducted where the initial and end speed was regressed across self-reported DBQ violation score.
Results: Results indicated the DBQ violation score significantly predicted initial speed when entering into the merge, suggesting that riskier drivers drove at a faster speed than lower risky drivers. A similar pattern emerged for DBQ violation score and end speed.
Discussion: Our findings suggested that risky drivers approached merging at a faster speed than drivers who reported lower risky driving behaviors. Given that merging onto the interstate is one of the leading causes for collisions for all drivers, these findings are particularly concerning and should be integrated into educational campaigns and interventions targeting at-risk drivers.

Honors Academy Leadership Projects—Exhibit 71

Anna Haddock, Alicja Foksińska, and Sarah Phillips
Project Mentor(s) and Stakeholder(s): Cassandra R Wells; Mrs. Kelly Peoples

Ambassadors of Angels

The HAC 301 Prime Time Leadership Project done by Alicja Foksinska, Sarah Phillips, and Anna Haddock, "The Ambassadors of Angels," served an early intervention program, "The Bell Center". The Bell Center is dedicated to maximizing the potential of children from birth to three years of age who are at risk for developmental delay. The goal of Ambassadors of Angels was become ambassadors for children with developmental delays. An "ambassador" is a person who represents a certain group of people, in this case, children with developmental delays. We not only wanted to represent these angels, but also to be their voice in order to raise funds for a critical program that will aid their lives. We accomplished this goal by rising over $1,000 for the Bell Center by setting up tip jars at locations around Birmingham and Arab, Alabama. Minor obstacles were encountered when initially working to find locations for the tip jars to be set up. We have benefited from this project by learning to depend on each other as a group and work together, so that we could better these children's lives. We hope to continue this project in the future by having The Bell Center be the "charity of the month" at Momma Goldberg's locations in Inverness, Homewood, and Downtown. Those stores brought many tips and it was easy and enjoyable to work with the owners who supported and advertised this great opportunity!

Honors Academy Leadership Projects—Exhibit 72

Alexis Raybon, Camille Turner, Valerie Barreau, Ashunti Kirk
Project Mentor: Cassandra Wells
Project Stakeholder: Marsha Sutton, YMCA Y-Achievers

College Express Opportunities (C.E.O)

We are serving the YMCA Y-Achievers Program, whose mission is to help minority teens set and achieve educational and career goals. Our project's goal was to help these students transition into the most challenging phases of a teenager's life: high school and college. We accomplished our goal by offering small group mentoring, interactive workshops, and open discussions. Making the students the "CEO" of their educational lives! Along the way, we encountered challenges in communicating with the stakeholder, the students, and with student participation at the sessions. We strived to keep our goal in mind while overcoming the difficulties of meeting and communication. The biggest reward was hearing the interest and feedback from the students. We definitely feel like we made an impact, and through this project we have learned to remain patient and perseverant when obstacles come our way.

Outcomes to be presented: Progress of students' feeling of preparedness for their transitions

Honors Academy Leadership Projects—Exhibit 73

Ricardo Muñoz, Whitney Peterson, and Justin Crossley

Project Pop Tabs

The purpose of the Experiential Learning Scholars Program (ELSP), of which all group members are a part, is to integrate curriculum-based learning with outside experiences. Through careful planning and continuous reflection, these experiences are intended to help guide students into the career field of their choice. Because so much of the learning for ELSP students falls outside of the classroom setting, students have been responsible for funding their own experiences. As a group, we have assessed a need to raise funds for our honors program for need-based students who are unable to complete their experiences without financial assistance. To accomplish this goal for the summer, we are collecting soda pop tabs in order to express our need for funds to potential sponsors for ELSP students. So far, we have collected nearly 2,000 pop tabs, and we plan to present our information to businesses who may be interested in sponsoring need-based students for potential shadowing, volunteering, or internship opportunities within their companies. In the future, the experience gained from our sponsors may be presented in the State Honors Conference. In the Fall semester, we plan to continue to collect pop tabs and work with businesses to reach our goal.

Honors Academy Leadership Projects—Exhibit 74

Rachel Harp

Supplies for Students

Supplies for Students was created as a way to reach out and help a local community, Center Point, that was devastated by a tornado earlier this year. With the help of Jefferson County Board of Education member Sally Price a project was created that would help to ensure that all students had the school supplies needed to start this new school year off right. Supplies for students was tasked with acquiring a pair of scissors for all 620 students at Center Point Elementary School. The funds for the scissors were acquired by gathering donations from companies and locally through the use of donation buckets at various businesses. The total cost of the supplies was around $900 and were purchased by the Global and Community Honors Program in order to get a discounted price as. This also allowed all donations to be tax deductible. Supplies for Students is a two part project. The second half will continue in Fall 2012 and will focus more on gathering supplies that teachers will need in their classroom.