Baylor Biomedical Research Collaborative

May 20-21, 2016

A meeting of biomedical researchers from the Baylor family of institutions

@ Baylor Research and Innovation Collaborative
100 Research Pkwy, Waco, TX 76704
Friday, May 20, 2016
3rd Floor

11:45 – 12:15 p.m. Sign-in/Poster Set-Up

12:45 – 1:15 p.m. Poster Session (Please set up posters prior to session.)

1:15 – 1:30 p.m. Welcome and CFRIP Symposium Research Overview

1:30 – 2:25 p.m Genetic and Chemical Biology Approaches to Studying Infertility and Contraception
Martin M. Matzuk, M.D., Ph.D.
Director, Center for Drug Discovery, Baylor College of Medicine
Stuart A. Wallace Chair and Professor, Department of Pathology & Immunology, Baylor College of Medicine; Director, Clinical Chemistry, Ben Taub General Hospital

2:30 – 3:25 p.m Development of Therapeutic and Prophylatic HIV-1 Vaccines Based on DC-targeting
Gerard Zurawski, Ph.D.
Director, Center for Biotechnology, Baylor Institute for Immunology Research, Baylor Scott & White Health

3:30 – 4:00 pm Coffee Break/Poster Session

4:00 – 4:55 pm The Preterm Infant Gut Microbiome: An Opportunity Emerges
Phillip Tarr, M.D.
Melvin E. Carnahan Professor of Pediatrics, Washington University School of Medicine, St. Louis; Director, Pediatric Division of Gastroenterology and Nutrition, Washington University School of Medicine, St. Louis

5:00 – 5:55 p.m. The great religions and their neglected diseases
Peter Jay Hotez, M.D., Ph.D.
Dean for the National School of Tropical Medicine, Baylor College of Medicine; Endowed Chair in Tropical Pediatrics, Texas Children’s Hospital; Professor, Departments of Pediatrics and Molecular Virology & Microbiology, Baylor College of Medicine; U.S. Science Envoy, U.S. Department of State, Middle East and North Africa; President, Sabin Vaccine Institute; Fellow in Disease and Poverty, James A. Baker III Institute for Public Policy, Rice University; Co-Editor in Chief, PLOS Neglected Tropical Diseases

7:00 p.m. President’s Suite, Baylor Club Open for Dinner Guests
Institutional Officials and Principal Investigators: Registration Required

7:30 – 9:00 p.m. Dinner - Institutional Officials and Principal Investigators
Registration Required
Saturday, May 21, 2016
3rd Floor
Sessions run consecutively - 20 min. w/10 min. Q&A
Concurrent session on 2nd floor; see following page for schedule.

8:00 - 8:30 a.m. Morning Coffee/Poster Session

Pathogen Morphology and Dendritic Cell Subsets
Determine T Helper Cell Differentiation
Botond Igyártó, Ph.D.

8:30 - 9:00 a.m. Assistant Investigator, Baylor Institute for Immunology Research, Baylor Scott & White Health; Adjunct Assistant Professor, Institute of Biomedical Studies, Baylor University

TP53-Microbiome Interaction in Human Lung Cancer
Leigh Greathouse, Ph.D.
Assistant Professor of Family and Consumer Sciences, Nutrition Sciences, Baylor University

9:00 - 9:30 a.m.

Building and Implementing a translational amicrobiome research program
Joseph Petrosino, Ph.D.
Associate Professor, Baylor College of Medicine

10:00 - 10:25 a.m. Break /Poster Session

10:30 - 11:00 a.m.
Targeting the Cancer Microenvironment
Kevin Pinney, Ph.D.
Professor of Chemistry, Baylor University

Differentially Expressed Transcriptome Analysis Reveals Candidate Antigens for a Transmission-Blocking Vaccine of Brugia
Bin Zhan, M.D., M.S.
Associate Professor, National School of Tropical Medicine and Department of Pediatrics, Section of Tropical Medicine, Baylor College of Medicine; Director, Laboratory for Antigen Discovery, Section of Pediatric Tropical Medicine; Director, Antigen Discovery Unit, Sabin Vaccine Institute & Texas Children's Hospital Center for Vaccine Development
Cheolho Sim, Ph.D.
Assistant Professor of Biology, Baylor University

11:00 - 11:30 a.m.

Dendritic Cell Targeting Vaccines for HPV-Associated Malignancies
Wenjie Yin, Ph.D., Post-doctoral Fellow
Joo Lab, Baylor Institute for Immunology Research, Baylor Scott & White Health
Chromatin State Dynamics and Transcription Factor Regulatory Circuitry in Multiple Myelome
Yin Lin, Ph.D.
Assistant Investigator, Baylor Institute for Immunology Research, Baylor Scott & White Health
8:30 - 9:00 a.m.

Ecology and transmission dynamics of tick-borne relapsing fever borrelia
Job E. Lopez, Ph.D.
Assistant Professor, Pediatrics-Tropical Medicine, Baylor College of Medicine
9:00 - 9:30 a.m.

Chemical Synthesis towards Drug Development
John Louis Wood, Ph.D.
Robert A. Welch Distinguished Professor and Cancer Prevention Research Institute Scholar, Baylor University
Department of Chemistry & Biochemistry
9:30 – 10:00 a.m.

Update on Zika
Peter Jay Hotez, M.D., Ph.D.
Dean for the National School of Tropical Medicine, Baylor College of Medicine; Endowed Chair in Tropical Pediatrics, Texas Children's Hospital; Professor, Departments of Pediatrics and Molecular Virology & Microbiology, Baylor College of Medicine; U.S. Science Envoy, U.S. Department of State, Middle East and North Africa; President, Sabin Vaccine Institute; Fellow in Disease and Poverty, James A. Baker III Institute for Public Policy, Rice University; Co-Editor in Chief, PLOS Neglected Tropical Diseases
10:30 - 11:00 a.m.

Metabolic signatures of gut dysbiosis in canine IBD
Jan S. Suchodolski, MedVet, DrVetMed, PhD, AGAF, DACVM
Associate Professor, Texas A&M University
11:00 - 11:30 a.m.

Fragments in 3D: Expanding Stereochemical Diversity in Fragment Collections
Damian Young, Ph.D.
Assistant Professor, Baylor College of Medicine
Assistant Professor, Department of Pathology, Center for Drug DisDiscovery
Adjunct Assistant Professor, Chemistry, Rice University
11:30 - 12:00 p.m.
Saturday, May 21, 2016

12:00 - 1:00 p.m.  Lunch available – 3rd Floor. (Registrants choosing the lunch option will have ticket in registration packet.)

1:00 – 2:00 p.m.  Concluding Remarks by Keynote Speakers or Institutional Representatives

**POSTER SESSION-3RD FLOOR**

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RESEARCH AREA DESCRIPTION
By Institution

Baylor College of Medicine

Maria Elena Bottazzi
bottazzi@bcm.edu

Tropical Medicine My major interest is in the role of vaccines as control tools integrated into international public health programs and initiatives.

Peter Hotez
hotez@bcm.edu

Infectious Diseases & Toxicology Research interests are neglected tropical diseases and vaccine development. Also, product development partnerships for developing new vaccines for hookworm infection, schistosomiasis, and Chagas disease, diseases affecting hundreds of millions of children and adults worldwide.

Adam Kuspa
akuspa@bcm.edu

Microbiome

Infectious Diseases & Toxicology Bin Zhan, MD is an Associate Professor of pediatrics, Section of Pediatric Tropical Medicine, National School of Tropic Medicine at BCM. He leads the Molecular Biology/Antigen Discovery unit for the Sabin Vaccine Institute & Texas Children's Hospital Center for Vaccine Development. Dr. Zhan is a senior parasitologist with more than 25 years' experience in the research against helminthic and protozoan parasites and parasitic diseases with multidisciplinary studies of epidemiology, immunology, and molecular biology. Particularly, he focuses his research on developing human hookworm vaccines with discovery of more than 30 novel hookworm antigens, many of them characterized and tested for their vaccine potential. He also works for vaccine development against human ascariasis, trichuriasis, schistosomiasis, Chagas diseases, leishmaniasis and onchocerciasis with expertise in the recombinant protein expression and characterization.

Bin Zhan
bzhan@bcm.edu

Infectious Diseases & Toxicology Pathogenesis and ecology of vector-borne diseases. Specifically, we work on tick-borne relapsing fever spirochetes and we investigate how the tick and pathogen are distributed within the United States into Latin America. Additionally, our lab focuses on identifying and defining essential molecular mechanisms required for tick colonization and transmission of relapsing fever spirochetes.

Job Lopez
job.lopez@bcm.edu

Joseph Petrosino
jpetrosi@bcm.edu

Microbiome Joseph F. Petrosino, Ph.D. is an associate professor of molecular virology and microbiology at BCM, where he also holds joint appointments in the Human Genome Sequencing Center, and the Department of Ophthalmology. Dr. Petrosino was a principal investigator for the NIH Common Fund Human Microbiome Project and has since established and directs the Alkek Center for Metagenomics and Microbiome Research.
With over 150 collaborations, the CMMR is pursuing over 300 metagenomics projects internationally with the goal to improve human health through detection and modulation of the microbiome and to translate new discoveries into new diagnostics and therapeutics. Among the latest CMMR projects initiated is a comprehensive microbiome analysis of 20,000+ type 1 diabetes samples from the NIH/NIDDK TEDDY (The Environmental Determinants of Diabetes in the Young) prospective cohort with the goal to identify microbial taxonomic and functional associations, and potentially triggers, for this disease. From 2012-2014, Dr. Petrosino was an American Society for Microbiology Distinguished lecturer and has contributed to more than 70 peer-reviewed microbiome studies since 2011, when the CMMR was founded.

**Microbiome** My lab focuses on wound healing and tissue repair outcomes of cutaneous wounds in normal and impaired disease states such as in diabetes and infection.

**Neuroscience** Trauma is the leading cause of death among people of the age group 1-44 and traumatic brain injury is one of the leading causes of long term disability and mortality in trauma patients. Brain edema followed by elevated intracranial pressure and decreased cerebral perfusion pressure contributes heavily to the pathophysiology and poor outcomes in the treatment of TBI. Microvascular hyperpermeability, the excessive leakage of fluid and proteins from the small blood vessels to the extravascular space that occurs via the blood-brain barrier (BBB), is a major contributor of vasogenic brain edema following TBI. Our lab conducts experimental studies to understand the cellular and molecular mechanisms of BBB dysfunction and vascular hyperpermeability following traumatic and ischemic brain injuries. Our studies are focused on the role of BBB tight junction associated proteins such as zonula occludens-1, claudin-5 and occludin in regulating BBB integrity and cerebrovascular permeability. Our research involves understanding the role of various cellular proteases, proinflammatory cytokines and pro and anti-apoptotic molecules in regulating the cellular expression and functions of these molecules. Our research utilizes BBB associated cells in culture conditions, animal models of traumatic brain injury and brain injury patients. We mainly employ cell biology and molecular biology tools, biochemical and physiological methods, transgenic/knockout mice technology and confocal and intravital videomicroscopy approaches.

**Cardiology** Heart failure (HF) currently affects 5.7 million Americans with incidence of 915,000. HF carries 50% mortality in 5-years. HF with preserved ejection fraction (HFP EF) is occurrence of HF despite left ventricular ejection fraction (EF)≥50%. HFP EF accounts for ~50% of HF diagnoses and currently has no effective treatment. My research aims to elucidate correctable mechanisms with eventual goal of translating discoveries to new therapies. Cardiac Myosin Binding Protein-C (cMyBP-C) is a 140KD protein on the thick filament of the heart muscle. Phosphorylation level of cMyBP-C can regulate cross-bridge cycling. Thus, I hypothesized that cMyBP-C phosphorylation is a...
mediator of diastolic function. My mouse model of cMyBP-C phosphorylation deficiency \(\text{cMyBP-C(t3SA)}\); recapitulated human HFrEF by demonstrating phenotype of diastolic dysfunction with EF>50%, exercise intolerance, and pulmonary edema. Conversely, my mouse model of cMyBP-C phosphorylation mimetic cMyBP-C(t3SD) demonstrated enhanced diastolic function. Simultaneous force and intracellular calcium \([\text{Ca}^{2+}]\) measurements on intact heart papillary muscles showed that cMyBP-C phosphorylation increased cross-bridge detachment rate as the underlying mechanism for enhancement of diastolic function. Besides application to HFrEF, cMyBP-C(t3SD) also demonstrated improved survival in trans-aortic constriction surgical model of heart failure with reduced ejection fraction (HFrEF). Thus, cMyBP-C phosphorylation holds promise as new treatments for HFrEF and HFrEF have initiated the process of making 3-dimesional human engineered heart tissue (EHT) from human induced pluripotent stem cells (HiPSCs). These EHTs will be made in 24-well format and followed with robotic automated test suite. This EHT system will serve as testbed for further mechanistic study and treatment development.

M. Karen Newell-Rogers
mknewell@gmail.com

Immunoology My research interests are in inflammation, immunogenetics, and mitochondrial metabolism.

Erxi Wu
erxi.wu@BSWhealth.org

Cancer My laboratory is currently focused on mechanism- and discovery-based disease research (such as cancer research and neurodegenerative disease research). There are a few ongoing research projects: Project 1: Mechanistic studies of CD44 standard form and PDGFR in medulloblastoma (MB) progression and metastasis. Project 2: Salinomycins binding target proteins in neuroblastoma (NB). Project 3: Molecular mechanisms of chronic stress in pancreatic cancer (PC). Project 4: TDP-43 proteinopathy in amyotrophic lateral sclerosis (ALS) and frontotemporal dementia (FTD). Project 5: Identification of biomarkers for glioblastoma (GBM)

Baylor Scott & White Research Institute

Jaime Walkowiak
jaime.walkowiak@bswhealth.org

Clinical Research Oncology/Transplant/Rehab/Neurology/Women's Health/Trauma/Pulmonary/Rheumatology/Surgery/Immunology

Immunology My lab focuses on the relationships between chronic inflammation in the mucosal immune system and how it relates to the development of hyperplasia leading to cancer and immune intolerance in graft rejection. To develop treatments for chronic inflammation would be beneficial in decreasing the incidence of colon cancer in the aging population as well as treating some forms of solid organ graft rejection. Several main players in the mucosal immune system are currently being studied in my lab including dendritic cells, innate immune lymphocytes and regulatory B cells. My lab focuses on the development of therapies for inflammatory responses that specifically target each of these cell types.

LuAnn Snipes
LuAnn.Snipes@BSWHealth.org
Gerard Boton
lynda.bennett@bswhealth.org

Biomarkers Research Examining the role of iNO in prevention of I/R injury during liver transplantation utilizing biomarkers of inflammation and protection

Cancer My lab focuses on DNA methylation and 5-hydroxymethylation in malignancies. In the drive for personalized precision medicine, the quest for biomarkers for cancer prediction, diagnosis and prognosis has been expanding over the past decade. DNA methylation is an ideal biomarker as DNA is a very stable molecule that can be isolated from a number of sources including blood, plasma, urine, tumor tissue and sputum. Additionally, there are simple assays for the detection of DNA methylation. Sought after prognostic biomarker panels would enable physicians to identify patients with more aggressive disease and devise therapeutic strategies accordingly. Other types of biomarkers can facilitate early accurate diagnosis, predict patient response to therapy through a personalized approach to therapeutic intervention, and be useful to monitor response to ongoing treatment or detect minimal residual disease, which leads to relapse.

We are using RRBS to explore the multiple myeloma (MM) methylome to identify DNA methylation biomarkers for aggressive rapidly progressing disease.

We are using RRBS and oXRRBS plus RNA-seq for epithelial ovarian tumors to investigate changes in DNA methylation and 5-hydroxymethylation associated with neoadjuvant carboplatin therapy to identify genes and pathways that are epigenetically regulated. This will give us a deeper understanding of the molecular response to carboplatin in ovarian cancer, and identify novel targets on which efforts can be focused to develop new treatment regimens.

Lynda Bennett
lynda.bennett@bswhealth.org

Immunology 1. Role of different dendritic cell (DC) subsets in induction of humoral immune responses. Generation of DC-vaccines targeting different cancers. In vivo re-programming of DCs for therapeutic purposes. Neurodendritic cell interactions.

Botond Igyarto
botond.igyarto@BSWHealth.org

Immunology I have been an Investigator at the Baylor Institute for Immunology Research (BIIR) since 2004 and am currently a BIIR Co-Director and Director for the BIIR Center for Biotechnology. I trained as a bacterial geneticist and received my Ph.D. from the Sydney University in Australia and trained in Molecular Biology at Stanford University, California and the C.S.I.R.O., Canberra. I am an expert in Molecular Biology and Protein Engineering, specializing in the immune system. Most particularly, in 21 years of work at the DNAX Research Institute, I identified and characterized cytokines and their receptor interactions, including IL-13, and IL-25. I directed the DNAX Genomics Division that was immensely successful in mining expressed sequence tag data for cytokine and cytokine receptor discovery and subsequent biological characterizations. At BIIR, I have led a vaccine-development program based on targeting antigens directly to human dendritic cells using antibody-antigen conjugates. Currently, with this platform technology our BIIR team and outside collaborators have successfully tested in human in vitro systems, as well as in mouse and monkey in vivo studies, novel vaccines against influenza, cancers, HIV, HCV, and HPV. Vaccines based on these studies are now in clinical development for HIV-1 therapeutic and prophylactic applications and for treatment on HPV-based cancers of the mucosa.

Gerard Zurawski
gerardz@baylorhealth.edu
Cancer Our laboratory focuses on the studies of transcriptional regulation in B-cell malignancies and lymphocyte development. We have applied and developed various molecular immunology and cell biology techniques as well as bioinformatics approaches to understand and identify critical regulatory elements and molecules that drive lymphocyte development, differentiation, and disease progression.

Baylor University

Cancer As the assistant director of the LINCHPIN and CPRIT labs at Texas A&M and BU, respectively, I worked with Prof. Romo in establishing collaborations with many academic and industrial scientists. Our lab is a collaboration and idea incubation center for interdisciplinary researchers in Texas and worldwide that require the chemical synthesis, selective derivatization (microscale), purification, and structural characterization of bioactive small organic molecules including natural products and derivatives with potential for human disease intervention. The CPRIT synthesis and drug-lead discovery lab at BU brings together diverse researchers with common interests in bioactive small molecules, proteomics and genomics.

Analytical Toxicology Our research group is broadly focused in areas of chemical separations and analysis. We have worked on a variety of problems in environmental toxicology. For example, we were the first to develop analytical methods to quantitatively screen for pharmaceuticals in fish tissue, as well as plasma. In collaboration with faculty and students in the Environmental Science department at Baylor, as well as scientists at USEPA, we are continuing to improve bioaccumulation models for drugs (and other ionizable contaminants) in rainbow trout. We have also developed analytical methods that were useful in establishing pABA as a biomarker of effect, following aquatic plant exposures to sulfamethoxazole. Lastly, we have pioneered efforts to identify nonextractable biotransformation products of explosives (i.e., TNT) in both terrestrial and aquatic organisms. An important outcome of this work is that protein-bound adducts of reduced metabolites have been identified as selective biomarkers of TNT exposure. Techniques and expertise used in each of these projects are also applicable to problems in human health.

Microbiome Our laboratory seeks to understand the relationship between diet, obesity and the microbiome, and their impact on risk of colon cancer.

Infectious Diseases & Toxicology My laboratory investigates carbon metabolic fluxes in host and pathogen during infection using solid-state NMR. Structure and composition analysis of host-pathogen interactions and carbon flux in vivo is difficult due to the complexity and heterogeneity of intact whole cells, making it incompatible with conventional structural methods such as x-ray diffraction and solution-state NMR. Our approach, using solid-state NMR methods, provides in situ characterization of structure at atomic resolution and accurate carbon composition to provide molecular insights into the mechanisms of microbial pathogenesis.
Synthesis & Bioconjugation The Kane research group combines the synthesis of bioactive small-molecules with bioconjugation chemistry (reactions with soluble proteins or intact live tissue) in order to address challenges in immunology and transplantation. For example, we are working in collaboration with scientists at BCM and BSWRI on the development of molecular vaccines. For this project our group synthesizes a variety of immunomodulatory compounds and then conjugates those compounds to targeting antibodies. A second major project in our lab is a collaboration with transplant scientists at the BSWH Simmons Transplant Institute. In this project our lab synthesizes small molecules and attaches them ex vivo to pancreatic islets. The survival of these modified islets after transplantation is then explored. The chemical modifications that we are making are designed to protect the islets from destruction immediately after transplantation.

Microbiome The Kearney Lab focuses on antimicrobial peptide design, especially targeted peptides. We are especially interested in developing partnerships with microbiome workers seeking to specifically eliminate a bacterial species from a microbiome. In peptide design, we have developed an algorithm to scan genomes or to evaluate de novo designed peptides for the specific cysteine-stabilized structure common to a particularly stable class of antimicrobial peptides (STPs, sequential tri-disulfide peptides). In addition, we have developed expertise in high-level expression of these recalcitrant peptides in both E. coli and plants (the latter being for potential Third World use with livestock). We seek a partner who needs an experimental tool to evaluate the elimination of a specific bacterial species from an extant microbiome. We can develop stable targeted peptides for protein delivery, but we are also interested in delivery via engineered probiotic species. In a parallel project, we are developing transgenic plants for delivery of specifically targeted peptides to the mosquito gut via nectar. Plants delivering marker protein to the nectar have been transformed and are scheduled for evaluation this summer, with mosquitocidal plants following.

Microbiome My research interests are on the microbiomes of different ecosystems including rhizosphere, stream with P gradients, and wastewater. My research lab is investigating compositional and functional profiles of those microbiome with research contexts in community ecology, ecosystem ecology, and public health. A few current projects are 1) understanding the role of rhizosphere microbiome of grass under CO2 gradient, 2) bacterial role of stream P cycle from Oklahoma streams with various P gradient and 3) swage microbiome and antibiotic resistance genes. We are utilize NGS technology, microarray technology, flow cytometry, stable isotope analysis along with bioinformatics, multivariate statistics and statistical modeling to carry out these research projects.

Cancer My training is in toxicology and the molecular mechanisms of cancer development. Since coming to Baylor, my work has focused on developing small projects that develop critical thinking and experimental design skills in undergraduate students. Along with my collaborator, Crystal Usenko, I currently utilize the embryonic zebrafish model of human toxicity, and we are open to testing novel compounds for basic toxicity and effects on gross development of zebrafish. If you have a need for a quick study of chemical
exposure effects in an in vivo model, please contact me. The zebrafish embryo model is rapid, sensitive, inexpensive and encompasses each of the core cell signaling pathways utilized in human development.

**Cancer** My work focuses on triple negative (ER-, PR-, HER2-) breast cancers (TNBCs) which are a diverse subset of breast cancers that exhibit increased cellular plasticity, which contributes to greater metastatic competence and frequent primary tumor relapse, often refractory to chemotherapy. By activating a conserved program of cellular dedifferentiation, cancer cells lose cadherin-mediated cell-cell adhesion and gain motility which facilitates invasion into the extracellular matrix leading ultimately to metastasis. However, recent studies support the notion that disseminated tumor cells undergo differentiation or EMT reversion-called mesenchymal-epithelial transition (MET)-which confers the proliferative potential and epithelial attributes necessary for efficient metastatic colonization. I have investigated the contributions of three separate categories of epigenetic phenomena-microRNAs, histone methylation and DNA methylation-to the process of EMT/MET. Consequently, my laboratory is pursuing the role of cellular plasticity in the progression of breast cancer by identifying critical epigenetic regulators of EMT/MET and demonstrating their roles in the interconversion between the epithelial and mesenchymal phenotypes and ascertain their impact on metastatic competence and chemotherapy-resistance of breast cancer cells.

**Cancer** - New chemotherapies for melanoma targeting the Cu transport system. The chemistry and characterizations of melanin, especially as related to biomarkers for melanoma susceptibility. Oxidative and nitrosative stress, reactivity with heme proteins and enzymes. The chemistry of NO and H₂S, biological effects of NOₓ, SOₓ, polysulfanes.

**Toxicology** The goal of the research performed in my laboratory is to investigate the fate, transformation, and biological effects of nano-drugs, pharmaceuticals, and nanobiomaterial systems. We address several fundamental issues relevant to the development of safe and effective nanomedicine for biological applications and environmental implications. These issues include material characterization, dosimetry, and pharmaco/toxicokinetics. Convergence of the fields of chemistry, engineering, toxicology, and environmental health resulted in my multidisciplinary approach to create transformational knowledge in the nano-bio space. As a member of BU, I have access to a variety of facilities and communicate frequently with faculty expertise that fosters basic science teaching/learning, applied research, and development of novel devices. My research aims to increase basic scientific research at the interface between nanoscience and toxicology, with the health of humans and our environment as the clear focus.

**Infectious Diseases & Toxicology** Developing intervention strategies for the control of parasitic nematodes continues to be a significant challenge. Genomic and post-genomic approaches play an increasingly important role for providing fundamental molecular information about these parasites, thus enhancing basic as well as translational research. We propose a comprehensive genome-wide survey of the developmental transcriptome of the filarial parasite Brugia species. Characterization of the transcriptional
program of the parasite’s lifecycle is an important step toward understanding the developmental processes required for the infectious cycle. We expect to find that the transcriptional activity has a number of stage-specific pathways activated during filarial development. In addition to advancing our understanding of transcriptional dynamics, these data will aid in the study of genome structure and organization by facilitating the identification of novel transcribed elements and splice variants. Stage-specific pathways activated during MF to L3 stages are potential targets for drugs or vaccines.

**Cancer** Projects in the Trakselis laboratory center on understanding the molecular mechanisms of DNA replication and repair and exploiting this knowledge for cancer therapeutics, biotechnology, and health applications. We molecularly dissect and compare model DNA replication and repair systems from all domains of life using advanced biochemistry and biophysics to understand the intricacies of these complex processes and understand the evolution of DNA processing enzymes. Additionally, we utilize cellular biology approaches in human cells to investigate the roles of various enzymes in double strand break repair and their contributions to fertility and cancer. In all, we aim to provide a molecular, mechanistic, structural and functional understanding to DNA replication and repair enzymes across species of life.

**Biomechanics** Computer algorithms and simulation tools to model human musculoskeletal biomechanics, with a particular focus on muscle wrapping paths, and forces and motions in the bones, joints, and muscles of the human shoulder; Computer algorithms to automate analysis of medical images, such as CT images, to detect risk of otherwise non-presenting injuries based on mis-alignment and mis-orientation of anatomical features, with a particular focus on the occipito-cervical complex; Study of electromagnetic (EM) wave propagation on and around the moving human body, particularly as it relates to the design of small, unobtrusive, power-efficient antennas suitable for continuous, remote health monitoring systems; Mechanical devices that facilitate exercise and therapy, with a particular focus on a mechanical horse device that simulates the experience of riding by accurately recreating the complex, three-dimensional motion pattern produced by a horse and experienced by a rider.

**Infectious Diseases & Toxicology** I am a geoscientist, studying climate-carbon cycle feedbacks, climate change, and climate change mitigation strategies. I also study climate-induced "events" like wildfire that affect air-quality and water quality. I am interested in attending because I would like to think about the kinds of scientific research that could be done, at Baylor, in the area of climate change and human health. I see a need to train graduate students capable of interdisciplinary research at the interface between climate science and health science.

**Natural Product Chemistry** My current research interest include:\n1. LCMS and Bio-guided isolation of chemical constituents from some
Cameroonian medicinal plants against cancer cell lines and Plasmodium parasites.

2. Cameroonian medicinal plants in the management of neurodegenerative disorders (alzheimer, parkinson and other psychiatric disorders).

3. Semi synthesis of bio-active compounds from Lapachol

4. Synthesis of alkaloids using different methods such as intra molecular Schmidt rearrangements.

**Immunology** Glycosylation on the cellular surface affects adhesion and host-pathogen interactions, with changes occurring during cellular differentiation, immune response, and in cancerous tissue. Though approximately half of the proteome is glycosylated, determining the structure of these post-translational modifications is analytically challenging. Unlike DNA replication or protein translation, glycosylation occurs through a non-template driven process and results in branched polymers with different monosaccharide components, linkages, and varying stereochemistries. Glycosylation results in a heterogeneous population of glycoproteins, with different structures having different functional activities. Thus, we are utilizing instrumental methods and developing new technologies to study how altered glycosylation affects protein binding interactions. Furthermore, we are applying these methods to study interactions of T-cell receptors and initiation of an adaptive immune response.

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