

## Research Opportunities

There are many research opportunities at LSUHSC-NO during both the school year and summer. The table below provides information on faculty who are interested in mentoring students, including a brief synopsis of their research interests. Many of the programs listed below require students to find a research mentor. Feel free to contact faculty members whose research is of interest to you. If they cannot take on a student at that time, then they may be able to direct you to someone else who can. Click on the department titles for additional faculty information.

An "X" denotes that the student type is accepted by the investigator to perform research in his/her research laboratory. Department titles link to additional faculty information.	PhD, MD/PhD Student	Medical Student	Undergraduate Student	High School Student
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### ***BASIC SCIENCE DEPARTMENTS***

#### **BIOCHEMISTRY AND MOLECULAR BIOLOGY**

Suresh K. Alahari, PhD	X	X	—	—
Thang Chiu, PhD	X	X	X	—
William C. Claycomb, PhD	X	X	X	—
Shyamal Desai	X	X	X	—
Arthur Haas, PhD	X	X	X	X
Sunyoung Kim, PhD	X	X	X	—
Kim Brint Pedersen, PhD	X	X	X	—
David Worthylake, PhD	X	X	—	—

#### **CELL BIOLOGY AND ANATOMY**

John Cork, PhD	X	X	X	X
Ray Gasser, PhD	—	X	X	X
Thomas Lallier, PhD	X	X	X	—
Siqiong June Liu, PhD	X	X	X	—

## LSUHSC-NO School of Graduate Studies

An "X" denotes that the student type is accepted by the investigator to perform research in his/her research laboratory. Department titles link to additional faculty information.	PhD, MD/PhD Student	Medical Student	Undergraduate Student	High School Student
Ranney Mize, PhD	X	X	—	—
Ya-Ping Tang, MD, PhD	X	X	X	—
Judith Venuti, PhD	X	X	X	X
Oliver Wessely, PhD	X	X	X	—
Ted Weyand, PhD	X	X	X	X
Matthew Whim, PhD	X	X	X	—
<b><u>GENETICS</u></b>				
Judy Crabtree, PhD	X	X	X	—
Yan Cui, PhD	X	—	—	—
Ed Grabczyk, PhD	X	—	X	—
Paula Gregory, PhD	—	X	X	—
Andrew Hollenbach, PhD	X	X	X	X
Tomoo Iwakuma, MD, PhD	X	X	X	—
Jay K. Kolls, MD	X	X	X	X
Wanguo Liu, PhD	X	X	X	—
Diptasri Mandal, PhD	X	X	X	—
Udai Pandey, PhD	X	X	X	X
Alistair Ramsay, PhD	X	X	—	—
Fem Tsien, PhD	—	—	X	X

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Guoshun Wang, DVM, PhD	X	X	X	—
<b><u>MICROBIOLOGY, IMMUNOLOGY AND PARASITOLOGY</u></b>				
Angela Martin Amedee, PhD	X	X	X	X
Ashok Aiyar, PhD	X	X	X	—
Bonny L. Dickinson, PhD	X	X	X	X
Paul Fidel, PhD	X	X	—	—
Timothy Foster, PhD	X	X	X	X
Michael Hagensee, MD, PhD	X	X	X	—
Ronald Luftig, PhD	X	X	X	X
Glen Palmer, PhD	X	X	X	—
Alison Quayle, PhD	X	X	X	—
Joy Sturtevant, PhD	X	X	X	X
Z. Tom Wen, PhD	X	X & Dental Students	X	—
Arnold H. Zea, PhD	X	X	X	—
<b><u>NEUROSCIENCE</u></b>				
Haydee E. P. Bazan, PhD	X	X	X	—
Nicolas G. Bazan, MD, PhD	X	X	—	—
Carmen Canavier, PhD	X	X	—	—
Chu Chen, PhD	X	X	—	—

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Jeffrey Erickson, PhD	X	X	X	—
Sonia Gasparini, PhD	X	X	—	—
Song Hong, PhD	X	X	X	X
Minghao Jin, VMD, PhD	X	X	X	—
Walter Lukiw, MS, PhD	X	X	—	—
Alberto Musto, MD, PhD	X	X	—	—
Christian T. Sheline, PhD	X	X	—	—
Hugh Xia, PhD	X	X	X	—
<b><u><a href="#">PATHOLOGY</a></u></b>				
Daitoku Sakamuro, PhD	X	X	—	—
Richard S. Vander Heide, MD, PhD	X	X	X	—
<b><u><a href="#">PHARMACOLOGY</a></u></b>				
Wayne L. Backes, PhD	X	X	X	—
Allison Berrier, PhD	X	X	X	X
Hamid Boulares, PhD	X	X	X	—
Andrew Catling, PhD	X	—	X	—
Stephania A. Cormier, PhD	X	X	X	X
Daniel R. Kapusta, PhD	X	X	—	—
Eric Lazartigues, PhD	X	X	X	—

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Charles Nichols, PhD	X	X	X	—
Dennis Paul, PhD	X	X	X	—
Kurt Varner, PhD	X	X	X	—
Guangyu Wu, PhD	X	X	X	X
<b><u>PHYSIOLOGY</u></b>				
Gregory J. Bagby, PhD	X	X	X	—
Jerome W. Breslin, PhD	X	X	—	—
Lisa M. Harrison-Bernard, PhD	X	X	X	—
Jason Gardner, PhD	X	X	X	X
John R. Porter, PhD	—	X	X	—
Barry J. Potter, PhD	—	X	X	X
Patricia E. Molina, MD, PhD	X	X	X	—
<b><i>OTHER DEPARTMENTS</i></b>				
<b><u>DENTISTRY AND BIOMATERIALS</u></b>				
Xiaoming Xu, PhD	X	X	X	—
<b><u>NEUROLOGY</u></b>				
Harry Gould, MD, PhD	X	X	X	X
<b><u>OBGYN</u></b>				
Madhwa Raj, PhD	X	X	X	X

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<b><u>OPHTHALMOLOGY</u></b>				
James Hill, PhD	X	X	X	X
Jean T. Jacob, PhD	X	X	X	—
Hilary W. Thompson, PhD	—	X	X	—
<b><u>PEDIATRICS</u></b>				
Mary Breslin, PhD	X	X	X	—
Mike Ferris, PhD	X	—	X	—
Deborah Fox, PhD	X	X	—	—
Michael S. Lan, PhD	X	X	—	—
Seth Pincus, MD	X	X	—	—
<b><u>SURGERY</u></b>				
Eugene Woltering, MD	X	X	X	X

**BIOCHEMISTRY AND MOLECULAR BIOLOGY****Suresh K. Alahari, PhD**[salaha@lsuhsc.edu](mailto:salaha@lsuhsc.edu)

01/07

We have identified a novel protein that we termed Nischarin, which is derived from Sanskrit that connotes slowness of motion. This molecule is ubiquitously expressed, is a cytosolic protein, and it interacts with the alpha5beta1 integrin *in vivo*. Tumor cell migration and invasion are important factors in development of solid tumors and are essential for metastasis to various organs. Recently, it has been shown that PAK regulates motile and invasive phenotypes of breast cancer cells through reorganization of actin cytoskeleton. In addition PAK1 plays a role in breast morphogenesis and differentiation. It has been suggested there is a functional correlation between high-grade breast tumors and enhanced PAK kinase activity, and thus PAK may have an important role in *in vivo* tumorigenesis. Since both PAK1 and PAK4 have been shown to strongly promote growth in soft agar, and since Nischarin binds to both of these kinases, it seems likely that Nischarin may affect anchorage independent growth as well as tumor growth in nude mice and thus Nischarin may be an important regulator of cancer progression.

Thus, we are investigating the role of Nischarin in breast tumor progression, and also we are in the process of identifying proteins that interact with Nischarin in breast cancer cells using proteomics as well as yeast two-hybrid approaches. A detailed understanding of the mechanistic basis of these events can significantly advance the development of new therapeutic approaches for cancer.

**Thang Chiu, PhD**[tchiu@lsuhsc.edu](mailto:tchiu@lsuhsc.edu)

12/07

We are interested in research, which can benefit millions of people worldwide. To pursue these studies we use modern molecular biology tools to design and produce recombinant proteins in bacterial or insect cells, purify them to homogeneity, and crystallize and determine their three dimensional structures by X-ray crystallography. We corroborate our structural interpretations of the biological function by using site-directed mutagenesis to knock out or introduce interactions at critical active site or interface residues, and study the altered proteins crystallographically, and biochemically.

Two exciting projects we are working on involve prolyl peptidases and mammalian cytidine deaminases. Prolyl peptidases are serine proteases that cleave small peptides at proline residues and are important for neurological functions and diabetes. We have solved the crystal structure of one member of this family and demonstrated for the first time that these enzymes function through an induced-fit mechanism. We will extend this work by determining the structures of the remaining members.

Cytidine deaminases are enzymes that convert cytidine to uracil, a process that hypermutates DNA. Activation Induced Cytidine Deaminase is a member that is responsible for generating antibody diversity, and patients with mutations in this enzyme suffer from Hyper-IgM2 syndrome. Apobec 3G is another member that functions in the innate defense against Human Immunodeficiency Virus (HIV). Its function is however counteracted by the virally-encoded protein Virulence Infectivity Factor (VIF), which targets Apobec 3G for proteolytic degradation. We will determine the structures of AID, Apobec 3G, VIF, and other cytidine deaminases to better understand their functions. Our long term goal is to use structure-based drug design to create compounds for therapeutic intervention.

**William C. Claycomb, PhD**[wclayc@lsuhsc.edu](mailto:wclayc@lsuhsc.edu)

The major interest of this laboratory is to develop mechanisms to repair or regenerate heart muscle tissue in the diseased heart. We are taking two major approaches. One is to understand the molecular machinery in which Nature restricts and irreversibly inhibits heart cell division during early development so that we can design procedures to reinitiate cell division to essentially regenerate muscle tissue.

The other approach is to actually transplant heart muscle cells back into the diseased heart to repair or replace the injured muscle cells. Presently we are using mouse embryonic stem cells (ES Cells) to derive immortalized ventricular, atrial and conducting heart cell lines that retain a cardiac lineage-specific phenotype. This involves using a combinatorial selection process with multiple promoters and selectable markers. The idea is to create three different types of heart muscle cells that could be grown continuously in culture and be used as model systems to study the function and dysfunction of the ventricle, atria and conduction system of the heart. We have recently been successful in utilizing specific molecular markers to identify a primitive cardiac conduction system utilizing differentiating ES cells in embryoid bodies.

We are also utilizing these genetically engineered ES cells in a tissue-engineering project. These cells would be extremely useful as research reagents for basic cardiac muscle cell research such as growth regulation and signal transduction as well as for therapeutic applications such as transplantation of cells into a diseased heart to repair damaged heart muscle and as a cell replacement therapy to treat a wide variety of cardiomyopathies.

## **Shyamal Desai, PhD**

[Sdesai@lsuhsc.edu](mailto:Sdesai@lsuhsc.edu)

12/07

The overall goals of my research program are (1) to understand the role of ubiquitin and ubiquitin-like protein ISG15 in tumorigenesis, (2) to understand the mechanism of tumor cell death and drug resistance, (3) to understand the role of ubiquitin and ubiquitin-like protein ISG15 in neurodegenerative diseases.

## **Arthur Haas, PhD**

[ahaas@lsuhsc.edu](mailto:ahaas@lsuhsc.edu)

Ubiquitin is a highly conserved 8600 Dalton polypeptide distributed throughout eukaryotes. The biological effects of ubiquitin are exerted through a unique post-translational modification in which the polypeptide is covalently ligated to free amino groups on various intracellular target proteins in an ATP-coupled reaction. Ubiquitination targets proteins for degradation by the 26S proteasome complex, a large (2 MDa) multi-subunit complex which recognizes multi-ubiquitinated proteins and degrades them to small peptides. The ubiquitin chain is released and is disassembled into single ubiquitin molecules which are then recycled. The major role of The ubiquitin/26S proteasome pathway for targeted degradation is a fundamental regulatory step involved in signal transduction, gene regulation, DNA repair, the stress response, cell cycle progression, apoptosis, and various disease states including muscle atrophy, Alzheimers dementia, Liddle's syndrome (familial hypertension), tumorigenesis, and Fanconi's anemia among others. We have also identified a second constitutive system within cells that is parallel but distinct from ubiquitin in which the 15 kDa interferon-like protein ISG15/UCRP is conjugated to a smaller subset of intracellular targets. ISG15 is the archetype of a small group of function-specific ubiquitin-like proteins that includes SUMO-1 and Nedd8. The conjugation of ISG15 to intracellular targets acts in trans to regulate protein-protein interactions. Work in the lab uses multiple approaches including enzymology, molecular and cell biology, and bioinformatics to study the mechanism and specificity of selected ubiquitin conjugation pathways as well as the function of ISG15 in cell regulation.

## **Sunyoung Kim, PhD**

[skim3@lsuhsc.edu](mailto:skim3@lsuhsc.edu)

03/08

The functional heart of enzymes is communication between a protein and its ligand partners, as well as the subsequent dialogue between residues during catalysis. We study members of protein families to pinpoint dynamic structural and chemical changes in the background of polypeptides that adopt similar folds. Biochemical, molecular, and biophysical tools are used to probe a kinesin motor family in dissecting the impact of potential anti-tumor agents on proteins with accepted roles in cell division, and the photolyase/cryptochrome family in answering how the protein matrix controls communication between redox-active species and developing tools to prevent skin cancer.

## **Kim Brint Pedersen, PhD**

[kpeder@lsuhsc.edu](mailto:kpeder@lsuhsc.edu)

01/08

The research is focused on the regulation of enzymes involved in intermediary metabolism. The activity and expression of many such enzymes are dependent on whether the organism is in a fed or fasted state. As signals of the fed and fasted states, insulin and glucagon can affect the enzyme activity and/or gene expression. An elevated glucose concentration is another signal of the fed state that can elicit activation or repression of various genes. We have studied the induction of the gene promoter for the catalytic subunit of glucose-6-phosphatase (G6Pase) by glucose. G6Pase catalyzes the hydrolysis of glucose 6-phosphate to glucose and is crucial for the ability of the liver to produce glucose. G6Pase is induced by glucose in both hepatocytes and pancreatic beta-cells. While this glucose regulation may be required for an adequate expression of G6Pase, it could also contribute to maintaining hyperglycemia in diabetics. We have mapped the *cis*-regulatory elements of the rat G6Pase gene promoter that mediate glucose responsiveness and found two distinct glucose-responsive regions. We intend to further investigate the mechanisms whereby glucose induces G6Pase and other glucose-responsive genes.

**David Worthylake, PhD**

[dworth@lsuhsc.edu](mailto:dworth@lsuhsc.edu)

01/07

Both the T-lymphoma invasion and metastasis factor (Tiam1), a guanine nucleotide exchange factor for Rac, and IQGAP1, a novel Rac and Cdc42 effector, have been shown to play a role in metastasis and invasion. We are using X-ray crystallography to study fragments encompassing individual and multiple domains derived from these two large proteins; in isolation and in complex with their interactors. 3-dimensional information will be used to aid in understanding the function and activities of Tiam1 and IQGAP1 in promoting cell migration and invasion.

## CELL BIOLOGY AND ANATOMY

**John Cork, PhD**

[jcork@lsuhsc.edu](mailto:jcork@lsuhsc.edu)

Research Interest: Digital 3D reconstruction of human embryos from serial sections.

**Ray Gasser, PhD**

[rgasse@lsuhsc.edu](mailto:rgasse@lsuhsc.edu)

Research Interest: Computer imaging of human embryos.

**Thomas Lallier, PhD**

[tlalli@lsuhsc.edu](mailto:tlalli@lsuhsc.edu)

10/09

Our lab investigates the interaction of aging, smoking and alcohol use on tissue remodeling. We are currently using an *in vitro* model system to examine how these factors influence cell adhesion, cell motility and the ability of these cells to exert contractile forces on collagen gels. In this system we are examining extracellular matrix (ECM) synthesis and secretion (of collagens and other matrix glycoproteins and proteoglycans), cell-ECM receptors (integrins) and matrix metalloproteinases (MMPs). Our system focuses on gingival and periodontal ligament fibroblasts as a means to examine the reparative properties of connective tissue cells on tissue regeneration. Our current findings indicate that aging selectively reduces the expression of several collagens and MMPs, reducing collagen gel contraction and cell motility without perturbing cell adhesion. In addition, nicotine drastically reduces gel contraction, without altering integrin expression. Finally, aging enhances the sensitivity of cells for nicotine, inducing significant alteration in ECM receptor (integrin) expression. Taken together, these data indicate that smoking and alcohol use may have an additive (or even synergistic) ability to reduce the reparative capabilities of cells in older subjects.

**Siqiong June Liu, PhD**

[sliu@lsuhsc.edu](mailto:sliu@lsuhsc.edu)

11/09

One of the fundamental features of the central nervous system is the ability to learn from previous experience. Neuronal circuits in the cerebellum contribute to motor learning and fear memory. The underlying mechanisms are thought to be experience-dependent long-term changes in synaptic transmission between cerebellar neurons. One critical component of any of neuronal circuit are inhibitory GABAergic interneurons that control the activity of principal neurons. Our research focuses on experience-induced neuronal plasticity of inhibitory interneurons. In particular, how emotional stress and fear memory alters (1) excitatory transmission via AMPA-type glutamate receptors onto GABAergic neurons and (2) the release of GABA from these neurons. Using a combined approach that includes electrophysiology, imaging, molecular biology and behavioral techniques, we investigate the molecular mechanisms and functional consequences of stress and fear-induced synaptic plasticity.

**Ranney Mize, PhD**

[rrmize@lsuhsc.edu](mailto:rrmize@lsuhsc.edu)

I study the development of synapses and axonal pathways in the brain. I am interested in the various molecules which control axon growth and the formation of synapses between neurons. I use the visual system to study this process, specifically the pathway from the retina (eye) to the superior colliculus, a subcortical structure involved in eye movements. I use several techniques, including light and electron microscope immunocytochemistry in which we localize various molecules (receptors, transmitters, growth factors) using antibodies directed against them. We also examine individual synapses with the electron microscope. We do quantitative analysis using digital microscopy and image analysis. Studies are performed in normal, transgenic, and gene knockout mice in order to determine if down-regulating genes which produce various substances alters the development of the pathway.

**Ya-Ping Tang, MD, PhD**

[ytang1@lsuhsc.edu](mailto:ytang1@lsuhsc.edu)

1/09

The research program in this lab consists of two main topics: neurobiology of learning and memory and neurobiology of neurodegeneration. The long-term goal of this program is to understand the roles of genes in learning and memory as well as the role of gene mutations in the pathogenesis of certain brain diseases with memory deficits such as Alzheimer's disease. A significant advantage in this lab is the combination of multiple disciplinary approaches including molecular biology, histology/morphology, mouse genetics, electrophysiological (collaborating with our colleagues), and mouse behavioral approaches in our studies.

Moreover, the use of conditional genetic approaches in this lab allows a time-dependent and/or neuronal cell types/brain region-specific analysis of gene function at the molecular, neuronal, morphological, and behavioral levels. Two representative projects are (1) how a synaptic stability contributes to memory consolidation and (2) how epigenetic events control aging-dependent neurodegeneration. More than 10 genetically engendered mouse models are currently available in this lab.

**Judith Venuti, PhD**

[jvenut@lsuhsc.edu](mailto:jvenut@lsuhsc.edu)

The research in my laboratory is centered on understanding the molecular mechanisms that pattern the early embryo and direct muscle differentiation. We use a combination of approaches including molecular biology, biochemistry, cell biology and cell/embryo culture. There are two principle areas of investigation:

- 1) Understanding the roles of components of the Nodal and Wnt signaling pathways in the establishment of the embryonic axes and specification of the germ layers - We are studying the consequences of perturbing genes in the early sea urchin embryo that are required for the embryo to develop its normal shape and form by introducing modified forms of these genes and investigating the consequences.
- 2) Identifying targets of Wnt signaling in the determination and differentiation of skeletal muscle - We are introducing modified forms of the downstream effector of Wnt signaling, TCF, into chicken embryo somites to determine Wnt target genes important in the differentiation of skeletal muscle. We hope to identify novel genes that respond to Wnt signals that can convert a stem cell into muscle.

**Oliver Wessely, PhD**

[owesse@lsuhsc.edu](mailto:owesse@lsuhsc.edu)

The laboratory works on the analysis of early embryonic patterning using the amphibian *Xenopus laevis* as a model system. In particular we are interested in the development of the pronephric kidney. Our aim is to establish the pronephros as an alternative system to study the molecular mechanism underlying polycystic kidney diseases.

**Ted Weyand, PhD**

[tweyan@lsuhsc.edu](mailto:tweyan@lsuhsc.edu)

Physiological and computational approaches to vision and sensorimotor integration. Projects:

1. Show videos to awake animals while recording from neurons early in their visual pathways to understand how information about the world is encoded under almost normal conditions.
2. Record from neurons in humans with movement disorders to understand how the disorder corrupts information flow through the brain.
3. Record eye movements in normal people and people with movement disorders as they look at pictures and read to better understand how the brain normally programs eye movements.

**Matthew Whim, PhD**

[mwhim@lsuhsc.edu](mailto:mwhim@lsuhsc.edu)

11/09

This laboratory is interested in the role of neuropeptides and stress. We are studying adrenal chromaffin cells which are part of the sympathetic nervous system. During the fight-or-flight response these cells become particularly active and release the hormones epinephrine and norepinephrine with consequent effects on blood pressure, heart rate and metabolism. In addition to the catecholamines, chromaffin cells also synthesize and secrete neuropeptides. Using electrophysiological, molecular and behavioral techniques we are examining the hypothesis that the role of adrenal neuropeptides is to prevent an excessive response to brief periods of stress.

## GENETICS

**Judy Crabtree, PhD**

[jcrabt@lsuhsc.edu](mailto:jcrabt@lsuhsc.edu)

10/09

Research Interest include:

- Understanding biological processes & epigenetics of endocrine tumor disorders.
- Candidate gene transcriptional regulation via methylation in tumors from both human and the Eker rat, and the functional consequences of this epigenetic regulation in uterine fibroid pathogenesis.
- Role of risk factors such as race and obesity in uterine fibroid etiology.
- The role of progesterone and other hormones in the epigenetic regulation of menin expression and function in Multiple Endocrine Neoplasia Type1 (MEN1).

**Yan Cui, PhD**

[ycui@lsuhsc.edu](mailto:ycui@lsuhsc.edu)

11/09

Research interest include:

- Cancer immunotherapy
- T cell development and lymphomagenesis
- Gene Therapy

**Ed Grabczyk, PhD**

[egrabc@lsuhsc.edu](mailto:egrabc@lsuhsc.edu)

10/06

We are using a combination of biochemistry, molecular biology and engineered human cell lines to study Friedreich ataxia (FRDA), the most common inherited ataxia. Expansion of an unstable GAA•TTC repeat within the first intron of the FXN gene causes FRDA by reducing frataxin expression. The degree of repression correlates with the length of the expansion, although how transcription is reduced by intronic GAA•TTC tracts remains unclear.

A major research area in the lab is to understand the molecular basis for suppressed frataxin expression, as a first step in developing a treatment. We hope to use the model FRDA cell lines we are making as a drug discovery platform. In a related area of research we are investigating the interplay between DNA structure, DNA repair, transcription and DNA instability.

In a separate area of FRDA research we are looking at changes in iron homeostasis, reactive oxygen species, mitochondrial function and cell metabolism in response to altered frataxin expression. Frataxin is an essential nuclear encoded mitochondrial protein. Insufficient frataxin expression in FRDA causes mitochondrial dysfunction, most severely affecting cells with high metabolic rates such as large neurons and heart muscle cells. Frataxin plays a role in iron-sulfur (Fe•S) cluster assembly, and may be involved in other iron transactions. The variable onset of neurodegeneration and cardiomyopathy in FRDA arise from a combination of reduced ATP production and increased reactive oxygen species damage.

**Paula Gregory, PhD** [pgrego@lsuhsc.edu](mailto:pgrego@lsuhsc.edu) 11/09

Research interest include:

- Research in genetics education for teachers, students, the public, and health care professionals
- Psychological barriers to understanding genetics information and the impact of predictive genetic testing on family dynamics

**Andrew Hollenbach, PhD** [aholle@lsuhsc.edu](mailto:aholle@lsuhsc.edu) 11/09

Research interest include:

- The regulation of transcription factors through phosphorylation
- Biochemical mechanisms of chromosomal translocation gene products in cancer formation

**Tomoo Iwakuma, MD, PhD** [tiwaku@lsunsc.edu](mailto:tiwaku@lsunsc.edu) 10/09

Research interest include:

- Protein function in p53 pathway
- Generation and analyses of genetically engineered mice related to tumor development

**Jay, K. Kolls, MD** [jkolls@lsuhsc.edu](mailto:jkolls@lsuhsc.edu) 11/09

Research interest include:

- Investigate mechanisms of the lung host defenses in normal and immunocompromised hosts.
- Investigate how IL-23 and IL-17 regulate neutrophil recruitment in response to infectious stimuli in the lung.
- Study Cellular sources of IL-17A, IL-17F, and IL-22 in lung as well as their signaling in response to pulmonary infection.
- Long-standing interest in determining if Th 17 cells and their cytokine products contribute to airway destruction in cystic fibrosis.
- Long-standing interest in understanding cytokine biology in the lung through over-expression or dominant negative inhibitor strategies using somatic gene transfer.
- Identified that sub-populations of CD8+ T-cells polarized in vivo via cytokine gene transfer have effector activity against *P. carinii*.
- Gene Expression profiling and proteomics to define this effector activity.
- Program developing CD4-independent vaccination against AIDS-related opportunistic infections.

**Wanguo Liu, PhD** [wliu3@lsuhsc.edu](mailto:wliu3@lsuhsc.edu) 11/09

Research interest include:

- Genetics and biological roles of Wnt signaling in GI tumor development
- Genetics and functional analysis of DNA damage-response defects in prostate cancer susceptibility

**Diptasri Mandal, PhD** [dmanda@lsuhsc.edu](mailto:dmanda@lsuhsc.edu) 11/09

Research interest include:

- Genetic linkage and segregation analysis of complex disorders, in particular humans cancers
- Investigation of properties of statistical genetic analysis methods through computer simulation

<b>Udai Pandey, PhD</b>	<a href="mailto:Upande@lsuhsc.edu">Upande@lsuhsc.edu</a>	11/09
Research interest include:		
<ul style="list-style-type: none"> <li>• Utilizing Drosophila melanogaster as a model system (fruit fly) to apply the power of genetics to understand the pathogenesis of neurodegeneration</li> <li>• Investigating the role of protein degradation pathways in neurodegeneration</li> </ul>		
<b>Alistair Ramsay, PhD</b>	<a href="mailto:aramsa@lsuhsc.edu">aramsa@lsuhsc.edu</a>	11/09
Research interest include:		
<ul style="list-style-type: none"> <li>• HIV/AIDS, molecular and immunological analysis of host/pathogen interactions</li> <li>• TB infection, molecular and immunological analysis of host/pathogen interactions</li> <li>• Vaccination, development of novel gene-based strategies for systemic and mucosal immunization and molecular analysis of host immune responses</li> </ul>		
<b>Fem Tsien, PhD</b>	<a href="mailto:fmille@lsuhsc.edu">fmille@lsuhsc.edu</a>	10/09
<p>One of my research interests is the correlation between DNA methylation and constitutive heterochromatin with gene silencing. Currently, we are studying chromosome and telomere instability in osteosarcomas and thymic lymphomas. Also, we are evaluating chromosomal instability in human and rhesus macaque adult stem cells. Clinical research includes molecular cytogenetic evaluation of translocation Down syndrome families. Our lab is involved with Genetics education of high school students, teachers, undergraduates, medical students, and graduate students, in the fields of Cytogenetics and Epigenetics.</p>		
<b>Guoshun Wang, DVM, PhD</b>	<a href="mailto:gwang@lsuhsc.edu">gwang@lsuhsc.edu</a>	11/09
<ul style="list-style-type: none"> <li>• Phagocytic Innate Immunity</li> <li>• Cystic Fibrosis</li> <li>• Gene Therapy and Stem Cells</li> </ul>		

**MICROBIOLOGY, IMMUNOLOGY AND PARASITOLOGY**

<b>Ashok Aiyar, PhD</b>	<a href="mailto:aaiyar@lsuhsc.edu">aaiyar@lsuhsc.edu</a>	12/07
My research program focuses on two aspects:		
<ol style="list-style-type: none"> <li>1) Understanding the key mechanisms involved in melanoma initiation. In particular, using in vitro and in vivo skin models, we seek to learn how dysfunction of the components of the Retinoblastoma (Rb) pathway deregulates cell death mechanisms and activates cell survival signaling leading to the onset of skin tumours</li> <li>2) Elucidating the downstream signaling mechanisms of the cell adhesion molecules CD44 and CD146 in cancer metastasis using “gene switch” systems both in vitro and in vivo</li> </ol>		
<b>Angela Martin Amedee, PhD</b>	<a href="mailto:aamede@lsuhsc.edu">aamede@lsuhsc.edu</a>	
<p>Pathogenesis of HIV and mother-to-infant transmission of human and simian immunodeficiency viruses (HIV and SIV). The major focus of research in the Amedee laboratory is to evaluate the parameters involved in transmission of virus from mother-to-infant. Other areas of interest include the identification and quantitation of viral genotypes expressed at mucosal surfaces (vaginal and oral), and characterization of HIV/SIV envelope sequences that emerge during disease progression.</p>		

**Bonny L. Dickinson, PhD**[bdicki@lsuhsc.edu](mailto:bdicki@lsuhsc.edu)

12/07

Mucosal vaccines

We are interested in mucosal vaccines and specifically, vaccines that are targeted to the gut (oral vaccines). A major focus of our work involves the development of safe and effective mucosal adjuvants to enhance the immunogenicity of oral vaccines. Cholera toxin (CT) is the most potent oral adjuvant examined to date, however its enterotoxicity precludes its use in humans. Therefore, defining the mechanism(s) by which CT functions as an adjuvant would set the stage for development of adjuvants that exploit the toxin pathway without causing disease. The watery diarrhea elicited following CT intoxication is mediated by the release of neuropeptides and neurotransmitters from the enteric nervous system and intestinal enterochromaffin cells. We hypothesize that the neuropeptides and neurotransmitters released in response to CT action participate in CT adjuvanticity by directly influencing the function of a key immune cell, the dendritic cell.

Transepithelial transport

Another focus of our research is the study of immunoglobulin G (IgG) transport across the intestine mediated by the neonatal Fc gamma receptor, FcRn. FcRn binds and traffics IgG so as to prolong IgG the serum half-life of the molecule and to carry IgG bi-directionally across epithelial cell/epithelial barriers to affect mucosal immunity. We have shown that FcRn is present in the adult human intestine and functions to transport IgG in both directions across polarized intestinal epithelial cells. In this way, FcRn both transports IgG onto mucosal surfaces where it may protect the host and may transport luminal antigens bound to IgG back across the epithelium where the antigens are processed by dendritic cells. How the receptor sorts IgG through the cell to accomplish these functions remains unknown. We have identified a calmodulin-binding site within the FcRn cytoplasmic tail that affects FcRn trafficking and we are examining the idea that calmodulin sorts FcRn and its cargo away from a degradative pathway and into a transcytotic route across the cell.

Carcinoid Cancer

Carcinoid cancer is the most prevalent gastrointestinal neuroendocrine cancer and accounts for 17-46% of malignant small bowel tumors. Carcinoid tumors derive from enterochromaffin cells, neuroendocrine cells found scattered throughout the intestinal epithelium. Many human tumors impair the function of dendritic cells, potent antigen-presenting cells that play a pivotal role in orchestrating immune responses against tumors. Whether carcinoid tumors also subvert dendritic cell function to prevent development of an effective anti-tumor immune response and the mechanisms employed are currently unknown. Our preliminary data show that like their absorptive enterocyte neighbors, enterochromaffin cells express toll-like receptors and the IgG receptor FcRn. Toll-like receptors initiate a well-defined inflammatory cascade in response to intact microbes and their products. FcRn functions to transport IgG and IgG-antigen complexes across the intestinal epithelium. Whether these immune receptors function to regulate enterochromaffin cell secretion of molecules that may impair or modulate dendritic cell function remains to be examined. To address the hypothesis that the carcinoid tumor microenvironment modulates dendritic cell phenotype and function we will examine primary and metastatic carcinoid tumors cultured ex vivo under conditions that support spontaneous angiogenesis using a technique developed by our collaborator and leader in carcinoid cancer research, Dr. Eugene Woltering. We will define dendritic cell subsets present within carcinoid tumors and compare this with the dendritic cell profiles of normal and inflamed intestinal tissue. We will also examine two human enterochromaffin cell lines to determine whether enterochromaffin cells harness toll-like receptor and FcRn signaling to subvert or regulate dendritic cell function. These studies are clinically relevant and the findings may extend to other cancers in which the tumor microenvironment dysregulates dendritic cell function to promote immune evasion and tumor survival.

**Paul Fidel, PhD**[pfidel@lsuhsc.edu](mailto:pfidel@lsuhsc.edu)

I have laboratories at both the dental school and medical schools. The research interests of my laboratory center on mucosal immunology to fungal infections. Specifically, we study host defense mechanisms against oral candidiasis (thrush) in HIV-infected persons, and host defense against vaginal candidiasis (yeast infections) in otherwise healthy women. Animal models are also used as well as in our research.

**Timothy P. Foster, PhD**

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10/09

A host's control of viral infections is mediated through cellular sentinels that detect pathogen invasion and initiate both innate and adaptive responses. Herpesviruses establish a lifelong chronic and persistent infection, and as such must continuously evade host antiviral responses. Despite effective HSV antivirals, two disconcerting trends have been observed: 1) the prevalence of genital herpes has continued to rise with approximately 1.6 million new cases occurring annually; 2) there has been an increased incidence of *recurrent* genital lesions. These trends are especially alarming considering the role HSV-2 plays in facilitating acquisition of other STIs, including HIV. HSV-2 infections contribute to increased STIs by either modulating cell-intrinsic innate recognition and response pathways or increasing the inflammatory milieu within the genital tract mucosa. *Our laboratory's overarching research interest is to understand the mechanisms by which HSV-2 viral proteins subvert host cell-intrinsic antiviral responses and thereby contribute to HSV-2 pathogenesis.* Our laboratory has utilized various molecular techniques to identify multiple viral proteins involved in subverting numerous host antiviral pathways. Understanding the virus/host interplay and the basic mechanisms employed to evade host cell-intrinsic pathogen recognition and response pathways provides new insights and targets for novel vaccine and/or therapeutic development.

**Michael Hagensee, PhD**

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10/09

My lab works on the human papillomavirus (HPV) and how it causes cervical cancer. Many men and women are infected with this virus but very few go on to have cancer. We are looking at ways to detect this virus since it does not grow readily in the laboratory. We are examining the role of co-factors that may explain those who progress to cancer from infection. In addition, we are examining how our body reacts and tries to control this virus in order to potentially improve therapeutic options.

**Ronald Luftig, PhD**

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01/08

Dr. Ron Luftig is conducting research on developing a novel AIDS vaccine using L-2 particles, which are mutated and defective in 8 genes. Current studies involve: 1) using cassette mutagenesis to create new envelopes on the backbone of L-2 with other than Clade B virus, using cassette mutagenesis and testing them for Neutralizing Antibodies; 2) using nanosphere particles and other adjuvants- to increase Nab production (with Tarun Mandel at Xavier); 3) examining the role of TRIM5alpha, a ubiquitin ligase in destruction of HIV vs non-destruction of L-2 in rhesus macaques.

**Glen Palmer, PhD**

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01/08

Dr. Palmer's research addresses the mechanisms by which pathogenic fungi adapt to the mammalian host and differentiate during colonization and infection. In particular, the research focuses on the opportunistic pathogen *Candida albicans*. Current studies are investigating the role played by the fungal vacuole in mediating yeast-hypha differentiation, survival within host cells such as macrophages, and invasion of host tissues.

**Alison Quayle, PhD**

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The central theme of our research is immune defense in the human female and male genital tract, and the mucosal immune response to sexually transmitted pathogens. Currently our major focus is on *Chlamydia trachomatis* infection. Many women are asymptotically infected with Chlamydia, and chronic infection can lead to infertility and ectopic pregnancy. In addition, Chlamydia infection increases susceptibility to HIV infection. There is currently no vaccine for Chlamydia, natural immunity is short-lived, and Chlamydia may be persistent in some individuals; these issues are all major research interests in the lab. We are funded by 2 NIH grants, and a Health Excellency Fund (HEF) grant. Dr. Quayle is a founder member of the Louisiana STD Center, and the NIH Gulf South Sexually Transmitted Infections Clinical Research Center, both based at LSU HSC.

**Z. Tom Wen, PhD**

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10/09

The primary interests of my research are in molecular characterization of biofilms and identification of novel targets for therapy and vaccine development against biofilm-associated diseases. In nature, bacteria exist in highly complex multiple-species communities, better known as biofilms. Due to their increased tolerance to host defense, antibiotic therapies and other antibacterial agents, biofilms are notoriously difficult to eliminate and are a source of many recalcitrant infections. A better understanding of the processes underlying biofilm formation and persistence should ultimately lead to the development of novel and effective therapeutic and preventive strategies for diseases (such as dental caries, periodontitis and cystic fibrosis) and conditions (e.g. fouling of catheters) in which biofilm formation plays a prominent role.

Currently, *Streptococcus mutans*, the primary etiological agent of human dental caries, serves as the model microorganism. Major effort is directed, but not limited to (1) microbial cell-cell communication and its impact on establishment, persistence and competitiveness of *S. mutans* when grown in mixed-species consortium using continuous flow, mixed-species biofilm models and confocal laser scanning microscopy; (2) identification and characterization of genes required for biofilm formation by *S. mutans*, including further characterization of BrpA, a glycoprotein with major roles in environmental stress tolerance and formation of biofilms by *S. mutans*, focusing on the role and the underlying mechanism of BrpA in regulation of *S. mutans* pathogenicity and the potential for targeting BrpA in anti-caries strategy.

**Joy Sturtevant, PhD**

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Work with the opportunistic fungal pathogen, *Candida albicans*. Basic research: Focus on signaling events after interaction with environment/host. Clinically related project: Acquisition of virulence in *C. albicans* in HIV+ patients.

**Arnold H. Zea, PhD**

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01/07

The research focus of this laboratory is to study T cell dysfunction in patients with renal cell carcinoma and tuberculosis. Until now, immune dysfunction in cancer and mycobacterial diseases has primarily been attributed to the loss of DTH responses to multiple tumor antigens or mycobacterial preparations. However, we believe that alterations in T cell signal transduction proteins may play an important role in T cell immune dysfunction. The characterization of these alterations may be used as markers to determine immune dysfunction.

Furthermore, we are interested in studying immunological and molecular mechanisms involved in T cell dysfunction, aiming to prevent or restore an adequate immune response that will benefit the clinical outcome of patients with renal cell carcinoma or tuberculosis. Understanding the mechanism (s) that lead to T cell dysfunction in those patients will allow us to develop new ways of improving the efficacy of the different clinical immunotherapy approaches currently in use. Our research is focus in three aspects: 1) Determine in both patients and cell lines the role of enzyme arginase II in the depletion of L-arginine associated with T cell dysfunction, 2) we are testing the role of arginase in tumor cell growth and mycobacterial growth-induced immunosuppression, 3) study of the immunological and molecular mechanisms of arginase induction in disease.

**NEUROSCIENCE**

**Haydee E. P. Bazan, PhD**

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10/09

Corneal inflammation and wound healing. Our laboratories study the effect of lipid inflammatory mediators and growth factors in the cornea and how they affect tissue repair. A second line of research is the role of neurotrophins and pigment epithelial derived factor (PEDF) in the regulation of corneal nerve re-growth after injury. Corneal nerves are important in maintenance of corneal integrity and prevention of dry eye following corneal injury. These studies are of clinical significance. A variety of molecular and cellular biology techniques as well as cells in culture and in vivo models of corneal injury are employed.

**Nicolas G. Bazan, MD, PhD**

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01/07

Our research has led to the identification of novel cell signaling responses of the nervous system (brain and retina) to various forms of injury. The injuries that are being studied in my laboratory have in common an upsurge of oxidative stress, protein misfolding and apoptotic cell death. The models used include experimental cerebrovascular disease (e.g. stroke), traumatic head injury, epilepsy, retinitis pigmentosa, age-related macular degeneration and other neurodegenerative diseases (e.g. Alzheimer's and Parkinson's).

In addition, the novel cell signaling targets are being explored in eye inflammatory models, in neuropathic pain, and in unique assays for pathoangiogenesis. Current studies seek to identify mechanisms that regulate the synthesis and availability of the newly discovered messenger neuroprotectin D1 as well as the downstream signaling including Bcl-2 proteins and proinflammatory genes. These cellular and molecular events are explored in terms of synaptic remodeling, neuron regeneration and neuroprotection. Overall, the recently uncovered messengers may contribute to integrate responses for cell survival with active participation of cytokines and growth factors/neurotrophins.

This research is leading to the application of novel endogenous molecules, as well as synthetic low molecular weight compounds that penetrate the blood brain barrier to experimental therapeutics. Our research engages cell biology, biochemistry, pharmacology, and experimental models of diseases, complemented with powerful lipidomic tools. We are currently defining the translational implications of these findings as novel therapeutic strategies.

**Carmen Canavier, PhD**

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1/07

I use the techniques of computational neuroscientist to quantify the electrical activity of neurons. I study basic mechanisms of synchronization and the production of the firing firing such as pacemaking, irregular firing and bursting. I am interested in central pattern generation and in the dopamine neurons of the mammalian midbrain.

Linear stability analysis of discrete and continuous systems, nonlinear dynamics, the numerical solution of nonlinear systems, and bifurcation theory are some of the tools that I use. Research Interests: Computational Neuroscience: Nonlinear Dynamics of Single Neurons and Small Networks Nonlinear dynamics of single neurons and small networks.

**Chu Chen, PhD**

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8/06

My laboratory studies membrane ion channel modulation, synaptic transmission and plasticity, and neuronal survival using electrophysiological recording, optical imaging and molecular biology approaches. The specific research interests in my lab currently focus on the roles of cyclooxygenase-2 (COX-2)-mediated lipid signaling in hippocampal synaptic transmission, plasticity and neurotoxicity. COX-2, an inducible key enzyme converting arachidonic acid to prostaglandins, is not only essential to our normal physiological function, but it is also involved in inflammatory responses, traumatic brain injury, stroke, multiple sclerosis and several neurological disorders, such as epilepsy, Parkinson's and Alzheimer's diseases.

Recent evidence indicates that COX-2 is also capable of oxygenating endogenous cannabinoids to form novel prostaglandins. However, physiological and pathological functions of these COX-2 oxidative metabolites of endocannabinoids are still unknown. The goals of ongoing projects in this lab are to elucidate cellular and molecular mechanisms underlying COX-2-mediated prostaglandin signaling in hippocampal synaptic physiology and pathology, and to provide important evidence or clues to design drugs aimed at treating, ameliorating, or preventing neuroinflammation-, traumatic brain injury-, ischemia-induced neuronal damage and neurodegenerative diseases, resulting from abnormally excessive activation of COX-2.

**Jeffrey Erickson, PhD**

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1/07

My laboratory studies the molecular and cellular properties of the transporters that package the major excitatory neurotransmitter glutamate into synaptic vesicles. We have cloned three genes that encode these transporters, characterized their functional activity and mapped their distributions in the brain. Using cultured neurons, we have found that they are differentially and coordinately regulated with the transporter for the major inhibitory transmitter GABA. Thus, the balance of expression of vesicular transporters for glutamate and GABA may determine the balance of excitatory and inhibitory transmission in the brain. We are currently studying the molecular and cellular mechanisms that govern the plasticity of the storage and synaptic release of these neurotransmitters from neurons.

**Sonia Gasparini, PhD**

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01/07

Information in the brain is encoded through patterns of action potentials, that occur in specific sets of neurons at a specific time. I am interested in studying how information is processed in the brain and in particular how neurons integrate the inputs they receive on their dendrite to generate an output at the soma/axon region. This very complex process depends on the characteristics of the synaptic inputs, the morphology of the dendritic tree and the voltage-dependent currents there expressed. In particular, we are interested in understanding the integrative properties of pyramidal neurons in the hippocampus and the entorhinal cortex, regions that are fundamental in processes of memory and learning.

For our research, we employ electrophysiological techniques (dendritic and somatic recordings) and two-photon imaging and unaging of caged neurotransmitters (such as glutamate) on brain slices. Using these techniques, we have recently shown that different spatio-temporal input patterns can differentially engage the intrinsic dendritic voltage-dependent currents to generate specific outputs that can be related to the main behavioral states of the animal.

**Song Hong, PhD**

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12/07

My laboratory focuses on lipidomic pathways of lipid mediators which play critical roles on the homeostasis and diseases of neurological and ocular systems. We identify and elucidate chemical structures and bio-functions of lipid mediators using state-of-art mass spectrometry and biological techniques. Our current study is on retinal degeneration. We are interested in the regulation of innate immunity by lipid mediators, and the links to inflammatory diseases. Lipid modification of bioactive proteins and the bio-functions are also of our interest.

**Minghao Jin, VMD, PhD**

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10/09

The current research in my laboratory is focusing on understanding the molecular mechanisms involved in: (1) regulation of the visual cycle and (2) degeneration of photoreceptors in blinding diseases caused by mutations in the visual cycle genes. The visual cycle is a biochemical pathway that regenerates 11-*cis*-retinal chromophore responsible for sensing light in the retinal photoreceptors. Using expression cloning and yeast two hybrid screening, we have isolated several genes that may regulate the visual cycle. We are currently investigating the functions of these genes using *in vitro* and *in vivo* biochemical and molecular biological approaches. Since the visual cycle is crucial for vision and retinal function, mutations in the visual cycle genes (e.g. RPE65 and IRBP) cause severe blinding diseases such as Leber's congenital amaurosis (LCA) and retinitis pigmentosa (RP). We are studying the molecular mechanisms by which the disease-associated mutations cause photoreceptor degeneration in mice models for LCA and RP. Other ongoing projects in my laboratory include rescuing or delaying the photoreceptor degeneration in the mice models by genetic and pharmacological approaches.

**Walter Lukiw, MS, PhD**

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01/07

The major research interests in my laboratory are: Alzheimer's disease; Parkinson's disease; prion-based neurodegeneration; neurotoxicology; brain-specific gene transcription; chromatin structure; molecular basis for memory; DNA array analysis and bioinformatics; gene expression and factors that modulate gene expression; transcription factors; neuroprotective omega-3 fatty acids; docosahexanoic acid (DHA) and neuroprotectin D1 (NPD1); neurotoxic environmental metals and especially aluminum, iron, mercury, cadmium, zinc and copper neurotoxicity and neurotoxicology; secretory products of aged and stressed brain cells, hypoxia; spreading mechanisms in neurodegenerative disease; novel neuroprotective agents; age-related macular degeneration.

**Alberto Musto, MD, PhD**

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10/09

Dr. Alberto E. Musto's laboratory is focusing in the basic mechanism/s that mediates the genesis of seizures (ictiogenesis) and the occurrence of spontaneous seizures (epileptogenesis). The central hypothesis is that failure of inhibitory neurotransmission mediated by GABA<sub>A</sub> receptors lead to the initiation and propagation of seizures. Several repetitive seizures enhance the accumulation of platelet activating factor (PAF) that activates molecular pathways, which triggers inflammatory and degenerative process in the brain and impair the central inhibition. Dr. Musto tests the mentioned hypothesis integrating his background of clinical neurology and neuroradiology into *in vivo* animal models of experimental epilepsy, using behavioral procedures, state of the art of electrophysiology *in vivo*, immunohistology techniques, biochemical protocols and novel chemical compounds (LAU-0901). Dr. Musto's laboratory hypothesizes that modulation of PAF activity through the PAF-antagonist receptor; LAU-0901, the neuroinflammation, neuronal damage and recurrent epileptic seizures will be attenuated. Dr. Musto collaborates with Dr. Nicolas G. Bazan in studying neuroprotective signaling in experimental epilepsy.

**Christian T. Sheline, PhD**

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11/09

My lab studies the death induced by excess zinc which occurs after injuries and pathophysiologic conditions in neurons and  $\beta$ -cells. In these cells zinc accumulates resulting in ATP and NAD<sup>+</sup> level depletion causing glycolytic inhibition. Measures which restore the NAD<sup>+</sup> levels, such as exogenous addition of NAD<sup>+</sup>, nicotinamide, or pyruvate prevent zinc-induced death. We and others have demonstrated the therapeutic value of nicotinamide, pyruvate, or Zn<sup>2+</sup> chelation against neuronal death caused by light-induced retinal damage, retinal, focal, and global ischemias, hypoglycemia, seizures, head trauma, and visual cortex ablation. This research was funded by an R01 grant from NINDS, and similar grant applications to investigate the role these pathways play in visual cortex ablation, and light-induced damage are pending at NINDS and NEI.

Zn<sup>2+</sup> toxicity also plays a role in the secondary death of  $\beta$ -cells in pancreatic islets of diabetic mice. Nicotinamide, Zn<sup>2+</sup> chelation, and pyruvate attenuated  $\beta$ -cell death and diabetic incidence in mouse models of diabetes. These studies are funded by an R01 from NIDDK. Zn<sup>2+</sup> dyshomeostasis through the  $\beta$ -cell specific Zn<sup>2+</sup> transporter, ZnT8, has been implicated in type-1 and type-2 diabetes in humans. We have made founder transgenic mice which overexpress human ZnT8 WT and mutant forms in  $\beta$ -cells, and are currently characterizing these founders. An R01 grant application to fund these studies is pending with NIDDK.

**Hugh Xia, PhD**

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8/06

Synapse has been shown to undergo persistent modifications in response to different patterns of activity and this change has been hypothesized to underlie the experience-dependent modifications in our brain, including learning and memory. We are interested in how NMDA receptors function in inducing these many forms of synaptic plasticity. We are not only interested in short term modifications in the synaptic protein composition through calcium mediated signaling pathway, but also CREB mediated gene transcription which provides new proteins for long term modification of the synapse. We are interested in both kinase and phosphatase mechanism of the signaling pathways leading to these changes in the synaptic strength. We use primary hippocampal cultures and hippocampal slices as our model systems. Techniques used include electrophysiological recordings of synaptic transmission, molecular biology for manipulating genes involved in the signaling pathway from NMDA receptor activation to synaptic strength medication and confocal/two-photon microscopy for localization studies of key proteins in these pathways.

**PATHOLOGY**

**Daitoku Sakamuro, PhD**

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01/07

Identification of a pro-apoptotic and pro-aging molecule or mechanism as a potential anti-cancer therapeutic target. Specifically, we are interested in the following two research directions:

- 1) Structural, functional, and molecular identification of cellular mechanisms that induce apoptosis, senescence, and oxidant stress-sensitive signaling pathways in cancer cells;
- 2) Signaling mechanisms elicited by oncogenic viral proteins, such as adenovirus E1A, human papilloma virus E7, human cytomegalovirus IEs, and hepatitis C virus NS3, in cell cycle progression, senescence, and apoptosis.

**Richard S. Vander Heide, MD, PhD**      [rvande3@lsuhsc.edu](mailto:rvande3@lsuhsc.edu)

10/09

Dr. Vander Heide's laboratory is interested in two projects. The long-term goal of the first project is to design rational approaches to limiting or preventing the cell death that occurs in a myocardial infarction (heart attack). Although much is known about the physical and biochemical status of dead cells, the exact sequence of events that occur leading to cell death is still open to debate. Among the questions addressed are the role of apoptosis versus necrosis and the signaling pathways, both extracellular and intracellular, that activate endogenous protective pathways.

The second project seeks to design and develop a new and unique delivery vehicle capable of delivering therapeutic drugs to ischemic tissue and thereby delay or prevent myocyte death. Many clinical trials of anti-ischemic drugs have been hindered by the inability to achieve effective concentrations of the drug at the critical site, the myocyte. In this project, we will develop a new delivery vehicle using the endogenous anti-oxidant protein catalase and will test the ability of the delivered catalase to inhibit myocyte cell death using both in vitro and in vivo model systems of ischemia/reperfusion injury.

## PHARMACOLOGY

**Wayne L. Backes, PhD**      [wbacke@lsuhsc.edu](mailto:wbacke@lsuhsc.edu)

Cytochrome P450 enzymes are responsible for the metabolism of virtually every foreign compound that enters an organism. The major function of the P450 system is to carry out oxidation reactions, usually by hydroxylation of the substrate. Most of these reactions lead to products/intermediates that are more water-soluble and consequently more rapidly excreted. However, some products are reactive, capable of binding to biological macromolecules, an initial step leading to carcinogenesis. P450 enzymes do not act independently, but require formation of a 1:1 complex with the flavoprotein NADPH-P450 reductase (reductase), which transfers electrons to P450. Because P450 exists in a large excess over reductase in vivo, the P450 enzymes must effectively compete for the reductase or be metabolically silent. The goal of this project is to examine the organization of multiple P450 enzymes and NADPH-cytochrome P450 reductase in the membrane, and to determine the potential for the formation of P450-P450 complexes that can influence the function of these enzymes. The studies include characterization of these interactions, identification of the contact points among the proteins, and determination of their effects on metabolism of hydrocarbons, carcinogens, and other foreign compounds.

**Allison Berrier, PhD**      [aberri@lsuhsc.edu](mailto:aberri@lsuhsc.edu)

11/09

The aim of research in the Berrier lab is to understand the cellular machinery that promotes oral tumor metastasis. We study the role of cell-matrix interactions in oral cancer because proteins in matrix adhesions are known to perform important functions in tumor progression, proliferation and invasion. Integrins are the principle cell surface receptors that mediate cell-matrix adhesion and disruption of the function of certain integrin receptors can reduce oral cancer tumor metastasis. One project area in the lab focuses on determining whether certain integrin receptors on invasive oral cancer cells recruit particular cytoplasmic proteins in order to regulate the invasive phenotype. A second project area involves determining whether a cell-derived matrix can be bio-engineered to change the behavior of invasive oral cancer cells. Both projects will potentially provide future approaches to reduce the invasive nature of oral tumors.

**Hamid Boulares, PhD**      [hboulr@lsuhsc.edu](mailto:hboulr@lsuhsc.edu)

My research interests focus on studying the intricate relation between the enzyme poly(ADP) ribose polymerase-1 (PARP-1) and associated endonucleases DNAS1L3 and DFF (DNA fragmentation factor) and oxidative stress in inflammation (asthma and atherosclerosis) and cancer. We use both cell culture systems and animal models to perform our studies. The induction of cellular oxidative stress is associated with the generation of reactive oxygen species (ROS) and consequent DNA damage. The breakage of DNA strands in turn results in activation of PARP-1, which, with NAD as its substrate, catalyzes the addition of long branched chains of poly(ADP-ribose) to a variety of nuclear proteins including itself. Such poly(ADP-ribosyl)ation contributes to various physiological and pathophysiological events that are associated with DNA strand breakage, including DNA replication, repair of DNA damage, gene expression, malignant transformation, and apoptosis. In several pathological situations that involve massive DNA damage, excessive activation of PARP-1 depletes cellular stores of both NAD and its precursor, ATP, leading to irreversible cytotoxicity and cell death (apoptosis or necrosis). Such depletion of cellular energy reserves results in perturbation of the function of

mitochondria, the main source of cellular ATP, and a consequent increased generation of ROS. We therefore investigate the cross talk between PARP-1 activation (and depletion of cellular energy reserves), its associated proteins, and mitochondria in an attempt to understand the mechanisms both of cell injury associated with inflammation and of cancer progression and resistance to chemotherapeutic drugs both at the levels of cell and whole animal.

**Andrew Catling, PhD**

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Cell fate is regulated by adhesion to the extracellular matrix. In normal cells, cell-matrix interactions are required for survival and proliferation, and also for regulated cell movement, for instance during embryogenesis and inflammation. Importantly, this control of cell fate is lost in two leading causes of human mortality, neoplasia and atherosclerosis, resulting in adhesion-independent growth, survival and metastasis of cancer cells, and inappropriate growth and migration of smooth muscle cells following vascular injury. These cellular functions are in part controlled by signaling through the MAP kinases pathway. My laboratory is interested in how adhesion signals are transduced by the MAP kinase pathway, and how signaling is altered during these disease processes.

**Stephania A. Cormier, PhD**

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12/07

The main goal of my laboratory is to determine if exposure during early neonatal life to environmental factors (i.e. allergens, pollutants, and respiratory viruses) leads to predisposition, development of, or exacerbation of respiratory disease in the adult. Our central hypothesis is that allergic respiratory diseases result, in part, from environmental impact(s) that occur during a critical phase of immuno-maturation. In the short term, we are exploring the validity of this hypothesis by defining the cellular and molecular and pathophysiological changes in the pulmonary microenvironment following gestational and/or neonatal exposure to allergens; urban pollutants (e.g. particulates such as diesel exhaust particles); and respiratory viral infection. Our present data clearly demonstrate that early exposure to respiratory viral infections, such as respiratory syncytial virus, predisposes to adult respiratory disease and alters subsequent immune responses in the lung. Current work in the lab seeks to determine the mechanisms involved in these processes.

**Daniel R. Kapusta, PhD**

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The research in my laboratory focuses on understanding the physiological responses, sites of action (e.g., brain, periphery, kidneys), and neural and hormonal mechanisms by which different opioid systems affect cardiovascular and renal function. These investigations are important from a clinical standpoint since we have demonstrated that the renal excretory responses produced by certain opioids, specifically those that activate *kappa* and *ORL1* opioid receptor subtypes, have important therapeutic applications in management of pathological states associated with edema and/or hyponatremia. Based on knowledge obtained from these investigations, we are developing novel 'aquaretics' (selective water diuretics) for the clinical management of fluid retaining states. In addition to therapeutic applications, we use pharmacological and genetic opioid receptor knockout approaches to investigate the physiological and potential pathological importance of endogenous opioid pathways in the regulation of cardiovascular and renal function and central autonomic control in normal, stressful and pathological states (e.g., hypertension, cirrhosis with ascites and congestive heart failure).

**Eric Lazartigues, PhD**

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01/07

Angiotensin-II (Ang-II) exerts its profound cardiovascular (CV) and volume homeostatic properties through activation of specific receptors, primarily Ang-II type 1 (AT1), located both in the periphery and in the brain. Evidence has shown the importance of the brain renin-angiotensin system (RAS) in the maintenance of normal blood pressure (BP) and in the development of hypertension. Although, new genetic and pharmacological tools have improved our understanding of the global functioning of this system, the role of its different components and their interactions remain poorly understood due to the difficulty in experimentally dissecting brain versus peripheral RAS. Recently, a new element of the RAS, named ACE2, has been identified and is believed to degrade Ang-II to the vasodilator peptide angiotensin-1-7 (Ang1-7).

Very recently, we identified the presence of ACE2 in the brain and our interests focus on the role of this enzyme in modulating the activity of the brain RAS during the development of neurogenic hypertension. Using non-transgenic (NT) and genetically-engineered mice in combination with molecular, physiological, and pharmacological tools, our laboratory is dedicated in assessing the relative physiological significance of central ACE2 in normal and pathophysiological regulation of BP and other CV diseases.

For additional details, go to [http://www.medschool.lsuhschool.edu/pharmacology/faculty/lazartigues\\_lab.htm](http://www.medschool.lsuhschool.edu/pharmacology/faculty/lazartigues_lab.htm).

**Charles Nichols, PhD**

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01/07

For my research, I follow an integrated approach utilizing both mammalian and *Drosophila* systems to identify and elucidate molecular mechanisms linking serotonin receptor activation to behaviors. The underlying hypothesis of my research program is that molecular events initiated by serotonin receptor activation, such as aberrant gene expression, which contribute to behavioral effects in animal models, represent potential candidates for involvement in the development and etiology of schizophrenia and related disorders in humans, and importantly, targets for new avenues of discovery for therapeutics. I have shown that serotonin receptor activation has a dramatic and dynamic effect on gene expression within the prefrontal cortex of mammalian brain.

The cellular functions regulated by these genes include signal transduction molecules, transcription factors, and structural proteins. A common theme of many of these gene products is the process of synaptic plasticity. Furthermore, I have developed the fruit fly, *Drosophila melanogaster*, to serve as a powerful genetically tractable model system to study molecular events underlying serotonin receptor-mediated behaviors.

Quite remarkably, pharmacological activation of serotonin 5-HT<sub>2</sub> receptors in the fly produces robust quantifiable behaviors not unlike those observed in mammalian systems. Future research projects in my laboratory will continue investigations into molecular mechanisms of serotonergic function that are relevant to human neuropsychiatric diseases utilizing both mammalian and *Drosophila* systems.

**Dennis Paul, PhD**

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The focus of my laboratory is the pharmacology of pain and analgesia. Currently, we have three major projects. First, we are examining the mechanisms by which drugs and neurotransmitters produce synergistic interactions. Our current focus is on the roles of lipid rafts and receptor dimers on subcellular interactions. Second, we are examining the role of sodium channels and pumps in the developing of diabetic neuropathy. Third, we are developing novel analgesic drug treatments that are as efficacious as morphine, but with reduced abuse liability. We use both in vivo and in vitro techniques and a collaborative approach to study all these questions.

**Kurt Varner, PhD**

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Cardiovascular and cardiac effects elicited by the acute and chronic administration of stimulants and club drugs. Another project is designed to determine the nicotinic receptor subtypes that control cardiovascular function and mediate the cardiovascular responses elicited by nicotine.

**Guangyu Wu, PhD**

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12/07

G protein-coupled receptors (GPCRs) constitute a superfamily of cell surface receptors that regulate a variety of downstream effectors including adenylyl cyclases, phospholipases, protein kinases and ion channels. GPCR function is regulated by the efficient trafficking and positioning of specific receptors. Over the past decades, most studies on the trafficking of GPCRs have focused on the events involved in receptor internalization. However, the molecular mechanism underlying the export of GPCRs from the endoplasmic reticulum (ER) through the Golgi to the cell surface remains poorly understood. The overall objective of my research is to elucidate the molecular mechanism underlying the export of GPCRs from the ER to the cell surface, the regulation of GPCR function by intracellular trafficking and the pathophysiological significance of GPCR trafficking and signaling in the development of cardiovascular disease.

**PHYSIOLOGY**

**Gregory J. Bagby, PhD**

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1/07

My research is a collaborative effort with Steve Nelson, MD, and Ping Zhang, MD, PhD in the Section of Pulmonary/Critical Care Medicine of the Department of Medicine. We explore host defense to systemic and pulmonary bacterial and viral infections in immunocompromised states such as alcohol intoxication, which is well known to increase the incidence and severity of infection, especially of the lung. Studies are performed in rodents and nonhuman primates. We use sophisticated analytical procedures to include molecular biology, multiplex protein analysis, and flow cytometry to identify cells and their individual functional state as well as isolated perfused tissues, and cell culture. In our studies we study immune cell migration and how mediators called cytokines orchestrate host defense against pathogens. As we discover impairments in the host defense system, we attempt to discover novel strategies to return host defense to normal. These include immune augmentation through the use of in vivo recombinant protein and gene delivery.

**Jerome W. Breslin, PhD**

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1/08

The overall goal of my research is to discover and characterize the cellular and molecular mechanisms that regulate the cardiovascular system in health and disease. I am particularly interested in how the endothelial cells of exchange microvessels regulate transport of fluids and solutes between 1) the blood and tissues, and 2) the tissues and lymph. The microcirculation usually acts as a selective barrier, however, excessive leakage of plasma, also called microvascular hyperpermeability, occurs during shock or inflammatory disease processes and can lead to tissue dysfunction. On the lymphatic side, when lymphatic vessels fail to collect excessive fluids from the tissue, a debilitating condition known as lymphedema forms.

The specific goals of my research are to better understand how inflammatory cells and mediators affect subcellular structures that control endothelial cell shape and adhesion, what genes promote microvascular hyperpermeability during disease processes, and what active role lymphatic endothelial cells may have in regulating lymph formation and propulsion. To achieve these research goals, I employ an integrative approach involving *in vivo* imaging experiments, cell culture models, and molecular biology techniques. Techniques routinely used in my lab include intravital fluorescence microscopy and image analysis, ECIS, protein analysis, and genetic mutation of cells. Recent studies have focused on the Rho/ROCK pathway in the control of endothelial cell tension development, the role of VEGFR-3 in lymphatic pump function, and how Toll-like receptor-4 contributes to systemic inflammation after severe burn injury. The intent of this research is to continually characterize the molecular and biochemical properties of adhesive and contractile structures that regulate microvascular permeability and lymph formation, with a practical view toward the development of therapeutic agents that target these end-point molecular processes, for more effective treatment of inflammatory diseases and lymphedema.

**Jason Gardner, PhD**

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10/09

*The major research emphasis is focused on understanding the pathogenesis of heart failure. Of particular interest are the mechanisms responsible for the adverse cardiac extracellular matrix (ECM) remodeling associated with the progression of congestive heart failure. Current topics of study include:*

- *the role of lysyl oxidase, a collagen crosslinking enzyme, and related peptides in myocardial ECM remodeling,*
- *the cardioprotective effects of estrogenic pathways, including soybean- and plant-derived compounds, and*
- *the cardiac effects of inhaled particulate matter and cigarette smoke.*

Our laboratory utilizes rodent models of cardiac disease, including models of pressure overload and chronic ventricular volume overload. We also use primary adult cell culture to examine specific pathways involved in the remodeling process.

**Lisa M. Harrison-Bernard, PhD**

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10/09

Diabetes is the 6<sup>th</sup> leading cause of death in the United States and diabetic nephropathy is the most common cause of end-stage renal disease. Many patients with diabetic renal disease require the use of dialysis to perform the functions of normal, healthy kidneys. Our research program focuses on how the effects of an important hormone system, renin angiotensin system, contributes to the failure of normal kidney blood vessel function and leads to the development and progression of kidney disease in type II diabetic patients. The model system that we use is the obese diabetic db/db mouse which exhibits features similar to human type II diabetic nephropathy. We utilize state-of-the-art techniques which combine in vitro and in vivo approaches.

Measurements of molecular expression, enzymatic activity, peptide hormone levels, and quantitative histological examination of renal disease markers are coupled with conscious animal cardiovascular and renal physiological and pharmacological assessments. In addition, direct measurements of renal resistance vessel diameter are accomplished using the mouse in vitro blood perfused juxtamedullary nephron technique in kidneys obtained from control and diabetic mice. Most important, blocking the actions of a new, kidney specific enzyme, chymase, may provide a new therapeutic drug target to reduce the influence of this hormone system on diabetic kidney disease.

**Patricia E. Molina, MD, PhD**

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12/07

Research in my laboratory is focused on neural control of traumatic injury-induced hemodynamic and host defense responses and how these are affected by acute alcohol intoxication. In addition, studies are also conducted on the mechanisms involved in the immune, behavioral and metabolic alterations associated with progression to AIDS and how drugs of abuse (alcohol and cannabinoids) interact with these systems affecting morbidity and progression of disease.

**John R. Porter, PhD**

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10/09

Dr. Svec and I have been working together in the general area of the neuroendocrinology of obesity. We have utilized the pre-diabetic obese Zucker rat as our animal model. In addition our studies have focused on the neurosteroid dehydroepiandrosterone (DHEA) in this model. Our particular emphasis has been on the potential mechanism of this steroid in the brain as it effects obesity, aging, and immune modulation. More recently we have been working to develop the pre-diabetic rat into an acute model of onset of type 2 diabetes. Type 2 diabetes is epidemic in the United States . This increased incidence of diabetes is certainly associated with the increased incidence of obesity.

Our laboratory has also been working on creating an animal model of premature labor that can be induced by oral inflammation. In this endeavor we have recently been funded by the March of Dimes. The object of this research is to try and determine some of the important neuroendocrine events in the fetal hypothalamus that could possibly lead to the trigger of parturition.

**Barry J. Potter, PhD**

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8/06

My research involves the investigation of free radical generation and nitric oxide production under conditions of oxidative stress in model systems. Current research is focusing on (a) the use of cell lines to mimic the liver and to investigate the effects of alcohol and infection following insults such as alcohol and/or infection, and (b) the estimation of anti-oxidant status using red blood cells from a variety of stressed animal models.

The major technique used in the laboratory for these determinations is electron paramagnetic resonance (epr or esr), which enables the ready detection and quantitation of specific free radicals and reactive oxygen species. Future research will involve purifying relevant sub-cellular components prior to investigating free radical generation and/or nitric oxide synthesis.

**DENTISTRY AND BIOMATERIALS**

**Xiaoming Xu, PhD**

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The general area of my research is the development and evaluation of new dental materials and biomaterials. Current I have the following on-going projects: (1) Development of novel fluoride-releasing dental composites. This is a six-year project funded by the Brown Foundation. (2) Development of novel fluoride-releasing adhesive monomers and dental adhesives. This is a five-year project funded by NIH, starting from September 2004. (3) Ceramic nanofibers and nanofiber-reinforced dental composites. (4) Fabrication of hydrogel nanofibers and their applications as controlled-releasing and wound-healing materials.

My other research interests include: biocompatibility and tissue reaction of dental materials/biomaterials, biosensors based on nanoparticles and nanofibers, and mass spectrometric study of metal-peptides/protein interactions.

**NEUROLOGY**

**Harry Gould**

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My research involves understanding the role of sodium channel modulation in models of pain.

**OBGYN**

**Madhwa Raj, PhD**

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Vitamin binding proteins in reproductive cancers: Research focuses on riboflavin, retinol and folate binding proteins in prostate, ovarian, breast, endometrial and cervical cancers. Their role in tumorigenesis and tumor progression, and possible use of these proteins as vaccines is explored. Molecular mechanisms involved in regulation of these proteins is being evaluated. Currently I have one graduate student, one undergraduate student and one high school (summer) student working in my lab.

**OPHTHALMOLOGY**

**James Hill, PhD**

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12/07

Our laboratory, using animal models that mimic human pathogenesis of viral keratitis, has identified unique agents that can induce or block viral reactivation. We have perfected animal models of HSV-1 reactivation and recurrent disease so that we can assess a whole spectrum of HSV-1 ocular pathogenesis. Current experiments are focused on understanding the molecular basis of HSV latency and reactivation to develop therapeutic strategies that will not only block viral replication but prevent neuronal reactivation, the primary source of the reactivated virus.

Studies on the molecular biology of HSV include recombinant technology to investigate various genomic factors within the virus that are responsible for reactivation and recurrent ocular disease. We also have studies assessing the host changes during latency and reactivation using microarray analysis to identify changes in gene expression. These findings will allow us to identify pathways and specific proteins involved in neuronal viral reactivation and to develop therapeutic strategies to block recurrent ocular disease. We are also using chromatin immuno-precipitation assays to analyze the viral genome and the histone interactions that control permissive or non-permissive transcription. These are critical for understanding the basic mechanisms of the structure and function of chromatin during HSV latency and reactivation. We have constructed recombinant viruses that have significantly different phenotypic reactivation profiles (i.e. very high or very low).

We have also constructed recombinant herpes viruses that contain an insert designated to enhance green fluorescent protein, which allows visualization of corneal lesions in infected eyes and tracking of viral progression in the neural system. All of these studies have the ultimate goal of preventing recurrent herpetic infection of the eye. We have recently discovered that a human gene, apolipoprotein allele E4 (apoE e4), involved in susceptibility to ocular herpes infections.

These studies involve assessment of neural tissues with the risk association of apoE alleles (E3 vs. E4), the HSV-1 genome copy, the neuroinvasive score, and Alzheimer's disease (AD). ApoE e4 is a known risk factor for AD. Using knock-in mice that are transgenic for either of the human apoE alleles, E3 or E4, we are investigating ocular HSV-1 pathogenesis focusing on recurrent stromal keratitis, the control of the development of viral latency, and reactivation. Our research engages tools of molecular biology, pharmacology, biochemistry, neurovirology, and experimental models of infectious disease.

We combine all of these tools into a practical paradigm that allows the development of new and novel chemotherapeutic agents. Graduate students have the opportunity to utilize the past and ongoing investigations to build on their graduate degree. We are currently defining the translational implication of all of these findings through the development of novel strategies for therapy of HSV stromal keratitis, HSV encephalitis, and AD.

For more details see <http://www.lsu-eye.lsuhsoc.edu>.

**Jean T. Jacob, PhD**

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My research focuses on the development and biocompatibility analysis of ocular implants and drug delivery systems. Current projects include the efficacy of artificial tear formulations, contact lens permeabilities, and manipulation of the epithelial cell response to nanopatterned surfaces. Students would be involved with *in vivo* and *in vitro* test methods.

**Hilary W. Thompson, PhD**

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Statistical research on medical decision analysis from electronic medical record databases. This research includes gathering data from patient charts, database analysis and programming, and image analysis methods for automated feature detection of pathological features in retinal images.

Useful skill sets for students would be computer programming, mathematics, and statistics.

## PEDIATRICS

**Mary Breslin, PhD**

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My work focuses on a transcriptional factor, IA-1 that is expressed during early embryonic development and is silenced by birth. IA-1 is not found in normal adult tissue, however, it is re-expressed in tumors of neuroendocrine origin such as retinoblastoma, medullablastoma, insulinoma, and small cell lung carcinoma. Lung cancer is the leading cause of cancer death in the US. My work focuses on the role of IA-1 at the transcriptional level in SCLC. Due to the limited expression pattern of IA-1, we speculate that it may play an important role in the maintenance of certain tumor phenotypes. SCLC cells express markers of neural differentiation.

To date, we have determined the sequence specific DNA binding site for IA-1 and have identified at least two potential target genes for its regulation. One of these genes, NeuroD is critical for pancreas and neuronal cell development. We have initiated a yeast two hybrid protein-protein interaction screen to determine proteins that interact with IA-1. A second aspect of the project is to do proteomics analysis to identify new IA-1 target genes in SCLC.

**Mike Ferris, PhD**

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10/09

The human body contains ten times more bacterial cells than human cells, and it is well accepted that these microbial populations play a significant role in both the normal immunity and inflammation. However, while traditional microbiology has focused on the study of cultivated pathogens, researchers using cultivation-independent techniques have shown that only a small percentage of bacterial species in the human body have been studied. Research in our lab makes use of next generation sequencing technologies, bioinformatics and statistics to describe the composition of bacterial communities in the human body.

Studies focus on exploring the association between alterations in bacterial populations and human diseases, for example those associated with the human gut and vaginal epithelium. Other basic research projects focus on environmental health associated with fungal growth in flooded/damp buildings and mycolactone producing Mycobacteria in warm water habitats in South Louisiana. .

**Deborah Fox, PhD**

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Fungal infections are a frequent and growing cause of morbidity and mortality in the ever-increasing organ transplant, cancer, and HIV/AIDS patient populations. In recent years, antifungal drugs that target the enzymes responsible for the synthesis of cell wall components have been developed and are beginning to be used to treat fungal disease. In particular, members of the echinocandin class of antifungal agents are potent inhibitors of cell wall synthesis in many pathogenic fungi, but display very low potency against *Cryptococcus neoformans*, a medically significant fungal pathogen. Because the inherent echinocandin-resistance of *C. neoformans* is likely a direct result of fundamental differences in the way cell wall biogenesis is regulated in this organism compared to other fungi, we anticipate that the identification of key components of signaling and regulatory complexes involved in cell wall biogenesis will facilitate the elucidation of mechanisms that promote resistance. To this end, we are working toward the identification of signaling events involved in cell wall biogenesis using a variety of biochemical and molecular approaches, including cell wall composition analysis, yeast two-hybrid library screening, and two-dimensional gel electrophoresis.

**Michael Lan, PhD**

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12/07

My research interests are focused on the gene regulation of pancreatic beta cells. The current project entitled "Transcription factors in neuroendocrine differentiation" has progressed into two additional area of research. One is developed into a basic research of insulin gene regulation. This project will use animal model to study the molecular mechanisms of transcription factor, INSM1, in regulating insulin gene expression during the development of pancreatic beta cells. The other project was recently initiated using neuroendocrine tumor-specific promoter to direct suicide gene for cancer gene therapy. Initially, we will use neuroendocrine cell lines in nude mice animal model to test the efficacy of our construct. It is expected that the INSM1 promoter could direct specific expression of suicide gene in neuroendocrine tumors. The third project is insulin gene therapy for diabetes. This project is ongoing in my laboratory using chimeric promoter to direct human insulin gene expression in liver cells. The regulated insulin gene expression in liver is the key of this study. Currently, we are constructing various chimeric promoters and test their potency and specificity to direct insulin gene expression in liver cells.

**Seth Pincus, MD**

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I study the interaction of antibodies with infectious agents. We are interested in how microbes evade the antibody response, but also in developing therapeutic and preventative approaches based on antibodies. In my lab we study HIV, group B streptococci, as well as toxins.

**SURGERY**

**Eugene Woltering, MD**

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The development of new blood vessel growth—what are the genetic and environmental influences that trigger these vessels to start growing? What can we do to stop these vessels from growing in cancer patients?