PURDUE
U N I V E R S I T Y

DRUG DISCOVERY
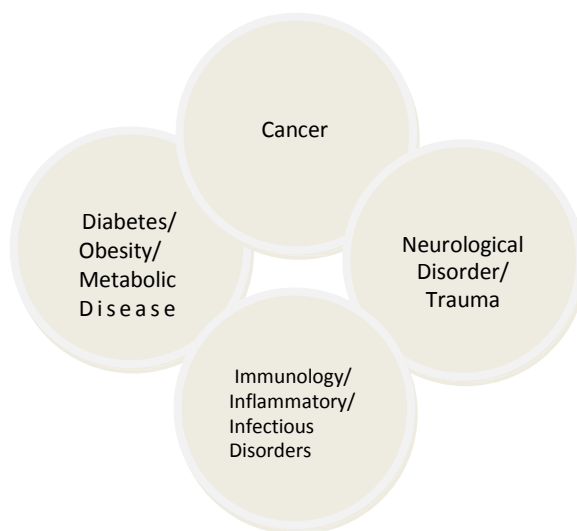# AT PURDUE 2016-17

TABLE OF CONTENTS

INTRODUCTION

The drug discovery process at Purdue University begins at the nano level and ends with a viable human therapy that can reduce mortality and morbidity of disease. There is a considerable effort in enhancing our portfolio of novel and innovative drug candidates to treat chronic and acute illnesses.

Nano/Molecular → Cellular → Animal → Human
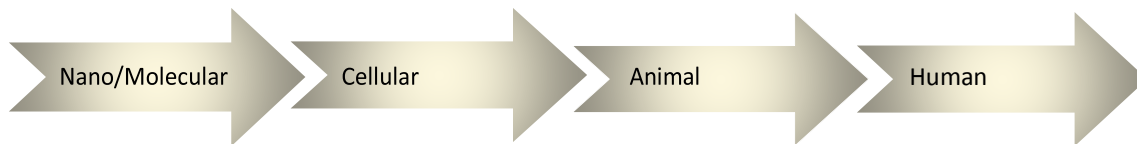
Our researchers are also invested in various approaches to drug discovery, which include understanding of drug targets for future drug therapies, detection technology that will aid clinicians in early diagnosis or monitoring of therapies and design and delivery of drugs.

Cancer

Diabetes/ Obesity/ Metabolic Disease

Neurological Disorder/ Trauma

Immunology/ Inflammatory/ Infectious Disorders

Researchers associated with the Institute for Drug Discovery are affiliated with colleges from all across campus including Pharmacy, Science, Nutrition, Agriculture, Engineering and Veterinary Medicine.
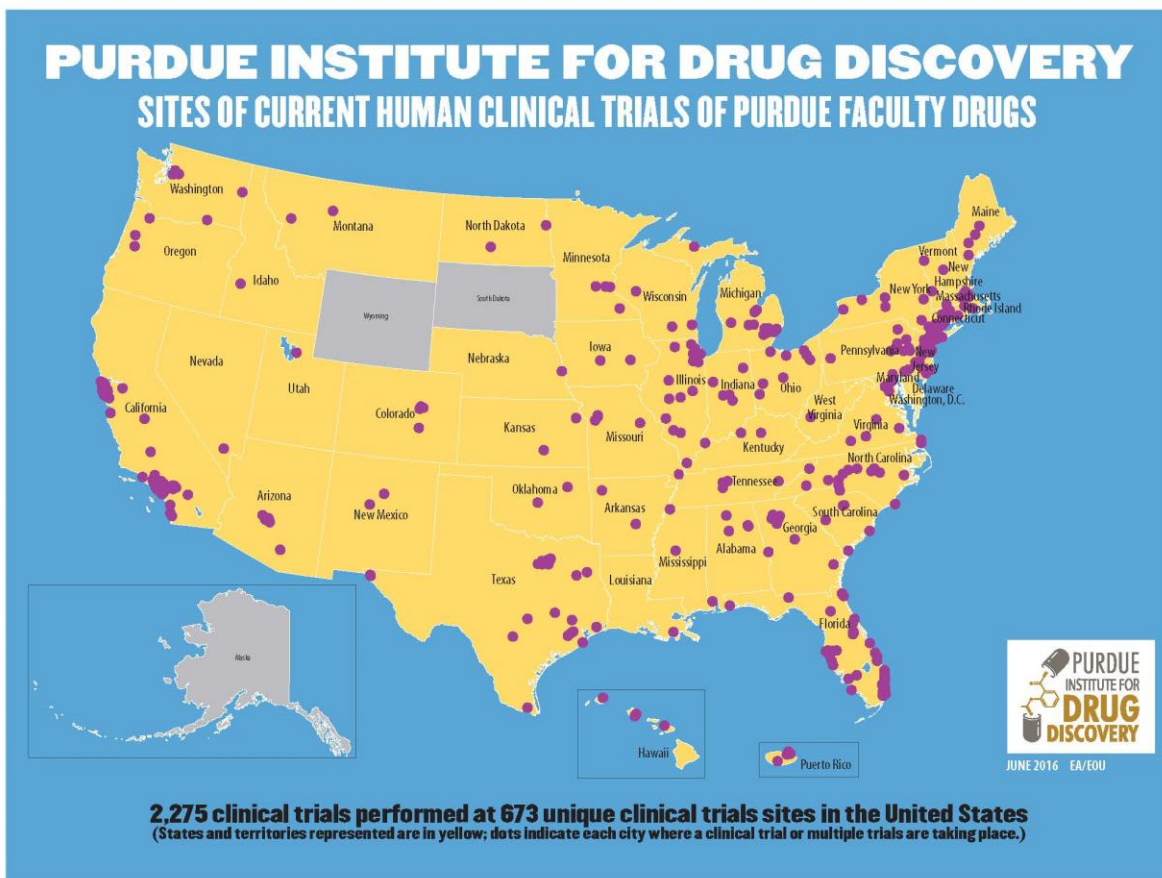
Purdue University's Institute of Drug Discovery was completed in 2014 and is located at 720 Clinic Drive West Lafayette, Indiana 47907.

Our Drug Discovery facility promotes the discovery, design and development of new drugs through innovative architecture that encourages collaborations in chemistry, medicinal chemistry and biology. The structure accommodates 90 multidisciplinary researchers with 9 faculty offices as well as several conference rooms and common eating facilities. Conference rooms are equipped with videoconferencing capabilities that enable research teams from across the world to interact as though they were present at Purdue. The building provides facilities for organic synthesis, cell culture, analytical chemistry, molecule purification, biochemistry, molecular biology and fluorescent imaging. Core facilities located within the building include the high-throughput screening & chemical genomics, NMR, and mass spectrometry facilities.
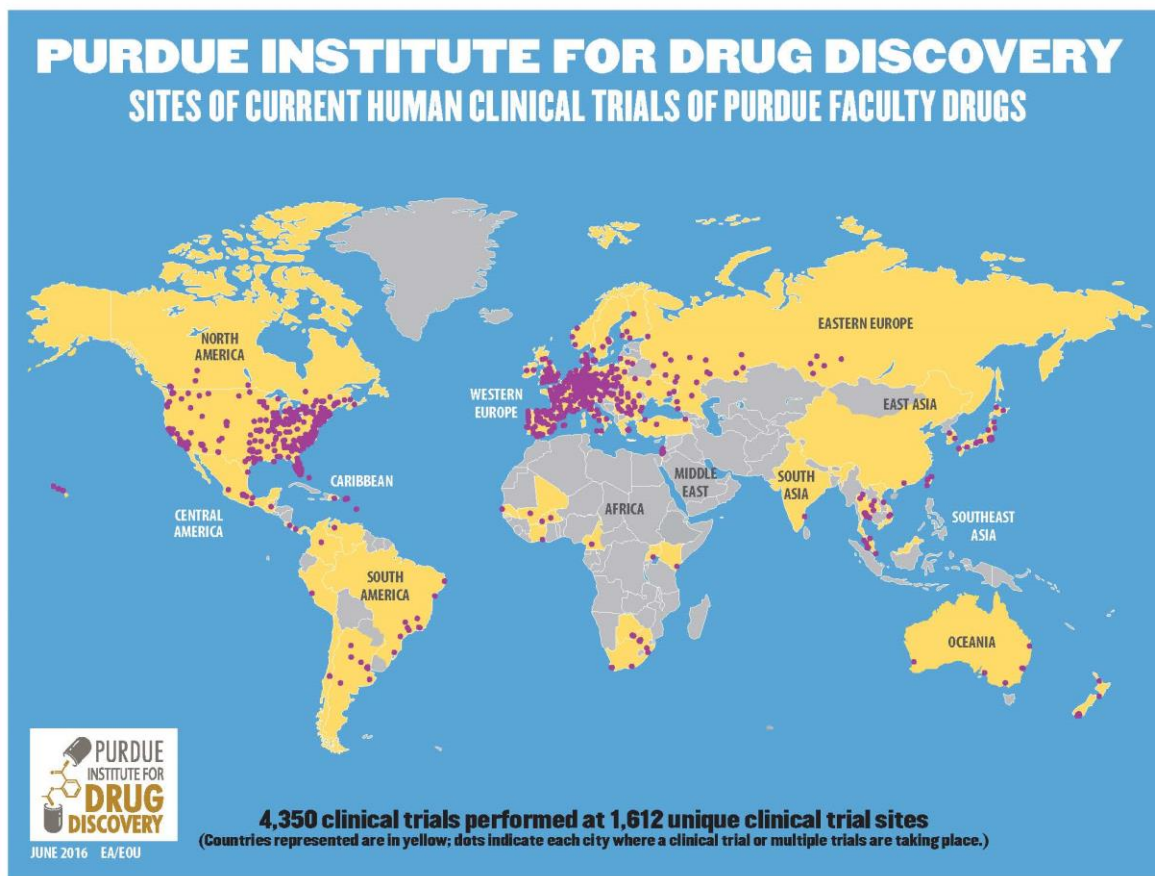
The Purdue Institute of Drug Discovery has broad reaching actions with 4,350 human clinical trials performed with Purdue faculty drugs at 1,612 unique clinical trial sites around the world.

PURDUE INSTITUTE FOR DRUG DISCOVERY
SITES OF CURRENT HUMAN CLINICAL TRIALS OF PURDUE FACULTY DRUGS

2,275 clinical trials performed at 673 unique clinical trials sites in the United States
(States and territories represented are in yellow; dots indicate each city where a clinical trial or multiple trials are taking place.)

JUNE 2016   EA/EOU

Forty-seven states and Puerto Rico are sites of 2,275 human clinical trials performed with Purdue faculty drugs around the United States at 673 unique sites.

COMPOUNDS IN CLINICAL DEVELOPMENT

Currently, our researchers are working on several classes of compounds and novel approaches to drug design. The figure below summarizes the active stages of drug discovery.
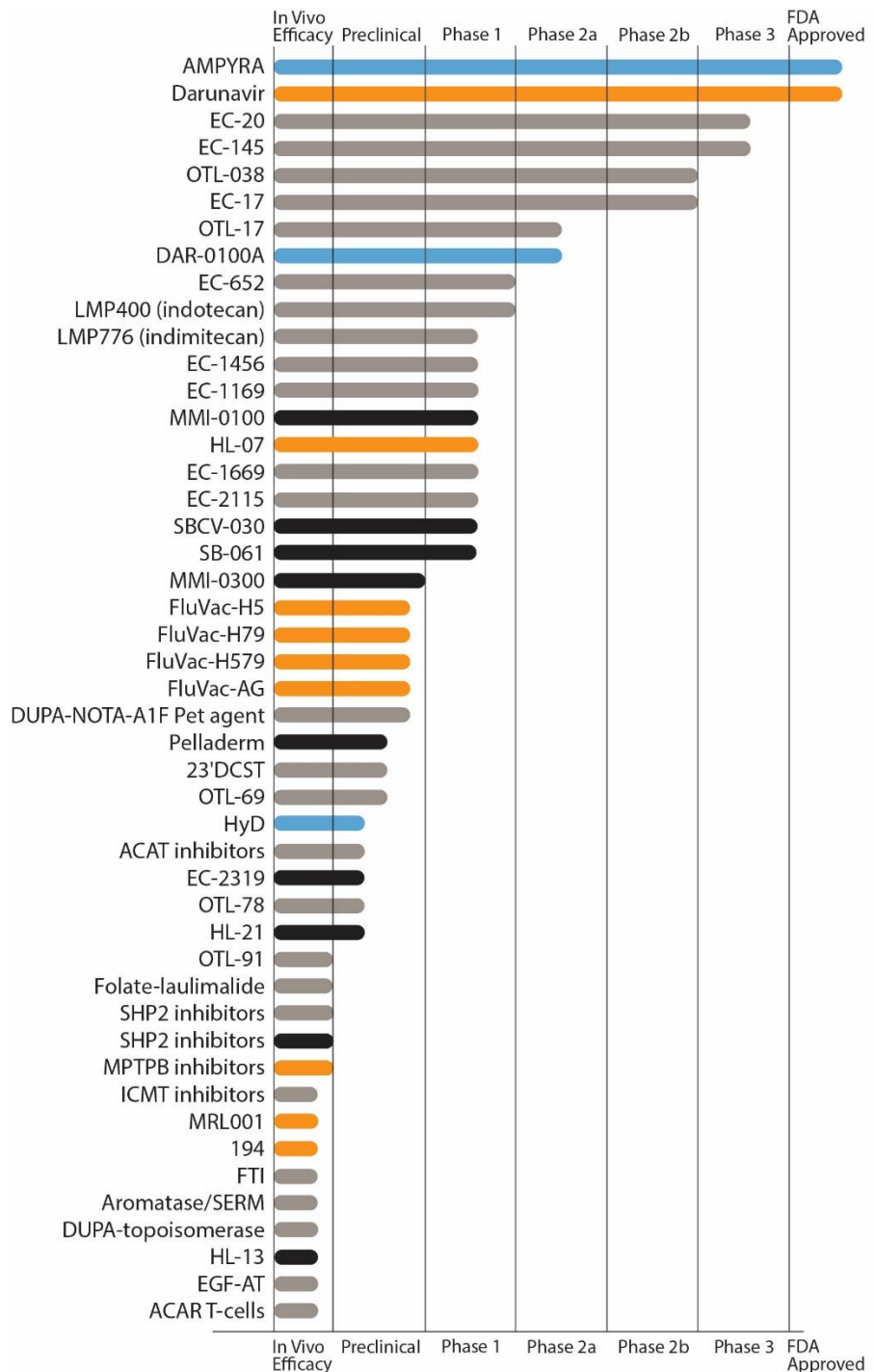
KEY: Oncology Neurological Disorders Infectious Disease Metabolic Disorders Cardiovascular Other

DISEASE RESEARCHERS

We have 78 faculty researching cancer, 26 faculty researching Diabetes, obesity and metabolic disease, 44 researching immunology, inflammatory and infectious disease, 36 researching neurological disorder/trauma and 19 researching other diseases.
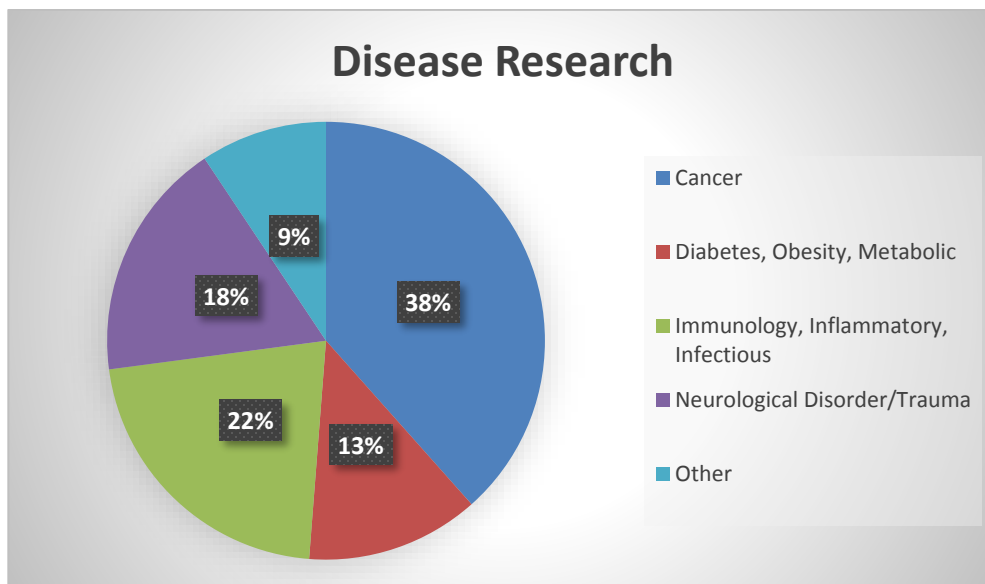
Thirty-eight percent of our faculty associated with the Institute for Drug Discovery are researching cancer, 22% are researching immunology, inflammatory and infectious disease, 18% are researching neurological disorder/trauma, 13% are researching diabetes, obesity and metabolic disease and 9% are researching other diseases.

The Drug Discovery facility houses four pieces of equipment for shared usage with researchers across campus.

NMR Spectrometer

HTS

Mass Spectrometer

Flow Cytometer

Four research buildings on the Purdue West Lafayette campus directly support our drug discovery mission.

Drug Discovery Facility

Burton D. Morgan Center for Entrepreneurship

Arthur G. Hansen Life Sciences Research Building

Bindley Bioscience Center

ALPHABETICAL LIST OF DRUG DISCOVERY RESEARCHERS

		CATEGORY							DISEASE			
Researcher	Department	Diagnostics	Target Discovery & Characterization	Drug Synthesis/ Optimization	Delivery/ Formulations	In Vivo	ADME DMPK Tox	Other	Cancer	Diabetes/ Obesity/ Metabolic Disease	Immunology/ Inflammatory/ Infectious Disease	Neuro-logical Disorder/ Trauma	Other
Adams, Stephen	Clinical Sciences			X	X						X		
Aguilar, Ruben Claudio	Biological Sciences		X						X			X	
Andrisani, Ourania	Basic Medical Sciences		X						X				
Barker, Eric	Medicinal Chemistry & Molecular Pharmacology	X	X									X	
Ben-Amotz, Dor	Chemistry	X							X	X	X	X	X
Bhunia, Arun	Food Science/ Comparative Pathobiology	X	X	X							X		
Borgens, Richard	Basic Medical Sciences/ Biomedical Engineering							X				X	
Bowman, Keith	Materials Engineering/ Engineering Education							X					X
Briggs, Scott	Biochemistry		X						X				X
Buhman, Kimberly	Nutrition Science		X			X			X	X			
Byrn, Stephen	Industrial & Physical Pharmacy							X				X	
Cabot, Ryan	Animal Sciences		X					X		X	X		
Camarillo, Ignacio	Biological Sciences		X						X				

		CATEGORY						DISEASE				
Researcher	Department	Diagnostics	Target Discovery & Characterization	Drug Synthesis/ Optimization	Delivery/ Formulations	In Vivo	ADME DMPK Tox	Other / Cancer	Diabetes/ Obesity/ Metabolic Disease	Immunology/ Inflammatory/ Infectious Disease	Neuro-logical Disorder/ Trauma	Other
Chang, Chun-Ju	Basic Medical Sciences		■			■		■				
Cheng, Ji-Xin	Biomedical Engineering	■			■			■	■	■	■	
Childress, Michael	Clinical Sciences	■			■			■				
Chmielewski, Jean	Chemistry			■	■			■		■	■	
Chopra, Gaurav	Chemistry		■					■		■		
Cooks, Graham	Medicinal Chemistry & Molecular Pharmacology	■						■				
Cushman, Mark	Medicinal Chemistry & Molecular Pharmacology			■				■		■		
Dai, Mingji	Chemistry			■				■	■	■	■	
Davisson, Vincent Jo	Medicinal Chemistry & Molecular Pharmacology				■			■			■	
Dykhuizen, Emily	Medicinal Chemistry & Molecular Pharmacology		■					■				
Figueiredo, Marxa	Basic Medical Sciences				■					■		
Flaherty, Daniel	Medicinal Chemistry & Molecular Pharmacology			■				■		■		
Foster, David	Pharmacy Practice	■					■		■	■		
Freeman, Jennifer	Health Sciences		■					■			■	

Researcher	Department	CATEGORY							DISEASE				
		Diagnostics	Target Discovery & Characterization	Drug Synthesis/ Optimization	Delivery/ Formulations	In Vivo	ADME DMPK Tox	Other	Cancer	Diabetes/ Obesity/ Metabolic Disease	Immunology/ Inflammatory/ Infectious Disease	Neuro-logical Disorder/ Trauma	Other
Garcia, R. Edwin	Materials Engineering			■	■								■
Geahlen, Robert	Medicinal Chemistry and Molecular Pharmacology		■						■				
Ghosh, Arun	Chemistry & Med. Chem. Med. Pharm.			■	■					■	■		
Gore, Jay	Mechanical Engineering	■							■				
Hall, Mark	Biochemistry		■						■				
Harrison, Marietta	Medicinal Chemistry and Molecular Pharmacology		■						■				
Hazbun, Tony	Medicinal Chemistry and Molecular Pharmacology		■						■		■	■	
Hill, Catherine	Entomology		■	■	■						■		
Hockerman, Gregory	Medicinal Chemistry and Molecular Pharmacology		■							■		■	
Hogan, Daniel	Clinical Sciences	■		■	■	■		■					■
HogenEsch, Harm	Comparative Pathobiology		■								■		
Hrycyna, Christine	Chemistry				■				■				
Hu, Chang-Deng	Medicinal Chemistry and Molecular Pharmacology		■						■				
Irudayaraj, Joseph	Agricultural & Biological Engineering	■							■			■	
Janle, Elsa	Nutrition Science					■	■	■		■			
Jiang, Qing	Nutrition Science		■						■		■		

CATEGORY　　　　　　　　　　　DISEASE

Researcher	Department	Diagnostics	Target Discovery & Characterization	Drug Synthesis/ Optimization	Delivery/ Formulations	In Vivo	ADME DMPK Tox	Other	Cancer	Diabetes/ Obesity/ Metabolic Disease	Immunology/ Inflammatory/ Infectious Disease	Neuro-logical Disorder/ Trauma	Other
Kasinski, Andrea	Biological Sciences		■		■	■			■				
Kim, Chang	Comparative Pathobiology		■						■		■		
Kirchmaier, Ann	Biochemistry		■						■				
Kissinger, Pete	Chemistry	■			■	■	■		■		■	■	
Knapp, Deborah	Veterinary Clinical Sciences					■			■				
Knipp, Gregory	Industrial and Physical Pharmacy				■		■		■		■	■	
Ko, Jeff	Veterinary Clinical Sciences		■							■			■
Konieczny, Steve	Biological Sciences		■						■				
Krusemark, Casey	Medicinal Chemistry and Molecular Pharmacology	■		■					■				
Kuang, Shihuan	Animal Science		■		■	■			■	■			
Leliever, Sophie	Basic Medical Sciences		■						■				
Leung, Yuk Fai	Biological Sciences		■			■		■	■			■	
Lill, Mark	Medicinal Chemistry and Molecular Pharmacology		■	■	■		■		■	■		■	
Lipton, Mark	Chemistry			■					■	■	■		
Liu, Julie	Chemical Engineering	■							■				
Liu, Shuang	Health Sciences	■					■		■				■
Liu, Xiaoqi	Biochemistry		■						■				
Lohman, Jeremy	Biochemistry			■					■		■		

CATEGORY   DISEASE

Researcher	Department	Diagnostics	Target Discovery & Characterization	Drug Synthesis/ Optimization	Delivery/ Formulations	In Vivo	ADME DMPK Tox	Other	Cancer	Diabetes/ Obesity/ Metabolic Disease	Immunology/ Inflammatory/ Infectious Disease	Neuro-logical Disorder/ Trauma	Other
Low, Philip	Chemistry	■		■	■				■	■	■		
Luo, Zhao-Qing	Biological Sciences		■		■						■		
Lyle, Tiffany	Comparative Pathobiology		■			■			■			■	
Lyon, Angeline	Chemistry & Biological Sciences		■						■		■		■
Mesecar, Andrew	Biological Sciences			■	■				■		■		
Mittal, Suresh	Comparative Pathobiology				■				■				
Mohammed, Sulma	Comparative Pathobiology		■			■			■				
Nagy, Zoltan	Chemical Engineering							■	■	■	■	■	■
Nauman, Eric	Mechanical Engineering	■			■				■		■		
Overholser, Brian	Pharmacy Practice		■										■
Park, Chiwook	Medicinal Chemistry and Molecular Pharmacology	■	■						■			■	■
Park, Kinam	Industrial & Physical Pharmacy				■				■	■			■
Pinal, Rodolfo	Industrial & Physical Pharmacy				■			■	■	■			
Porterfield, Marshall	Agricultural and Biological Engineering	■							■	■		■	
Post, Carol	Medicinal Chemistry and Molecular Pharmacology		■						■		■	■	
Ramachandran, PV	Chemistry			■					■			■	

CATEGORY   DISEASE

Researcher	Department	Diagnostics	Target Discovery & Characterization	Drug Synthesis/ Optimization	Delivery/ Formulations	In Vivo	ADME DMPK Tox	Other	Cancer	Diabetes/ Obesity/ Metabolic Disease	Immunology/ Inflammatory/ Infectious Disease	Neuro-logical Disorder/ Trauma	Other
Ramkrishna, Doraiswami	Chemical Engineering				▉				▉				
Ratliff, Timothy	Comparative Pathobiology		▉		▉						▉		
Reklaitis, G.V.	Chemical Engineering				▉				▉	▉	▉	▉	▉
Robinson, Paul	Basic Medical Sciences	▉	▉				▉		▉		▉		▉
Rochet, (Chris)	Medicinal Chemistry & Molecular Pharmacology		▉		▉	▉						▉	
Rossie, Sandra	Biochemistry				▉				▉				
Savaiano, Dennis	Nutrition Science				▉								▉
Seleem, Mohamed	Comparative Pathobiology	▉	▉			▉					▉		
Shah, Kavita	Chemistry		▉						▉			▉	
Shi, Riyi	Basic Medical Sciences							▉				▉	
Simpson, Garth	Chemistry				▉				▉	▉	▉		
Sintim, Herman	Chemistry			▉	▉				▉		▉		
Smith, Daniel	Pharmacy Practice							▉				▉	
Sowinski, Kevin	Industrial and Physical Pharmacy							▉					▉
Stauffacher, Cynthia	Biological Sciences		▉						▉				
Tao, Andy	Chemistry		▉						▉	▉			
Taparowsky, Elizabeth	Biological Sciences		▉						▉		▉		
Taylor, Lynne	Industrial and Physical Pharmacy				▉				▉	▉	▉	▉	
Thompson, David	Chemistry				▉				▉				

CATEGORY   DISEASE

Researcher	Department	Diagnostics	Target Discovery & Characterization	Drug Synthesis/ Optimization	Delivery/ Formulations	In Vivo	ADME DMPK Tox	Other	Cancer	Diabetes/ Obesity/ Metabolic Disease	Immunology/ Inflammatory/ Infectious Disease	Neuro-logical Disorder/ Trauma	Other
Tisdale, James	Pharmacy Practice							■					■
Topp, Elizabeth	Industrial and Physical Pharmacy				■				■	■	■		
Trader, Darci	Medicinal Chemistry and Molecular Pharmacology		■	■					■		■	■	
van Rijn, Richard	Medicinal Chemistry and Molecular Pharmacology		■			■						■	
Varma, Arvind	Chemical Engineering				■								■
Watts, Val	Medicinal Chemistry and Molecular Pharmacology		■								■	■	
Wei, Alexander	Chemistry	■			■				■		■		
Wendt, Michael	Medicinal Chemistry and Molecular Pharmacology	■	■		■	■		■				■	
Wilker, Jonathan	Chemistry							■					■
Wirth, Mary	Chemistry	■							■				
Yang, Danzhou			■	■					■			■	
Yang, Jer-Yen	Basic Medical Sciences		■						■				
Yuan, Chongli	Chemical Engineering	■									■	■	
Zhang, Guangjun	Comparative Pathobiology		■						■				
Zhang, Zhong-Yin	Medicinal Chemistry & Molecular Pharmacology		■	■					■	■	■		
Zheng, Wei	Health Sciences			■									■
Zhou, Daoguo	Biological Sciences		■		■						■		

DIAGNOSTICS

ERIC BARKER

College of Pharmacy   **Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Proper control of the chemical mediators of neurotransmission requires dynamic regulation of neurotransmitter concentrations in the synapse. For most transmitters such as serotonin, clearance from the synapse is mostly dependent upon an active uptake system mediated by Na^+- and Cl^--dependent transporter proteins located on presynaptic terminals. In addition to these active transport systems, recent evidence suggests that certain neuromodulatory substances such as the putative endogenous cannabinoid anandamide are removed from the synapse by facilitative transport processes. Our research focuses on identifying structural determinants of functional and pharmacological properties of serotonin and anandamide transporters. These studies use multiple techniques including expression and characterization of cloned transporters in mammalian cells, electrophysiology, immunoblotting, the formation of chimeric proteins, and site-directed mutagenesis to investigate the molecular properties of these transporters.

Serotonin transporters (SERTs) are of particular clinical interest because they are the molecular targets for many antidepressants such as imipramine (Tofranil), sertraline (Zoloft), and fluoxetine (Prozac), as well as many drugs of abuse like cocaine and amphetamine. The cloning of SERT revealed a proposed protein structure consisting of 12 transmembrane-spanning domains. The question related to this structure is what amino acids are involved in the formation of the binding site for SERT inhibitors and substrates? We are currently using chimeric protein and mutagenesis strategies to identify amino acids involved in the pharmacological properties of cocaine and amphetamines like MDMA or "ecstasy." In addition to molecular biology approaches, we anticipate using structure-activity relationship studies and molecular modeling to further refine our understanding of drug binding and action at serotonin transporters.

We are also interested in the identification and characterization of transport proteins for the endogenous cannabinoid anandamide. Anandamide (N-arachidonylethanolamide) is a member of a larger class of fatty acid derived signaling molecules that possess in vivo and in vitro marijuana-like actions. Evidence suggests that anandamide is rapidly transported into neurons and astrocytes after release, where it undergoes rapid intracellular degradation. Anandamide uptake appears to be a facilitative process, and we have evidence that the intracellular metabolizing enzyme, fatty acid amide hydrolase (FAAH), plays an important role in maintaining the inward gradient needed for anandamide transport. Future studies in this area will focus on better understanding the role of FAAH in anandamide uptake as well as identifying novel proteins that may also be involved with anandamide transport.

DOR BEN-AMOTZ

College of Science   **Department of Chemistry**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
We specialize in spectral imaging of biological tissue, cells, arrays, and pharmaceuticals using Raman scattering and/or fluorescence. We also work with optical instrument development for rapid chemical sensing and imaging, along with biomarker discovery, drug delivery and pharmaceutical formulation analysis.

ARUN BHUNIA

College of Agriculture   Department of Food Science

College of Veterinary Medicine   Department of Comparative Pathobiology

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Pathogen and Toxin Detection:
- Biosensor technologies including laser light scattering, mammalian cell-based, and fiber optic sensors for rapid and high throughput screening of live pathogens and toxins in food
- Development of biorecognition including antibodies, receptors, ligands, and microbiological growth media

Host-Pathogen Interaction and Control Strategies Using Probiotics :
- Understanding the molecular and cellular mechanism of *Listeria monocytogenes* colonization and translocation through epithelial barrier during intestinal phase of infection
- Prevention and control using bioengineered probiotic and antimicrobial peptide loaded biocompatible nano-carrier

JI-XIN CHENG

College of Engineering   **Department of Biomedical Engineering**

Category of Research
___X___ Diagnostics
___X__ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Cancer (prostate, pancreatic, lung, colon, ovarian)
Bloodstream infections
Traumatic spinal cord injury

Molecular/Cellular Target(s)
ACAT-1 inhibition for suppression of cancer growth and metastasis
Anti-inflammation agents for treatment of spinal cord injury
Glucose and lipid metabolism in fungal and bacterial cells

Research Interest and Expertise
The mission of our research program is developing label-free imaging technologies to enable improved early diagnosis and/or precise treatment of human diseases. With integrated expertise in physics, chemistry, biology, medicine and entrepreneurship, our 3D research program is devoted to

- Development of label-free molecular spectroscopic imaging tools
- Discovery of new biology and drug targets at single cell level
- Device for early molecule-based diagnosis and surgery guidance

MICHAEL CHILDRESS

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Lymphomas
Spontaneous canine cancer models

Molecular/Cellular Target(s)

Research Interest and Expertise
My primary research interest is in canine and feline hematopoietic neoplasia, particularly canine lymphomas. I am a board-certified veterinary oncologist with extensive experience in the clinical management of canine and feline cancers.

R. GRAHAM COOKS

College of Science   **Department of Chemistry**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
We are interested in the use of mass spectrometry (MS) to identify markers for diseases such as prostate cancer. We are particularly interested in tissue imaging using MS to supplement standard histological methods. These experiments are best conducted on site, during surgery, and our attempts at building high-performance handheld mass spectrometers are consistent with this aim.

Desorption electrospray ionization (DESI) is a new MS ionization method that is applicable in the ambient environment. We are interested in extending its use to problems of in situ disease diagnosis as well as clinical analysis.

DAVID FOSTER

College of Pharmacy   **Department of Pharmacy Practice**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
___X___ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My research interests are focused on the study of alterations in drug and nutrient disposition and drug effects in critically ill patients. Current research includes evaluation of changes in intestinal permeability to xenobiotics in critical illness. Specifically, this research involves the investigation of alterations in drug and nutrient absorption by passive and active transport mechanisms, and the molecular mediators underlying these changes in burn injury and sepsis. A related area of research is the use of natural anti-inflammatory compounds to attenuate inflammation-related changes in intestinal function. Other interests include the study of the contribution of active transport processes to variability in drug disposition in a number of patient populations. Dr. Foster's clinical interests are focused the provision of pharmacotherapy to critically-ill patients, with an emphasis on burn and trauma patients.

JAY P. GORE

College of Engineering   **Department of Mechanical Engineering**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Sensors and models of fluid flow and chemical reaction processes in metabolic and other biological activities

DANIEL F. HOGAN

College of Veterinary Medicine

Department of Clinical Sciences

Category of Research

___X___ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)

_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Cardiac, vascular, thrombosis, valvular

Molecular/Cellular Target(s)

TGF-B and valvulopathy

Research Interest and Expertise

Our research focuses on cardiovascular therapeutics, including heart failure and antithrombotics. We have expertise in veterinary clinical trials, pre-clinical animal trials and animal modeling.

JOSEPH IRUDAYARAJ

College of Engineering   **Department of Agriculture and Biological Engineering**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The basis of Dr. Irudayaraj's work stems from a strong background and skills developed in the areas of engineering, biosciences, and computer sciences. Their group is interested in developing multifunctional nanomaterials and single molecule technologies to understand the etiology of diseases such as cancer and neurodegenerative disorders. Specifically, their interest is in exploring intracellular mechanisms related to epigenetics, phosphorylation, and protein aggregation in live cells. Core technologies developed are single molecule fluorescence, Super-resolution second harmonic generation imaging, Plasmon resonance imaging, and surface-enhanced Raman spectroscopy for detection, quantification, and structure elucidation.

PETER T. KISSINGER

College of Science   **Department of Chemistry**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
___X___ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Our focus is more from early development to clinical development and then post market surveillance. We have worked with many therapeutic programs with academics as well as large and small firms.

Molecular/Cellular Target(s)
Our expertise is with conventional organic therapeutics in the molecular weight range up to 1000. We are not expert at mabs or ADCs or vaccines.

Research Interest and Expertise
The development of pharmaceuticals is a tortuous process from basic research on the biochemistry of disease to the ultimate commercial formulation. Analytical chemistry is crucial throughout this process and supports disciplines as diverse as genetics, pharmacology, toxicology, and pharmacokinetics. This defines our goal - improving the measurement capability for disciplines challenged to understand how foreign substances ("xenobiotics") interact with mammalian biology.

Liquid chromatography, electrochemistry, and mass spectrometry are principal tools in our search for trace amounts of organic compounds in body fluids, and tissue homogenates. A more recent focus of our work has been on following chemical events in vivo using implanted membrane capillaries operating by dialysis or ultrafiltration. These "artificial blood vessels" enable us to continuously sample the extracellular space in living tissue for drugs and other low molecular weight metabolites such as amino acids, peptides, glucose, and lactate. We are therefore able to monitor real time chemical events in awake animals and correlate such data with physiological and behavioral information. We have developed and helped commercialize tools widely used in commercial drug development including automated blood sampling devices for animal models and humans as well as measurement instrumentation to determine concentrations of drugs, their metabolites and markers in body fluids and tissue sections. Ambient ionization mass spectrometry (first developed at Purdue) is a major focus.

JULIE C. LIU

College of Engineering   **Department of Chemical Engineering**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My laboratory is focused on engineering modular proteins for applications in tissue engineering, surgical adhesives, and biosensor diagnostic assays. In particular, we have investigated peptide-based cues, such as domains derived from growth factors including bone morphogenetic protein-2 (BMP-2) and vascular endothelial growth factor (VEGF), and their subsequent effect on cell behavior. We have evaluated the physical properties of crosslinked hydrogels made from these materials and have investigated human mesenchymal stem cell (hMSC) response to these materials. In addition, we are currently developing biosensors for determining the epigenetic state of live cells. These biosensors would facilitate isolation of cell populations with homogeneous epigenetic modifications and thus enable studies of drugs targeted for specific disease states.

SHUANG LIU

College of Health and Human Sciences			**Department of Health Sciences**

Category of Research

___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
___X___ ADME/DMPK/Tox
_____ Other

General Disease Area(s)

___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

More than 70 million Americans live with cardiovascular diseases. Accurate diagnosis is highly desirable so that appropriate therapeutic regimens can be given before irreversible damage occurs in the patients with known or suspected coronary artery disease (CAD). Myocardial perfusion imaging (MPI) with single photon emission computed tomography (SPECT) is an integral component in routine clinical evaluation of CAD patients. In spite of recent development of stress echocardiography and coronary CT angiography, SPECT MPI remains the mainstay for noninvasive diagnosis of CAD.

Molecular/Cellular Target(s)

Cardiolipin as the Molecular Target for Diagnosis of Heart Diseases. Heart is one of the organs rich with mitochondria. The mitochondrial density is as high as 40% of the cellular volume in myocytes. It is not surprising that mitochondrion has been a target for development of myocardial perfusion radiotracers that tend to localize inside the mitochondrial matrix. In contrast, CL is embedded in the inner mitochondrial membrane and constitutes up to as high as ~20% of its total lipid content. The fact that CL alterations underlie the myocardial dysfunction makes CL a useful and multifunctional biomarker for cardiovascular diseases (particularly HF), and provides the conceptual basis to develop molecular imaging probes that can be used to measure early CL changes noninvasively in the HF patients and those with diabetes.

Research Interest and Expertise

I worked at DuPont Medical Imaging Division (new Lantheus Medical Imaging Inc.) for nine years, and have research interests include receptor-based target radiopharmaceuticals, new bifunctional chelators, development of new techniques for radiolabeling of small biomolecules, formulation development, design/synthesis/evaluation of metal complexes as MRI contrast agents for cardiac perfusion imaging, and coordination chemistry of radiopharmaceuticals. There have been tremendous research efforts from his research group in the development of novel radiotracers for early tumor detection and diagnosis of cardiovascular diseases. These efforts rely on identification and the use of small biomolecules as "vehicles" to carry a diagnostic radionuclide to the tumor cells. Imaging with radiolabeled small biomolecules allows us to monitor the tumor biological changes at the molecular level. Over the last 10 years, Dr. Liu has become the leader in radiolabeled cyclic RGD peptides as integrin $\alpha_v\beta_3$-specific SPECT and PET radiotracers for imaging the integrin expression $\alpha_v\beta_3$ in rapidly growing and metastatic tumors. Dr. Liu is the author or co-author over 160 scientific publications, and has been granted 30 US patents and PCT applications. Dr. Liu's contributions also have significant impacts on inorganic chemistry, radiochemistry, radiopharmaceutical development, bioconjugates chemistry, molecular imaging, and nuclear medicine. His research has been supported by grants from the National Institute of Health, Department of Energy, American Heart Association, and industry.

PHILIP LOW

College of Science   **Department of Chemistry**

Category of Research

___X___ Diagnostics

_____ Target Discovery & Characterization

___X___ Drug Synthesis/Optimization

___X___ Delivery/Formulations

_____ In Vivo Disease Models

_____ ADME/DMPK/Tox

_____ Other

General Disease Area(s)

___X___ Cancer

___X___ Diabetes/Obesity/Metabolic Disease

___X___ Immunology/Inflammatory/ Infectious Disease

_____ Neurological Disorder/Trauma

_____ Other

Specific Disease(s)

- Cancers of the ovaries, prostate, cervix, kidneys, colon, lung, breast
- Autoimmune/Inflammatory diseases such as rheumatoid arthritis, atherosclerosis, pulmonary fibrosis, Crohn's disease, osteoarthritis, psoriasis
- Influenza, malaria, HIV
- Obesity, diabetes
- Sickle cell disease

Molecular/Cellular Target(s)

Folate receptors (alpha, beta, and delta), carbonic anhydrase IX, CCK2R, prostate specific membrane antigen (PSMA), luteinizing hormone-releasing hormone (LHRH), bombesin receptor, aminopeptidase N, fibroblast activation protein, neuraminidase, red blood cell kinases, band 3

Research Interest and Expertise

To date, we have developed targeted therapeutic and/or imaging agents for a variety of cancers (e.g. ovarian, lung, kidney, endometrial, breast and prostate), several inflammatory diseases (rheumatoid arthritis, Crohn's disease, osteoarthritis, organ transplant rejection, psoriasis, etc.), diabetes, atherosclerosis and a variety of infectious diseases (e.g. malaria, influenza virus, Staphylococcus, Pseudomonas, etc.). Eleven drugs stemming from research in my lab are currently undergoing human clinical trials (mainly at Endocyte, Inc., HuLow, and On Target Laboratories, three companies that I have founded).

Interests include: Imaging of malignant diseases; isolation and analysis of circulating tumor cells; fluorescence guided surgery using tumor-targeted fluorescent dyes; and personalized medicine, therapies for infectious diseases.

ERIC NAUMAN

College of Engineering   **Department of Mechanical Engineering**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
- Cell and tissue mechanics
- Human injury
- Adult stem cell-based tissue regeneration
- Biophysics and biotransport

CHIWOOK PARK

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Proteins are dynamic molecules. Even under native conditions, they do not adopt a single static conformation. Rather, they access many different conformations in their native state ensemble. This native state ensemble includes small fluctuations around the native conformation, partially unfolded forms, and even globally unfolded forms. The distribution of these conformations and the kinetic barriers between the conformational states define the conformational energy landscapes of proteins. My research interest is investigating conformational energy landscapes of proteins and deciphering the relationship between the energetics of proteins and their biochemical functions, such as catalysis, signal transduction, and ligand binding. We use proteolysis as a major tool to probe protein structures and dynamics as well as conventional spectroscopic methods. We also use proteomics extensively for investigating energy landscapes of proteins on a system level.

D. MARSHALL PORTERFIELD

College of Engineering   **Department of Agricultural and Biological Engineering**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
- Biosensors
- Cell signaling
- Cellular metabolism
- Lab-on-a-chip systems for cell physiology

J. PAUL ROBINSON

College of Veterinary Medicine   **Department of Basic Medical Sciences**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The group focuses on interdisciplinary projects that cover basic biology through to practical biomedical engineering.

MOHAMED SELEEM

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Bacterial and Fungal

Molecular/Cellular Target(s)

Research Interest and Expertise
- Antibacterial and antifungal for treatment of Infectious diseases
- Molecular target identification of new antimicrobials
- Drug delivery and targeting of intracellular pathogens
- Animal model for infectious diseases
- Bacterial and Fungal biofilm and drug resistant
- Repurposing of existing drugs to find new uses outside the scope of the original medical indication
- Detection and rapid diagnostics of antimicrobial resistance

MARY WIRTH

College of Science   **Department of Chemistry**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
We work at the interface of chemistry and medicine, and our focus is to create technology for earlier detection of diseases. The dream of 21st century medicine is that simple lab tests will reveal diseases well before the onset of symptoms, while the disease is easily curable. We are using nanotechnology to modernize the materials used for lab tests and for the discovery of the biomarkers that are the targets of lab tests.

ALEXANDER WEI

College of Science   **Department of Chemistry**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Cancer, ovarian and bladder (using orthotopic animal models)
Bacterial infections

Molecular/Cellular Target(s)
- SKOV3 cells
- Tumor-associated macrophages
- *Bacillus anthracis*
- *Chlamydia trachomatis*
- *Listeria monocytogenes*
- *Pseudomonas aeruginosa*
- *Salmonella enterica*
- *Staphylococcus aureus* / MRSA
- *Streptococcus pneumoniae*
- *Yersinia enterocolitica*
- Albumin receptors
- Hemin receptors (Isd, etc.)
- Siderophore receptors (FoxA, FhuD2, FhuE)

Research Interest and Expertise
- Targeting ligands for pathogen detection and treatment, with particular interests in respiratory-tract and sexually transmitted infections.
- Targeted photodynamic therapy/inactivation (PDT / PDI) using photoactive hemin derivaties
- Identifying key serum proteins as mediators in nanoparticle tracking and cell uptake
- siRNA uptake and release in ovarian cancer cells

MICHAEL WENDT

College of Pharmacy   **Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Breast cancer

Molecular /Cellular Target(s)
EGFR, Her2, FGFR

Research Interest and Expertise
Research in the Wendt is focused on the role of epithelial-mesenchymal transition (EMT) in breast cancer metastasis. EMT is associated with resistance to several chemotherapeutic drugs and targeted molecular compounds. Recent studies by the Wendt has identified fibroblast growth factor receptor (FGFR) as major driver of drug resistance, particularly in the metastatic setting. Furthermore, cells that have undergone EMT become preferentially sensitive to inhibition of FGFR kinase activity. Work in the Wendt utilizes 3D cell culture and *in vivo* disease modeling in combination with an array of small molecule and biological approaches to optimize FGFR targeting for the treatment of metastatic and drug resistant breast cancer.

CHONGLI YUAN

College of Engineering   **Department of Chemical Engineering**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)
Develop sensors for monitoring cell response to extracellular matrix, drug and environmental stimuli.
Develop platforms for detecting drug resistance

Research Interest and Expertise
Our lab is currently focused on studying the effect of epigenetic modifications, i.e., DNA methylation and histone post-translational modifications, on chromatin structure and identifying sequence-specific epigenetic changes as potential early stage biomarkers for cancer and neurological diseases. We also develop novel engineering probes to detect and monitor disease-related epigenetic features as well as various other sensors for disease detection and management.

TARGET DISCOVERY & CHARACTERIZATION

RUBEN CLAUDIO AGUILAR

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Developmental diseases: Lowe syndrome, Oligophrenia
- Neurodegenerative diseases: Huntington disease and Spinocerebelar ataxias
- Bladder cancer
- Invasive cancers

Molecular/Cellular Target(s)
- Endocytic machinery: clathrin, epsin, adaptor proteins (APs)
- Huntingtin, ataxin-3
- Notch and Wnt signaling
- Ocrl1 and Ophn1

Research Interest and Expertise
My laboratory is focused in the study of protein and vesicle trafficking in relation to the processes of cell polarity establishment (a feature that is key for animal development and crucial for physiological functions such as synaptic transmission and immune response) as well as carcinogenic transformation. In order to pursue our research goals we routinely use genetic, biochemistry and cell biology techniques with yeast and mammalian cells. We study protein-protein interactions at molecular level by using bioinformatics, biochemical and genetic tools (like the two-hybrid system) and we investigate the physiological relevance of these interactions by using functional assays, microscopy (of live and fixed cells) and genetic approaches.

OURANIA ANDRISANI

College of Veterinary Medicine   **Department of Basic Medical Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Liver Cancer

Molecular/Cellular Target(s)

Research Interest and Expertise
My interests and expertise are on molecular mechanisms of transcriptional regulation, epigenetics, and signal transduction involved in cell growth control, cellular differentiation, and cancer pathogenesis.

My laboratory has been studying cellular pathways induced by Hepatitis B virus (HBV) infection that are involved in virus biosynthesis and disease pathogenesis. Our goal is to identify essential mechanisms that can be targeted to suppress HBV infection and the resulting HBV-mediated liver cancer. One such mechanism identified by our studies is activation of the cellular S/T kinase Polo-like-kinase 1 (Plk1) by the virus-encoded oncogenic HBx protein. We have shown that Plk1 activation exerts a crucial role both in HBx-mediated oncogenic transformation, and serves as a positive effector role in HBV replication. Our ongoing studies with the team of Prof. Zoulim M.D.,Ph.D., Medical Co-Director of the Liver Department at Lyon University Hospital, France, support that Plk1 can be explored as a *novel antiviral target* for the suppression of HBV infection.

In addition, we have shown that Plk1 activation by HBx downregulates the activity of two chromatin modifying complexes, the Polycomb repressive complex2 (PRC2) and the LSD1/CoREST/HDAC1. The consequence of this epigenetic deregulation is re-expression of a *hepatic cancer stem cell (hCSC)*-like group of genes. In collaboration with the team of Professor Philippe Merle, M.D., Ph.D., Medical Co-Director of the Liver Department at Lyon University Hospital, France, we have shown that expression of this gene signature in clinical samples is associated with poor patient prognosis. Thus, our studies have provided the first direct evidence that HBV epigenetically reprograms normal hepatocytes.

Our current studies have identified yet another essential piece of this epigenetic puzzle, the RNA helicase DDX5, involved both in HBV replication and HBV-associated liver cancer. In collaboration with Dr. E. Tran, Biochemistry Department at Purdue who is an expert in the study of yeast RNA helicases, we are investigating the role and mechanism of the interaction between PRC2 and DDX5, from the point of view of the function/stability of the PRC2 complex. In addition, in collaboration with the teams of Prof. Merle and Zoulim, we will analyze the clinical relevance of our observations, both in terms of HBV biosynthesis and HCC pathogenesis. Thus, our studies, with a strong team of collaborators, will reveal novel insights into HBV-mediated liver cancer, viral infection and regulation of DDX5 activity and function. Importantly, these studies are necessary first steps to elucidate novel targets for therapeutic intervention targeting essential steps for HBV infection and HBV-associated liver cancer.

Positions:

1977-1979	Teaching Assistant, State University of New York at Buffalo
1979-1982	Graduate Research Assistant, State University of New York at Buffalo
1982-1985	Postdoctoral Fellow with Dr. N.C. Jones, Biology Department, Purdue University
1985-1989	Postdoctoral Fellow with Dr. J.E. Dixon, Biochemistry Department, Purdue University
1989–1991	Research Associate, Walther Cancer Institute and Biochemistry Department, Purdue
1991-1995	Assistant Professor, Department of Basic Medical Sciences, Purdue University
1995-2000	Associate Professor, Department of Basic Medical Sciences, Purdue University
2000-Present	Professor, Department of Basic Medical Sciences, Purdue University

Honors:

1987-1989	Recipient of NIH Post-doctoral Fellowship
1993-1998	Recipient of NIH First Award,
1997	Lion's Club Cancer Research Award,
2000	Pfizer Award in Research Excellence
2004	Faculty Exchange Scholar Purdue University-University of Hamburg,
2008, 2012	Seed for Success Award, Purdue University,
2013	Excellence in Research Award, College of Veterinary Medicine, Purdue University

Peer Reviews:

American Heart Association Peer Review Board, 1992-1996
NIH Endocrinology Study Section, October 1999.
NIH Endocrinology Study Section, 2000 – 2004, permanent member
NIH Molecular Cellular Endocrinology Study Section, 2004, 2005
NIH Neurogenesis and Cell Fate Study section, June 2008
NCI Molecular Oncogenesis Study Section, June 2009
NCI Molecular Oncogenesis Study Section, October 2009
Welcome Trust Foundation, 2010
Australian Research Foundation, 2010
NCI Cellular and Tissue Oncology P01 Special Emphasis Panel, 2011
NCI Special emphasis Study Section 05 ZRG1 OBT-H (02) M, 2012
NIAD Special emphasis Study Section (U.S.-China Program for Biomedical Collaborative Research)
05 ZAI1BDP M (M1)1, 2013
NCI Special Emphasis Panel/Scientific Review Group 2013/05 ZCA1 SRLB-J (M1) P 03/28/2013.
INSERM, France, 2013
Medical Research Council, UK, 2013
NCI Molecular Oncogenesis Study Section, permanent member 6/1/13 to 6/30/17
NCI Omnibus Cancer Genetics Study Section ZCA1 SRLB-J (M2) March 27th 2014
French National Research Agency (ANR) 6/1/2015
INSERM, France, 9/1/2015

ERIC BARKER

College of Pharmacy   **Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Proper control of the chemical mediators of neurotransmission requires dynamic regulation of neurotransmitter concentrations in the synapse. For most transmitters such as serotonin, clearance from the synapse is mostly dependent upon an active uptake system mediated by Na^+- and Cl^--dependent transporter proteins located on presynaptic terminals. In addition to these active transport systems, recent evidence suggests that certain neuromodulatory substances such as the putative endogenous cannabinoid anandamide are removed from the synapse by facilitative transport processes. Our research focuses on identifying structural determinants of functional and pharmacological properties of serotonin and anandamide transporters. These studies use multiple techniques including expression and characterization of cloned transporters in mammalian cells, electrophysiology, immunoblotting, the formation of chimeric proteins, and site-directed mutagenesis to investigate the molecular properties of these transporters.

Serotonin transporters (SERTs) are of particular clinical interest because they are the molecular targets for many antidepressants such as imipramine (Tofranil), sertraline (Zoloft), and fluoxetine (Prozac), as well as many drugs of abuse like cocaine and amphetamine. The cloning of SERT revealed a proposed protein structure consisting of 12 transmembrane-spanning domains. The question related to this structure is what amino acids are involved in the formation of the binding site for SERT inhibitors and substrates? We are currently using chimeric protein and mutagenesis strategies to identify amino acids involved in the pharmacological properties of cocaine and amphetamines like MDMA or "ecstasy." In addition to molecular biology approaches, we anticipate using structure-activity relationship studies and molecular modeling to further refine our understanding of drug binding and action at serotonin transporters.

We are also interested in the identification and characterization of transport proteins for the endogenous cannabinoid anandamide. Anandamide (N-arachidonylethanolamide) is a member of a larger class of fatty acid derived signaling molecules that possess in vivo and in vitro marijuana-like actions. Evidence suggests that anandamide is rapidly transported into neurons and astrocytes after release, where it undergoes rapid intracellular degradation. Anandamide uptake appears to be a facilitative process, and we have evidence that the intracellular metabolizing enzyme, fatty acid amide hydrolase (FAAH), plays an important role in maintaining the inward gradient needed for anandamide transport. Future studies in this area will focus on better understanding the role of FAAH in anandamide uptake as well as identifying novel proteins that may also be involved with anandamide transport.

ARUN BHUNIA

College of Agriculture   Department of Food Science

College of Veterinary Medicine   Department of Comparative Pathobiology

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Pathogen and Toxin Detection:
- Biosensor technologies including laser light scattering, mammalian cell-based, and fiber optic sensors for rapid and high throughput screening of live pathogens and toxins in food
- Development of biorecognition including antibodies, receptors, ligands, and microbiological growth media

Host-Pathogen Interaction and Control Strategies Using Probiotics :
- Understanding the molecular and cellular mechanism of *Listeria monocytogenes* colonization and translocation through epithelial barrier during intestinal phase of infection
- Prevention and control using bioengineered probiotic and antimicrobial peptide loaded biocompatible nano-carrier

SCOTT BRIGGS

College of Agriculture   **Department of Biochemistry**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Several histone methyltransferases and demethylases are found either mutated, chromosomal translocated, or over-expressed when isolated from oncogenic cells, suggesting that they play an important regulatory role in the cell. Unique interactions have been identified that are being pursued to develop therapeutics. Currently, structural analyses are in progress to assist with targeting the interaction in an effort to disrupt in a specific manner.

KIM BUHMAN

College of Health and Human Sciences   **Department of Nutrition Science**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The long-term goal of the Buhman laboratory is to identify novel factors that regulate dietary fat sensing, metabolism or absorption that may be exploited for preventive and therapeutic interventions for obesity, diabetes, and heart disease. Research in the Buhman laboratory focuses on trafficking and metabolism of digestive products of dietary fat within the absorptive cells of the small intestine, enterocytes. Projects in the Buhman laboratory are currently addressing how diet, drugs and genetics affect chylomicron synthesis and secretion, cytoplasmic lipid droplets synthesis and metabolism, and fatty acid oxidation by enterocytes. Recent publications from the Buhman laboratory highlight important functions of diet, drugs, and genetics in regulation of dietary fat processing within enterocytes that results in effects related to metabolic diseases such as body weight, blood lipid concentrations, and hepatic steatosis.

RYAN CABOT

College of Agriculture   **Department of Animal Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The research conducted in our laboratory is focused on learning how the mammalian embryo directs its development from a single cell to a complex group of differentiated tissues and ultimately a fully formed adult organism. We are particularly interested in understanding how in vitro manipulation procedures affect development of the pig embryo and how these effects can be circumvented to improve embryo quality and embryo viability. It is well-established that many of the in vitro manipulations performed on mammalian embryos (e.g., in vitro production and culture of embryos) are correlated with increased rates of developmental failure and altered gene expression in surviving live-born animals. One technique in particular, cloning by nuclear transfer, has given scientists the ability to produce live-born domestic animals that harbor targeted genetic modifications.

The benefits from increasing the quality of embryos produced following in vitro manipulation will have a large impact on several scientific fields. First, it will allow us to increase the reproductive efficiency of agriculturally important species. Secondly, understanding how to better handle mammalian embryos in vitro will benefit the biomedical community as a resource to generate animal models for human diseases. While the scientific community has gained tremendous insight into the mechanisms of many human diseases through the use of transgenic and knock-out mice, much more sophisticated models, perhaps using animals that are more 'physiologically relevant', may be found in genetically modified livestock species, like the pig.

Current projects in the lab are aimed at examining the how specific epigenetic modifications are mediated in the early embryo (e.g., histone methylation) and the mechanisms by which specific chromatin-interacting factors access the nucleus during development.

IGNACIO CAMARILLO

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our lab integrates aspects of physiology, cell biology, and molecular biology to elucidate the mechanisms by which prolactin (PRL) and growth hormone (GH) regulate locally produced hormones, receptors and growth factors. The main goal of this research is to better understand the complex interactions between the mammary epithelia and stroma. These studies are critical to our understanding of breast cancer, given that circulating levels of GH and PRL can significantly influence mammary tumorigenesis. The study of normal mammary development will provide more specific roles for these hormones and can identify novel potential targets for cancer therapies.

Several hormones, including PRL and GH, are necessary for normal mammary gland development. Two primary components of the mammary gland are epithelial cells, which differentiate to produce milk, and stromal cells consisting primarily of adipocytes. The majority of studies examining PRL and GH action during mammary development have centered on their effects in epithelial cells. Recently, there has been increasing evidence indicating the mammary stroma is a rich source of lipids and growth factors that are critical for epithelial growth. The regulation of these stromal factors by PRL or GH is therefore an important question in mammalian physiology.

CHUN-JU CHANG

College of Veterinary Medicine   **Department of Basic Medical Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Breast cancer

Molecular/Cellular Target(s)
MicroRNAs, chromatin modification enzymes

Research Interest and Expertise
Cancer stem cells (CSCs) are a unique cell population with perpetuating self-renewal properties that resemble normal stem cells. With these special properties and accelerated growing rate, CSCs give rise to the bulk of a tumor as the "seed" of cancer and account for all cancer initiation, progression, chemo-resistance, and recurrence. To date, treatment strategies designed to eliminate the genesis of the cancer (CSC) still remain a significant challenge. Interestingly, it is during cell division that a key decision is made to determine the fate of the stem cells that either maintain or lose the self-renewal properties. Our research has revealed the critical mechanism involved in the regulation of the cell fate decision in breast CSCs and also facilitated the discovery of pharmacological drugs that create a blockade to the self-renewing division pathway. Using new transgenic animals and drug screening platform targeting CSCs, the ongoing studies are expected to enable development of novel therapeutic strategies that can manipulate the CSC fate decision for exhaustion of CSCs so as to eradicate breast cancer.

JI-XIN CHENG

College of Engineering   **Department of Biomedical Engineering**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Cancer (prostate, pancreatic, lung, colon, ovarian)
- Bloodstream infections
- Traumatic spinal cord injury

Molecular/Cellular Target(s)
- ACAT-1 inhibition for suppression of cancer growth and metastasis
- Anti-inflammation agents for treatment of spinal cord injury
- Glucose and lipid metabolism in fungal and bacterial cells

Research Interest and Expertise
The mission of our research program is developing label-free imaging technologies to enable improved early diagnosis and/or precise treatment of human diseases. With integrated expertise in physics, chemistry, biology, medicine and entrepreneurship, our 3D research program is devoted to

- Development of label-free molecular spectroscopic imaging tools
- Discovery of new biology and drug targets at single cell level
- Device for early molecule-based diagnosis and surgery guidance

MICHAEL CHILDRESS

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Lymphomas
Spontaneous canine cancer models

Molecular/Cellular Target(s)

Research Interest and Expertise
My primary research interest is in canine and feline hematopoietic neoplasia, particularly canine lymphomas. I am a board-certified veterinary oncologist with extensive experience in the clinical management of canine and feline cancers.

GAURAV CHOPRA

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The overarching theme of our research is to develop and verify multiscale chemical models of cellular systems for therapeutic discovery by integrating sequence, structure, function, interaction, and systems-based methodologies. Our lab is a hybrid computational and wet-lab to identify drugs by taking into account all possible interactions between biomolecules, namely, interactome based drug discovery. We will focus on designing disease-specific compounds interacting with multiple proteomes and biomolecular interfaces (protein/protein and protein/nucleic-acid interfaces) and identifying compounds that change the fate and proliferation of cell types *in vivo* by developing structural/chemical signatures of individual cells.

Specifically, we will start by repurposing human approved compounds and designing new compounds to perturb the immune system to identify therapeutics for cancer and autoimmune diseases. Developing computational chemistry/biology tools and using physical chemistry principles fuel the research work that we do. The experimental validations of the computational predictions will be done in our laboratory, together with existing and new collaborators. Our lab will make use of high performance computing to generate predictions, use high-throughput robotic set-up for compound screening on cell assays, use molecular biology techniques & sequencing (RNA-seq, ChIP-seq, ATAC-seq etc.), flow cytometry instrumentation as needed to select and test computational and *in vitro* validated predictions in mice.

EMILY DYKHUIZEN

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Recent cancer genome sequencing studies have uncovered frequent mutations in genes encoding subunits of nuclear protein complexes involved in chromatin remodeling and epigenetic regulation. We are interested in using a combination of chemical and biochemical techniques to uncover the role of chromatin structure in tumor suppression. Uncovering the mechanisms of these complexes will reveal potential therapeutic avenues for cancers that currently have few therapeutic options, such as renal clear cell carcinoma and ovarian clear cell carcinoma.

JENNIFER FREEMAN

College of Health and Human Service   **Department of Health Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Neurodegenerative diseases with a specific current focus on Alzheimer's disease
- Cancer with a specific current focus on melanoma and neuroendocrine cancers
- Reproductive function

Molecular/Cellular Target(s)

Research Interest and Expertise
The Freeman laboratory is an environmental molecular toxicology laboratory with current research efforts focused on investigating the adverse health effects of exposure to environmental stressors on human and environmental health using the zebrafish model system. The zebrafish is a prominent model system in a variety of biological disciplines and has become one of the preferred vertebrate models in biomedical research.

Similarities between the zebrafish and human genome permits investigations into the molecular pathways found to play a role in the mechanisms of toxicity in the zebrafish and translation to humans. Ongoing research projects in the Freeman laboratory are defining the underlying genetic and epigenetic mechanisms of toxicity of environmental stressors with current focus on pesticides, metals, radiation, and other legacy and emerging contaminants. These projects are identifying genetic biomarkers and molecular pathways of the immediate adverse impacts of a developmental exposure, the lasting impacts of this developmental exposure throughout the lifespan, and the analysis of subsequent generations linking genetic, epigenetic, and phenotypic assessments. These studies are investigating a developmental origin of adult disease pathogenesis with a specific focus on cancer, reproductive function, and neurodegenerative disorders.

The Freeman laboratory has expertise in the application of the zebrafish model system and with genomic and targeted genetic and epigenetic technologies including array comparative genomic hybridization (CGH) to detect copy number variants and aberrations; transcriptomics including gene expression microarrays and sequencing to identify genetic biomarkers (i.e., gene targets) and molecular pathway alterations; and epigenetic analysis specifically with a focus on microRNA deregulation. All equipment and analysis platforms needed for microarray experiments are available in the Freeman laboratory.

ROBERT GEAHLEN

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our laboratory is interested in the molecular mechanisms by which cytoplasmic protein-tyrosine kinases modulate cellular responses to environmental signals. Our major focus is the kinase, Syk (spleen tyrosine kinase), a 72-kDa protein-tyrosine kinase originally discovered in our laboratory. We use chemical, biochemical and genetic approaches to understand the role of Syk in signal transduction pathways in two primary model systems: B cells activated through antigen and other stimulatory or inhibitory co-receptors and breast cancer cells interacting with other cells or with the extracellular matrix.

Structure-Function Analysis of Syk in B Cells. Signals transduced by the binding of antigens to receptors on B cells take the form of increased tyrosine phosphorylation of intracellular proteins. Since the components of the receptor complex itself lack intrinsic enzymatic activity, these responses are mediated instead by cytoplasmic protein-tyrosine kinases that associate with the liganded receptor, including Syk. B cells fail to develop properly in mice lacking the gene for Syk due to the inability of antigen receptors to signal in its absence. Receptor engagement leads to the recruitment of Syk, its phosphorylation on multiple sites and its association with effectors of downstream signaling pathways. We have been mapping these sites of phosphorylation and elucidating their roles in the regulation of the kinase's activity and in its interactions with other proteins. Through the use of genetic and biochemical screens, we are identifying and characterizing novel Syk-interacting proteins that are involved in these signal transduction pathways. In collaboration with Dr. Carol Post, we are examining the structural bases for these interactions. Ligation of B cell antigen receptors recruits Syk from both the cytoplasmic and nuclear compartments to the site of the clustered receptor. We are exploring the mechanisms by which Syk is translocated into and out of the nucleus and the roles that this translocation plays in regulating cellular responses to receptor engagement. In collaboration with Dr. Kavita Shah, we also are developing chemical genetic approaches to understanding Syk's function in B cells.

Analysis of Syk in Cancer Cells. Syk is expressed in a variety of non-hematopoietic cells including many epithelial cells. The expression of Syk has interesting and often opposing effects on the growth and survival of cancer cells. In many cancer cell types (e.g., leukemia, retinoblastoma, pancreatic carcinoma), Syk functions as a pro-survival factor while in other cancers (e.g., breast cancer, malanoma), the expression of Syk is inversely correlated with invasive growth and metastatic behavior. We are studying the molecular mechanisms by which Syk regulates the growth properties of cancer cells and the nature of the proteins with which it interacts and the substrates that it phosphorylates. In collaboration with Dr. Andy Tao, we are using proteomics approaches to identify Syk interacting proteins and substrates in cancer cells.

Inhibitors of Protein-Tyrosine Kinases. We are interested in the development of chemical probes that act selectively to inhibit the activity of cytoplasmic protein-tyrosine kinases. The most recent targets to be investigated are the SH2 domains that mediate protein-protein interactions. In collaboration with Dr. Richard Borch, we are analyzing the effects of metabolically activated, cell permeable, SH2 domain ligands on the growth properties of leukemia cells.

MARK HALL

College of Agriculture   **Department of Biochemistry**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The majority of our work is conducted in the budding yeast Saccharomyces cerevisiae. Budding yeast are easy to work with and manipulate genetically, making them an attractive model organism for studying conserved and fundamental biological processes, such as cell division. We apply biochemistry, cell biology, molecular biology, and genetics methods to our research projects, providing a diverse training experience for students. In addition, we use mass spectrometry in a variety of ways, particularly for the discovery, quantification, and characterization of protein-protein interactions and protein post-translational modifications.

MARIETTA HARRISON

College of Pharmacy   **Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our group studies the signaling molecule Lck. Lck is a member of the Src-family of protein tyrosine kinases. Lck is required for the activation of T-lymphocytes (T-cells) and individuals lacking functional T-cells fail to develop immune responses. In addition to protecting the body from the invasion of foreign pathogens, the immune system is thought to impact the development of cancer. In the case of cancer vaccine development, the immune system actually impedes the therapy of cancer and harnessing the immune system to aid in the prevention and treatment of tumors has been an ongoing strategy in the war against cancer. The recent discovery that subsets of T cells protect against the development of skin cancer lends powerful support to the original hypothesis that the immune system provides surveillance against developing malignancies. In addition to its requisite role in T cell development and activation, Lck is itself an oncogene and the forced expression of a constitutively active form in mice leads to the development of thymic tumors. Lck is thus an important player in the field of cancer immunology and a critical player in the overall immune response.

TONY HAZBUN

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Infectious diseases such as Candidiasis
- Prostate cancer
- Parkinson's disease
- Prions
- Aging

Molecular/Cellular Target(s)
- Hsp90 chaperone
- Kinetochore proteins, Aurora kinase, Mitotic kinases
- Hsp31/DJ-1 chaperone
- Prions

Research Interest and Expertise

The Hazbun lab uses yeast as a functional genomics and systems biology tool to probe biological pathways involved in mitosis and protein homeostasis. The facility of yeast genetics and genomewide resources allows us to probe many different biological pathways involved in disease including Parkinsons Disease, Cancer and infectious disease.

A major biological focus of the lab is centered on the protein-protein interactions that occur in the assembly and function the kinetochore, an important macromolecular complex that is at the hub of chromosome segregation process. Aurora kinases are an important enzyme that phosphorylates many kinetochore proteins and regulates kinetochore function. They are overexpressed in many cancers and have been pursued as a therapeutic target although there has been limited success partly because of the limited approach taken by many pharmaceutical companies. We are investigating how the Aurora kinase and other mitotic kinases control protein-protein interactions at the kinetochore. Understanding this overall process and delineating how these interactions are controlled will allow us to develop a more targeted and designed approach to inhibit cellular proliferation.

An additional focus in the lab is the targeting of Hsp90, a chaperone protein for which tumor cells are

preferentially dependent. Chaperones are proteins that assist in folding and increasing the activity of other protein substrates. We are identifying small molecule modulators of this chaperone and investigating their novel mechanisms of binding. Although several inhibitors exist for Hsp90, we have identified a novel inhibitor with a new mode of binding that results in unique biological response. We have recently published on another chaperone, Hsp31, which is the yeast homolog of DJ-1, a human protein implicated in Parkinson's Disease. We have delineated and probed the multiple functions of this protein, which include chaperone activity and enzyme activities. We have also shown that Hsp31 can have a role in modulating prion status in yeast providing valuable insight into how Hsp31 intervenes when a protein is misfolded. Further work will focus on finding small molecules that can bind to Hsp31 and modulate its function.

A final project in the lab is to use yeast genomics to identify small molecule targets. We have implemented the haploinsufficiency chemogenomic profiling method in the lab to identify the targets of small molecules that have unclear or poorly defined mechanisms of action. We are currently focusing on antifungal compounds but the method can be used for small molecules involved in cancer or neurodegenerative disease depending on the potential target.

CATHERINE HILL

College of Agriculture   **Department of Entomology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Genomics of Arthropod Vectors of Human Disease: Our research program is focused on the genomics of arthropod vectors of human disease such as malaria, West Nile virus and Lyme disease. The overall objective of this research is the development of novel strategies to control arthropod disease vectors.

Mosquito G Protein-coupled Receptors: Mosquito transmitted diseases such as malaria and dengue cause significant morbidity and mortality worldwide. Insecticide and drug resistance problems and lack of effective vaccines necessitate the development of novel approaches for mosquito and mosquito-borne disease control. G protein-coupled receptors (GPCRs) are highly desirable molecular targets due to their function in many fundamental biological processes such as chemo- and photoreception, development, neuro-physiology and stress response. We use bioinformatic, molecular and comparative genomics approaches to identify and characterize GPCRs in two major mosquito vectors of disease, the malaria mosquito Anopheles gambiae and the yellow fever mosquito, Aedes aegypti.

Genomics of Ixodid Ticks: Ticks (subphylum Chelicerata, class Arachnida) transmit a diverse array of infectious agents and are second only to mosquitoes as vectors of human pathogens. Current knowledge of ixodid tick biology is limited and the genetic basis of phenotypes such as host location, vector competence and insecticide resistance is poorly understood. We are currently leading an international effort funded by the National Institutes of Health to sequence the first tick genome, namely the Lyme disease tick, Ixodes scapularis. In the USA, I. scapularis transmits the causative agents of Lyme disease, babesiosis and human granulocytic anaplasmosis. The Ixodes Genome Project (IGP), represents an unparalleled resource for studying tick biology and tick-host-pathogen relationships, and identifying novel targets for tick and tick-borne disease control. We are currently undertaking genomic and cytogenetic studies in the Ixodidae to understand tick chromosome biology and genome architecture and to facilitate genome assembly.

GREGORY HOCKERMAN

College of Pharmacy   **Department of Molecular Chemistry & Medicinal Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X__ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Voltage-gated calcium channels are key players in a large array of physiological processes including contraction of cardiac, vascular and skeletal muscle, release of neurotransmitters from nerve terminals, gene expression, and hormone secretion. The long-range goal of our studies is to contribute to the development of drugs that can modulate voltage-gated calcium channels in a tissue and type selective manner to treat *cardiovascular disease* and *type II diabetes*.

HARM HOGENESCH

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Dr. HogenEsch is a board-certified veterinary pathologist with 20 years of experience in immunology and pathology. His research focuses on vaccine development and the immunopathology of chronic inflammation. Dr. HogenEsch is an expert on aluminum-containing adjuvants, the only adjuvants allowed for use in human vaccines in the US. The HogenEsch lab investigates mechanisms by which aluminum-containing adjuvants enhance the immune response and develops methods to optimize the formulation of aluminum-adjuvanted vaccines. The research on chronic inflammation focuses on the role of the protein SHARPIN in inflammation. Dr. HogenEsch discovered the cpdm mouse mutant which is caused by a mutation in the Sharpin gene. The mutant mice develop a severe chronic eosinophilic dermatitis, systemic inflammation and defects in the development of lymphoid organs and in the Th1 immune response.

CHANG-DENG HU

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Prostate cancer

Molecular/Cellular Target(s)
AP1, CREB, PRMT5 and other PRMTs

Research Interest and Expertise
Regulation of gene expression at the transcriptional and epigenetic level is a key process to determine how cells respond to intracellular and extracellular signals. Because of this, deregulation of transcription factors and epigenetic regulators is often implicated in many human diseases such as cancer. We use molecular, cellular, biochemical, genetic, "Omics" and imaging approaches to identifying novel and unique molecular interactions at the transcriptional and epigenetic level that regulate the growth of cancer cells, determine the response of cancer cells to therapy, and confer the resistance to treatment. The ultimate goal is to develop novel therapeutics to treat cancer.

QING JIANG

College of Health and Human Sciences   **Department of Nutrition Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Chronic inflammation constitutes one of the major etiologies of degenerative diseases including cancer. My laboratory is interested in studying the molecular mechanism of inflammation-associated diseases, and exploring prevention and therapy of these diseases, using nutrition factors including natural forms of vitamin E as well as combinations of vitamin E forms and other antioxidants.

ANDREA L. KASINSKI

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___ X __ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Lung and breast cancer

Molecular/Cellular Target(s)
- Non-coding RNAs
- Kras
- p53
- LIN28
- MYC
- MET
- miR-34
- let-7

Research Interest and Expertise
MicroRNAs (miRNAs) are small non-coding RNAs that posttranscriptionally regulate the expression of protein-coding genes. The discovery of miRNAs has resulted in a paradigm shift in our knowledge about gene control and therapeutic intervention. Through their binding to their target genes, these "master regulators" induce subtle alterations in gene expression that can culminate in major phenotypic changes. This is based on the notion that miRNAs are pleiotropic, referring to the fact that miRNAs can bind to and affect multiple targets. Although the expression of an individual miRNA target may only change marginally, the combined effect of suppressing several targets at the same time results in a phenotypic transformation. This is most clearly illustrated in the context of cancer where miRNA dysregulation contributes to many types of cancer. In some instances the combination of multiple subtle changes causes the tumor cells to become addicted to a single miRNA. MiR-21 and miR-155 are two oncogenic miRNAs (oncomiRs) that have shown this type of addictive pattern *in vivo*. Similarly loss of key tumor suppressive miRNAs, through epigenetic silencing, genomic loss, and reduced upstream signaling and processing, has been correlated with disease state. Based on this knowledge we have two major goals: i) to identify noncoding RNAs that drive tumorigenesis, specifically miRNAs, and ii) to utilize this knowledge to target miRNAs and their biogenesis pathways for cancer therapeutic.

CHANG KIM

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Colon cancer
- Multiple Sclerosis
- Intestinal infection
- Kidney diseases

Molecular/Cellular Target(s)
- Chemokines
- Integrin
- mTOR pathway
- SCFA receptors
- Retinoid acid receptors
- T cells
- Innate Lymphoid Cells
- Purigergic receptors on immune cells

Research Interest and Expertise
Hematopoiesis, differentiation, migration and function of immune cells: Immune cells in our bodies develop immunity against pathogens and cancer. Immune cells are produced from stem and progenitor cells that are present mainly in the bone marrow. Many subsets of T cells play central roles in regulation of immune responses. Immune cells migrate from the thymus to lymph nodes and then to sites of infection and cancer for differentiation and effector functions. We study the mechanisms of trafficking and effector function of immune cells and differentiation of stem and progenitor cells. Current studies in the lab include: 1) Roles of chemokines and chemokine receptors in trafficking of immune cells (focusing on FoxP3+ cells and Th17 cells); 2) Regulation of inflammation and cancer through host and microbial metabolites; 3) Migration and function of regulatory and inflammatory T cells in autoimmune diseases such as Crohn's disease and multiple sclerosis; 4) Biology of Tfh and Tfr cells for regulation of antibody responses; 5) Regulation of immunity and inflammation at the mucosal surface; and 6) Homing and differentiation of hematopoietic stem and progenitor cells.

ANN KIRCHMAIER

College of Agriculture   **Department of Biochemistry**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Diseases associated with misregulated epigenetic processes

Molecular/Cellular Target(s)
Chromatin assembly factors, histone de/acetylases, histone de/methylases, histone variants, DNA methyltransferases, Tet oxygenases

Research Interest and Expertise
The research in my lab focuses on understanding how cells regulate epigenetic processes. Our research examines the role of the cell cycle and DNA replication in assembly or maintenance of chromatin structures and the effects of these structures on DNA replication. We are interested in how the cell restricts heterochromatin to specific genomic loci, why heterochromatin formation is regulated by the cell cycle, how transcription of genes is prevented in silenced regions, and whether epigenetic processes are influenced by or influence events including DNA damage and the initiation of DNA replication. We are intrigued by how epigenetic states are maintained throughout the cell cycle and are duplicated and inherited each time the chromosome itself is replicated and the cell divides. We investigate how environmental factors perturb epigenetic processes and can contribute to inappropriate gene expression, developmental defects, tumorogenesis and other catastrophic disorders.

Our research explores the interface between epigenetic processes, histone modifications, chromatin assembly, DNA replication and the cell cycle, Our laboratory combines molecular biology, biochemical and quantitative microscopy-based approaches with mammalian cell culture and the power of yeast genetics to understand the impact of genetic and external factors on epigenetic gene regulation.

JEFF KO

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research

_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)

_____ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise

We specialize in anesthesia and pain management, obesity/metabolic syndrome animal models, cardiovascular-pulmonary dysfunctions, and spinal cord-CNS animal models, including:

1) animal models of anesthesia and pain management
2) inhalant and injectable anesthetics
3) pain management techniques and drug delivery
4) pain assessment and brain images with functional MRI
5) anesthesia equipment
6) anesthetic monitoring of cardiorespiratory and brain functions

STEVE KONIECZNY

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The research in our laboratory involves defining the molecular mechanisms that regulate gene expression in pancreatic epithelial cells during development and in cases of pancreas disease, including pancreatitis and pancreatic cancer. The goal of our studies is to identify the earliest transcriptional changes that are induced upon disease initiation and to determine mechanisms of harnessing downstream pathways to prevent and/or treat advanced stage disease. We have focused our studies on two different transcription factor families - the basic helix-loop-helix (bHLH) factors and the SRY-related HMG-box family of SOX proteins since both bHLH and SOX members are essential to controlling developmental and cell proliferation events. Indeed, alterations in bHLH and SOX factor activity, or in gene expression patterns, often correlate with the development of pancreatic disease including pancreatic cancer.

CASEY KRUSEMARK

College of Pharmacy   **Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Cancer

Molecular /Cellular Target(s)
Protein Kinases (broadly)
chromodomains

Research Interest and Expertise
Our work centers on the use of DNA-encoding approaches for discovery and development of biologically active small molecules. In one area, we utilize DNA-programmed combinatorial chemistry to construct novel chemical libraries of DNA-encoded small molecules. We are using these libraries to develop peptidomimetic inhibitors of protein-protein interactions. In a second area, we have developed a DNA-based assay approach for biochemical assays including several enzymatic assays and ligand binding assays. We work to apply these assays in proteomic activity profiling and in small molecule screening.

Our lab has extensive expertise in DNA-encoded chemical approaches and in design of DNA-compatible combinatorial chemical libraries. Additional expertise lies generally in the areas of bioconjugation chemistry, peptide/peptidomimetic synthesis, and DNA sequence analysis.

SHIHUAN KUANG

College of Agriculture   **Department of Animal Science**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Obesity, Type 2 Diabetes, Muscular Dystrophy, Rhabdomyosarcoma, Liposarcoma

Molecular/Cellular Target(s)
Notch signaling pathway, PTEN, Lkb1/Stk11, mTOR

Research Interest and Expertise
Muscle stem cell biology and muscle regeneration: A balance between self-renewal and differentiation is crucial for stem cell maintenance and tissue homeostasis. However, mechanisms governing stem cell fate are poorly understood. One goal of our research is to address this question using muscle satellite cells as a model system. Several recent studies have revealed an important role of asymmetric division in satellite cell self-renewal. We are particularly interested in the role of Notch signaling in the cell fate decision of muscle satellite cells.

Skeletal muscles have a remarkable regenerative capacity due to myogenic differentiation of satellite cells. Deregulation and dysfunction of muscle stem cells lead to regenerative failure in aged muscle and a number of muscular dystrophy diseases. One focus of my lab is to explore the signaling mechanisms that regulate satellite cells and explore how such mechanisms are employed in muscle regeneration.

Adipose tissue plasticity and obesity: Adipose tissue contains white, beige (also called brite) and brown adipocytes. White adipocytes store lipids and excessive accumulation of lipids is associated with obesity. Beige and brown adipocytes can break down and utilize lipids to generate heat, and are associated with leaner body mass. We are particularly interested in the lineage origin of the three types of adipocytes and their plasticity (interconversion). To this end, my lab has discovered a novel role of Notch signaling in regulating adipocyte plasticity. Interestingly, aberrant activation of Notch signaling induces tumorgenic transformation of adipocytes, resulting in development of liposarcoma. Understanding the molecular mechanisms that regulate adipose tissue plasticity is key to the development of therapeutic approached to combat the rising epidemics of obesity and its associated metabolic syndromes.

Muscle-fat crosstalk: We have recently shown that muscle interstitial adipocytes are required for efficient regeneration of injured muscles. Meanwhile, we found that muscle-specific cytokines (myokines) can regulate the plasticity (for example conversion of white to beige adipcytes) and gene expression of adipose tissues. We use a variety of animal models to understand the key signaling pathways that regulate skeletal muscle and adipose tissue health. Understanding the molecular basis of muscle-fat interaction will ultimately leads to strategies to improve the regenerative capacity of skeletal muscles and prevent/treat obesity and diabetes.

SOPHIE LELIÈVRE

College of Veterinary Medicine   **Department of Basic Medical Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Research in the laboratory focuses on understanding the mechanisms by which the organization of components of the cell nucleus directs the expression and stability of the genome, and how tissue architecture influences nuclear organization. Our approach makes use of three-dimensional cultures of nonmalignant and malignant breast epithelial cells that recapitulate the formation of normal tissue structures (mammary acini) and tumor nodules, respectively. Using this system, nuclear structural proteins, including the nuclear mitotic apparatus protein NuMA, have been demonstrated to differentially relocate upon differentiation and tumorigenesis and their specific subcellular distribution has been shown to direct gene expression and cell behavior (e.g., invasive potential, proliferation, apoptosis). We have shown that NuMA participates in chromatin organization related to transcription control and DNA repair. Our current focus is to identify the binding partners of NuMA during differentiation and tumorigenesis and decipher the nuclear mechanisms by which NuMA controls higher order chromatin structures. We have unraveled sequences in NuMA that are potential regulators of its function and ligands involved in epigenetic mechanisms and response to environmental stress. This information will be used to further decipher the mechanisms by which nuclear structure controls cell phenotypes. A separate focus is to decipher the proteomic and genomic determinants of apical polarity, an important element of tissue architecture that is altered very early during breast cancer development. These determinants will be used as detection markers for the classification of breast cancers and as potential therapeutic targets. The effect of apical polarity on gene expression control is also being investigated. In addition, nanotechnology approaches, based on the use DNA tweezers, are being developed to control the expression of specific genes. These studies should yield strategies to fight against differentiation and proliferation disorders like cancers. Another area of research is the development of breast cancer prevention strategies by combining epigenomics research with the study of environmental risk and protective factors for breast tissue homeostasis. This aspect of the research is highly interdisciplinary and includes all aspects of public health necessary to develop prevention programs. Finally, collaborative endeavors with engineers are focused on the design of organ-on-a-chip models with readouts at the cell nucleus level for target discoveries and screening of drugs and materials for prevention and treatment of cancers.

YUK FAI LEUNG

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Retinal degeneration

Molecular/Cellular Target(s)
Retinas, photoreceptors, retinal ganglion cells

Research Interest and Expertise
Retinal degeneration is a group of inherited eye diseases including retinitis pigmentosa and age-related macular degeneration that impair our vision. They are incurable, even though much has been learned about the molecular basis of these diseases. To expedite discovery of new drugs for these diseases, we study zebrafish retinal-degeneration models.

We focus on two research directions:
1. Disease-causing gene network for retinal degeneration
2. Drug discovery for retinal degeneration.

Please visit our lab website for further information.

MARKUS LILL

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
___X___ ADME/DMPK/Tox
___X___ Other: Computational Drug Design

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Hypoglycemia, alcohol abuse, pain

Molecular/Cellular Target(s)
Glucagon receptor, delta opoid receptor, PCNA, adenylyl cyclase, cytochrome P450 enzymes

Research Interest and Expertise
My current research has been dedicated to the development and application of molecular modeling techniques to gain insight into the processes associated with protein-ligand and protein-protein binding. Current research activities are focused on addressing serious shortcomings of present computational approaches for modeling protein-ligand and protein-protein association: protein flexibility, entropic contributions associated with the dynamics of the complex, solvation effects, and a reliable quantification of binding affinities and kinetic properties. I have been leading the development of nine different software products, some of them freely available for download from our group website. Computational methods are applied in collaboration with experimental groups focusing on CYP-mediated drug metabolism, GPCRs, PCNA and other cancer-related targets.

XIAOQI LIU

College of Agriculture   **Department of Biochemistry**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Current therapeutic strategies for cancer patients have shown only moderate success in reducing incidence and mortality rates and improving survival, thus a new class of more specific treatments for various cancers is greatly needed. A major goal in cancer research is to understand the molecular events that are associated with this disease to aid in the development of such novel therapies. The long-term goal of my research program is to understand the molecular mechanisms that cause cancer and to use this information to provide new avenues for cancer therapy. My work focuses on an enzyme known as Polo-like kinase 1 (Plk1), which plays a central role in controlling cell division and is known to exist at abnormally high levels in many types of human cancers. Compounds that inhibit Plk1 are currently viewed as promising new anti-cancer drugs. To fully exploit Plk1 as a potential anticancer drug target, it is essential to fully understand its regulation and function, particularly in the context of the cancer cell. We have made a series of contributions to understanding both Plk1 regulation and its function and the lab is in a position to make crucial contributions in understanding how Plk1 can be exploited as a target for drugs to treat cancer and other important human diseases. The lab is currently using a combination of biochemistry, cell biology and mouse genetics to dissect the roles of Plk1 in initiation, progression and metastasis of prostate and pancreatic cancer.

L. TIFFANY LYLE

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Brain metastasis
Spontaneous canine brain tumors
Neurodegenerative disease

Molecular /Cellular Target(s)
Blood-brain barrier

Research Interest and Expertise
The mission of the Comparative Blood-Brain Barrier Laboratory is to evaluate and characterize molecular alterations of the blood-brain barrier in animal models of brain metastasis and neurodegenerative disease to facilitate effective drug delivery and uptake.

ZHAO-QING LUO

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our laboratory is interested in understanding the mechanisms that allow microbial pathogens to survive and multiply within the hostile host cells and how host cells respond to infection. We use Legionella pneumophila, the causative agent of Legionnaires disease as a model organism. One essential pathogenic factor of this bacterium is the Dot/Icm type IV secretion system that injects approximately 300 virulence proteins (effectors) into host cells to create a niche permissive for bacterial replication. One focus of our research is to determine the function of these proteins and their roles in bacterial infection. The second focus is to examine the mechanism of the detection and response of immune cells to intracellular pathogens, particularly the signaling pathway involved in the detection of the bacterial ribosomal protein RpsL that triggers lysosomal cell death. Finally, we are interested in study the function of Fic proteins found in diverse bacteria. The long term goal of these studies is to elucidate the signal transduction pathways important for bacterial virulence, immune detection and other events important for the establishment of successful infection, such information will be invaluable not only in combating infectious diseases but also in our understanding of cell signaling in both prokaryotic and eukaryotic cells.

ANGELINE LYON

College of Science   **Departments of Chemistry and Biological Sciences**

Category of Research

_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)

___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Cardiac hypertrophy, arrhythmias, heart failure

Molecular/Cellular Target(s)

Phospholipase C (PLC) β and ε subfamilies

Research Interest and Expertise

We use a combination of X-ray crystallography and electron microscopy to gain structural insights into PLC regulation and activation. Structure-based hypotheses are validated through functional assays, and ultimately cell-based and whole animal studies.

SULMA MOHAMMED

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Dr. Mohammed's research interest is to develop a model to study breast cancer progression in women and discern strategies for prevention. Due to routine breast mammography, detection of noninvasive mammary intraepithelial lesions (IELs), such as normotypic hyperplasia, atypical hyperplasia, and duct carcinoma in situ, is increasingly frequent. These lesions are believed to signal increased risk of developing invasive breast carcinoma in women. Although chemotherapy to reverse these lesions or to prevent their progression is a promising new strategy, an animal model with spontaneous pre-cancerous mammary intraepithelial lesions is needed to evaluate the safety and efficacy of candidate compounds. In a DoD-funded project, Dr. Mohammed studies the dog as an animal model with spontaneous mammary lesions that are phenotypically and genetically similar to human intraepithelial lesions. The advantages of studying the dog as a model over the rodent model include spontaneous development of DCIS and invasive cancer (all subtypes including triple-negative tumors), an intact immune system, hormonal responsiveness, and response to human chemotherapies. Dr. Mohammed's in collaboration with her colleagues in Department of Comparative Pathobiology have shown that spontaneous canine mammary premalignant lesions such as atypical ductal hyperplasia (ADH), and ductal carcinoma in situ (DCIS) are similar to those of the human breast in term of developing spontaneously before mammary tumors, histologic diversity, and immunohistochemical profile of ER-α, PR, and HER-2 (these findings, Antuofermo et al., 2007; were featured on the cover page of AACR Journal of Cancer Epidemiology, Biomarkers and Prevention where the article was published accompanied by an editorial by Dr. Elaine Ostrander, (Chief, Cancer Genetics Branch, National Human Genome Research Institute, NIH, Bethesda, Maryland) and were spread by various news agencies. In addition, her lab showed that clustered micro-calcifications and other radiographic lesions, corresponding to BI-RAD criteria for human breast cancer screening, can be detected in the canine mammary glands. This work is important, as it will allow non-invasive evaluation of drug efficacy in prevention clinical trials. Furthermore, Dr. Mohammed lab has conducted genome-wide transcription and methylation studies of canine mammary lesions along the continuum of cancer progression in the same gland (with progressing and non-progressing DCIS) and identified 21 genes with differential methylation and altered expression including immune-related genes (NKG7, CCL5, IFGGD3 (IRGM), and

IFGGB2). The ultimate goal of this work, using this canine model, is to determine the mechanisms mediating the progression of DCIS to invasive cancer.

Dr. Mohammed (with significant contributions to activities related to cancer prevention among African women), along with colleagues from various organizations in Africa, reactivated the African Organization for Research and Training in Cancer (AORTIC) (www.aortic_africa.org) during the American Association for Cancer Research Annual Meeting in San Francisco, CA. AORTIC has subsequently become a pan-African cancer organization with a membership of approximately 800 MDs, PhDs, RNs, scientists, and others spanning five continents with over 100 countries represented. It has a clear mission to facilitate research and training and to provide relevant and accurate information on the prevention, early diagnosis, treatment, and palliation of cancer in Africa, primarily for effective healthcare delivery in remote clinics. Dr. Mohammed serves as a member of the executive council of AORTIC. To promote cancer research in Africa, Dr. Mohammed chair a session of cancer biology during the AORTIC cancer meeting and invite to the session prominent cancer investigators from Europe, USA and Africa and a session where she invite and involve all African diaspora researchers in dialogue in how to improve cancer research in Africa.

Dr. Mohammed has led a study in collaboration with her colleagues in Sudan at the Gezira University Cancer Center aimed at early detection of breast cancer in women villagers living in the rural areas of Sudan. The study focused on using local women volunteers to screen other women in their own village for breast abnormalities. The culturally appropriate approach has resulted in the detection of early stage breast cancer that was amenable to treatment. The study was published in Lancet Oncology (Ref. 38) and in podcasted at **http://download.thelancet.com/flatcontentassets/audio/lanonc/2013/lanonc_april.mp**. Dr. Mohammed has strong experience working in local settings in Africa because of her background and upbringing in Sudan and her keen interest in bringing science to tackling cancer in remote settings. In another project, in collaboration with Dr. Joseph Irudayaraj from the Department of Agriculture and Biological Engineering, Purdue University; Dr. Groesbeck Parham, oncogynecologist and implementation scientist at Zambia; Dr. Carla Chibwesha, oncogynecologist and clinical researcher, Zambia; and Chembio Diagnostic Systems Inc. (CDS) – industry partner with over 20 years of experience in prototype development, marketing, and commercialization of point-of-care technologies, Dr. Mohammed is addressing the challenges that hinder implementation of national screening programs in cervical cancer in low and middle income countries (LMICs) by developing a simple, colorimetric test, CERVBIO, for point-of-care (POC) quantitative cervical cancer screening. Interestingly, this test in addition to being sensitive and specific for invasive cervical cancer and its precursors, no specialized infrastructure or personnel will be required to perform the test, and it will be affordable for LMIC markets.

For her leadership in this effort to prevent cancer in Africa she was awarded numerous awards and certificates of appreciation for excellence and leadership in the field of breast cancer and health awareness in African countries. For example she recently received the African Diaspora Ambassador Award during the Harvard global health Catalyst, from Harvard Medical School, Boston, MA and the Pillar of Support Award – for Decade of support and personal commitment to stop cancer in African – awarded by the Forum of African First Ladies/Spouses against Cervical, Breast and Prostate Cancer. Dr. Mohammed is recognized nationally and internationally for her effort to build cancer research infrastructure in Africa and has been invited to give talks, chair conference session, and committees.

BRIAN R. OVERHOLSER

College of Pharmacy   **Department of Pharmacy Practice**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My research program is focused on the clinical pharmacology of cardiovascular drugs. The overall goal is to enhance the understanding of pathophysiological mechanisms and pharmacological factors influencing the response variability to cardiovascular active agents.

CHIWOOK PARK

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Proteins are dynamic molecules. Even under native conditions, they do not adopt a single static conformation. Rather, they access many different conformations in their native state ensemble. This native state ensemble includes small fluctuations around the native conformation, partially unfolded forms, and even globally unfolded forms. The distribution of these conformations and the kinetic barriers between the conformational states define the conformational energy landscapes of proteins. My research interest is investigating conformational energy landscapes of proteins and deciphering the relationship between the energetics of proteins and their biochemical functions, such as catalysis, signal transduction, and ligand binding. We use proteolysis as a major tool to probe protein structures and dynamics as well as conventional spectroscopic methods. We also use proteomics extensively for investigating energy landscapes of proteins on a system level.

CAROL POST

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)
- Tyrosine kinases
- Flavivirus capsid proteins
- synuclein

Research Interest and Expertise
Research interests of the Post group include the regulation and functional aspects of protein-protein interactions, enzymatic catalysis and activation, and protein structure. Multidimensional spin magnetic resonance methods are used to determine three-dimensional structures and internal dynamics of protein complexes. Computational methods are used to understand the structural basis for protein stability, protein-ligand binding energetics, enzymatic regulation and activity, and the mechanism of action of antiviral compounds.

TIMOTHY L. RATLIFF

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Prostate Cancer, Bladder Cancer, autoimmune disease

Molecular/Cellular Target(s)
Immune regulatory cells, prostate cancer cell, prostate stem cells

Research Interest and Expertise
Our laboratory focuses on understanding immune regulation and the development of alternative approaches to treating urologic cancers, primarily bladder and prostate cancers, through the modulation of anti-cancer immunity. Current studies focus on prostate inflammation, its immune regulation and its impact on prostate stem cells, gene expression in prostate tissue, cholesterol metabolism in prostate cancer and impact of inflammation on prostate cancer development. The intent is to develop a better understanding of the inflammatory factors contributing to cancer development and to use the information gained to develop novel approaches to treating prostate cancer through modulation of the immune response. Genetically modified mouse models are used to probe inflammation, immune regulation, the development of autoimmunity and anticancer effector mechanisms. Regulatory cells termed myeloid-derived suppressor cells have been linked to regulation of prostate inflammation and are observed early in genetically modified mouse spontaneous prostate tumor models. Determining how to control myeloid-derived suppressor cell function is a focus that is anticipated to provide a new approach to augmenting antitumor immunity. Likewise, understanding the impact of inflammation on prostate stem cells is anticipated to advance knowledge about the mechanisms of prostate growth and cancer development.

J. PAUL ROBINSON

College of Veterinary Medicine   **Department of Basic Medical Sciences**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The group focuses on interdisciplinary projects that cover basic biology through to practical biomedical engineering.

JEAN-CHRISTOPHE R OCHET

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Parkinson's disease

Molecular/Cellular Target(s)
Alpha-synuclein

Research Interest and Expertise
Research in the Rochet laboratory is aimed at understanding the role of protein aggregation in neurodegenerative disorders, with an emphasis on Parkinson's disease (PD). PD, an age-related neurodegenerative disorder that disrupts the lives of an estimated 5 million people worldwide, is manifested by classic motor symptoms including resting tremor, slowness of movement, rigidity, and postural instability. These symptoms result largely from a loss of dopaminergic neurons from the *substantia nigra* in the midbrain, and this neuronal loss is thought to involve oxidative stress and aggregation of the presynaptic protein α-synuclein (aSyn). Current therapies only temporarily relieve symptoms without slowing the underlying neurodegenerative disease. In addition, a large proportion of neurons have been destroyed by the time PD symptoms are detectable, and no therapies exist to reverse this damage. Accordingly, there is a critical need for neuroprotective strategies to help reduce the risk of PD.

Dr. Rochet's lab has taken the approach of characterizing gene products involved in aging and neurodegenerative disorders (e.g. alpha-synuclein, DJ-1), with the aim of elucidating mechanisms of neuronal death and dysfunction. His group's research involves an interdisciplinary approach with methods ranging from biochemical analyses of recombinant proteins to characterization of neurotoxic and neuroprotective mechanisms in cellular and animal models. Dr. Rochet's studies in models that reproduce key aspects of PD pathobiology have yielded new insights into genetic and chemical suppressors of neurodegeneration.

MOHAMED SELEEM

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Bacterial and Fungal

Molecular/Cellular Target(s)

Research Interest and Expertise
- Antibacterial and antifungal for treatment of Infectious diseases
- Molecular target identification of new antimicrobials
- Drug delivery and targeting of intracellular pathogens
- Animal model for infectious diseases
- Bacterial and Fungal biofilm and drug resistant
- Repurposing of existing drugs to find new uses outside the scope of the original medical indication
- Detection and rapid diagnostics of antimicrobial resistance

KAVITA SHAH

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Signal transduction at the cellular level refers to the perception and conversion of extracellular perturbations into intracellular signals that are transmitted to effectors, eventually resulting in an alteration in cellular activity and the gene expression profile. Deregulation of these processes is known to lead to several disease states such as cancer, neurodegenerative diseases, diabetes, vascular diseases, osteoporosis, autoimmune diseases and multiple others. Most of these key signaling events are mediated by members of large protein families like kinases and G proteins.

CYNTHIA STAUFFACHER

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My research interest is in using X-ray crystallography to study the details of large macromolecular systems where a set of proteins work together to perform a biological function. Membrane proteins are often organized into these large systems and are of particular interest, as very few membrane protein structures are known.

ANDY TAO

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The Tao research group focuses on the development and applications of biological mass spectrometry for functional proteomics. Examining changes in proteins of interest and their modifications within cells under different physiological conditions will offer insights into understanding cellular and molecular mechanisms that cannot currently be obtained through traditional biological studies that usually focus on the detailed analysis of individual biomolecules. Functional proteomics thus holds significant promise for the discovery of diagnostic or prognostic protein markers, for the detection of new therapeutic targets, and as a powerful tool to further our understanding of basic biological processes and mechanisms. The realization of these expectations relies on the development of robust and highly sensitive and specific methods to identify and quantify important proteins and their specific modifications.

ELIZABETH TAPAROWSKY

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Autoimmune and Inflammatory Disease
Allergies
Leukemia and Lymphoma

Molecular/Cellular Target(s)
AP-1 sub-family of basic leucine zipper transcription factors

Research Interest and Expertise
The precise regulation of gene transcription is critical to the growth and development of all organisms and thus is frequently targeted by mutations accumulating in neoplasms progressing towards a cancerous state. Current projects in the lab are focused on BATF, a member of the Activator Protein-1 (AP-1) family of basic leucine zipper (bZIP) transcription factors that functions as a regulator of AP-1 mediated transcription. BATF is expressed exclusively in cells of the immune system and we have generated a number of mouse models in which the level of BATF protein expression in these cells is altered. The phenotypes observed in these mice indicate that BATF function is required for the proper development of TH2, TH17 and TFH cells. Additionally, mis-expression of BATF in B cells leads to a dramatic change in the ability of B cells to recognize and produce antigen-specific immunoglobulins. Our mouse models provide the starting material for RNA-seq analyses aimed at identifying BATF target genes. The long-term goal of our work is to establish how molecular regulators of transcription such as BATF might be manipulated to reverse the dysfunction of immune cells that contributes to inflammation, autoimmune disease and cancer.

DARCI TRADER

College of Pharmacy					**Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
_____ Diagnostics
____X__ Target Discovery & Characterization
____X__ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
____X__ Cancer
_____ Diabetes/Obesity/Metabolic Disease
____X__ Immunology/Inflammatory/ Infectious Disease
____X__ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Parkinson's, Huntington's, HIV, Hepatitis C, Melanoma, Lymphoma

Molecular /Cellular Target(s)
In cancer we are targeting Rpn-6, an essential component of the 26S proteasome, and gankyrin, a chaperone folding protein essential for forming the proteasome. Our interest in protein-accumulation diseases, such as Parkinson's and Huntington's disease, is focused on developing new small molecule agonists that stimulate the 20S proteasome to degrade the protein fibrils associated with these diseases. For targeting HIV and hepatitis we are working towards discovering peptidomimetics that can prevent proteins associated with the previously mentioned viruses from inhibiting the immunoproteasome.

Research Interest and Expertise
Our main research interests lie in targeting the proteasome, through inhibition in cancer cells and stimulation in protein accumulation diseases. Additionally, we are also working towards developing small molecules that rescue the immunoproteasome from inhibition by virally-produced proteins and how to target this proteasome isoform as a prodrug release mechanism.

RICHARD M. VAN RIJN

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Alcohol use disorder, anxiety disorder, depressive disorder, chronic pain disorder

Molecular/Cellular Target(s)
Opioid receptor signal transduction

Research Interest and Expertise
In my laboratory we use innovative strategies and techniques to provide a better understanding of the molecular mechanism by which G-protein coupled receptors (GPCRs) function, propagate signal transduction and modulate behavior. GPCRs form the largest protein family in the human genome and are crucial in relaying extracellular information into the cell. GPCRs are involved in many diverse physiological responses, including light perception, taste, immune responses, cardiovascular activity and neurotransmission. Currently, 30-40% of all drugs, approved by the Federal Drug Administration, target GPCRs. New insights into how GPCRs work have re-energized the study of these receptors. Specifically, we study biased receptor signaling and GPCR heteromerization and potential overlap of these concepts and their roles in (patho)-physiological responses.

We frequently use the delta opioid receptor as model receptor for our studies. We use a combination of in vitro cell culture assays, with in vivo mouse behavioral models and ex vivo assays to perform translational/pre-clinical research with the goal of proposing and developing new therapeutic drugs that may have better potency, efficacy and fewer side effects. Our main focus is on neurological disorders, with an emphasis on drug addiction and co-morbid mood and anxiety disorders as well as chronic pain conditions. Our primary research project is aimed at developing novel delta opioid receptor selective drugs that can treat alcohol use disorders, by simultaneously reducing alcohol craving and (alcohol-withdrawal-induced) anxiety. Additional projects involve investigations into the risk of adolescent consumption of alcohol mixed energy drinks, and the study of delta opioid receptors in models of alcohol withdrawal induced hyperalgesia as well as diabetic neuropathic pain and opioid induced hyperalgesia.

VAL J. WATTS

College of Pharmacy   **Department of Medicinal Pharmacy & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Neuropathic/inflammatory Pain
- Parkinson's disease
- Drug Addiction
- Excitotoxicity
- Aging
- Infectious disease

Molecular/Cellular Target(s)
- D1 and D2 Dopamine Receptors
- Adenylyl Cyclases (1-9)
- Invertebrate Receptors

Research Interest and Expertise
The research in our laboratory is designed to use a multi-disciplinary approach, combining molecular biology, pharmacology, and biochemistry, to study the pharmacology and signaling mechanisms of G protein-coupled receptors (GPCRs). The fact that GPCRs are the target of approximately 50% of today's clinically used drugs emphasizes further the relevance of these studies. Much of the work in our lab has focused on members of the dopamine, serotonin, and adenosine receptor families. Studies have examined the pharmacology of these receptors including the characterization of novel ligands that activate these receptors as well as examining the receptors' ability to modulate the activity of their primary effector, the enzyme adenylyl cyclase. Recent efforts have focused on exploring the "druggability" of membrane adenylyl cyclase isoforms for human conditions. Additional efforts include drug discovery in the area of insecticides with Dr. Catherine Hill (Entomology). Together we have identified more than 100 different GPCRs in the genomes of the *Aedes aegypti* mosquito vector of Zika and dengue fever, the *Anopheles gambiae* mosquito vector of malaria, the *Culex quinquefasciatus* mosquito vector of filariasis and encephalitis, and the *Ixodes scapularis* tick vector of Lyme disease as potential drug targets. In summary, the goals of Dr. Watts' research are to provide important information describing the biochemical changes associated with both short- and long-term activation of GPCRs and to identify novel novel receptor ligands and signaling pathways.

ALEXANDER WEI

College of Science   **Department of Chemistry**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Cancer, ovarian and bladder (using orthotopic animal models)
- Bacterial infections

Molecular/Cellular Target(s)
- SKOV3 cells
- Tumor-associated macrophages
- *Bacillus anthracis*
- *Chlamydia trachomatis*
- *Listeria monocytogenes*
- *Pseudomonas aeruginosa*
- *Salmonella enterica*
- *Staphylococcus aureus* / MRSA
- *Streptococcus pneumoniae*
- *Yersinia enterocolitica*
- Albumin receptors
- Hemin receptors (Isd, etc.)
- Siderophore receptors (FoxA, FhuD2, FhuE)

Research Interest and Expertise
- Targeting ligands for pathogen detection and treatment, with particular interests in respiratory-tract and sexually transmitted infections.
- Targeted photodynamic therapy/inactivation (PDT / PDI) using photoactive hemin derivaties
- Identifying key serum proteins as mediators in nanoparticle tracking and cell uptake
- siRNA uptake and release in ovarian cancer cells

MICHAEL WENDT

College of Pharmacy   **Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Breast cancer

Molecular /Cellular Target(s)
EGFR, Her2, FGFR

Research Interest and Expertise
Research in the Wendt is focused on the role of epithelial-mesenchymal transition (EMT) in breast cancer metastasis. EMT is associated with resistance to several chemotherapeutic drugs and targeted molecular compounds. Recent studies by the Wendt has identified fibroblast growth factor receptor (FGFR) as major driver of drug resistance, particularly in the metastatic setting. Furthermore, cells that have undergone EMT become preferentially sensitive to inhibition of FGFR kinase activity. Work in the Wendt utilizes 3D cell culture and *in vivo* disease modeling in combination with an array of small molecule and biological approaches to optimize FGFR targeting for the treatment of metastatic and drug resistant breast cancer.

DANZHOU YANG

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)
DNA secondary structures and interactive proteins

Research Interest and Expertise
DNA-targeted anticancer drugs and structure-based rational drug design; Structures and functions of DNA secondary structures as cancer-specific molecular targets; DNA G-quadruplex secondary structures and their interactions with small molecule drugs and proteins; DNA-targeted anticancer drugs that inhibit transcription factors and topoisomerases. High-field NMR macromolecule structure determination.

DRUG SYNTHESIS/
OPTIMIZATION

STEPHEN B. ADAMS

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My interests are in developing and testing novel methods of local antimicrobial delivery for treatment of orthopedic infections, which include septic synovitis and osteomyelitis. I am currently involved in research on drug delivery using absorbable gels and non-absorbable delivery vehicles, intravenous and intraosseous regional limb perfusion, and use of continuous infusion pumps to delivery drugs directly to site of infections. I would like to develop a delayed absorbable (7-10 days) vehicle for delivery of antimicrobial and anti- inflammatory drugs directly into infected joints. I am also doing research on needle insertion techniques that will minimize contamination of joints with tissue and hair debris following injections of drugs into the joints.

ARUN BHUNIA

College of Agriculture   Department of Food Science

College of Veterinary Medicine   Department of Comparative Pathobiology

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Pathogen and Toxin Detection:
- Biosensor technologies including laser light scattering, mammalian cell-based, and fiber optic sensors for rapid and high throughput screening of live pathogens and toxins in food
- Development of biorecognition including antibodies, receptors, ligands, and microbiological growth media

Host-Pathogen Interaction and Control Strategies Using Probiotics :
- Understanding the molecular and cellular mechanism of *Listeria monocytogenes* colonization and translocation through epithelial barrier during intestinal phase of infection
- Prevention and control using bioengineered probiotic and antimicrobial peptide loaded biocompatible nano-carrier

JEAN CHMIELEWSKI

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Diseases resulting from pathogenic bacteria, including *Mycobacterium tuberculosis, MRSA, VRSA, Salmonella, Shigella, Listeria, Brucella, Acinetobacter baumannii,* and others
- Bacteria biofilms
- HIV reservoirs
- Drug-resistant malaria

Molecular/Cellular Target(s)
- Intracellular pathogenic bacteria with an emphasis on subcellular localizations within mammalian cells
- HIV reservoirs in the brain
- Drug resistant *P. falciparum* with an emphasis on the chloroquine-resistance transporter (PfCRT)

Research Interest and Expertise
- We have expertise in the design and synthesis of novel non-membrane lytic antibacterial peptides that penetrate mammalian cells and their reversible conjugates with other antimicrobial agents.
- We have developed potent Trojan horse inhibitors of multidrug resistance transporters present at the blood-brain-barrier that revert to therapeutic agents within mammalian cells. This strategy can be used to improve the uptake of therapies (antiviral and anti-cancer) into the brain for HIV reservoir and tumor eradication.
- We have designed novel inhibitors of PfCRT within *P. falciparum* that effectively reverses drug resistance in cell culture with anti-malaria activity and show efficacy in a mouse model.

GAURAV CHOPRA

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The overarching theme of our research is to develop and verify multiscale chemical models of cellular systems for therapeutic discovery by integrating sequence, structure, function, interaction, and systems-based methodologies. Our lab is a hybrid computational and wet-lab to identify drugs by taking into account all possible interactions between biomolecules, namely, interactome based drug discovery. We will focus on designing disease-specific compounds interacting with multiple proteomes and biomolecular interfaces (protein/protein and protein/nucleic-acid interfaces) and identifying compounds that change the fate and proliferation of cell types *in vivo* by developing structural/chemical signatures of individual cells. Specifically, we will start by repurposing human approved compounds and designing new compounds to perturb the immune system to identify therapeutics for cancer and autoimmune diseases. Developing computational chemistry/biology tools and using physical chemistry principles fuel the research work that we do. The experimental validations of the computational predictions will be done in our laboratory, together with existing and new collaborators. Our lab will make use of high performance computing to generate predictions, use high-throughput robotic set-up for compound screening on cell assays, use molecular biology techniques & sequencing (RNA-seq, ChIP-seq, ATAC-seq etc.), flow cytometry instrumentation as needed to select and test computational and *in vitro* validated predictions in mice.

MARK CUSHMAN

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Inhibitors and modulators of a wide variety of other targets are also being designed and synthesized, including topoisomerase II, tyrosyl-DNA phosphodiesterases 1 and 2, and Janus kinases 1, 2, and 3.

MINGJI DAI

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___ X __ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The goal of our research program is to innovate in both the strategy and methodology of organic synthesis, and apply them to solve problems of biological and medical importance and ultimately impact human health.

We work on both natural and unnatural molecules with particular potential for the treatment of cancer, CNS disorders and infectious diseases. We view the completion of a synthesis as the beginning of a larger and deeper scholarly inquiry. It would enable us to profile the biology of the selected natural products and rationally designed small molecules, decipher their mechanism of actions, and optimize the lead compounds into biological probe and novel therapeutics development. We also use our new synthetic methodologies to create novel, diverse, complex and bio-functional small-molecule libraries in order to target new disease targets, particularly those important, but "undruggable" ones, such as protein-protein interactions and transcription factors

Our research program involves the fields of organic synthesis, chemical biology, and drug discovery.

DANIEL P. FLAHERTY

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Gram-negative infectious disease
Staphylococcus aureus (MRSA) infection
Breast cancer
B-cell lymphoma

Molecular/Cellular Target(s)
Ribonuclease E (Gram-negative pathogenic target)
Ribonuclease P protein (*S. aureus* target)
Ubiquitin C-terminal Hydrolase L1 (metastatic breast cancer and B-cell lymphoma target)

Research Interest and Expertise
Our laboratory employs a blend of traditional ligand-based medicinal chemistry with structure-based design techniques in early to intermediate stage drug discovery. We are primarily interested in novel therapeutic targets in the areas of infectious disease and cancer. We utilize our expertise to pursue quality modulators worthy of advancing as leads compounds. Our laboratory applies a tri-lateral approach to drug discovery incorporating fragment-based, traditional high-throughput screen based, and virtual HTS based techniques. We are heavily involved in screening and hit selection stages as well as design and synthesis of analogs. Furthermore, we provide a fragment-based screening platform in our lab that is available for investigators who would like to pursue a fragment-based approach against their targets and are in need of medicinal chemistry support.

R.EDWIN GARCÍA

College of Engineering   **Department of Materials Engineering**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our group is interested in the development, integration and application of discrete and continuous analytical and numerical models to predict the processing-properties relationships and the mechanical reliability of pharmaceutical tablets. Of great interest is also the development of models and theories to design the dissolution and precipitation kinetics of pharmaceutical materials.

ARUN GHOSH

College of Science   Departments of Chemistry and Medicinal Chemistry & Molecular Pharmacology

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My research group is involved in multidisciplinary research projects in the areas of synthetic organic, bioorganic and medicinal chemistry. Of particular interest, we are investigating:

- Synthesis and biological studies of Bioactive Natural Products
- Design and synthesis of Molecular Probes for Bioactive Peptides and Proteins
- Structure-based Design of Enzyme Inhibitors for Alzheimer's Disease and AIDS
- Development of Asymmetric methodologies (Catalytic and Stoichiometric)
- Multicomponent Reactions (MCR) for Highly Functionalized Products

CATHERINE HILL

College of Agriculture   **Department of Entomology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Genomics of Arthropod Vectors of Human Disease: Our research program is focused on the genomics of arthropod vectors of human disease such as malaria, West Nile virus and Lyme disease. The overall objective of this research is the development of novel strategies to control arthropod disease vectors.

Mosquito G Protein-coupled Receptors: Mosquito transmitted diseases such as malaria and dengue cause significant morbidity and mortality worldwide. Insecticide and drug resistance problems and lack of effective vaccines necessitate the development of novel approaches for mosquito and mosquito-borne disease control. G protein-coupled receptors (GPCRs) are highly desirable molecular targets due to their function in many fundamental biological processes such as chemo- and photoreception, development, neuro-physiology and stress response. We use bioinformatic, molecular and comparative genomics approaches to identify and characterize GPCRs in two major mosquito vectors of disease, the malaria mosquito Anopheles gambiae and the yellow fever mosquito, Aedes aegypti.

Genomics of Ixodid Ticks: Ticks (subphylum Chelicerata, class Arachnida) transmit a diverse array of infectious agents and are second only to mosquitoes as vectors of human pathogens. Current knowledge of ixodid tick biology is limited and the genetic basis of phenotypes such as host location, vector competence and insecticide resistance is poorly understood. We are currently leading an international effort funded by the National Institutes of Health to sequence the first tick genome, namely the Lyme disease tick, Ixodes scapularis. In the USA, I. scapularis transmits the causative agents of Lyme disease, babesiosis and human granulocytic anaplasmosis. The Ixodes Genome Project (IGP), represents an unparalleled resource for studying tick biology and tick-host-pathogen relationships, and identifying novel targets for tick and tick-borne disease control. We are currently undertaking genomic and cytogenetic studies in the Ixodidae to understand tick chromosome biology and genome architecture and to facilitate genome assembly.

DANIEL F. HOGAN

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)
Cardiac, vascular, thrombosis, valvular

Molecular/Cellular Target(s)
TGF-B and valvulopathy

Research Interest and Expertise
Our research focuses on cardiovascular therapeutics, including heart failure and antithrombotics. We have expertise in veterinary clinical trials, pre-clinical animal trials and animal modeling.

CASEY KRUSEMARK

College of Pharmacy   **Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Cancer

Molecular /Cellular Target(s)
Protein Kinases (broadly)
chromodomains

Research Interest and Expertise
Our work centers on the use of DNA-encoding approaches for discovery and development of biologically active small molecules. In one area, we utilize DNA-programmed combinatorial chemistry to construct novel chemical libraries of DNA-encoded small molecules. We are using these libraries to develop peptidomimetic inhibitors of protein-protein interactions. In a second area, we have developed a DNA-based assay approach for biochemical assays including several enzymatic assays and ligand binding assays. We work to apply these assays in proteomic activity profiling and in small molecule screening.

Our lab has extensive expertise in DNA-encoded chemical approaches and in design of DNA-compatible combinatorial chemical libraries. Additional expertise lies generally in the areas of bioconjugation chemistry, peptide/peptidomimetic synthesis, and DNA sequence analysis.

MARKUS LILL

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
___X___ ADME/DMPK/Tox
___X___ Other: Computational Drug Design

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Hypoglycemia, alcohol abuse, pain

Molecular/Cellular Target(s)
Glucagon receptor, delta opoid receptor, PCNA, adenylyl cyclase, cytochrome P450 enzymes

Research Interest and Expertise
My current research has been dedicated to the development and application of molecular modeling techniques to gain insight into the processes associated with protein-ligand and protein-protein binding. Current research activities are focused on addressing serious shortcomings of present computational approaches for modeling protein-ligand and protein-protein association: protein flexibility, entropic contributions associated with the dynamics of the complex, solvation effects, and a reliable quantification of binding affinities and kinetic properties. I have been leading the development of nine different software products, some of them freely available for download from our group website. Computational methods are applied in collaboration with experimental groups focusing on CYP-mediated drug metabolism, GPCRs, PCNA and other cancer-related targets.

MARK LIPTON

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Drug Resistant Bacterial infections
- Prostate cancer
- Prader-Willi Syndrome

Molecular/Cellular Target(s)
- Type II HMG CoA Reductase
- FabF
- Ghrelin O-Acyl Transferase

Research Interest and Expertise
Our research effort combines the disciplines of organic synthesis, bioorganic chemistry and molecular modeling. Current projects in the Lipton group fall into two areas:

Development of novel synthetic methodology.
We are currently working on the development of new methods in the area of solid phase synthesis of larger and head-to-tail cyclized peptides.

Design and synthesis of biologically active molecules.
Ongoing projects include the development of dual-action antimicrobials that target drug-resistant bacterial pathogens. These molecules are designed to inhibit two essential enzymes, type II HMG CoA Reductase and FabF. We also are making peptidic inhibitors of Ghrelin O-Acyl transferase (GOAT), an enxyme essential for the production of functional peptide hormone ghrelin. Ghrelin is associated with hunger as well as glucose homeostasis and it is believed that inhibition of GOAT may lead to new treatments for diabetes. A third project area is the production of a targeted chemotherapeutic agent designed to combat refractory prostate cancers through the conjugation of a cholesterol-depleting drug to DUPA, an agent that targets Prostate Specific Antigen.

JEREMY R. LOHMAN

College of Agriculture   **Department of Biochemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Natural products are one of our best sources of drugs and drug leads. Natural products from bacteria and fungi have the benefit of being supplied through fermentation, in contrast to sources such as plants and sponges that suffer from slow-growth and ecological concerns such as overharvesting. Natural products exist to benefit their hosts, as such some natural product drugs are not ideal for human use. Synthetic derivatives of these natural products often have superior activity, but cost significantly more to produce. Therefore finding methods to generate natural product derivatives through fermentation is an important goal. Combinatorial biosynthesis is the process of creating natural products through the genetic engineering of producing organisms to generate natural product derivatives. Currently, the easiest method for producing natural product derivatives is through deletion of genes encoding enzymes that add functionality to a natural product. However, many enzymes are essential to building the core of a natural product, limiting the number of derivatives created through gene deletion. Another approach is to add enzymes to the pathway or to alter the substrate specificity of enzymes within the biosynthetic pathway. The major hurdle to the second approach is a lack in our current understanding of the structure-function relationships of these enzymes. Our lab is seeking to understand the sequence-structure-function relationships in families of biosynthetic enzymes, so that our knowledge will be of use in engineering multiple biosynthetic pathways. Through reverse engineering the sequence-structure-function relationships of biosynthetic enzyme families we will engineer new substrate specificity into enzymes within pathways, and thus enable true combinatorial biosynthesis. Using bioinformatics, x-ray crystallography and enzymology together, we will discover how sequence-structure-function is related within families of biosynthetic enzymes. We will have genes synthesized that encode proteins with engineered substrate specificity and probe their activities in vitro. Finally using genetics we will introduce the engineered synthetic genes into natural product producers to isolate natural product derivatives.

PHILIP LOW

College of Science										**Department of Chemistry**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Cancers of the ovaries, prostate, cervix, kidneys, colon, lung, breast
- Autoimmune/Inflammatory diseases such as rheumatoid arthritis, atherosclerosis, pulmonary fibrosis, Crohn's disease, osteoarthritis, psoriasis
- Influenza, malaria, HIV
- Obesity, diabetes
- Sickle cell disease

Molecular/Cellular Target(s)
Folate receptors (alpha, beta, and delta), carbonic anhydrase IX, CCK2R, prostate specific membrane antigen (PSMA), luteinizing hormone-releasing hormone (LHRH), bombesin receptor, aminopeptidase N, fibroblast activation protein, neuraminidase, red blood cell kinases, band 3

Research Interest and Expertise
To date, we have developed targeted therapeutic and/or imaging agents for a variety of cancers (e.g. ovarian, lung, kidney, endometrial, breast and prostate), several inflammatory diseases (rheumatoid arthritis, Crohn's disease, osteoarthritis, organ transplant rejection, psoriasis, etc.), diabetes, atherosclerosis and a variety of infectious diseases (e.g. malaria, influenza virus, Staphylococcus, Pseudomonas, etc.). Eleven drugs stemming from research in my lab are currently undergoing human clinical trials (mainly at Endocyte, Inc., HuLow, and On Target Laboratories, three companies that I have founded).

Interests include: Imaging of malignant diseases; isolation and analysis of circulating tumor cells; fluorescence guided surgery using tumor-targeted fluorescent dyes; and personalized medicine, therapies for infectious diseases.

ANDREW MESECAR

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The fundamental research interests of the Mesecar lab involve elucidating the molecular mechanisms and function of therapeutic enzymes and proteins. We wish to understand at the molecular level how enzymes and proteins recognize their substrates, catalyze their requisite chemical reactions, and trigger signal-transduction cascades. Our ultimate goal is to utilize this fundamental scientific knowledge to develop new therapeutics to treat cancer and infectious diseases.

To achieve these goals, we integrate a variety of state-of-the-art research tools and approaches including X-ray crystallography, enzyme chemistry and kinetics, molecular biology, bioinformatics, mass spectrometry, and computational chemistry to gain an understanding of the role of protein dynamics and conformational change in molecular recognition and catalysis. We then couple these technologies with high-throughput screening and structure-based design to develop compounds capable of modulating the activity of enzymes and receptors involved in cancer chemoprevention, cancer cell proliferation, cell longevity, and bacterial and viral pathogenesis.

P.V. RAMACHANDRAN

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Design and syntheses of complex molecular targets for the treatment of cancer, inflammation, and central nervous system disorders. Our current efforts focus on (1) the preparation of fluorinated analogs of the potent tubulin polymerizing agent, (-)-dictyostatin (2) the synthesis and biology of several fluorinated carbohydrates and nucleosides for the treatment of pancreatic cancer in collaboration with Indiana University School of Medicine. (3) synthesis of optically active GABA agonists/antagonists/potentiators and assay on various ion channels and GABA receptors for the treatment of epilepsy, neuropathic pain, and addiction through collaborations (Purdue Medicinal Chemistry Department and the Stark Neurosciences Research Institute).

HERMAN SINTIM

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
1) Acute Myeloid Leukemia
2) Pancreatic Cancer
3) Gram-(-) and (+) infections

Molecular/Cellular Target(s)
1) Kinases
2) G-quadruplexes
3) Cyclic Dinucleotide Synthases
4) Cyclic Dinucleotide Phosphodiesterases

Research Interest and Expertise
Research interests are new anticancer agents, the chemical biology of bacterial communication, virulence factors production and biofilm formation, the discovery of antibiotics with novel modes of action, the catalytic cycle of total syntheses of complex bioactive molecules, and the discovery of reaction methodologies and new DNA nanostructures and machines for bioanlyte detection.

DARCI TRADER

College of Pharmacy   **Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
_____ Diagnostics
____X__ Target Discovery & Characterization
____X__ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
____X__ Cancer
_____ Diabetes/Obesity/Metabolic Disease
____X__ Immunology/Inflammatory/ Infectious Disease
____X__ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Parkinson's, Huntington's, HIV, Hepatitis C, Melanoma, Lymphoma

Molecular /Cellular Target(s)
In cancer we are targeting Rpn-6, an essential component of the 26S proteasome, and gankyrin, a chaperone folding protein essential for forming the proteasome. Our interest in protein-accumulation diseases, such as Parkinson's and Huntington's disease, is focused on developing new small molecule agonists that stimulate the 20S proteasome to degrade the protein fibrils associated with these diseases. For targeting HIV and hepatitis we are working towards discovering peptidomimetics that can prevent proteins associated with the previously mentioned viruses from inhibiting the immunoproteasome.

Research Interest and Expertise
Our main research interests lie in targeting the proteasome, through inhibition in cancer cells and stimulation in protein accumulation diseases. Additionally, we are also working towards developing small molecules that rescue the immunoproteasome from inhibition by virally-produced proteins and how to target this proteasome isoform as a prodrug release mechanism.

DANZHOU YANG

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

DNA secondary structures and interactive proteins

Research Interest and Expertise

DNA-targeted anticancer drugs and structure-based rational drug design; Structures and functions of DNA secondary structures as cancer-specific molecular targets; DNA G-quadruplex secondary structures and their interactions with small molecule drugs and proteins; DNA-targeted anticancer drugs that inhibit transcription factors and topoisomerases. High-field NMR macromolecule structure determination.

ZHONG-YIN ZHANG

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Lung cancer, melanoma, glioblastoma, pancreatic cancer and other malignancies.
Lupus, rheumatoid arthritis and other autoimmune disorders
Diabetes and obesity
Tuberculosis

Molecular/Cellular Target(s)
SHP2, PRL, PTP1B, Lyp, LMW-PTP, mPTPA and mPTPB

Research Interest and Expertise
Research in this laboratory spans the disciplines of chemistry and biology with an emphasis on the structure and function of protein tyrosine phosphatases (PTPs), roles of PTP in normal physiology and pathological conditions, and the design and synthesis of PTP inhibitors as chemical probes to interrogate PTP function and as novel therapeutics.

- Portfolio of PTP inhibitors for oncology, diabetes, autoimmune disorders and infectious diseases
- PTP-based drugs will be first-in-class
- Recognized world leader in PTP chemistry and biochemistry
- Unparalleled expertise in the PTP space - over 30 years of experience in the area
- PTP-dedicated lab with substantial medicinal chemistry, structure-based design, structural biology and molecular modeling, assay development, high throughput screening, cell biology and in vivo testing.
- Largest collection of PTPs and assays for selectivity profiling

WEI ZHENG

College of Health and Human Services   **Department of Health Sciences**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
- Molecular mechanisms, biomarkers and chelation therapy of manganese (Mn)-induced Parkinsonian disorder.
- Molecular mechanisms by which lead (Pb) exposure alters brain transport and homeostasis of beta-amyloid, which contributes to the etiology of Alzheimer's disease.
- Adult neurogenesis in metal-induced neurotoxicities and contributions of brain barrier systems in adult neurogenesis.
- Transport of substances (metals, polypeptides, and drug molecules) by the blood-brain barrier and blood-CSF barrier.
- Integrity of brain barriers in neurodegenerative diseases and obesity-associated neurobehavioral alterations.

DELIVERY/ FORMULATIONS

STEPHEN B. ADAMS

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My interests are in developing and testing novel methods of local antimicrobial delivery for treatment of orthopedic infections, which include septic synovitis and osteomyelitis. I am currently involved in research on drug delivery using absorbable gels and non-absorbable delivery vehicles, intravenous and intraosseous regional limb perfusion, and use of continuous infusion pumps to delivery drugs directly to site of infections. I would like to develop a delayed absorbable (7-10 days) vehicle for delivery of antimicrobial and anti-inflammatory drugs directly into infected joints. I am also doing research on needle insertion techniques that will minimize contamination of joints with tissue and hair debris following injections of drugs into the joints.

JI-XIN CHENG

College of Engineering   **Department of Biomedical Engineering**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Cancer (prostate, pancreatic, lung, colon, ovarian)
- Bloodstream infections
- Traumatic spinal cord injury

Molecular/Cellular Target(s)
- ACAT-1 inhibition for suppression of cancer growth and metastasis
- Anti-inflammation agents for treatment of spinal cord injury
- Glucose and lipid metabolism in fungal and bacterial cells

Research Interest and Expertise
The mission of our research program is developing label-free imaging technologies to enable improved early diagnosis and/or precise treatment of human diseases. With integrated expertise in physics, chemistry, biology, medicine and entrepreneurship, our 3D research program is devoted to:

- Development of label-free molecular spectroscopic imaging tools
- Discovery of new biology and drug targets at single cell level
- Device for early molecule-based diagnosis and surgery guidance

MICHAEL CHILDRESS

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Lymphomas
- Spontaneous canine cancer models

Molecular/Cellular Target(s)

Research Interest and Expertise
My primary research interest is in canine and feline hematopoietic neoplasia, particularly canine lymphomas. I am a board-certified veterinary oncologist with extensive experience in the clinical management of canine and feline cancers.

JEAN CHMIELEWSKI

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Diseases resulting from pathogenic bacteria, including *Mycobacterium tuberculosis, MRSA, VRSA, Salmonella, Shigella, Listeria, Brucella, Acinetobacter baumannii,* and others
- Bacteria biofilms
- HIV reservoirs
- Drug-resistant malaria

Molecular/Cellular Target(s)
- Intracellular pathogenic bacteria with an emphasis on subcellular localizations within mammalian cells
- HIV reservoirs in the brain
- Drug resistant *P. falciparum* with an emphasis on the chloroquine-resistance transporter (PfCRT)

Research Interest and Expertise
- We have expertise in the design and synthesis of novel non-membrane lytic antibacterial peptides that penetrate mammalian cells and their reversible conjugates with other antimicrobial agents.
- We have developed potent Trojan horse inhibitors of multidrug resistance transporters present at the blood-brain-barrier that revert to therapeutic agents within mammalian cells. This strategy can be used to improve the uptake of therapies (antiviral and anti-cancer) into the brain for HIV reservoir and tumor eradication.
- We have designed novel inhibitors of PfCRT within *P. falciparum* that effectively reverses drug resistance in cell culture with anti-malaria activity and show efficacy in a mouse model.

VINCENT JO DAVISSON

College of Pharmacy **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Breast, Bone, Colon, Ovarian and Prostate carcinomas

Molecular/Cellular Target(s)

Research Interest and Expertise
Our primary interests are at the intersection of chemical and systems biology to enhance the drug discovery and development process. The research group uses both hypothesis-driven and technology-focused discovery approaches to address therapeutic strategies for unmet needs in treating several cancer diseases, emerging viral infections, and neurodegenerative diseases. We engage a number of collaborative efforts to enhance the overall approaches to addressing these objectives.

MARXA FIGUEIREDO

College of Veterinary Medicine **Department of Basic Medical Sciences**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Prostate cancer bone metastasis, Inflammatory Arthritis, cartilage repair in osteoarthritis

Molecular/Cellular Target(s)
Interleukin-27, Pigment Epithelium Derived Factor, Laminin Receptor 1

Research Interest and Expertise
Our laboratory aims to understand the interactions between the skeletal and immune systems with the goal to develop novel therapeutic applications. We focus on integrating biological mechanisms with development of strategies that can leverage the immune system to simultaneously promote restoration of bone and alter immune responses to control inflammation or cell viability. Our therapeutic modalities build on multifunctional osteo-immune cytokines, which can be targeted to bone or inflammatory cells in order to exert regenerative effects.

R. EDWIN GARCÍA

College of Engineering   **Department of Materials Engineering**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our group is interested in the development, integration and application of discrete and continuous analytical and numerical models to predict the processing-properties relationships and the mechanical reliability of pharmaceutical tablets. Of great interest is also the development of models and theories to design the dissolution and precipitation kinetics of pharmaceutical materials.

ARUN GHOSH

College of Science   **Departments of Chemistry and Medicinal Chemistry & Molecular Pharmacology**

Category of Research

_____ Diagnostics

_____ Target Discovery & Characterization

___X___ Drug Synthesis/Optimization

___X___ Delivery/Formulations

_____ In Vivo Disease Models

_____ ADME/DMPK/Tox

_____ Other

General Disease Area(s)

___X___ Cancer

___X___ Diabetes/Obesity/Metabolic Disease

___X___ Immunology/Inflammatory/ Infectious Disease

_____ Neurological Disorder/Trauma

_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise

My research group is involved in multidisciplinary research projects in the areas of synthetic organic, bioorganic and medicinal chemistry. Of particular interest, we are investigating:

- Synthesis and biological studies of Bioactive Natural Products
- Design and synthesis of Molecular Probes for Bioactive Peptides and Proteins
- Structure-based Design of Enzyme Inhibitors for Alzheimer's Disease and AIDS
- Development of Asymmetric methodologies (Catalytic and Stoichiometric)
- Multicomponent Reactions (MCR) for Highly Functionalized Products

CATHERINE HILL

College of Agriculture   **Department of Entomology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Genomics of Arthropod Vectors of Human Disease: Our research program is focused on the genomics of arthropod vectors of human disease such as malaria, West Nile virus and Lyme disease. The overall objective of this research is the development of novel strategies to control arthropod disease vectors.

Mosquito G Protein-coupled Receptors: Mosquito transmitted diseases such as malaria and dengue cause significant morbidity and mortality worldwide. Insecticide and drug resistance problems and lack of effective vaccines necessitate the development of novel approaches for mosquito and mosquito-borne disease control. G protein-coupled receptors (GPCRs) are highly desirable molecular targets due to their function in many fundamental biological processes such as chemo- and photoreception, development, neuro-physiology and stress response. We use bioinformatic, molecular and comparative genomics approaches to identify and characterize GPCRs in two major mosquito vectors of disease, the malaria mosquito Anopheles gambiae and the yellow fever mosquito, Aedes aegypti.

Genomics of Ixodid Ticks: Ticks (subphylum Chelicerata, class Arachnida) transmit a diverse array of infectious agents and are second only to mosquitoes as vectors of human pathogens. Current knowledge of ixodid tick biology is limited and the genetic basis of phenotypes such as host location, vector competence and insecticide resistance is poorly understood. We are currently leading an international effort funded by the National Institutes of Health to sequence the first tick genome, namely the Lyme disease tick, Ixodes scapularis. In the USA, I. scapularis transmits the causative agents of Lyme disease, babesiosis and human granulocytic anaplasmosis. The Ixodes Genome Project (IGP), represents an unparalleled resource for studying tick biology and tick-host-pathogen relationships, and identifying novel targets for tick and tick-borne disease control. We are currently undertaking genomic and cytogenetic studies in the Ixodidae to understand tick chromosome biology and genome architecture and to facilitate genome assembly.

DANIEL F. HOGAN

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)
Cardiac, vascular, thrombosis, valvular

Molecular/Cellular Target(s)
TGF-B and valvulopathy

Research Interest and Expertise
Our research focuses on cardiovascular therapeutics, including heart failure and antithrombotics. We have expertise in veterinary clinical trials, pre-clinical animal trials and animal modeling.

CHRISTINE HRYCYNA

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The overall goal of my research program is to understand the mechanisms and roles of important eukaryotic integral membrane proteins that are fundamental to human health and disease. My multidisciplinary work successfully integrates the tools of biochemistry, molecular biology, cell biology and biophysical chemistry to define how these membrane proteins recognize their substrates and how they operate at the molecular level. We also develop ways to use our mechanistic knowledge to create pharmacological agents to modulate the activities of these important proteins. Specifically, I focus on three major areas: 1) the membrane-associated enzymes involved in the posttranslational processing of) the human ATP binding cassette (ABC) transporters ABCG2 and P-glycoprotein, and (3) drug discovery for inhibitors of human Icmt and for human ABC transporters at the blood-brain barrier.

ANDREA L. KASINSKI

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___ X __ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Lung and breast cancer

Molecular/Cellular Target(s)
- Non-coding RNAs
- Kras
- p53
- LIN28
- MYC
- MET
- miR-34
- let-7

Research Interest and Expertise
MicroRNAs (miRNAs) are small non-coding RNAs that posttranscriptionally regulate the expression of protein-coding genes. The discovery of miRNAs has resulted in a paradigm shift in our knowledge about gene control and therapeutic intervention. Through their binding to their target genes, these "master regulators" induce subtle alterations in gene expression that can culminate in major phenotypic changes. This is based on the notion that miRNAs are pleiotropic, referring to the fact that miRNAs can bind to and affect multiple targets. Although the expression of an individual miRNA target may only change marginally, the combined effect of suppressing several targets at the same time results in a phenotypic transformation. This is most clearly illustrated in the context of cancer where miRNA dysregulation contributes to many types of cancer.

In some instances the combination of multiple subtle changes causes the tumor cells to become addicted to a single miRNA. MiR-21 and miR-155 are two oncogenic miRNAs (oncomiRs) that have shown this type of addictive pattern *in vivo*. Similarly loss of key tumor suppressive miRNAs, through epigenetic silencing, genomic loss, and reduced upstream signaling and processing, has been correlated with disease state. Based on this knowledge we have two major goals: i) to identify noncoding RNAs that drive tumorigenesis, specifically miRNAs, and ii) to utilize this knowledge to target miRNAs and their biogenesis pathways for cancer therapeutic.

PETER T. KISSINGER

College of Science   **Department of Chemistry**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
___X___ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Our focus is more from early development to clinical development and then post market surveillance. We have worked with many therapeutic programs with academics as well as large and small firms.

Molecular/Cellular Target(s)
Our expertise is with conventional organic therapeutics in the molecular weight range up to 1000. We are not expert at mabs or ADCs or vaccines.

Research Interest and Expertise
The development of pharmaceuticals is a tortuous process from basic research on the biochemistry of disease to the ultimate commercial formulation. Analytical chemistry is crucial throughout this process and supports disciplines as diverse as genetics, pharmacology, toxicology, and pharmacokinetics. This defines our goal - improving the measurement capability for disciplines challenged to understand how foreign substances ("xenobiotics") interact with mammalian biology.

Liquid chromatography, electrochemistry, and mass spectrometry are principal tools in our search for trace amounts of organic compounds in body fluids, and tissue homogenates. A more recent focus of our work has been on following chemical events in vivo using implanted membrane capillaries operating by dialysis or ultrafiltration. These "artificial blood vessels" enable us to continuously sample the extracellular space in living tissue for drugs and other low molecular weight metabolites such as amino acids, peptides, glucose, and lactate. We are therefore able to monitor real time chemical events in awake animals and correlate such data with physiological and behavioral information. We have developed and helped commercialize tools widely used in commercial drug development including automated blood sampling devices for animal models and humans as well as measurement instrumentation to determine concentrations of drugs, their metabolites and markers in body fluids and tissue sections. Ambient ionization mass spectrometry (first developed at Purdue) is a major focus.

GREGORY KNIPP

College of Pharmacy   **Department of Industrial & Physical Pharmacy**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
___X___ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)
Drug transporters

Development Stage
Early, Intermediate

Research Interest and Expertise
I currently serve as the Associate Director of the Dane O. Kildsig-Center for Pharmaceutical Processing Research and the Director of the Purdue Translational Pharmacology CTSI core. My specific interests lie in the preclinical and early translational development ADMET research for facilitating NCE selection and optimization. General research interests include:

- The molecular and functional characterization of drug transporters
- Determining the effect of xenobiotics on placental fatty acid homeostasis and fetal development.
- Investigating the effects of excipients on drug transport
- in vitro cell permeability studies for drug screening
- GI cell lines: NCI-N87 (gastric epithelium), Caco-2 (Small intestine), and HT-29 (Colon)
- Peripheral vasculature and Blood Brain Barrier: HUVECs, hCMEC/D3, and primary human cells
- Placental: HRP-1, Rcho-1, and BeWo.
- Other Cell Lines: COS-7, THP-1, HeLa
- In vivo PK work with the rodent Culex and large animal Culex-L porcine models.
- Utilization of the porcine model for testing the PK assessment of drug formulations.
- Preclinical formulation development
- Recently developed a novel 3D human blood brain barrier in vitro model for drug screening.

SHIHUAN KUANG

College of Agriculture   **Department of Animal Science**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Obesity, Type 2 Diabetes, Muscular Dystrophy, Rhabdomyosarcoma, Liposarcoma

Molecular/Cellular Target(s)
Notch signaling pathway, PTEN, Lkb1/Stk11, mTOR

Research Interest and Expertise
Muscle stem cell biology and muscle regeneration: A balance between self-renewal and differentiation is crucial for stem cell maintenance and tissue homeostasis. However, mechanisms governing stem cell fate are poorly understood. One goal of our research is to address this question using muscle satellite cells as a model system. Several recent studies have revealed an important role of asymmetric division in satellite cell self-renewal. We are particularly interested in the role of Notch signaling in the cell fate decision of muscle satellite cells.

Skeletal muscles have a remarkable regenerative capacity due to myogenic differentiation of satellite cells. Deregulation and dysfunction of muscle stem cells lead to regenerative failure in aged muscle and a number of muscular dystrophy diseases. One focus of my lab is to explore the signaling mechanisms that regulate satellite cells and explore how such mechanisms are employed in muscle regeneration.

Adipose tissue plasticity and obesity: Adipose tissue contains white, beige (also called brite) and brown adipocytes. White adipocytes store lipids and excessive accumulation of lipids is associated with obesity. Beige and brown adipocytes can break down and utilize lipids to generate heat, and are associated with leaner body mass. We are particularly interested in the lineage origin of the three types of adipocytes and their plasticity (interconversion). To this end, my lab has discovered a novel role of Notch signaling in regulating adipocyte plasticity. Interestingly, aberrant activation of Notch signaling induces tumorgenic transformation of adipocytes, resulting in development of liposarcoma. Understanding the molecular mechanisms that regulate adipose tissue plasticity is key to the development of therapeutic approached to combat the rising epidemics of obesity and its associated metabolic syndromes.

Muscle-fat crosstalk: We have recently shown that muscle interstitial adipocytes are required for efficient regeneration of injured muscles. Meanwhile, we found that muscle-specific cytokines (myokines) can regulate the plasticity (for example conversion of white to beige adipcytes) and gene expression of adipose tissues. We use a variety of animal models to understand the key signaling pathways that regulate skeletal muscle and adipose tissue health. Understanding the molecular basis of muscle-fat interaction will ultimately leads to strategies to improve the regenerative capacity of skeletal muscles and prevent/treat obesity and diabetes.

MARKUS LILL

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research

_____ Diagnostics

___X___ Target Discovery & Characterization

___X___ Drug Synthesis/Optimization

___X___ Delivery/Formulations

_____ In Vivo Disease Models

___X___ ADME/DMPK/Tox

___X___ Other: Computational Drug Design

General Disease Area(s)

___X___ Cancer

___X___ Diabetes/Obesity/Metabolic Disease

_____ Immunology/Inflammatory/ Infectious Disease

___X___ Neurological Disorder/Trauma

_____ Other

Specific Disease(s)

Hypoglycemia, alcohol abuse, pain

Molecular/Cellular Target(s)

Glucagon receptor, delta opoid receptor, PCNA, adenylyl cyclase, cytochrome P450 enzymes

Research Interest and Expertise

My current research has been dedicated to the development and application of molecular modeling techniques to gain insight into the processes associated with protein-ligand and protein-protein binding. Current research activities are focused on addressing serious shortcomings of present computational approaches for modeling protein-ligand and protein-protein association: protein flexibility, entropic contributions associated with the dynamics of the complex, solvation effects, and a reliable quantification of binding affinities and kinetic properties. I have been leading the development of nine different software products, some of them freely available for download from our group website. Computational methods are applied in collaboration with experimental groups focusing on CYP-mediated drug metabolism, GPCRs, PCNA and other cancer-related targets.

PHILIP LOW

College of Science   **Department of Chemistry**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Cancers of the ovaries, prostate, cervix, kidneys, colon, lung, breast
- Autoimmune/Inflammatory diseases such as rheumatoid arthritis, atherosclerosis, pulmonary fibrosis, Crohn's disease, osteoarthritis, psoriasis
- Influenza, malaria, HIV
- Obesity, diabetes
- Sickle cell disease

Molecular/Cellular Target(s)
Folate receptors (alpha, beta, and delta), carbonic anhydrase IX, CCK2R, prostate specific membrane antigen (PSMA), luteinizing hormone-releasing hormone (LHRH), bombesin receptor, aminopeptidase N, fibroblast activation protein, neuraminidase, red blood cell kinases, band 3

Research Interest and Expertise
To date, we have developed targeted therapeutic and/or imaging agents for a variety of cancers (e.g. ovarian, lung, kidney, endometrial, breast and prostate), several inflammatory diseases (rheumatoid arthritis, Crohn's disease, osteoarthritis, organ transplant rejection, psoriasis, etc.), diabetes, atherosclerosis and a variety of infectious diseases (e.g. malaria, influenza virus, Staphylococcus, Pseudomonas, etc.). Eleven drugs stemming from research in my lab are currently undergoing human clinical trials (mainly at Endocyte, Inc., HuLow, and On Target Laboratories, three companies that I have founded).

Interests include: Imaging of malignant diseases; isolation and analysis of circulating tumor cells; fluorescence guided surgery using tumor-targeted fluorescent dyes; and personalized medicine, therapies for infectious diseases.

145

ZHAO-QING LUO

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our laboratory is interested in understanding the mechanisms that allow microbial pathogens to survive and multiply within the hostile host cells and how host cells respond to infection. We use Legionella pneumophila, the causative agent of Legionnaires disease as a model organism. One essential pathogenic factor of this bacterium is the Dot/Icm type IV secretion system that injects approximately 300 virulence proteins (effectors) into host cells to create a niche permissive for bacterial replication.

One focus of our research is to determine the function of these proteins and their roles in bacterial infection. The second focus is to examine the mechanism of the detection and response of immune cells to intracellular pathogens, particularly the signaling pathway involved in the detection of the bacterial ribosomal protein RpsL that triggers lysosomal cell death. Finally, we are interested in study the function of Fic proteins found in diverse bacteria. The long term goal of these studies is to elucidate the signal transduction pathways important for bacterial virulence, immune detection and other events important for the establishment of successful infection, such information will be invaluable not only in combating infectious diseases but also in our understanding of cell signaling in both prokaryotic and eukaryotic cells.

ANDREW MESECAR

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The fundamental research interests of the Mesecar lab involve elucidating the molecular mechanisms and function of therapeutic enzymes and proteins. We wish to understand at the molecular level how enzymes and proteins recognize their substrates, catalyze their requisite chemical reactions, and trigger signal-transduction cascades. Our ultimate goal is to utilize this fundamental scientific knowledge to develop new therapeutics to treat cancer and infectious diseases.

To achieve these goals, we integrate a variety of state-of-the-art research tools and approaches including X-ray crystallography, enzyme chemistry and kinetics, molecular biology, bioinformatics, mass spectrometry, and computational chemistry to gain an understanding of the role of protein dynamics and conformational change in molecular recognition and catalysis. We then couple these technologies with high-throughput screening and structure-based design to develop compounds capable of modulating the activity of enzymes and receptors involved in cancer chemoprevention, cancer cell proliferation, cell longevity, and bacterial and viral pathogenesis.

SURESH MITTAL

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
- Pandemic Influenza Vaccine
- Adenoviral Vectors
- Cancer Gene Therapy

ERIC NAUMAN

College of Engineering　　　　　　　　**Department of Mechanical Engineering**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
- Cell and tissue mechanics
- Human injury
- Adult stem cell-based tissue regeneration
- Biophysics and biotransport

KINAM PARK

College of Pharmacy   **Departments of Industrial & Physical Pharmacy**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
His research has been focused on the use of various polymers and hydrogels for controlled drug delivery. His current research includes homogeneous nano/microparticles using nanofabrication, hydrotropic polymeric micelles, superporous hydrogels, fast melting tablet formulations, and drug-eluting stents. He has published more than 200 peer-reviewed papers, 70 book chapters, and presented 190 abstracts at national and international meetings. He has also made more than 200 invited lectures throughout the world. He co-authored and co-edited 7 books in the area of controlled drug delivery, and edited special journal issues in the area of protein- and cell-repellent surfaces and in the area of hydrogels. He has trained more than 80 Ph.D. graduate students, postdoctoral fellows and visiting scientists. He founded Akina, Inc. specializing in drug delivery technologies in 2001.

RODOLFO PINAL

College of Pharmacy   **Department of Industrial & Physical Pharmacy**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Dr. Pinal's research interests include: solution chemistry, solubility and solubilization techniques, mixtures, polymer-based composites as means of control of product performance (mechanical strength, dissolution, release rate and bioavailability) of bioactive compounds, antiplasticization, and molecular relaxation in amorphous organic materials.

DORAISWAMI RAMKRISHNA

College of Engineering   **Department of Chemical Engineering**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Professor Ramkrishna's research group is motivated by ideas in the application of mathematics to solving problems in chemical and biochemical reaction engineering, biotechnology and biomedical engineering. Their research ideas arise from linear (operator methods) and nonlinear analysis of ordinary and partial differential equations, stochastic processes, and population balance modeling involving integro-partial differential equations.

TIMOTHY L. RATLIFF

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Prostate Cancer, Bladder Cancer, autoimmune disease

Molecular/Cellular Target(s)
Immune regulatory cells, prostate cancer cell, prostate stem cells

Research Interest and Expertise
Our laboratory focuses on understanding immune regulation and the development of alternative approaches to treating urologic cancers, primarily bladder and prostate cancers, through the modulation of anti-cancer immunity. Current studies focus on prostate inflammation, its immune regulation and its impact on prostate stem cells, gene expression in prostate tissue, cholesterol metabolism in prostate cancer and impact of inflammation on prostate cancer development. The intent is to develop a better understanding of the inflammatory factors contributing to cancer development and to use the information gained to develop novel approaches to treating prostate cancer through modulation of the immune response.

Genetically modified mouse models are used to probe inflammation, immune regulation, the development of autoimmunity and anticancer effector mechanisms. Regulatory cells termed myeloid-derived suppressor cells have been linked to regulation of prostate inflammation and are observed early in genetically modified mouse spontaneous prostate tumor models. Determining how to control myeloid-derived suppressor cell function is a focus that is anticipated to provide a new approach to augmenting antitumor immunity. Likewise, understanding the impact of inflammation on prostate stem cells is anticipated to advance knowledge about the mechanisms of prostate growth and cancer development.

G. V. REKLAITIS

College of Engineering   **Department of Chemical Engineering**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Professor Reklaitis' research involves the application of computing, information and systems technology to support the complex decisions inherent to the design and operation of processing systems. Areas of recent emphasis are investigation of approaches to support batch and semi-continuous operations as well as methodology for plant- and enterprise-wide planning and optimization with applications in the pharmaceutical industry and in integrated energy systems.

JEAN-CHRISTOPHE (CHRIS) ROCHET

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Parkinson's disease

Molecular/Cellular Target(s)
Alpha-synuclein

Research Interest and Expertise
Research in the Rochet laboratory is aimed at understanding the role of protein aggregation in neurodegenerative disorders, with an emphasis on Parkinson's disease (PD). PD, an age-related neurodegenerative disorder that disrupts the lives of an estimated 5 million people worldwide, is manifested by classic motor symptoms including resting tremor, slowness of movement, rigidity, and postural instability. These symptoms result largely from a loss of dopaminergic neurons from the *substantia nigra* in the midbrain, and this neuronal loss is thought to involve oxidative stress and aggregation of the presynaptic protein α-synuclein (aSyn). Current therapies only temporarily relieve symptoms without slowing the underlying neurodegenerative disease. In addition, a large proportion of neurons have been destroyed by the time PD symptoms are detectable, and no therapies exist to reverse this damage. Accordingly, there is a critical need for neuroprotective strategies to help reduce the risk of PD.

Dr. Rochet's lab has taken the approach of characterizing gene products involved in aging and neurodegenerative disorders (e.g. alpha-synuclein, DJ-1), with the aim of elucidating mechanisms of neuronal death and dysfunction. His group's research involves an interdisciplinary approach with methods ranging from biochemical analyses of recombinant proteins to characterization of neurotoxic and neuroprotective mechanisms in cellular and animal models. Dr. Rochet's studies in models that reproduce key aspects of PD pathobiology have yielded new insights into genetic and chemical suppressors of neurodegeneration.

SANDRA ROSSIE

College of Agriculture   **Department of Biochemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Reversible phosphorylation is an important and common mechanism for regulating a wide variety of processes ranging from cellular excitation to gene expression. In contrast to our knowledge of protein kinases and their roles in these processes, we know far less about protein phosphatases and their regulation. Protein phosphatase 5 (PP5) is a recently described member of the largest Ser/Thr protein phosphatase family, with a unique N-terminal domain that inhibits PP5 activity and binds other proteins. Little is known about PP5's biological function, however this enzyme is implicated in controlling cell growth and in hormone signal transduction pathways. We are using biochemical and molecular approaches to define the role and regulation of PP5 in brain and other tissues. Projects are focused on the structural basis for controlling PP5 activity, identification of physiologic substrates and regulators for PP5, and examination of the regional and subcellular distribution of PP5. These studies will advance our understanding of PP5's function and the role that Ser/Thr protein phosphatases play in signal transduction pathways in brain and elsewhere.

DENNIS SAVAIANO

College of Health and Human Sciences   **Department of Nutrition Science**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our research group has studied numerous factors which influence lactose digestion and tolerance including lactose load, gastric and intestinal transit, the use of lactose digestive aids, colon fermentation of lactose and the consumption of fermented dairy foods and lactic acid bacteria. Major findings from these studies include: (1) The identification of a microbial lactase in yogurts that assists lactose digestion in the intestinal tract following the consumption of yogurt. (2) The characterization of the amount of lactose required to cause symptoms in lactose maldigesters, being 12g or more of lactose (one cup of milk). (3) The finding that lactose consumed with a meal is tolerated about 3 times better than lactose consumed in a fasted state. (4) Identifying the colonic flora as key in determining tolerance to lactose. The colonic flora readily adapts to lactose in the diet of maldigesters. Thus, maldigesters who routinely consume lactose have less symptoms due to more efficient metabolism of lactose by the colon microflora. (5) The identification of a population of digesters and maldigesters who believe that they are extremely intolerant to lactose, but who tolerate lactose quite well in double-blinded clinical trials. (6) The characterization of the ability of lactic acid bacteria including acidophilus and bifidus to improve lactose digestion in vivo in the gastro-intestinal system.

GARTH SIMPSON

College of Science **Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our research group is devoted to the theoretical development and experimental application of new instrumental methods taking advantage of unique nonlinear optical interactions. Recent interests include detection and analysis of crystals formed from chiral molecules, building on a long-standing interest in understanding the role of chirality and polarization-dependent effects in nonlinear optics.

HERMAN SINTIM

College of Science　　　　　　　　　　**Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
1) Acute Myeloid Leukemia
2) Pancreatic Cancer
3) Gram-(-) and (+) infections

Molecular/Cellular Target(s)
1) Kinases
2) G-quadruplexes
3) Cyclic Dinucleotide Synthases
4) Cyclic Dinucleotide Phosphodiesterases

Research Interest and Expertise
Research interests are new anticancer agents, the chemical biology of bacterial communication, virulence factors production and biofilm formation, the discovery of antibiotics with novel modes of action, the catalytic cycle of total syntheses of complex bioactive molecules, and the discovery of reaction methodologies and new DNA nanostructures and machines for bioanlyte detection.

LYNNE TAYLOR

College of Pharmacy   **Department of Industrial & Physical Pharmacy**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our overall goal is to enhance drug delivery by optimizing and understanding the physicochemical properties of drugs and excipients. Of particular interest are amorphous solid dispersions which are used to improve the oral delivery of poorly water-soluble drugs. We are also interested in the stability of pharmaceutical salts and the impact of excipients on product performance. For these types of solids, it is extremely important to understand drug-excipient interactions as well as the impact of water on stability. We achieve an improved molecular level understanding of pharmaceutical materials and formulations through the use of high resolution analytical techniques. Some of the analytical techniques that we use are infrared, Raman, ultraviolet and fluorescence spectroscopy, X-ray powder diffraction and differential scanning calorimetry.

DAVID THOMPSON

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
We are developing novel synthetic chemical and biochemical tools to address fundamental problems in human health, with a special emphasis on cancer therapeutic agents, Niemann-Pick Type C therapeutics, delivery of nucleic acid anti-cancer agents, and accelerated protein structure determination. Development of efficient chemoseletive routes to these materials is a major focus of our research. We are also exploring the effects of particle shape, size, and environmentally responsive transformations (e.g., pH, enzyme, light, ultrasound) on therapeutic performance. Translation of these basic studies to animal models of disease (e.g., bladder, lung, pancreatic & breast tumors) is the near-term goal of our materials development efforts.

ELIZABETH TOPP

College of Pharmacy   **Department of Industrial & Physical Pharmacy**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Diabetes (Type I)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our research focuses on the chemical and physical stability of protein drugs, with particular emphasis on chemical degradation reactions in the amorphous solid state. Currently active research projects address (i) the development of hydrogen/deuterium exchange methods for examining protein structure and excipient interactions in amorphous solids, (ii) invention of novel glucagon derivatives with improved solubility and stability, (iii) the development of *in vitro* assays for innate immunogenicity of aggregated protein drugs, (iv) consortium building and technology roadmapping for an industry-led consortium focused on lyophilization of foods and pharmaceuticals and (v) lyophilization formulations and processing methods to preserve viability for of cells.

ARVIND VARMA

College of Engineering   **Department of Chemical Engineering**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our research group investigates topics in hydrogen and other energy sources, and chemical and catalytic reaction engineering. The projects typically involve combined experimental and modeling studies.

ALEXANDER WEI

College of Science   **Department of Chemistry**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Cancer, ovarian and bladder (using orthotopic animal models)
Bacterial infections

Molecular/Cellular Target(s)
- SKOV3 cells
- Tumor-associated macrophages
- *Bacillus anthracis*
- *Chlamydia trachomatis*
- *Listeria monocytogenes*
- *Pseudomonas aeruginosa*
- *Salmonella enterica*
- *Staphylococcus aureus* / MRSA
- *Streptococcus pneumoniae*
- *Yersinia enterocolitica*
- Albumin receptors
- Hemin receptors (Isd, etc.)
- Siderophore receptors (FoxA, FhuD2, FhuE)

Research Interest and Expertise
- Targeting ligands for pathogen detection and treatment, with particular interests in respiratory-tract and sexually transmitted infections.
- Targeted photodynamic therapy/inactivation (PDT / PDI) using photoactive hemin derivatives
- Identifying key serum proteins as mediators in nanoparticle tracking and cell uptake
- siRNA uptake and release in ovarian cancer cells

MICHAEL WENDT

College of Pharmacy   **Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Breast cancer

Molecular /Cellular Target(s)
EGFR, Her2, FGFR

Research Interest and Expertise
Research in the Wendt is focused on the role of epithelial-mesenchymal transition (EMT) in breast cancer metastasis. EMT is associated with resistance to several chemotherapeutic drugs and targeted molecular compounds. Recent studies by the Wendt has identified fibroblast growth factor receptor (FGFR) as major driver of drug resistance, particularly in the metastatic setting. Furthermore, cells that have undergone EMT become preferentially sensitive to inhibition of FGFR kinase activity. Work in the Wendt utilizes 3D cell culture and *in vivo* disease modeling in combination with an array of small molecule and biological approaches to optimize FGFR targeting for the treatment of metastatic and drug resistant breast cancer.

DAOGUO ZHOU

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Salmonellosis
- peptic ulcers
- stomach cancer

Molecular/Cellular Target(s)
- Type III secretion
- Type IV secretion

Research interest and expertise
The Zhou group focuses on the cell biology of infectious diseases, in particular human intestinal diseases caused by pathogenic Salmonella, E. coli and more recently Helicobacter pylori. These pathogens utilize the protein secretion/translocation system to inject bacterial "effector proteins" into host cells to exploit host cell functions to survive in the hostile environment and cause inflammatory responses. Using modern biochemical, cellular and microbiological approaches, they aim to understand the molecular and cellular mechanism of how these effectors function to enable the pathogens to circumvent the host immune system to cause diseases. They currently have projects studying the role(s) of actin dynamics in infections and how bacterial effectors exploit the host signaling pathways to induce inflammatory responses.

IN VIVO, ADME, DMPK, TOX

KIM BUHMAN

College of Health and Human Sciences   **Department of Nutrition Science**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The long-term goal of the Buhman laboratory is to identify novel factors that regulate dietary fat sensing, metabolism or absorption that may be exploited for preventive and therapeutic interventions for obesity, diabetes, and heart disease. Research in the Buhman laboratory focuses on trafficking and metabolism of digestive products of dietary fat within the absorptive cells of the small intestine, enterocytes. Projects in the Buhman laboratory are currently addressing how diet, drugs and genetics affect chylomicron synthesis and secretion, cytoplasmic lipid droplets synthesis and metabolism, and fatty acid oxidation by enterocytes. Recent publications from the Buhman laboratory highlight important functions of diet, drugs, and genetics in regulation of dietary fat processing within enterocytes that results in effects related to metabolic diseases such as body weight, blood lipid concentrations, and hepatic steatosis.

CHUN-JU CHANG

College of Veterinary Medicine   **Department of Basic Medical Sciences**

Category of Research

_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)

___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Breast cancer

Molecular/Cellular Target(s)
MicroRNAs, chromatin modification enzymes

Research Interest and Expertise
Cancer stem cells (CSCs) are a unique cell population with perpetuating self-renewal properties that resemble normal stem cells. With these special properties and accelerated growing rate, CSCs give rise to the bulk of a tumor as the "seed" of cancer and account for all cancer initiation, progression, chemo-resistance, and recurrence. To date, treatment strategies designed to eliminate the genesis of the cancer (CSC) still remain a significant challenge. Interestingly, it is during cell division that a key decision is made to determine the fate of the stem cells that either maintain or lose the self-renewal properties. Our research has revealed the critical mechanism involved in the regulation of the cell fate decision in breast CSCs and also facilitated the discovery of pharmacological drugs that create a blockade to the self-renewing division pathway. Using new transgenic animals and drug screening platform targeting CSCs, the ongoing studies are expected to enable development of novel therapeutic strategies that can manipulate the CSC fate decision for exhaustion of CSCs so as to eradicate breast cancer.

MICHAEL CHILDRESS

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
- Lymphomas
- Spontaneous canine cancer models

Molecular/Cellular Target(s)

Research Interest and Expertise
My primary research interest is in canine and feline hematopoietic neoplasia, particularly canine lymphomas. I am a board-certified veterinary oncologist with extensive experience in the clinical management of canine and feline cancers.

GAURAV CHOPRA

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The overarching theme of our research is to develop and verify multiscale chemical models of cellular systems for therapeutic discovery by integrating sequence, structure, function, interaction, and systems-based methodologies. Our lab is a hybrid computational and wet-lab to identify drugs by taking into account all possible interactions between biomolecules, namely, interactome based drug discovery. We will focus on designing disease-specific compounds interacting with multiple proteomes and biomolecular interfaces (protein/protein and protein/nucleic-acid interfaces) and identifying compounds that change the fate and proliferation of cell types *in vivo* by developing structural/chemical signatures of individual cells.

Specifically, we will start by repurposing human approved compounds and designing new compounds to perturb the immune system to identify therapeutics for cancer and autoimmune diseases. Developing computational chemistry/biology tools and using physical chemistry principles fuel the research work that we do. The experimental validations of the computational predictions will be done in our laboratory, together with existing and new collaborators. Our lab will make use of high performance computing to generate predictions, use high-throughput robotic set-up for compound screening on cell assays, use molecular biology techniques & sequencing (RNA-seq, ChIP-seq, ATAC-seq etc.), flow cytometry instrumentation as needed to select and test computational and *in vitro* validated predictions in mice.

DAVID FOSTER

College of Pharmacy   **Department of Pharmacy Practice**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
___X___ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My research interests are focused on the study of alterations in drug and nutrient disposition and drug effects in critically ill patients. Current research includes evaluation of changes in intestinal permeability to xenobiotics in critical illness. Specifically, this research involves the investigation of alterations in drug and nutrient absorption by passive and active transport mechanisms, and the molecular mediators underlying these changes in burn injury and sepsis. A related area of research is the use of natural anti-inflammatory compounds to attenuate inflammation-related changes in intestinal function. Other interests include the study of the contribution of active transport processes to variability in drug disposition in a number of patient populations. Dr. Foster's clinical interests are focused the provision of pharmacotherapy to critically-ill patients, with an emphasis on burn and trauma patients.

DANIEL F. HOGAN

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)
Cardiac, vascular, thrombosis, valvular

Molecular/Cellular Target(s)
TGF-B and valvulopathy

Research Interest and Expertise
Our research focuses on cardiovascular therapeutics, including heart failure and antithrombotics. We have expertise in veterinary clinical trials, pre-clinical animal trials and animal modeling.

ELSA JANLE

College of Health and Human Sciences   **Department of Nutrition Science**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
___X___ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My major interest is diabetes and glucose control. To monitor glucose in diabetics without removal of blood, I developed the ultrafiltrate probe. The ultrafiltrate probe is a membrane probe which can be implanted in subcutaneous tissue. A negative pressure is applied and interstitial fluid is removed. These probes can be used for long term monitoring in large or small animal models. I have also worked on additional uses of the ulrafiltrate probe for other areas of medical research including measurement of bone minerals in bone, muscle and subcutaneous tissue.

As part of the Botanical Center I have investigated the potential of green tea and other supplements to improve glucose tolerance and reduce long term complications of diabetes. I also investigate bioavailability and tissue distribution of botanical compounds. I have worked for 5 years with an Alzheimer's Disease center to measure brain distribution of plant polyphenols which may be useful in prevention of Alzheimer's disease.

ANDREA L. KASINSKI

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___ X __ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Lung and breast cancer

Molecular/Cellular Target(s)
- Non-coding RNAs
- Kras
- p53
- LIN28
- MYC
- MET
- miR-34
- let-7

Research Interest and Expertise
MicroRNAs (miRNAs) are small non-coding RNAs that posttranscriptionally regulate the expression of protein-coding genes. The discovery of miRNAs has resulted in a paradigm shift in our knowledge about gene control and therapeutic intervention. Through their binding to their target genes, these "master regulators" induce subtle alterations in gene expression that can culminate in major phenotypic changes. This is based on the notion that miRNAs are pleiotropic, referring to the fact that miRNAs can bind to and affect multiple targets.

Although the expression of an individual miRNA target may only change marginally, the combined effect of suppressing several targets at the same time results in a phenotypic transformation. This is most clearly illustrated in the context of cancer where miRNA dysregulation contributes to many types of cancer. In some instances the combination of multiple subtle changes causes the tumor cells to become addicted to a single miRNA. MiR-21 and miR-155 are two oncogenic miRNAs (oncomiRs) that have shown this type of addictive pattern *in vivo*. Similarly loss of key tumor suppressive miRNAs, through epigenetic silencing, genomic loss, and reduced upstream signaling and processing, has been correlated with disease state. Based on this knowledge we have two major goals: i) to identify noncoding RNAs that drive tumorigenesis, specifically miRNAs, and ii) to utilize this knowledge to target miRNAs and their biogenesis pathways for cancer therapeutic.

PETER T. KISSINGER

College of Science   **Department of Chemistry**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
___X___ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Our focus is more from early development to clinical development and then post market surveillance. We have worked with many therapeutic programs with academics as well as large and small firms.

Molecular/Cellular Target(s)
Our expertise is with conventional organic therapeutics in the molecular weight range up to 1000. We are not expert at mabs or ADCs or vaccines.

Research Interest and Expertise
The development of pharmaceuticals is a tortuous process from basic research on the biochemistry of disease to the ultimate commercial formulation. Analytical chemistry is crucial throughout this process and supports disciplines as diverse as genetics, pharmacology, toxicology, and pharmacokinetics. This defines our goal - improving the measurement capability for disciplines challenged to understand how foreign substances ("xenobiotics") interact with mammalian biology.

Liquid chromatography, electrochemistry, and mass spectrometry are principal tools in our search for trace amounts of organic compounds in body fluids, and tissue homogenates. A more recent focus of our work has been on following chemical events in vivo using implanted membrane capillaries operating by dialysis or ultrafiltration. These "artificial blood vessels" enable us to continuously sample the extracellular space in living tissue for drugs and other low molecular weight metabolites such as amino acids, peptides, glucose, and lactate. We are therefore able to monitor real time chemical events in awake animals and correlate such data with physiological and behavioral information. We have developed and helped commercialize tools widely used in commercial drug development including automated blood sampling devices for animal models and humans as well as measurement instrumentation to determine concentrations of drugs, their metabolites and markers in body fluids and tissue sections. Ambient ionization mass spectrometry (first developed at Purdue) is a major focus.

DEBORAH KNAPP

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
In our focus area of invasive urinary bladder cancer, we are defining heritable (through very strong dog breed-associated risk) and environmental risk factors. This will facilitate cancer prevention research in a highly relevant model in a very timely fashion. Because prevention studies in dogs can be performed in 1-3 years, dog studies can be used to select the most promising approach for the longer-term (15+ years) human studies. Our group is also studying cancer treatments including nanoparticles (in collaboration with Dr. James Leary), folate targeted therapy (in collaboration with Dr. Philip Low), demethylating agents (in collaboration with Dr. Noah Hahn, Indiana University School of Medicine) and with already established drugs (cyclooxygenase inhibitors, oral chemotherapies) being applied in a more effective dosing schedule.

GREGORY KNIPP

College of Pharmacy   **Department of Industrial & Physical Pharmacy**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
___X___ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
__X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)
Drug transporters

Development Stage
Early, Intermediate

Research Interest and Expertise
I currently serve as the Associate Director of the Dane O. Kildsig-Center for Pharmaceutical Processing Research and the Director of the Purdue Translational Pharmacology CTSI core. My specific interests lie in the preclinical and early translational development ADMET research for facilitating NCE selection and optimization. General research interests include:

- The molecular and functional characterization of drug transporters
- Determining the effect of xenobiotics on placental fatty acid homeostasis and fetal development.
- Investigating the effects of excipients on drug transport
- in vitro cell permeability studies for drug screening
- GI cell lines: NCI-N87 (gastric epithelium), Caco-2 (Small intestine), and HT-29 (Colon)
- Peripheral vasculature and Blood Brain Barrier: HUVECs, hCMEC/D3, and primary human cells
- Placental: HRP-1, Rcho-1, and BeWo.
- Other Cell Lines: COS-7, THP-1, HeLa
- In vivo PK work with the rodent Culex and large animal Culex-L porcine models.
- Utilization of the porcine model for testing the PK assessment of drug formulations.
- Preclinical formulation development
- Recently developed a novel 3D human blood brain barrier in vitro model for drug screening.

SHIHUAN KUANG

College of Agriculture   **Department of Animal Science**

Category of Research

_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)

___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Obesity, Type 2 Diabetes, Muscular Dystrophy, Rhabdomyosarcoma, Liposarcoma

Molecular/Cellular Target(s)

Notch signaling pathway, PTEN, Lkb1/Stk11, mTOR

Research Interest and Expertise

Muscle stem cell biology and muscle regeneration: A balance between self-renewal and differentiation is crucial for stem cell maintenance and tissue homeostasis. However, mechanisms governing stem cell fate are poorly understood. One goal of our research is to address this question using muscle satellite cells as a model system. Several recent studies have revealed an important role of asymmetric division in satellite cell self-renewal. We are particularly interested in the role of Notch signaling in the cell fate decision of muscle satellite cells.

Skeletal muscles have a remarkable regenerative capacity due to myogenic differentiation of satellite cells. Deregulation and dysfunction of muscle stem cells lead to regenerative failure in aged muscle and a number of muscular dystrophy diseases. One focus of my lab is to explore the signaling mechanisms that regulate satellite cells and explore how such mechanisms are employed in muscle regeneration.

Adipose tissue plasticity and obesity: Adipose tissue contains white, beige (also called brite) and brown adipocytes. White adipocytes store lipids and excessive accumulation of lipids is associated with obesity. Beige and brown adipocytes can break down and utilize lipids to generate heat, and are associated with leaner body mass. We are particularly interested in the lineage origin of the three types of adipocytes and their plasticity (interconversion). To this end, my lab has discovered a novel role of Notch signaling in regulating adipocyte plasticity. Interestingly, aberrant activation of Notch signaling induces tumorgenic transformation of adipocytes, resulting in development of liposarcoma. Understanding the molecular mechanisms that regulate adipose tissue plasticity is key to the development of therapeutic approached to combat the rising epidemics of obesity and its associated metabolic syndromes.

Muscle-fat crosstalk: We have recently shown that muscle interstitial adipocytes are required for efficient regeneration of injured muscles. Meanwhile, we found that muscle-specific cytokines (myokines) can regulate the plasticity (for example conversion of white to beige adipcytes) and gene expression of adipose tissues. We use a variety of animal models to understand the key signaling pathways that regulate skeletal muscle and adipose tissue health. Understanding the molecular basis of muscle-fat interaction will ultimately leads to strategies to improve the regenerative capacity of skeletal muscles and prevent/treat obesity and diabetes.

YUK FAI LEUNG

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Retinal degeneration

Molecular/Cellular Target(s)
Retinas, photoreceptors, retinal ganglion cells

Research Interest and Expertise
Retinal degeneration is a group of inherited eye diseases including retinitis pigmentosa and age-related macular degeneration that impair our vision. They are incurable, even though much has been learned about the molecular basis of these diseases. To expedite discovery of new drugs for these diseases, we study zebrafish retinal-degeneration models.

We focus on two research directions:
1. Disease-causing gene network for retinal degeneration
2. Drug discovery for retinal degeneration. Please visit our lab website for further information.

MARKUS LILL

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
___X___ ADME/DMPK/Tox
___X___ Other: Computational Drug Design

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Hypoglycemia, alcohol abuse, pain

Molecular/Cellular Target(s)
Glucagon receptor, delta opoid receptor, PCNA, adenylyl cyclase, cytochrome P450 enzymes

Research Interest and Expertise
My current research has been dedicated to the development and application of molecular modeling techniques to gain insight into the processes associated with protein-ligand and protein-protein binding. Current research activities are focused on addressing serious shortcomings of present computational approaches for modeling protein-ligand and protein-protein association: protein flexibility, entropic contributions associated with the dynamics of the complex, solvation effects, and a reliable quantification of binding affinities and kinetic properties. I have been leading the development of nine different software products, some of them freely available for download from our group website. Computational methods are applied in collaboration with experimental groups focusing on CYP-mediated drug metabolism, GPCRs, PCNA and other cancer-related targets.

SHUANG LIU

College of Health and Human Sciences   **Department of Health Sciences**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
___X___ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

More than 70 million Americans live with cardiovascular diseases. Accurate diagnosis is highly desirable so that appropriate therapeutic regimens can be given before irreversible damage occurs in the patients with known or suspected coronary artery disease (CAD). Myocardial perfusion imaging (MPI) with single photon emission computed tomography (SPECT) is an integral component in routine clinical evaluation of CAD patients. In spite of recent development of stress echocardiography and coronary CT angiography, SPECT MPI remains the mainstay for noninvasive diagnosis of CAD.

Molecular/Cellular Target(s)

Cardiolipin as the Molecular Target for Diagnosis of Heart Diseases. Heart is one of the organs rich with mitochondria. The mitochondrial density is as high as 40% of the cellular volume in myocytes. It is not surprising that mitochondrion has been a target for development of myocardial perfusion radiotracers that tend to localize inside the mitochondrial matrix. In contrast, CL is embedded in the inner mitochondrial membrane and constitutes up to as high as ~20% of its total lipid content. The fact that CL alterations underlie the myocardial dysfunction makes CL a useful and multifunctional biomarker for cardiovascular diseases (particularly HF), and provides the conceptual basis to develop molecular imaging probes that can be used to measure early CL changes noninvasively in the HF patients and those with diabetes.

Research Interest and Expertise

I worked at DuPont Medical Imaging Division (new Lantheus Medical Imaging Inc.) for nine years, and have research interests include receptor-based target radiopharmaceuticals, new bifunctional chelators, development of new techniques for radiolabeling of small biomolecules, formulation development, design/synthesis/evaluation of metal complexes as MRI contrast agents for cardiac perfusion imaging, and coordination chemistry of radiopharmaceuticals. There have been tremendous research efforts from his research group in the development of novel radiotracers for early tumor detection and diagnosis of cardiovascular diseases. These efforts rely on identification and the use of small biomolecules as "vehicles" to carry a diagnostic radionuclide to the tumor cells. Imaging with radiolabeled small biomolecules allows us to monitor the tumor biological changes at the molecular level. Over the last 10 years, Dr. Liu has become the leader in radiolabeled cyclic RGD peptides as integrin $\alpha_v\beta_3$-specific SPECT and PET radiotracers for imaging the integrin expression $\alpha_v\beta_3$ in rapidly growing and metastatic tumors. Dr. Liu is the author or co-author over 160 scientific publications, and has been granted 30 US patents and PCT applications. Dr. Liu's contributions also have significant impacts on inorganic chemistry, radiochemistry, radiopharmaceutical development, bioconjugates chemistry, molecular imaging, and nuclear medicine. His research has been supported by grants from the National Institute of Health, Department of Energy, American Heart Association, and industry.

L. TIFFANY LYLE

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Brain metastasis
Spontaneous canine brain tumors
Neurodegenerative disease

Molecular /Cellular Target(s)
Blood-brain barrier

Research Interest and Expertise
The mission of the Comparative Blood-Brain Barrier Laboratory is to evaluate and characterize molecular alterations of the blood-brain barrier in animal models of brain metastasis and neurodegenerative disease to facilitate effective drug delivery and uptake.

SULMA MOHAMMED

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Dr. Mohammed's research interest is to develop a model to study breast cancer progression in women and discern strategies for prevention. Due to routine breast mammography, detection of noninvasive mammary intraepithelial lesions (IELs), such as normotypic hyperplasia, atypical hyperplasia, and duct carcinoma in situ, is increasingly frequent. These lesions are believed to signal increased risk of developing invasive breast carcinoma in women. Although chemotherapy to reverse these lesions or to prevent their progression is a promising new strategy, an animal model with spontaneous pre-cancerous mammary intraepithelial lesions is needed to evaluate the safety and efficacy of candidate compounds. In a DoD-funded project, Dr. Mohammed studies the dog as an animal model with spontaneous mammary lesions that are phenotypically and genetically similar to human intraepithelial lesions. The advantages of studying the dog as a model over the rodent model include spontaneous development of DCIS and invasive cancer (all subtypes including triple-negative tumors), an intact immune system, hormonal responsiveness, and response to human chemotherapies. Dr. Mohammed's in collaboration with her colleagues in Department of Comparative Pathobiology have shown that spontaneous canine mammary premalignant lesions such as atypical ductal hyperplasia (ADH), and ductal carcinoma in situ (DCIS) are similar to those of the human breast in term of developing spontaneously before mammary tumors, histologic diversity, and immunohistochemical profile of ER-α, PR, and HER-2 (these findings, Antuofermo et al., 2007; were featured on the cover page of AACR Journal of Cancer Epidemiology, Biomarkers and Prevention where the article was published accompanied by an editorial by Dr. Elaine Ostrander, (Chief, Cancer Genetics Branch, National Human Genome Research Institute, NIH, Bethesda, Maryland) and were spread by various news agencies. In addition, her lab showed that clustered micro-calcifications and other radiographic lesions, corresponding to BI-RAD criteria for human breast cancer screening, can be detected in the canine mammary glands. This work is important, as it will allow non-invasive evaluation of drug efficacy in prevention clinical trials. Furthermore, Dr. Mohammed lab has conducted genome-wide transcription and methylation studies of canine mammary lesions along the continuum of cancer progression in the same gland (with progressing and non-progressing DCIS) and identified 21 genes with differential methylation and altered expression including immune-related genes (NKG7, CCL5, IFGGD3 (IRGM), and

IFGGB2). The ultimate goal of this work, using this canine model, is to determine the mechanisms mediating the progression of DCIS to invasive cancer.

Dr. Mohammed (with significant contributions to activities related to cancer prevention among African women), along with colleagues from various organizations in Africa, reactivated the African Organization for Research and Training in Cancer (AORTIC) (www.aortic_africa.org) during the American Association for Cancer Research Annual Meeting in San Francisco, CA. AORTIC has subsequently become a pan-African cancer organization with a membership of approximately 800 MDs, PhDs, RNs, scientists, and others spanning five continents with over 100 countries represented. It has a clear mission to facilitate research and training and to provide relevant and accurate information on the prevention, early diagnosis, treatment, and palliation of cancer in Africa, primarily for effective healthcare delivery in remote clinics. Dr. Mohammed serves as a member of the executive council of AORTIC. To promote cancer research in Africa, Dr. Mohammed chair a session of cancer biology during the AORTIC cancer meeting and invite to the session prominent cancer investigators from Europe, USA and Africa and a session where she invite and involve all African diaspora researchers in dialogue in how to improve cancer research in Africa.

Dr. Mohammed has led a study in collaboration with her colleagues in Sudan at the Gezira University Cancer Center aimed at early detection of breast cancer in women villagers living in the rural areas of Sudan. The study focused on using local women volunteers to screen other women in their own village for breast abnormalities. The culturally appropriate approach has resulted in the detection of early stage breast cancer that was amenable to treatment. The study was published in Lancet Oncology (Ref. 38) and in podcasted at **http://download.thelancet.com/flatcontentassets/audio/lanonc/2013/lanonc_april.mp**. Dr. Mohammed has strong experience working in local settings in Africa because of her background and upbringing in Sudan and her keen interest in bringing science to tackling cancer in remote settings. In another project, in collaboration with Dr. Joseph Irudayaraj from the Department of Agriculture and Biological Engineering, Purdue University; Dr. Groesbeck Parham, oncogynecologist and implementation scientist at Zambia; Dr. Carla Chibwesha, oncogynecologist and clinical researcher, Zambia; and Chembio Diagnostic Systems Inc. (CDS) – industry partner with over 20 years of experience in prototype development, marketing, and commercialization of point-of-care technologies, Dr. Mohammed is addressing the challenges that hinder implementation of national screening programs in cervical cancer in low and middle income countries (LMICs) by developing a simple, colorimetric test, CERVBIO, for point-of-care (POC) quantitative cervical cancer screening. Interestingly, this test in addition to being sensitive and specific for invasive cervical cancer and its precursors, no specialized infrastructure or personnel will be required to perform the test, and it will be affordable for LMIC markets.

For her leadership in this effort to prevent cancer in Africa she was awarded numerous awards and certificates of appreciation for excellence and leadership in the field of breast cancer and health awareness in African countries. For example she recently received the African Diaspora Ambassador Award during the Harvard global health Catalyst, from Harvard Medical School, Boston, MA and the Pillar of Support Award – for Decade of support and personal commitment to stop cancer in African – awarded by the Forum of African First Ladies/Spouses against Cervical, Breast and Prostate Cancer. Dr. Mohammed is recognized nationally and internationally for her effort to build cancer research infrastructure in Africa and has been invited to give talks, chair conference session, and committees.

JEAN-CHRISTOPHE (CHRIS) ROCHET

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Parkinson's disease

Molecular/Cellular Target(s)
Alpha-synuclein

Research Interest and Expertise
Research in the Rochet laboratory is aimed at understanding the role of protein aggregation in neurodegenerative disorders, with an emphasis on Parkinson's disease (PD). PD, an age-related neurodegenerative disorder that disrupts the lives of an estimated 5 million people worldwide, is manifested by classic motor symptoms including resting tremor, slowness of movement, rigidity, and postural instability. These symptoms result largely from a loss of dopaminergic neurons from the *substantia nigra* in the midbrain, and this neuronal loss is thought to involve oxidative stress and aggregation of the presynaptic protein α-synuclein (aSyn). Current therapies only temporarily relieve symptoms without slowing the underlying neurodegenerative disease. In addition, a large proportion of neurons have been destroyed by the time PD symptoms are detectable, and no therapies exist to reverse this damage. Accordingly, there is a critical need for neuroprotective strategies to help reduce the risk of PD.

Dr. Rochet's lab has taken the approach of characterizing gene products involved in aging and neurodegenerative disorders (e.g. alpha-synuclein, DJ-1), with the aim of elucidating mechanisms of neuronal death and dysfunction. His group's research involves an interdisciplinary approach with methods ranging from biochemical analyses of recombinant proteins to characterization of neurotoxic and neuroprotective mechanisms in cellular and animal models. Dr. Rochet's studies in models that reproduce key aspects of PD pathobiology have yielded new insights into genetic and chemical suppressors of neurodegeneration.

MOHAMED SELEEM

College of Veterinary Medicine   **Department of Comparative Pathobiology**

Category of Research
___X_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Bacterial and Fungal

Molecular/Cellular Target(s)

Research Interest and Expertise
- Antibacterial and antifungal for treatment of Infectious diseases
- Molecular target identification of new antimicrobials
- Drug delivery and targeting of intracellular pathogens
- Animal model for infectious diseases
- Bacterial and Fungal biofilm and drug resistant
- Repurposing of existing drugs to find new uses outside the scope of the original medical indication
- Detection and rapid diagnostics of antimicrobial resistance

RICHARD M. VAN RIJN

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Alcohol use disorder, anxiety disorder, depressive disorder, chronic pain disorder

Molecular/Cellular Target(s)
Opioid receptor signal transduction

Research Interest and Expertise
In my laboratory we use innovative strategies and techniques to provide a better understanding of the molecular mechanism by which G-protein coupled receptors (GPCRs) function, propagate signal transduction and modulate behavior. GPCRs form the largest protein family in the human genome and are crucial in relaying extracellular information into the cell. GPCRs are involved in many diverse physiological responses, including light perception, taste, immune responses, cardiovascular activity and neurotransmission. Currently, 30-40% of all drugs, approved by the Federal Drug Administration, target GPCRs. New insights into how GPCRs work have re-energized the study of these receptors.

Specifically, we study biased receptor signaling and GPCR heteromerization and potential overlap of these concepts and their roles in (patho)-physiological responses. We frequently use the delta opioid receptor as model receptor for our studies. We use a combination of in vitro cell culture assays, with in vivo mouse behavioral models and ex vivo assays to perform translational/pre-clinical research with the goal of proposing and developing new therapeutic drugs that may have better potency, efficacy and fewer side effects. Our main focus is on neurological disorders, with an emphasis on drug addiction and co-morbid mood and anxiety disorders as well as chronic pain conditions. Our primary research project is aimed at developing novel delta opioid receptor selective drugs that can treat alcohol use disorders, by simultaneously reducing alcohol craving and (alcohol-withdrawal-induced) anxiety. Additional projects involve investigations into the risk of adolescent consumption of alcohol mixed energy drinks, and the study of delta opioid receptors in models of alcohol withdrawal induced hyperalgesia as well as diabetic neuropathic pain and opioid induced hyperalgesia.

MICHAEL WENDT

College of Pharmacy　　　　　　　　**Department of Medicinal Chemistry and Molecular Pharmacology**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
_____ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Breast cancer

Molecular /Cellular Target(s)
EGFR, Her2, FGFR

Research Interest and Expertise
Research in the Wendt is focused on the role of epithelial-mesenchymal transition (EMT) in breast cancer metastasis. EMT is associated with resistance to several chemotherapeutic drugs and targeted molecular compounds. Recent studies by the Wendt has identified fibroblast growth factor receptor (FGFR) as major driver of drug resistance, particularly in the metastatic setting. Furthermore, cells that have undergone EMT become preferentially sensitive to inhibition of FGFR kinase activity. Work in the Wendt utilizes 3D cell culture and *in vivo* disease modeling in combination with an array of small molecule and biological approaches to optimize FGFR targeting for the treatment of metastatic and drug resistant breast cancer.

OTHER AREAS OF RESEARCH

RICHARD BORGENS

College of Veterinary Medicine

Basic Medical Sciences

College of Engineering

Biomedical Engineering

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The Center for Paralysis Research and Department of Industrial and Physical Pharmacy focus on neurological trauma, endeavoring to discover and develop drugs for the treatment of spinal cord injuries.

KEITH J. BOWMAN

College of Engineering   **Departments of Materials Engineering and Engineering Education**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
- Mechanical processing and properties of active ingredients and excipients
- Thermal and mechanical effects on crystalline solids
- X-ray diffraction

STEPHEN BYRN

College of Pharmacy   **Department of Industrial & Physical Pharmacy**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The Center for Paralysis Research and Department of Industrial and Physical Pharmacy focus on neurological trauma, endeavoring to discover and develop drugs for the treatment of spinal cord injuries.

RYAN CABOT

College of Agriculture   **Department of Animal Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The research conducted in our laboratory is focused on learning how the mammalian embryo directs its development from a single cell to a complex group of differentiated tissues and ultimately a fully formed adult organism. We are particularly interested in understanding how in vitro manipulation procedures affect development of the pig embryo and how these effects can be circumvented to improve embryo quality and embryo viability. It is well-established that many of the in vitro manipulations performed on mammalian embryos (e.g., in vitro production and culture of embryos) are correlated with increased rates of developmental failure and altered gene expression in surviving live-born animals. One technique in particular, cloning by nuclear transfer, has given scientists the ability to produce live-born domestic animals that harbor targeted genetic modifications.

The benefits from increasing the quality of embryos produced following in vitro manipulation will have a large impact on several scientific fields. First, it will allow us to increase the reproductive efficiency of agriculturally important species. Secondly, understanding how to better handle mammalian embryos in vitro will benefit the biomedical community as a resource to generate animal models for human diseases. While the scientific community has gained tremendous insight into the mechanisms of many human diseases through the use of transgenic and knock-out mice, much more sophisticated models, perhaps using animals that are more 'physiologically relevant', may be found in genetically modified livestock species, like the pig.

Current projects in the lab are aimed at examining the how specific epigenetic modifications are mediated in the early embryo (e.g., histone methylation) and the mechanisms by which specific chromatin-interacting factors access the nucleus during development.

DANIEL F. HOGAN

College of Veterinary Medicine   **Department of Clinical Sciences**

Category of Research
___X___ Diagnostics
_____ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)
Cardiac, vascular, thrombosis, valvular

Molecular/Cellular Target(s)
TGF-B and valvulopathy

Research Interest and Expertise
Our research focuses on cardiovascular therapeutics, including heart failure and antithrombotics. We have expertise in veterinary clinical trials, pre-clinical animal trials and animal modeling.

ELSA JANLE

College of Health and Human Sciences   **Department of Nutrition Science**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
___X___ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My major interest is diabetes and glucose control. To monitor glucose in diabetics without removal of blood, I developed the ultrafiltrate probe. The ultrafiltrate probe is a membrane probe which can be implanted in subcutaneous tissue. A negative pressure is applied and interstitial fluid is removed. These probes can be used for long term monitoring in large or small animal models. I have also worked on additional uses of the ulrafiltrate probe for other areas of medical research including measurement of bone minerals in bone, muscle and subcutaneous tissue.

As part of the Botanical Center I have investigated the potential of green tea and other supplements to improve glucose tolerance and reduce long term complications of diabetes. I also investigate bioavailability and tissue distribution of botanical compounds. I have worked for 5 years with an Alzheimer's Disease center to measure brain distribution of plant polyphenols which may be useful in prevention of Alzheimer's disease.

YUK FAI LEUNG

College of Science   **Department of Biological Sciences**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
___X___ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Retinal degeneration

Molecular/Cellular Target(s)
Retinas, photoreceptors, retinal ganglion cells

Research Interest and Expertise
Retinal degeneration is a group of inherited eye diseases including retinitis pigmentosa and age-related macular degeneration that impair our vision. They are incurable, even though much has been learned about the molecular basis of these diseases. To expedite discovery of new drugs for these diseases, we study zebrafish retinal-degeneration models.

We focus on two research directions:
1. Disease-causing gene network for retinal degeneration
2. Drug discovery for retinal degeneration. Please visit our lab website for further information.

MARKUS LILL

College of Pharmacy   **Department of Medicinal Chemistry & Molecular Pharmacology**

Category of Research
_____ Diagnostics
___X___ Target Discovery & Characterization
___X___ Drug Synthesis/Optimization
___X___ Delivery/Formulations
_____ In Vivo Disease Models
___X___ ADME/DMPK/Tox
___X___ Other: Computational Drug Design

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)
Hypoglycemia, alcohol abuse, pain

Molecular/Cellular Target(s)
Glucagon receptor, delta opoid receptor, PCNA, adenylyl cyclase, cytochrome P450 enzymes

Research Interest and Expertise
My current research has been dedicated to the development and application of molecular modeling techniques to gain insight into the processes associated with protein-ligand and protein-protein binding. Current research activities are focused on addressing serious shortcomings of present computational approaches for modeling protein-ligand and protein-protein association: protein flexibility, entropic contributions associated with the dynamics of the complex, solvation effects, and a reliable quantification of binding affinities and kinetic properties. I have been leading the development of nine different software products, some of them freely available for download from our group website. Computational methods are applied in collaboration with experimental groups focusing on CYP-mediated drug metabolism, GPCRs, PCNA and other cancer-related targets.

ZOLTAN K. NAGY

College of Engineering   **Department of Chemical Engineering**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
___X___ Cancer
___X___ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Professor Nagy's research is characterized by the development and application of process systems engineering approaches and tools for engineered product design and optimal process operation, with applications in pharmaceutical, fine chemical, biotechnology, food and agrochemical industries. Our research combines modeling, optimization and advanced control approaches with experimental investigations using modern measurement techniques, with the generic aim to develop theoretically founded, practical methodologies for complex processes with quantifiable system performance improvements that can be supported in an industrial environment.

J. PAUL ROBINSON

College of Veterinary Medicine   **Department of Basic Medical Sciences**

Category of Research
___X___ Diagnostics
___X___ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
___X___ Cancer
_____ Diabetes/Obesity/Metabolic Disease
___X___ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The group focuses on interdisciplinary projects that cover basic biology through to practical biomedical engineering.

RIYI SHI

College of Veterinary Medicine   **Department of Basic Medical Sciences**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our research contributions includes originating the use of double sucrose gap technique for recording action potential conduction, establishing the methods of neuronal membrane resealing by polyethelyne glycol (PEG), and identifying acrolein as a key pathological factor in spinal cord injury and multiple sclerosis. His research interests also include using nanotechnology to improve drug delivery to nervous tissue and incorporating biomedical engineering principles to enhance neuronal repair and diagnosis. This includes designing innovative scaffolds to enhance neuronal regeneration and using bioadhesives for neuronal tissue repair.

DANIEL SMITH

College of Pharmacy   **Department of Pharmacy Practice**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
___X___ Neurological Disorder/Trauma
_____ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
The Center for Paralysis Research and Department of Industrial and Physical Pharmacy focus on neurological trauma, endeavoring to discover and develop drugs for the treatment of spinal cord injuries.

KEVIN M. SOWINSKI

College of Pharmacy   **Department of Industrial & Physical Pharmacy**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Sex-related differences in drug pharmacokinetics and response; Impact of renal disease and dialysis on drug pharmacokinetics and response; Mathematical modeling of pharmacokinetic and pharmacodynamics; Cardiovascular pharmacokinetics and pharmacodynamics.

JAMES E. TISDALE

College of Pharmacy   **Department of Pharmacy Practice**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
My research interests are in the area of cardiovascular pharmacotherapy, focusing on: mechanisms, risk factors, and management of drug-induced arrhythmias, and drug therapy for prevention and treatment of atrial fibrillation.

JONATHAN WILKER

College of Science   **Department of Chemistry**

Category of Research
_____ Diagnostics
_____ Target Discovery & Characterization
_____ Drug Synthesis/Optimization
_____ Delivery/Formulations
_____ In Vivo Disease Models
_____ ADME/DMPK/Tox
___X___ Other

General Disease Area(s)
_____ Cancer
_____ Diabetes/Obesity/Metabolic Disease
_____ Immunology/Inflammatory/ Infectious Disease
_____ Neurological Disorder/Trauma
___X___ Other

Specific Disease(s)

Molecular/Cellular Target(s)

Research Interest and Expertise
Our laboratory is working to understand how such biological materials function, design synthetic mimics, and develop applications for these materials.