

2018-2019
GRADUATE
FACULTY RESEARCH
PROFILES

**ALBANY COLLEGE OF PHARMACY
AND HEALTH SCIENCES**

FOREWORD

The Faculty at the Albany College of Pharmacy and Health Sciences is a distinguished group of scholars with research interests in the clinical, biomedical, pharmaceutical and social sciences. Faculty across all academic departments are engaged in research focused on untangling the complex mechanisms of disease, diagnosing and characterizing disease markers, identifying new and effective drug therapies, and understanding the clinical challenges associated with delivering the most effective healthcare to diverse patient populations. Many of our faculty explore research questions that are supported by federal granting agencies such as the National Institute of Health, and by pharmaceutical and biotechnology companies and private foundations. Their work is regularly reported at prominent national and international conferences and is published in influential peer-reviewed journals. Collaboration among faculty within ACPHS as well as with external scientists and clinicians provide a network of opportunity and resources that enhances the research environment at the College. Research facilities and resources both on our New York and Vermont campuses, and around the Capital region and the greater Burlington, VT area are available and accessible, that further enrich the research productivity and experience for both students and their faculty mentors. Faculty work closely with student collaborators, providing hands-on, one-on-one interactions that results in deepening the students' research training. Our over 25 graduate faculty are thoroughly committed to training the next generation of scientific, clinical and administrative professionals to become leaders in pharmaceutical and biotechnology companies, healthcare institutions, government and academia.

This catalog represents a listing of our Research Graduate Faculty with summaries of their research interests and contact information. Feel free to contact Faculty with questions you may have about research. Student researchers are an integral part of the research community and educational experience at ACPHS.

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Research Interests:

Research in Dr. Balaz's laboratory is oriented towards development of experimental and computational methods for structure-based predictions of the rate and extent of processes, which determine drug disposition and receptor binding. In disposition, his lab performs experimental measurements using (1) surrogate phases to find structural determinants of transbilayer transport rates and accumulation in membranes and triglyceride phases, and (2) binding to prevalent human proteins such as albumin and extracellular matrix components. The data is used to develop structure-based models for prediction of the volume of distribution and other pharmacokinetic characteristics. One of the goals is to find the way to tailor drug structures for limited distribution, to reduce the cytotoxicity of some drugs, e.g. for treatment of some cancers or arthritis. For receptor binding, we utilize the growing database of receptor structures to develop computational models for prediction of binding affinity of compounds before they are tested. Our state-of-the-art models incorporate as much chemistry of the studied systems as feasible: we include flexibility of interacting structures including multiple binding modes, as well as ionization and tautomerism species of both ligands and receptors. The laboratory is well equipped for analytical and imaging work, and utilizes industry-standard molecular modeling systems.



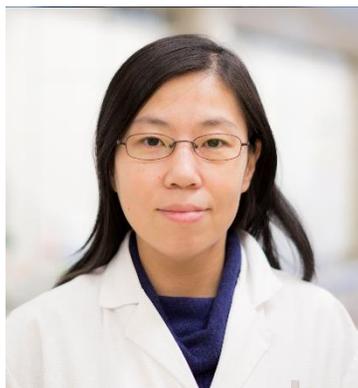
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Program Affiliation: MS, Health Outcomes and Informatics

Research Interests:

My primary area of research is on the behavioral aspects of cancer prevention and survivorship in families with hereditary cancer syndromes. Specifically, I am interested in developing interventions to improve health behaviors in this population, with a focus on improving patient-provider communication. Recent projects include comparing Lynch syndrome-associated colorectal cancer survivors with sporadic controls to examine similarities and differences in the cancer survivorship experience and examining screening behaviors and patient-provider communication regarding gynecologic cancer risk for women with Lynch syndrome.



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Program Affiliation: MS, Pharmaceutical Sciences

Research Interests:

Our research focuses on the design and synthesis of molecular probes and therapeutic agents targeting epigenetic modifying enzymes. The ultimate goal is to translate these findings into novel treatments for cancers and age-related diseases. One of our on-going projects involves the study of sirtuins (or Class III HDACs) which are involved in central physiological regulation mechanisms, many of them with relevance to metabolic regulation and aging processes. Therefore, the seven mammalian sirtuin isoforms are emerging targets for the treatment of metabolic disorders and aging-related diseases. Despite the intense pursuit of sirtuin-targeted therapeutics, the connection between sirtuins and disease pathogenesis is not fully understood. To elucidate the transient but essential functions of sirtuins, traditional biological and genetic tools are often limited due to the lethal or slow responses of these enzymes at gene level. The need for novel chemical tools to evaluate sirtuin activity in native biological system is apparent. We will take advantage of the unique sirtuin catalytic mechanism: 1) to engineer active-site directed chemical probes for profiling sirtuins in native proteomes and live cells; 2) to design and identify potent, isoform-specific small-molecule sirtuin regulators as pharmacological modulators and anti-cancer reagents.



Christopher Cioffi, PhD

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Program Affiliation: MS, Pharmaceutical Sciences

Research Interests:

Dr. Cioffi is a medicinal chemist with extensive experience in integrated drug discovery working on research programs in support of large pharma, biotech, academic, and NIH collaborations. He has made significant drug design contributions to programs that spanned multiple therapeutic indications (e.g., dyslipidemia, irritable bowel syndrome, CNS, and ophthalmology) and have advanced drug candidates into pre-clinical development and clinical trials. His current research interests involve the synthesis of molecular probes and small molecule drug discovery focused on CNS-based targets implicated in various neuropsychiatric and neurological disorders. His laboratory provides training opportunities for students interested in the drug discovery process, which includes organic synthesis, structure- and ligand-based drug design, hit-to-lead identification, and lead optimization. Furthermore, the collaborative nature of these research programs will also provide students exposure in the areas of *in vitro* biology, pharmacology, computer assisted drug discovery (CADD), and drug metabolism and pharmacokinetics (DMPK).



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Program Affiliation: MS, Pharmaceutical Sciences

Research Interests:

Dr. Dearborn's research focuses on development neurobiology in the fruit fly, *Drosophila*, in three primary areas: 1) The elucidation of vitamin D₃ up-regulated protein 1 (VDUP1) tumor suppressor function during brain development, including VDUP1's role in neural stem cell biology; 2) Hedgehog (Hh)-dependent regulation of VDUP1 in cell proliferation, including how tumor cell-specific differences in Hh signaling affect pharmacological treatment strategies; 3) Molecular characterization of Eph receptor signaling pathways, which regulate axon guidance, vascular growth and tumorigenesis, through the study of several novel pathway associated genes. The lab emphasizes molecular-genetic approaches in these studies, each with clinical and translational relevance.



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Program Affiliation: MS, Pharmaceutical Sciences

Research Interests:

The human genome is compacted into chromatin, allowing nearly three meters of DNA to fit into the small volume of the nucleus. Chromatin is composed of DNA and histone proteins, and this DNA-protein complex is the template for a number of essential cellular processes. For example, DNA transcription, replication and repair are regulated by the spatial organization of chromatin throughout the cell cycle, which can be manipulated by chromatin remodelers that alter specific chemical modifications on the histones and DNA. Understanding the role of chromatin remodeling proteins in transcriptional control is important as deregulation of gene expression (due to mutation or overexpression) can contribute to disease progression. The Glass laboratory investigates how epigenetic mechanisms regulate diverse cellular activities. High field Nuclear Magnetic Resonance (NMR) spectroscopy, X-ray crystallography, and biochemical and molecular biology approaches are utilized determine the three-dimensional structures and functions of chromatin binding proteins implicated in human diseases such as leukemia, heart disease and cancer. Ultimately, these studies will lead to the identification of new therapeutic targets, more specific treatment strategies, and better overall outcomes for patients.



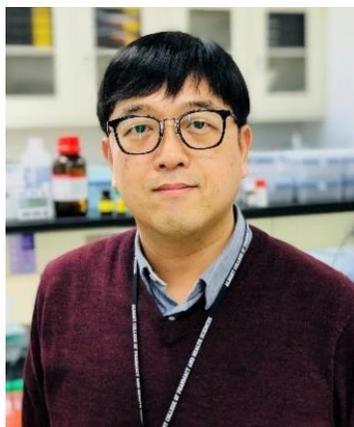
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Program Affiliation: MS, Pharmaceutical Sciences

Research Interests:

Dr. Hass' research integrates synthetic organic chemistry, pharmaceutical formulation and stability, biochemical assays, medicinal chemistry and pharmacology. Her laboratory provides unique training opportunities for research students in the areas of drug synthesis, pharmaceutical formulation, topical drug delivery and assessment of drug efficacy. Major current projects are focused on the synthesis and activity of new drugs for use as topical agents to treat skin diseases. One group of novel co-drugs are designed to replenish natural antioxidants in the skin for enhanced and extended photoprotection relative to existing topical products. Other topical agents under development utilize the co-drug approach to target hyperproliferation of keratinocytes and inflammation associated with psoriasis.



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Program Affiliation: MS, Pharmaceutical Sciences

Research Interests:

About 70% of estrogen receptor (ER) positive breast cancers have a significantly reduced risk of invasive breast cancer through the use of various endocrine therapies. Despite the relative safety and significant anti-neoplastic and chemopreventive activities of tamoxifen and aromatase inhibitors, many initially responsive breast tumors develop resistance and ultimately recur. My current research is to investigate the secretome leading to the endocrine resistance in crosstalk between endocrine resistant breast cancer and tumor microenvironment. The long-term mission of my laboratory is to understand the steps of the endocrine resistant process in order to develop therapeutic approaches to prevent and treat endocrine resistant breast cancer effectively. The ultimate goal of my research is to bring therapies into the clinic that will improve the survival of metastatic breast cancer patients.



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Program Affiliations: MS, Pharmaceutical Sciences; MS, Molecular Biosciences

Research Interests:

Dr. LaRocca's research interest lies primarily in mechanisms of eukaryotic programmed cell death (PCD). This includes mechanisms of apoptosis, necroptosis, and molecular switches that balance the two pathways. In particular, Dr. LaRocca is interested in the role of glucose in driving PCD. Metabolism of glucose (glycolysis) drives necroptosis through the formation of toxic advanced glycation end products (AGEs) and reactive oxygen species (ROS). Therefore, situations in which cellular glucose stores are elevated (hyperglycemia/diabetes) should sensitize cells to necroptosis. Dr. LaRocca has observed that hyperglycemia enhances necroptosis and shifts apoptosis toward necroptosis. This is significant as it represents a shift from a non-inflammatory cell death (apoptosis) toward a highly inflammatory one (necroptosis). Dr. LaRocca is actively investigating the mechanism of this hyperglycemic cell death shift at the cellular level and is investigating its role in the exacerbation of ischemic brain injury (stroke). *In vivo* portions of this project which utilize a mouse model of neonatal stroke are being done in collaboration with Dr. Vadim Ten at Columbia University. A second project in the lab is aimed at understanding the mechanisms and outcomes of erythrocyte (red blood cell, RBC) necroptosis, a cell death pathway discovered by Dr. LaRocca. Previous studies have demonstrated that certain CDCs can induce a PCD in RBCs called programmed necrosis or necroptosis. RBCs have long been thought to lack the capacity for PCD, mainly due to the absence of nuclei and mitochondria, making this project fascinating from a cell biology point of view. Dr. LaRocca is interested in characterizing the mechanism and role of RBC necroptosis with *in vitro* and *in vivo* studies and exploring the impact of necroptosis on RBCs stored for transfusions. A third project is focused on the induction of PCD in target cells by ricin toxin. In particular, Dr. LaRocca is interested in the possibility that ricin-induced apoptosis of macrophages leads to bystander cell death of lung epithelial cells, which may explain the high extent of lung damage in response to ricin exposure via aerosol route. This project is relevant as ricin is considered to be a toxin that may be used as a biological weapon. The ricin project is being done in collaboration with Dr. Nicholas Mantis at Wadsworth (New York State Department of Health).



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Program Affiliations: MS, Pharmaceutical Sciences; MS, Molecular Biosciences

Research Interests:

The long term research goal of Dr. Malik's laboratory is to understand the complexities of host pathogen interactions for the development of improved prophylactics and therapeutics against important bacterial infections. She has a three-year grant by the National Institutes of Health to investigate the mechanisms by which *Francisella tularensis*, a category A biothreat agent survives inside the immune cells and suppresses the protective immune responses. A second area of research in the lab is to investigate the molecular mechanisms leading to the development of antibiotic resistance in methicillin resistant *Staphylococcus aureus* (MRSA) strains. For additional information on research projects going on in the lab, please refer to the publication list on PubMed: <http://www.ncbi.nlm.nih.gov/pubmed/?term=Meenakshi+Malik>



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Program Affiliations: MS, Pharmaceutical Sciences; MS, Health Outcomes and Informatics

Research Interests:

Dr. Mousa's current research interest is focused on advancing novel concepts in therapeutic and diagnostic targets through the exploration for the role of cell adhesion molecules and extracellular matrix proteins, angiogenesis, thrombosis, and inflammation modulation in health and diseases. At the Pharmaceutical Research Institute enabling technologies including nanotechnology, biotechnology, pharmacotherapy, and stem cells are key catalysts to the discovery of novel therapeutics and diagnostics for the treatment and prevention of various diseases including cancer, cardiovascular, neurological, ophthalmological, inflammatory, and other vascular disorders.



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Research Interests:

Dr. Musteata's research interests include the development of miniaturized analytical technology for pharmacokinetic studies and therapeutic drug monitoring, with the purpose of creating personalized therapeutic devices that integrate chemical analysis, decision, and drug delivery.



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Program Affiliations: MS, Clinical Laboratory Sciences; MS, Molecular Biosciences

Research Interests:

Dr. Parent is a trained Microbiologist, Clinical Microbiologist and Immunologist. Her research focus has been on understanding the immune response to infection, specifically she has focused on two different bacterial pathogens. *Vibrio parahaemolyticus*, a Gram-negative bacterium is most commonly associated with the ingestion of raw oysters. This emerging pathogen causes self-limiting gastrointestinal infection, wound infection, and in the immunocompromised host, significant systemic disease leading to death. The laboratory's goal is to characterize the host response to infection that may allow it to evade the host innate responses and potentially contributing to pathogenesis by preventing rapid elimination from the infected host. Additionally, the laboratory studies *Yersinia pestis*, a facultative intracellular gram-negative bacillus. Recent vaccine trials, using a *Y. pestis* specific protein-subunit in nonhuman primates, resulted in the generation high antibody titers however, vaccination failed to protect against a lethal pneumonic infection. We hypothesized that cell-mediated immunity is required in addition to humoral immunity for complete protection. Toward that end, my lab is focusing on identifying and understanding those aspects of the immune response needed to survive a lethal pneumonic infection. Using attenuated *Y. pestis* our goal is to understand the underlying mechanisms of a protective immune response directed against *Y. pestis* in order to produce a more efficacious vaccine.



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Research Interests:

Dr. Parker is a medical sociologist and interdisciplinary health services researcher. Dr. Parker studies health disparities throughout the life course in vulnerable populations with a specific emphasis on maternal and child health and complex patient populations. She utilizes mixed method approaches ranging from in-depth interviews and focus groups to survey research and secondary data analysis. Recent work includes a series of projects around medication management in patients with chronic kidney disease, as well as a number of studies exploring a range of topics around women's health (e.g., contraceptive and fertility decision-making, choosing the right health care provider, and lessons learned from the OBOS archives).



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Program Affiliation: MS, Health Outcomes and Informatics

Research Interests:

Dr. Polimeni's current research interests include sustainable economic development and energy economics.



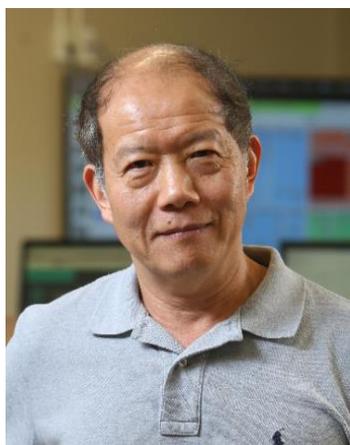
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Program Affiliations: MS, Molecular Biosciences; MS, Pharmaceutical Sciences

Research Interests:

Cytochrome P450 (CYP) constitutes the major enzyme family in drug metabolism with increasing importance in pharmacogenetics, and more recently to pharmacogenomics. Dr. Shah's laboratory investigates genetic polymorphisms in drug-metabolizing CYPs using structural and biophysical methods. His research employs various protein biochemistry techniques to study structure-function relationships of CYP2C9 enzyme, which metabolizes up to 20% of the clinical drugs including warfarin, losartan, ibuprofen and tolbutamide. Students will gain experience in recombinant protein expression, purification, crystallization, remote data collection via Stanford Synchrotron Radiation Lightsource, in California, and structure determination of protein-drug complexes using multiple computational tools. Furthermore, ongoing collaborative studies that utilize a broader range of structural biology techniques including cryo-electron microscopy will help students to prepare for a career in industry or academia.



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Program Affiliations: MS, Clinical Laboratory Sciences; MS, Cytotechnology and Molecular Cytology; MS, Molecular Biosciences; MS, Pharmaceutical Sciences

Research Interests:

The research at Dr. Shi's lab is focused on understanding HIV pathogenesis. The main area of research is to study viral-host interactions during HIV-1 infection. In particular, nucleic acids generated in HIV-1 early stage of replication can be sensed by various host cellular factors. These viral-host interactions further induce and activate different cell death pathways. Studying regulation of host response towards HIV-1 infection will shed light on the understanding of molecular mechanism of pathogenesis. Another research area in Dr. Shi's lab is to design and develop nucleic acid-based molecular assays for detecting HIV-1 infection and monitoring AIDS disease progression for clinic management and treatment.

Recent publications at Dr. Shi's lab can be found at:

<https://www.ncbi.nlm.nih.gov/myncbi/1dQyhERxjvks/bibliography/49369196/public/>



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Research Interests:

Mass spectrometry (MS)-based proteomics has become a powerful, unbiased approach to understand the complex molecular mechanisms underlying fundamental biological processes as well as mechanisms associated with the development and progression of human disease. This approach is an integral component of our research program at ACPHS Vermont, where we are investigating epigenetics changes that occur in various cell and tissue types after chronic alcohol abuse. Specifically, we utilize MS to identify and quantify changes in alcohol-induced histone modifications as well as differential protein expression on a global scale in cell culture and animal models of acute and chronic alcohol exposure. In conjunction with bioinformatics, MS-based proteomic data can be used to not only determine novel proteins and/or pathways that are affected due to a specific physiological or pathophysiological state, but can also predict the activity of potential upstream regulators (e.g., transcription factors) and downstream functional outcomes. The results from proteomic and bioinformatic analysis can provide a detailed mechanistic framework for the development of targeted hypotheses for future studies.



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Program Affiliation: MS, Pharmaceutical Sciences

Research Interests:

Cancer stem cells are able to undergo asymmetric division, leading either to replenishment of the existing stem cell population or generation of cells which can undergo differentiation and constitute the bulk of the cells present in a tumor. Studies have shown that cancer stem cells are resistant to a range of cytotoxic anti-cancer drugs. This resistance can eventually lead to regrowth of the tumor if cancer stem cells are not completely eradicated following chemotherapy. We are studying the regulation of growth of cancer stem cells isolated from mouse mammary tumors, with a focus on identifying signal transduction pathways that contribute to this regulation. The goal of these studies is to identify pathways that could be inhibited in order to decrease the proliferative capacity of these stem cells. Elucidation of these pathways may also lead to a better understanding for the basis of stem cell resistance to cytotoxic drugs.



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Program Affiliation: MS, Molecular Biosciences

Research Interests:

Respiratory infection by influenza viruses are a significant cause of morbidity and mortality worldwide. Research in Dr. Yager's laboratory is focused on understanding how the body regulates inflammatory responses during flu infection. Recent studies have established a critical role for the multi-protein cytosolic NLPR3 inflammasome complex in host defense and pathophysiology during flu infection. Specifically, Dr. Yager and his team are investigating how NLRP3 inflammasome activation and resultant inflammatory cytokine secretion are regulated on a molecular level to favor host protection over immunopathology. Other areas of research include the identification of novel targets for the development of new anti-viral drugs to combat flu infection, and the role of viral-induced inflammation in the etiology and pathogenesis of autism spectrum disorder.



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Program Affiliation: MS, Pharmaceutical Sciences

Research Interests:

Dr. Zheng's research group is interested in the product design and quality assessment of Complex Drug Products, such as botanicals, therapeutic peptides and proteins. Interdisciplinary technologies and translational strategies are used to elucidate mechanisms of actions, evaluate pharmaceutical quality, and access therapeutic benefits and risks. These efforts can enable regulatory decisions and enhance patient centric product design. Our recent research projects focus on the risks and benefits of cannabis products, and cannabinoids' effects to the endocannabinoid systems, in the brain, at the blood brain barrier, and across the drug delivery interfaces.



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