ABI BIOTECHNOLOGY RESEARCH INTERNSHIP 2016 MENTOR RESEARCHERS

Dr. Fabricio Medina-Bolivar - Bioproduction of medicinal compounds from plants

The Medina-Bolivar laboratory team is involved in the discovery and bioproduction of bioactive plant compounds with medicinal applications (such as cancer and obesity). Our studies utilize "immortalized" root cultures (known as "hairy roots") as factories for a large diversity of plant natural products. Students involved in this project will learn molecular biology (gene cloning and PCR), plant tissue culture (micropropagation and hairy root cultures) and analytical/purification techniques (high performance liquid chromatography and high performance countercurrent chromatography) for the production, isolation and characterization of bioactive plant compounds. Bioactivity assessment of the distinct natural products produced in the roots cultures is currently done in the Medina-Bolivar laboratory and through collaborative projects with scientists across the country. The students are expected to participate in all aspects of the research and produce results for presentation at scientific conferences.

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Mohammad Abrar Alam

In my research group, we develop new methodology for the synthesis of new heterocyclic molecules as potential anticancer and antimicrobial agents. Our long term goal is to find potent anticancer and antimicrobial therapeutic agents. While working in my lab during summer, students will learn to do reactions and will learn to use analytical techniques such as NMR and IR spectroscopy to elucidate the structures of new molecules. Students will also learn to interpret NMR, IR, and Mass spectral data for small molecules. If students are interested in biology focused research then my group has large number of new molecules to evaluate their antimicrobial activities against different strains of bacteria. Students will do Kirby–Bauer testing (KB testing or disc diffusion assay) and MIC testing to get potency of new molecules against Gram-positive and Gram-negative bacteria.

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Susan Motts

I study the connections of different parts of the brain, especially the brainstem. I am particularly interested in connections related to the startle reflex. This reflex combines my expertise in auditory neuroscience with my interest in the motor system (I am a physical therapist). Interns will have the opportunity to learn basic science research techniques including brain surgery on rats, labeling cells, tissue processing, immunohistochemistry, and microscopy.

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Jianfeng (Jay) Xu

My research objective is to effectively produce recombinant proteins of pharmaceutical applications with plant cell, yeast and bacteria. Experiments are focused on understanding gene expression, protein synthesis and post-translational modification, protein separation/purification, and protein bioactivity. While working in my lab in this summer, the student will design and build 2-3 gene expression constructs/vectors and transform them into tobacco or yeast cells. The genes to be built encode therapeutic proteins such as vaccines, growth factors and interleukins. By working on this project, students will learn all basic techniques in molecular cloning including PCR, restriction digestion, ligation, plasmid extraction, *E. Coli* transformation, and gel electrophoresis, etc. Students also have chance to learn to run ELISA, Western blotting, Northern blotting, gas chromatography and liquid chromatography. Another research area of my lab is biofuel production from cellulosic plant biomass such as dedicated energy crops, rice and wheat straw, and duckweed, etc. Students will learn the whole process to convert some plant biomass to ethanol if you are interested in working in this area. **E-Mail:** jxu@astate.edu **Tel:** 870-680-4812

Dr. Brett J. Savary, ABI Research Professor - Protein and Polysaccharide Chemistry.

I investigate nutritional components isolated from whole-grain rice varieties to determine their dietary contribution for healthy colon functioning. This addresses a primary mission of the Arkansas Biosciences Institute at A-State: interfacing AR agriculture and human health. Current research in my laboratory focuses on isolating polysaccharides from rice bran fiber, and treating them with enzymes with produced with recombinant expression technologies in my lab, and recovering products for structure analysis and bioassay testing. Summer interns will have the opportunity to learn and apply techniques involved in all of these activities. Our ABI laboratories have advanced instruments that students will learn about and gain working knowledge of their operation during research participation. The goal of the summer internship will be to gain an understanding of our rice bran nutrition project, acquire hands-on experience in a multidisciplinary research laboratory, and obtain experience with preparing a scientific presentation – all invaluable experience in preparing for future graduate studies. See my web page http://www.plantpoweredproduction.com/faculty/brett-savary/ or contact me directly for further information.

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Dr. Maureen Dolan, Therapeutic Protein Production using Plants as "Bio-factories"

Undergraduate research scholars in the Dolan lab will be a part of a dynamic research team that includes undergraduate, graduate and senior researchers focused on using plants as "factories" and recombinant DNA techniques to produce animal therapeutic proteins. Specifically we use this plant production system to develop fish protein therapeutics that could be used as alternatives to antibiotics in controlling disease outbreaks in farmed raised (aquacultured) fish. Other projects in the lab in collaboration with engineering faculty are involved with the development of DNA-based diagnostics that can be used for identifying fish species that is important for managing our food supplies as well as in supporting conservation management efforts. Student researchers will have opportunity for hands-on experience using some of the skills and techniques seen/learned in your lab courses including buffer preparation, pipetting, PCR, DNA extraction, protein chromatography, electrophoresis and animal cell culture. Student scholars are paired with senior researchers in the lab to train in the techniques they will use to carry out their research project. Please check out this weblink for more information about research in our lab: <u>http://www.plantpoweredproduction.com/faculty/maureen-dolan/</u>or contact me at:

Email: mdolan@astate.edu Phone: 870-680-4359

Dr. Malathi Srivatsan - Developing Strategies for Regeneration to address Neurodegeneration

Millions of people suffer from neurodegenerative disorders or brain/spinal cord injury throughout the world. It is difficult to find cures for these conditions because neurons which are the basic functional units of the central nervous system (CNS) do not divide and replace the dead cells. Our research uses bioengineering approaches and stem cells towards tissue regeneration for the nervous system as a potential treatment for diseases/injuries. We also use our cell culture model of neurons to screen drugs that are developed to act on the nervous system. We use cell cultures of neurons, stem cells on engineered matrices with a mix of growth factors and employ cellular and molecular techniques such as cell culture, immunocytochemistry, affinity chromatography, electrophoresis, ELISA, Western and Northern blots, spectrophotometry, light and fluorescence microscopy, real time imaging, calcium imaging, morphometry, electrophysiology with multi electrode array and microarray (gene chip) analysis. We have research collaborations with scientists at Arkansas State University, University of Arkansas for Medical Sciences (UAMS), University of Arkansas at Favetteville and at National Center for Toxicology Research. Currently three undergraduate students are working in the Srivatsan laboratory and we expect to actively perform experiments in the summer with undergraduate students. Students participating in this research are expected to have an interest in learning, perform experiments paying attention to details, participate in lab meetings and discussions, present results at scientific conferences and participate in publishing the results .:

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