

ABI BIOTECHNOLOGY RESEARCH INTERNSHIP 2014 MENTOR RESEARCHERS

Jianfeng (Jay) Xu

My research objective is to effectively produce recombinant proteins of pharmaceutical applications with plant cell, microalgae, 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 vaccine 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.

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Bioproduction of medicinal compounds from plants

Dr. Fabricio Medina-Bolivar

The Medina-Bolivar laboratory team is involved in the discovery and bioproduction of bioactive plant compounds with medicinal applications. 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 through collaborative projects with scientists at Arkansas State University, University of Arkansas for Medical Sciences (UAMS), University of Mississippi Medical Center, University of Tennessee Health Science Center and St. Jude Children’s Research Hospital. The students are expected to participate in all aspects of the research and produce results for presentation at scientific conferences.

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Developing Strategies for Regeneration to address Neurodegeneration

Dr. Malathi Srivatsan

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 diseases/injuries. 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 Fayetteville and at National Center for Toxicology Research. Currently three 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 learn and 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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Shiguang Yu

Yu's lab provides summer interns with an opportunity to address the impact of health related issues (e.g. inflammation, autoimmune diseases) using a laboratory mouse model and cell culture. Interns will have the opportunity to learn immunology techniques, cell culture and flow cytometry and participate in the research about targeting inflammatory cytokines in immune cells. Hopefully this will increase the intern's interests in biomedical research.

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Susan Motts

Dr. Motts studies the connections of different parts of the brain, especially the brainstem. Interns will have the opportunity to learn basic science research techniques including labeling cells, tissue processing, immunohistochemistry, and microscopy. Interns will have a choice whether or not they would like to be involved in the small animal brain surgeries conducted in the lab.

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Brett Savary

Dr. Savary is leading a new multidisciplinary research project to isolate nutritional components from whole-grain rice varieties and establish their biological function for colon-specific health benefits. This project closely involves Drs. Jay Xu and Shiguang Yu and their laboratories in the ABI, faculty at the University of Arkansas' Food Science and Nutrition, and research scientists at the USDA National Rice Research Center in Stuttgart. Student interns will have the opportunity to learn and develop laboratory skills in such diverse areas as enzymology and recombinant protein expression, bioanalytical and separations chemistry (electrophoresis, western blotting, chromatography and mass spectrometry), and human cell culture and immune response bioassays. An expected outcome of this summer internship is to gain sufficient experience and knowledge to develop an independent research project under Dr. Savary's guidance. This will provide continuing training and experience that will particularly benefit those students planning for advanced education in medical or graduate school. Candidates are encouraged to contact Dr. Savary to meet and discuss opportunities on this project.

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Maureen Dolan

Summer interns in the Dolan lab will be a part of a dynamic research team that includes undergraduate, graduate and senior researchers focused on using genetically modified plants as "factories" for producing 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. Student researchers will use many of the techniques they have seen/learned in your lab courses including PCR, protein chromatography, electrophoresis and animal cell culture in producing, purifying and testing the activity of these fish protein therapeutics. Student interns are paired with senior researchers in the lab to train in the techniques they will use to carry out their summer research project. In addition students will participate in weekly lab meetings and gain the skills for orally presenting their research results at the

conclusion of their internship. Please check out this weblink for more information about research in our lab
<http://www.plantpoweredproduction.com/faculty/maureen-dolan/> or contact me at:

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