2016 Seed Opportunity Program – Phase I

Funded Projects

Transcriptional Changes Of Plants In Response To Arbuscular Mycorrhizal Fungi With Different Benefit Potential
Principal Investigator: Heike Bucking - South Dakota State University
Co-Investigator: Senthil Subramanian - South Dakota State University

Why do arbuscular mycorrhizal (AM) fungal isolates from one morphospecies differ so much in their effect on plant nitrogen (N) nutrition, and how does the plant contribute to these differences? This BioSNTR seed proposal will address this question by studying the transcriptome of *Medicago* plants in response to the colonization of the plant with a high performance, medium performance, or a low performance isolate. This will allow us to identify how the host plant compatibility contributes to the efficiency with which AM fungi contribute to N nutrition. Goal of this project are to identify candidate genes (e.g. N transporter of the plant that are involved in the N uptake from the mycorrhizal interface) that can act as molecular markers for the capability of the plant to benefit from fungal N transport. A better understanding of these differences could provide us with more information, how AM fungi could be used to improve the N uptake of important crop plants and reduce the required N fertilizer inputs.

Award Amount: $28,863

To define how exosomes drive myeloid derived suppressor cells (MDSC) accumulation
Principal Investigator: Paola Vermeer - Sanford Research
Co-Investigator: Adam Hoppe - South Dakota State University

We hypothesize that tumor-derived EphrinB1 exosomes are taken up by endocytically active macrophage and neutrophil precursors, resulting in expansion of MDSCs that exacerbates HNSCC disease. To tackle this question, we will team up with Dr. Adam Hoppe and BioSNTR to define how exosomes interact with immune cells and define how exosome-immune cell interactions impact immune cell phenotype and function.

Award Amount: $40,000

Generate a toolbox for measurement of dynamic changes involved in cellular force generation and membrane tension in live cells
Principal Investigator: Indra Chandrasekar, Sanford Research
Co-Investigators: Kyle Roux - Sanford Research; Jing Liu - SDSMT

We propose to generate a toolbox for measurement of dynamic changes involved in cellular force generation and membrane tension in live cells. We will do this by creating fluorescence resonance energy transfer (FRET) based tension sensor probes of candidate proteins that are important molecular players in maintaining and responding to these cellular forces.

Award Amount: $24,500

Interaction of co-cultures of marcophages with platelets, endothelial cells, and smooth muscle cells on implantable polytetrafluoroethylene biomaterial
Principal Investigator: Gopinath Mani - University of South Dakota
Co-Investigators: Zhongkui Hong - University of South Dakota; Mark Larson - Augustana University

Polytetrafluoroethylene (PTFE) is commonly used for making various cardiovascular implants and medical devices such as vascular bypass grafts, balloon catheters, and heart patches. Also, PTFE is used for making some of the principal components of heart valves and stent grafts. Although PTFE has such widespread clinical applications, the implants that are made from this material are still associated with undesirable clinical events such as chronic inflammation, acute thrombosis and anastomotic neointimal hyperplasia. These events are primarily caused due to inappropriate interactions of macrophages, platelets, endothelial cells (ECs), and smooth muscle cells (SMCs) with PTFE. The research goal of this study is to investigate the interaction of co-cultures of macrophages with platelets, ECs, and SMCs on the PTFE, to fundamentally understand how the co-interactions of these cells contribute to the adverse clinical events. This fundamental understanding would pave the way for developing biomaterials that can minimize inflammation and concurrently maximize wound healing.

Award Amount: $15,170

Identification of Novel Signaling Pathways Controlling Mobile Genetic Elements in Cancer
Principal Investigator: Wenfeng An, South Dakota State University
Co-Investigators: Qin Ma, Padmapriya Swaminathan - South Dakota State University

The over-arching goal of the project is to uncover molecular mechanisms controlling L1 transcription and retrotransposition in cancer cells. We will use human colorectal cancer cells as a model to investigate such signaling pathways. Colorectal cancer cells are well suited for the proposed study as colorectal cancer had the highest number of L1 insertions among all the cancer types examined. Colorectal cancer is also the third most common cancer in both men and women in the US. Therefore, mechanistic insights into colorectal cancer progression, especially concerning the role
of L1-mediated mutagenesis, hold the promise for aiding our fight against this deadly disease.

Award Amount: $50,000

Controlled Drug-Eluting Balloons for the Treatment of Cardiovascular Disease
Principal Investigator: Gopinath Mani - University of South Dakota
Industry Collaborator: Patrick Kelly - Sanford Health; Tyler Remund - Sanford Vascular Research Commercialization

We have recently developed a DCB (drug-coated balloon) that contains a polymeric coating (polyethylene oxide – PEO) to precisely control the delivery of drug from the balloons. The PEO coating platform strongly holds the drug onto the balloon surface during its tracking time period and then immediately dissolves during the balloon inflation and treatment time period to deliver all of the drug from the balloon. Also, the drug that is delivered successfully inhibited the growth of smooth muscle cells for preventing scar tissue growth to establish PEO as a next generation coating platform for DCBs. The proposed technology using polyethylene oxide (PEO) polymer platform offers a significant improvement over commercially available DCBs by preventing the drug loss during tracking, and then immediately delivering a therapeutic level of drug at the treatment site. The research goal of this proposed study is to demonstrate the *in vivo* efficacy of polyethylene oxide coated DCBs in an animal (rabbit) model to effectively uptake paclitaxel (PAT) into the arterial wall of animals.

Award Amount: $25,000