



2017 Seed Opportunity Program – Phase II

Funded Projects

Application of novel microscopy techniques and FRET based tension sensor probes to measure dynamic changes in cellular tensions

Principal Investigator: Indra Chandrasekar - Sanford Research

Co-Investigators: Kyle Roux - Sanford Research, Jing Liu - South Dakota School of Mines & Tech, Adam Hoppe - South Dakota State University

In the Phase I BioSNTR grant we aimed to generate a molecular toolbox to measure the cellular and nuclear tension changes in live cells. We successfully generated Myosin IIB tension sensor and Lamin A tension probes as proposed, our preliminary data show proper expression and localization of the exogenous MIIB and Lamin A TSMOD proteins in cells. FLIM-FRET measurements indicate dynamic changes in FRET intensity and donor lifetimes of MIIB TSMOD on the actin filaments (Fig.1) Lamin A TSMOD on the nuclear envelope (Fig.2) in live cells. We propose to utilize these novel FRET based tension sensor probes to study the cellular tension changes during various cellular processes like cell migration, adhesion, spreading and endocytosis.

Award Amount: \$49,000

Multi-Release Drug-Coated Balloons for the Treatment of Peripheral Artery Disease (PAD) with Multiple Blockages

Principal Investigator: Dan Engebretson, University of South Dakota

Co-Investigator - Sujan Lamichhane - Postdoctoral Fellow, University of South Dakota

Industry Collaborators: Patrick Kelly - Sanford Health; Tyler Remund - Sanford Vascular Innovations

We have developed a drug-coated balloon (DCB) that contains a polymeric coating (polyethylene oxide – PEO) to precisely control the delivery of drug from the balloon. Varying the ratio of Paclitaxel to PEO provides a means to tune the release time of the drug from the balloon. Therefore, by making a single balloon with multiple ratios we can make a single balloon that is able to treat multiple sites. The innovative approach for development of a multi-release balloon can lead to a great invention in the interventional cardiology that now has a \$1 billion market for the DCBs alone.

Award Amount: \$50,440

Predictive model and single cell transcriptomic profiling in Atypical Teratoid Rhabdoid Tumors (ATRT)

Principal Investigator: Etienne Gnimpieba, University of South Dakota

This project aims to develop an experimental and computational framework for the identification and validation of target molecules for potential therapeutics for Atypical Teratoid Rhabdoid Tumor (ATRT), a very aggressive central nervous system tumor that comprises 10% of pediatric brain tumors.

Award Amount: \$50,000

Engineering a biomimetic nano-structured 3D bone niche for cancer bone metastasis study

Principal Investigator: Hongli Sun - University of South Dakota

Co-Investigator: Jianning Tao - Sanford Research

One of the challenges in studying bone metastases and anti-cancer drug development is the lack of reliable, controllable, and reproducible experimental models to recapitulate the complex nature of the native bone environment. We propose to develop a unique, 3D scaffold that simulates the bone stem cell niche; this will allow us and others to study the earliest stages of bone metastasis. This key stage is an opportune time for therapy, but is frequently missed because it is long and asymptomatic.

Award Amount: \$45,000