

## PROJECT SUMMARY

Topic Name and Subtopic Letter: BC/BM3 – Drug Delivery

### INTELLECTUAL MERIT:

*This proposal focuses on technical feasibility of a remotely-controlled implantable drug infusion pump miniaturized to a standard pill form factor. Technical challenges include the development of a low-power inductively-powered pump actuator, ten-fold pump miniaturization to an unprecedented small form factor for minimally invasive implantation, and implementation of remote programmable control of a large number of implanted pumps. Our research strategy and competitive edge lies in the innovation of novel microtechnology-based pump components and wireless inductive power and control technologies.*

*Our technical objectives are to:*

- (1A) miniaturize the pump system*
- (1B) integrate the wireless multi-component pump*
- (2A) develop wireless controller hardware*
- (2B) develop programmable dosing software*
- (3) perform system validation*

*Successful demonstration of the remotely-controlled implantable infusion pump system with external hardware/software controller modules will enable new dosing schemes, provide precise temporally controlled dosing for more reproducible results from acute and chronic studies, and enable new approaches to drug therapy that would not otherwise be possible. Remotely-controlled dosing following a programmable drug regimen would dramatically simplify and expedite experimental studies. These novel pumps can also be adapted or scaled up to treat human disease, especially for advanced drug regimens not available with current commercial pumps.*

### BROADER IMPACTS/COMMERCIAL POTENTIAL:

*The FluidSync system features and benefits will uniquely facilitate drug development by improving outcomes in scientific and drug discovery. The system includes several significant first-to-market capabilities including chronic dosing studies in freely-moving, behavior animals in naturalistic environments and rapid evaluation of many new drugs at once which are enabled by automation. Importantly, the FluidSync pump system enables studies that are performed in a manner that will facilitate translation of therapies from animal to human.*

*Our FluidSync technology will first be deployed to meet critical needs of preclinical pharmaceutical, medical and animal research markets followed by animal care providers in the veterinary market. Our long term goal is advanced implantable drug infusion for clinical use. Therefore, our suite of software and hardware technologies is applicable to multiple markets and has the potential to improve healthcare. Automated, wireless, and temporal control will advance the state-of-the-art in drug delivery technologies. The innovation is compatible with future sensor integration for closed loop drug delivery systems. Fluid Synchrocy is woman and minority owned and committed to creating student internships to advance NSF's education mission. This effort involves Hispanic and female engineers and will create additional medical device industry jobs for engineers and scientists.*

**Key Words:** Drug delivery, drug administration, micropumps, actuators, microelectromechanical systems