Center for Pediatric Bioengineering

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Summary: As a new field of bioengineering, pediatric bioengineering is the development and application of engineering concepts, methods and approaches to improve the health of children through better diagnosis, more effective treatment and prevention of pediatric diseases, especially in underdeveloped countries. Children suffer from diseases of every organ system, arising from both congenital and acquired sources of illness. The unique physiology of a growing child changes over time and the pathophysiology of many pediatric diseases are distinct from adult diseases. This necessitates the development of pediatric bioengineering at Rice to provide a unique interdisciplinary research and educational opportunity for students at both graduate and undergraduate levels. Specific research areas of pediatric bioengineering at Rice may include (but are not limited to) the diagnosis and treatment of: neonatal disorders; cystic fibrosis; congenital heart disease, infectious diseases, cancers and blood diseases including sickle cell disease; pediatric neurological diseases and autism; musculoskeletal diseases and obesity. Pediatric bioengineering is expected to generate a major impact to pediatric healthcare and global health, improving the lives of children worldwide and helping train the next-generation leaders in pediatrics and bioengineering.

Current strengths: Currently Rice Bioengineering faculty has outstanding research activities in pediatric bioengineering, including the development of a low-cost, high-performance bubble CPAP system to treat infants with respiratory distress syndrome in the developing world, pediatric cardiovascular bioengineering that focuses on the understanding of mechanotransductive pathways in cardiac maturation, and the development of cellularized cardiac patch for repairing congenital heart defects, and efforts in pediatric nanomedicine that develop nanotechnologies for pediatric disease diagnostics and therapeutics, and apply genome editing for treating sickle cells disease and other single-gene disorders. Being in the Texas Medical Center and very close to Baylor, Texas Children's and UTHealth Medical School, Rice Bioengineering has a unique advantage in developing pediatric bioengineering research and education. For example, in collaboration with colleagues at TMC, Rice faculty can develop a broad range of cutting edge pediatric technologies including pediatric medical and surgical devices, pediatric biomaterials and regenerative medicine, molecular imaging approaches, bioinformatics, and computational methods. Rice also has clear strengths in global health, biomaterials and nanomaterials, and biochemistry. In terms of education and training, we could develop a pediatric bioengineering track in both the undergraduate and graduate programs at Rice Bioengineering, a summer internship program in pediatric bioengineering, and have pediatric fellows from TMC to work in bioengineering research labs.

Investment needed: To develop the **Center for Pediatric Bioengineering** at Rice and TMC, an investment of $4,000,000 is needed. With $400,000 per year for ten years, we will be able to establish a seed grant program that funds 5 pilot projects each year ($60,000 per project), support a pediatric device core and a genome editing core, and provide stipend for undergraduate students doing pediatric bioengineering research in the summer.

Potential impact: With a top bioengineering department co-localized with one of the largest and best children's hospitals in the US, Rice University has the opportunity to develop **the best pediatric bioengineering program in the world**. The potential impact is huge: to save children's lives and improve pediatric healthcare worldwide. It will also help train the next-generation leaders in pediatrics and bioengineering. It is likely that the initial investment will lead to an NIH-funded center, and some of the pediatric technologies developed can be applied to addressing global health needs and commercialized in the TMC Innovation Center, thus generating a direct impact to pediatric healthcare and economic development in the US and the rest of the world.