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BME Team Wins $2.5M NIH Grant to Study Effects of Physical Force on Cells

By Michael G Seele

Bela Suki

The National Institutes of Health today announced an award of $2.5 million to a team led by Boston University biomedical engineer Bela Suki that will study the role of physical forces on cell function, with the goal of understanding the possible roles of these forces in diseases like atherosclerosis, neuro-degenerative diseases, metabolic disorders, aging and cancer.

NIH today announced Suki's team among the winners of Transformative R01 grants, created to support exceptionally innovative, high-risk, original and/or conventional research projects that have the potential to create or overturn fundamental paradigms.

"We know that physical force plays a role in vascular disease and other ailments," Suki said. "Our research is aimed at understanding the scope of this impact using forces that more closely mimic those in nature."

Suki's team plans to lay cells on an elastic membrane and stretch them using a new method that randomly alters the magnitude and timing of each stretch – as would happen naturally – then study the effect on the cells' function.

Researchers have already documented a correlation between repeated stretching at regular intervals and altered cell function, and Suki's preliminary research on lung cells indicates a more dramatic cellular response when the stretching is varied. Suki's group observed significant changes in the secretion of a vital molecule that facilitates gas exchange in the lung when his method was used.

He plans to use the NIH grant to expand the research to include vascular endothelial and smooth muscle cells, as well as skin fibroblasts. If the researches observe effects on these cells similar to what Suki has seen in the lung cells, scientists and medical professionals may have to rethink their approach to mechano-biology.

Specifically, Suki's team will investigate the effect of variable stretching on transcription, translation and secretion of molecules like cytokines, enzymes and proteins, and how it influences basic cellular functions like division, growth and death. He will attempt to determine if there are universal mechanisms that govern cellular function among different organ systems.

"Uncovering how cells deal with such physiological variability may help understand how cells work in real living tissue, as well as the pathogenesis of several major diseases," he said.

Other members of the research team include Prof. James J. Collins (BME); Associate Professor Dimitrije Stamenovic (BME); Instructor Philip G. Allen (BME); and cell biologist Elizabeth Bartolak-Suki, MD, Cellutraf Scientific. The length of the grant is five years.