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Bioengineered miniature structures could prevent heart failure

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The delivery of tiny biodegradable microstructures to heart tissue damaged by heart attack may help repair the tissue and prevent future heart failure. A team led by cardiovascular researchers at the Medical College of Wisconsin (MCW) bioengineered the microstructures to be the same size, shape and stiffness as adult heart muscle cells, or cardiomyocytes, with the goal of releasing biologically active peptides that act as cardioprotective agents.

The findings are published in *Biomaterials*. Paul Goldspink, Ph.D., associate professor of physiology at MCW, led the study.

Heart disease is the leading cause of death across the globe, and there are 610,000 heart attacks and 325,000 recurrent attacks each year. While heart attack survival rates are high, the resulting destruction of heart muscle often leads to heart failure, and current pharmaceuticals do not repair or restore function of the depleted muscle.

Dr. Goldspink's lab focuses on exploiting aspects of the chemical and physical environment of the heart via bioengineered structures to restore organ function. This has resulted in the design of a technology that mimics the cellular environment by bringing together biodegradable microstructures bioengineered to be the same size, shape and stiffness as adult muscle cells that can protect and release biologically active peptides.

"In this study, we used an animal model and injected the miniaturized

structures into the heart following a heart attack, which restored organ function and prevented a series of adverse events that would lead to heart failure," said Dr. Goldspink. "Our hope for this technology is that it might be adapted for delivery of other therapeutic biologicals to support repair of a variety of tissues and pathologies, with the potential for directing tissue regeneration."

Provided by Medical College of Wisconsin

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