Material screening method allows more precise control over stem cells

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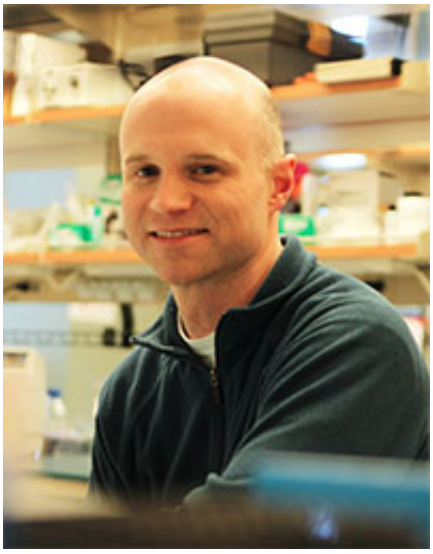

William Murphy, the Harvey D. Spangler professor of biomedical engineering

(Phys.org) —When it comes to delivering genes to living human tissue, the odds of success come down the molecule. The entire therapy - including the tools used to bring new genetic material into a cell - must have predictable effects.

Now, a new screening process will simplify non-viral transfection, providing a method researchers and clinicians to use to find an optimal set of biomaterials to deliver genes to cells.

Developed by William Murphy, the Harvey D. Spangler professor of biomedical engineering at the University of Wisconsin-Madison, the method gives researchers greater control over how cells react to the gene delivery mechanism. The broader implication is more nuanced, effective control over cell behavior. "We've been exploring using this concept for reprogramming of adult cells, as well as controlling differentiation of stem cell types," he says.

Murphy and his collaborators published news of their advance in the March 28, 2013 issue of Nature's *Scientific Reports*.

In a current successful approach, researchers use specialized viruses to deliver genetic material to cells. While efficient, that method also carries a greater risk of turning on unwanted genes or provoking an immune response from the body—making it less attractive for sensitive biomedical applications like controlling stem cell behavior, says Murphy.

His team has developed a process that does not rely on viruses. Rather, the researchers can grow specific calcium phosphate coatings that serve as a medium via which genetic material can be delivered to cells more efficiently. By matching a coating to a specific application for delivering genes, Murphy has seen up to a 70-fold increase in successful expression of those genes in human stem cells.

"From an application standpoint, the advance could be really impactful, and could enable gene delivery to become an integral part of medical device design and tissue engineering applications," says Murphy.

The process could be critical to further advances in regenerative medicine. Since researchers can apply it to any size or shape of tissue engineering structure, it could help provide engineers a simpler way to build the complex tissue structures required to deliver next-generation drug screening and patient therapies.

More information: www.nature.com/srep/2013/13032 … /full/srep01567.html

Provided by University of Wisconsin-Madison