Researchers discover unique suspension technique for large-scale stem cell production

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Post-doctoral researcher David Fluri and Professor Peter Zandstra at the University of Toronto's Institute of Biomaterials and Biomedical Engineering (IBBME) have developed a unique new technique for growing stem cells that may make possible cost-effective, large-scale stem cell manufacturing and research.

Although stem cells are widely used for the testing of new drugs, researchers have always faced difficulties manufacturing enough viable cells from a culture. Typically, stem cells are grown on surfaces that must be scraped, and which must then be differentiated from other types of cells to prevent the death of those all-important cells. This has proven to be an inefficient way to harvest stem cells, since the process doesn't produce stem cells in high enough numbers that they can be cost-effectively used by researchers.

Wanting to overcome this challenge, Fluri decided to pair the stem cell creation process, known as reprogramming, with the use of a bioreactor—an apparatus that creates stable environmental conditions. Through this process Fluri was able to "reprogram" mouse cells to become "pluripotent" stem cells—cells that can become any kind of cell—and then into cardiac cells.

But it was the way these cells were successfully grown that has researchers excited.

By introducing the cultures to this particular bioreactor process, the stem

cells were grown in suspension, eliminating the problems inherent in growing the cells on surfaces—something that has never before been accomplished. "This is an enabling technology," says Prof. Zandstra of the discovery. "[It] takes something we showed we could do before at low efficiency but not at such numbers that could be used in manufacturing."

Fluri hopes his discovery, which is "more compatible with large scale processes" will help ease the "bottleneck of cell production" used for research and drug development. The results of his research have just been released in the high profile scientific research journal, *Nature Methods.*

Yet there are greater implications involved in Fluri's discovery: once stem cells are produced, they are "differentiated" to become other kinds of cells—cardiac cells, for instance—and Fluri's new growing process has the potential to make this phase of cell production safer and more stable.

Fluri specifically experimented with the integrated differentiation of stem cells into cardiac cells, which could then be used for drug screening and identifying new drugs for cardiac diseases. But created in large enough numbers—and translated to human models—the process may one day be used to treat heart disease.

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