Embryonic stem cell culturing grows from art to science

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(PhysOrg.com) -- Growing human embryonic stem cells in the lab is no small feat. Culturing the finicky, shape-shifting cells is labor intensive and, in some ways, more art than exact science.

Now, however, a team of researchers at the University of Wisconsin-Madison reports the development of a fully defined culture system that promises a more uniform and, for cells destined for therapy, safer product.

Writing this week (Nov. 14) in the journal Nature Methods, a team led by Laura Kiessling, a UW-Madison professor of chemistry, unveiled an inexpensive system that takes much of the guess work out of culturing the all-purpose cells.

"It's a technology that anyone can use," says Kiessling. "It's very simple."

At present, human embryonic stem cells are cultured mostly for use in research settings. And while culture systems have improved over time, scientists still use surfaces that contain mouse cells or mouse proteins to grow batches of human cells, whether embryonic or induced stem cells. Doing so increases the chances of contamination by animal pathogens such as viruses, a serious concern for cells that might be used in therapy.

The new culture system utilizes a synthetic, chemically made substrate of protein fragments, peptides, which have an affinity for binding with stem cells. Used in combination with a defined growth medium, the

system devised by the Wisconsin team can culture cells in their undifferentiated states for up to three months and possibly longer. The system, according to the new report, also works for induced pluripotent stem cells, the adult cells genetically reprogrammed to behave like embryonic stem cells.

Cells maintained in the system, Kiessling notes, were subsequently tested to see if they could differentiate into desired cell types, and performed just as well as cells grown in less defined, commercially available cell culture systems.

Kiessling notes that the first clinical trials involving human embryonic stem cells are underway and that as more tests in human patients are initiated, confidence in the safety of the cells will be paramount.

"The disadvantages of the culture systems commonly used now are that they are undefined – you don't really know what your cells are in contact with – and there is no uniformity, which means there is batch-to-batch variability," Kiessling explains. "The system we've developed is fully defined and inexpensive."

Provided by University of Wisconsin-Madison