Medical Xpress

Embryonic stem cells thrive when shaken

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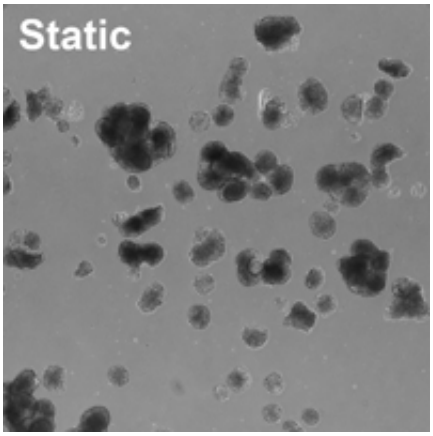
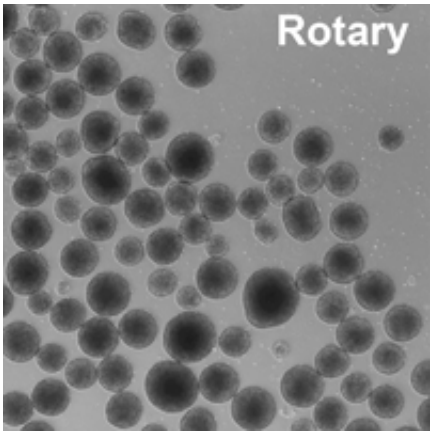


These are embryonic stem cells grown under normal static conditions. Note that they are not uniform and clump together.

Embryos spend much of their time in the womb bobbing along with a mother's movement, and, surprisingly enough, new research from the Georgia Institute of Technology and Emory University suggests that embryonic stem cells may develop much better under similarly shaky conditions.

Georgia Tech and Emory researchers discovered that moderate and controlled physical movement of embryonic stem cells in fluid environments, similar to shaking that occurs in the womb, improves their development and suggests that different types of movement could some day be used to control what type of cell they become. The research was published in the September issue of the journal *Stem Cells*.



These are embryonic stem cells that have experienced a mild rotary motion (or shaking). Note that they are much more uniform and plentiful than stems cells grown in still conditions.

“Embryonic stem cells develop under unique conditions in the womb, and no one has ever been able to study the effect that movement has on that development process,” said Todd McDevitt, assistant professor in the Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech and Emory University and head of the project. “While labs typically add all sorts of things to their cultures to influence cell direction, we were able to control the levels of differentiation and size of cell clusters by simply providing some fluid motion.”

It all started with a fortunate accident. Rich Carpenedo, a graduate student and first author of the paper, discovered by chance that a dish of embryonic stem cells left on a common lab shaker (typically used to slowly mix samples) had developed in greater numbers and more uniformly than cells grown in a static environment (i.e. unshaken).

Current popular methods of developing embryonic stem cells in the lab involve single droplets of cells separated by a great deal of space in the

dish. This time - and space-consuming technique allows the cells to develop without excessive clumping (a frequent problem for stem cells developed in the lab) and for a greater number to survive in a small space.

Researchers experimented with the shaking plate and determined that they could consistently produce samples with healthier, more uniform cells just by gently sloshing the dishes of stem cells on a shaker plate. The method proved to be much simpler and more space efficient than the current standard for producing embryonic stem cells, McDevitt said.

“We can throw many cells in a dish and not have to worry about clumping and cell survival,” McDevitt said. “We call it the ‘set it and forget it’ method for growing stem cells.”

While the secret to the shaken stem cells’ success is still unclear, it’s suspected that the movement of the fluid likely increases nutrient distribution to cells, creating healthier cells, McDevitt said.

The Georgia Tech and Emory research team then began experiments to determine if the motion could be used to control the size of the cell aggregates and type of cells the embryonic cells would eventually become and found that there was a correlation between different types and speeds of movement and the phenotype and size of the stem cells.

Much work remains to be done before the movement control concept could be used to influence what types of cells embryonic stem cells eventually become. The team’s next goal is to pinpoint more precisely exactly what speeds and manners of shaking can influence stem cell phenotype.

Source: Georgia Institute of Technology