Stem cell research could prevent premature births

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Researchers from the University of Reading have developed the first fully tissue-engineered fetal membrane from human stem cells that could significantly reduce the number of premature births.

The leading cause of perinatal and neonatal mortality is pre-term birth, of which 40% is attributed to the pre-term premature rupture of fetal membranes (pPROM). Interventions during pregnancy, such as amniocentesis and fetoscopy (testing for birth defects), are associated with a high incidence of pPROM due to damage to the fetal amniotic membrane (AM).

The study was supported by the Biotechnology and Biological Sciences Research Council and led by Dr. Che Connon from the Reading School of Pharmacy in conjunction with University College London Hospital (UCLH).

Researchers successfully developed an artificial fetal membrane by using human amniotic stem cells and a compacted collagen gel containing human amniotic fibroblasts which form the structural framework for tissues. The resulting cellular-collagen construct displays many of the structural and functional properties of human amniotic membrane.

For pregnant women with a ruptured fetal membrane, the artificial AM can be used to replace the damaged area to allow her to carry the baby to term.

Cells from the human AM are of great interest as a source of cells for regenerative medicine. Another advantage is that placental tissue and amniotic membrane is readily available and easily procured without invasive procedures. The placenta and fetal membranes were collected under sterile conditions from healthy donor pregnant women undergoing delivery by elective term caesarean section at UCLH.

Dr. Connon said: "A number of techniques to prevent pre-term births, such as plugging the insertion site with a silicon seal or with platelets, have been developed to seal off the membrane defect after fetoscopy, but none have proved to be of much benefit.

"The artificial AM retained structural and functional properties similar to normal AM and this human tissue construct may become a useful means to repair defects in the fetal membranes or cases of preterm premature rupture of the membranes."

More information: 'Tissue engineering a fetal membrane' will appear this week in the journal Tissue Engineering at www.liebertonline.com/loi/tea (will appear under Instant Online articles)

Provided by University of Reading