Medical Xpress

Harvesting stem cells from amniotic fluid

December 4 2017

Amniotic fluid, the protective liquid surrounding an unborn baby, is discarded as medical waste during caesarean section deliveries. However, there is increasing evidence that this fluid is a source of valuable biological material, including stem cells with the potential for use in cell therapy and regenerative medicine. A team of scientists and clinicians at Lund University in Sweden have now developed a multi-step method, including a unique collection device and new cell harvesting and processing techniques, that enables term amniotic fluid to be safely harvested for large quantities of cells.

The new method is used in combination with full-term caesarean section deliveries, and with millions of caesarean sections performed worldwide each year, it opens the potential for an unexploited reserve of stem cells and valuable bioactive molecules in the fluid surrounding the baby to be utilized.

"We showed that using our device, we can collect up to a litre of amniotic fluid at full-term caesarean deliveries. The collection added on average 90 seconds to the operation, and was safe for both mother and child," says Associate Professor Andreas Herbst, lead clinician and a corresponding author of the study.

The collection device, which has been constructed with bio-inert plastics and 3-D-printing techniques, forms a seal with the fetal cavity, enabling gentle and sterile collection of large volumes of amniotic fluid, while being completely safe for mother and baby. The collected fluid contains specialized cells with high therapeutic potential. The cell type that the

current protocol purifies is called a Mesenchymal Stem Cell (MSC).

MSCs can obtained from other tissues in the body, and have already demonstrated therapeutic potential for immune and inflammatory-mediated diseases, for example, cardiovascular disease, diabetes, arthritis, and neurodegenerative disorders. However, the difficulty in acquiring sufficient numbers of these cells limits their broad use in cell therapy and tissue repair applications. "Full term amniotic fluid, being an easily obtainable and abundant tissue source, may be the solution for MSC based cell therapy and regenerative medicine applications", says Associate Professor Niels-Bjarne Woods, a corresponding author in the study.

Since the collections involve planned Caesarean sections, no additional invasive medical procedures are needed for the MSC isolation, in contrast to MSC isolation from bone marrow.

The research group has also shown another potential use for MSCs purified from full-term amniotic fluid. By converting these cells to an embryonic-like stem cell state, they can potentially give rise to all different cell types of the body, including neural cells, blood cells and heart cells, among others.

"The combination of this novel device and the coupled cellular selection and cultivation methods could be transformative for the stem cell field, as large quantities of newborn-MSC's can be provided by utilizing this waste material. The safety standards we adhere to are also a central component for gaining clinical acceptance. The obvious next step would be to evaluate these cells further in the laboratory and, if successful, in disease models", says Dr Marcus Larsson, clinician and a corresponding author on the publication.

The long-term goal is that amniotic fluid collection will be adopted in

clinics worldwide, and by doing so, the numbers of suitably matched MSCs obtained would rapidly increase to finally be sufficient to treat any genetically matched person in need of individualized MSC based therapy.

"Now that we have demonstrated the feasibility to access this neonatal MSC source, our hope is that many more research groups will start working with these cells. This will accelerate our understanding of their full therapeutic potential", says Dr. Niels-Bjarne Woods.

More information: Roksana Moraghebi et al. Term amniotic fluid: an unexploited reserve of mesenchymal stromal cells for reprogramming and potential cell therapy applications, *Stem Cell Research & Therapy* (2017). DOI: 10.1186/s13287-017-0582-6

Provided by Lund University