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LONGBOAT AMNIOTICS

Neonatal, tissue-specific stem cells for next-generation cell therapies

With burgeoning research into cell-based therapies, Longboat Amniotics has developed a novel process for the retrieval and processing of tissue-specific neonatal quality stem cells from amniotic fluid.

Longboat Amniotics was born out of the discovery of a novel source of stem cells from full-term amniotic fluid. Based on a decade of research at the renowned Lund University Stem Cell Center and Hospital, the company is pioneering the harvesting and propagation of lung, skin and urinary tract tissue-specific neonatal quality mesenchymal stem cells (MSCs), among others. These cells are collected from amniotic fluid captured during planned caesarean sections using Longboat's patented technology. With new good manufacturing practice (GMP) facilities due to become operational in early 2020, Longboat is now looking to establish strategic partnerships with companies that are interested in developing stem-cell-based therapies.

"Our ultimate vision is to contribute to the successful treatment of serious human diseases by providing the very best cells for various regenerative medical applications," explained Kåre Engkilde, Longboat's CEO. The idea and technology for harvesting this new source of MSC came from Longboat cofounders, pediatrician Marcus Larsson, obstetrician Andreas Herbst and stem cell specialist Niels-Bjarne Woods, who is also Longboat's CSO. The company is based at Medicon Village in Lund and was founded in 2015 with support from serial entrepreneur Christer Fåhraeus.

MSCs are multipotent stromal cells that can differentiate into a variety of cell types such as bone, cartilage and adipose cells. These cells seem to possess the ability to detect changes in their environment, such as inflammation, and subsequently release bioactive agents and initiate new cell growth. MSCs are therefore being used to develop novel treatments for bone and cartilage repair as well as a variety of disorders including cardiovascular disease, spinal cord injury, and inflammatory and degenerative diseases. The market is already worth $1.5–2 billion and is anticipated to grow.

Potential of neonatal MSCs

"The neonatal source of our cells makes them superior in several ways to the traditional adult sources of stem cells that are currently in therapeutic use. They have significantly increased expansion and differentiation capacities, and their neonatal origin infers that they have greater genome integrity," said Woods. Furthermore, with 10 million caesarean sections performed worldwide each year, this is potentially an unlimited source of therapeutic cells. Adult donor MSCs account for 75% of the current MSC market, but these cells usually come from adipose tissue donated from liposuction procedures, which do not represent the youngest or healthiest potential donors, leading to lower-quality cells.

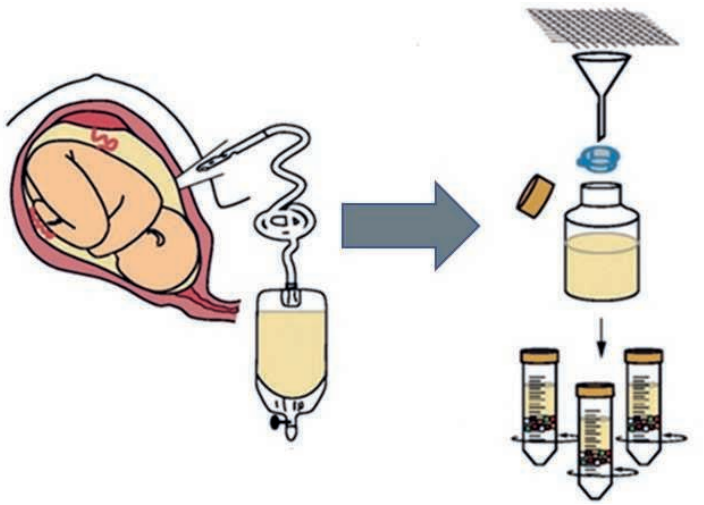

Fig. 1| Amniotic fluid processing technology. This technology produces neonatal quality and tissue-specific mesenchymal stem cells and human pulmonary surfactant.

Neonatal MSCs can be harvested from umbilical cord tissue and umbilical cord blood, but this provides only one type of MSC. Longboat Amniotics is able to provide an array of stem cell populations that are unique and tissue-specific (**Fig. 1**). "The amniotic fluid is in contact with various tissues in the unborn infant, so we are able to find cells deposited from specific tissues and propagate these individual cell types separately," said Woods, "and there is evidence suggesting that using specific MSCs can affect therapeutic outcomes, so, for example, lung-specific MSCs should provide better treatments for lung diseases." The three largest subpopulations of MSCs that Longboat can propagate are from lung, skin and urinary tract tissue.

Patent-protected ecosystem

The company has developed a patent-protected ecosystem for the safe retrieval, processing, typing, cataloging and biobanking of these cells. The amniotic fluid comes from altruistic donations, sourced from planned caesarean sections, during which the fluid is siphoned in a short initial procedure. "Through a unique processing system, we are able to separate the different component cells for propagation," said Engkilde.

In addition to this, Longboat has also isolated human lung surfactant from amniotic fluid. This could prove useful in treating acute respiratory distress syndrome (ARDS), which is the leading cause of death in premature infants. ARDS occurs owing to a lack of pulmonary surfactant, which is secreted into the alveolar space to reduce the surface tension at the air–liquid interface. "Current treatment involves surfactants from cows or pigs, and of course that can cause immune reactions, so there is a desire to use human surfactant," said Engkilde. Longboat has advanced intellectual property on a potential human lung surfactant product that will provide an alternative to animal-derived surfactants, a market currently worth $300 million.

"There are of course other proteins and other potential therapeutic components within the amniotic fluid which we haven't yet explored, so we anticipate even more therapeutic value to come in the future," said Engkilde.

The company is currently focusing on the development of respiratory cells and intends to initiate its own clinical program, with a view to later out-license these cells. Longboat is also looking to out-license other MSCs for clinical development and research on stem cell therapies, as well as seeking partners for further work in human surfactant therapies.

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