Preemies who develop chronic lung disease had more stem cells at birth

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In the first large-scale clinical study to characterize stem cells from the umbilical cord blood and tissues of premature infants with bronchopulmonary dysplasia—a severe, chronic lung

disease—researchers found that these babies had more stem cells at birth. They also found that a growth factor (G-CSF), which is responsible for stem cell migration and differentiation, is decreased in these infants. Based on these results, researchers speculate that the increase in cord stem cells might play an early role in the development of bronchopulmonary dysplasia, which is usually diagnosed when the infant is 2-3 months old. Their findings, published in the *Frontiers in Pediatrics*, also add to the identification of disease risk factors, as well as contribute to the research into cell-based therapies for prevention and management of bronchopulmonary dysplasia.

"We want to be able to use stem cell therapies to regenerate the damaged and underdeveloped lungs of premature infants with bronchopulmonary dysplasia," says senior author Karen Mestan, MD, MSCI, neonatologist at Ann & Robert H. Lurie Children's Hospital of Chicago and Associate Professor of Pediatrics at Northwestern University Feinberg School of Medicine. "Our characterization of cord stem cells in these infants is a big step toward development of stem cell therapies to manage and possibly prevent this challenging disease."

About 10,000 babies a year develop bronchopulmonary dysplasia. Premature infants, and especially those born more than 10 weeks preterm and weigh less than two pounds, are at highest risk. However, there are no clear predictors of this disease.

To study the stem cell differences between premature infants who develop bronchopulmonary dysplasia and those who do not, Dr. Mestan and colleagues collected cord blood and tissue from 200 preemies of different gestational ages. They measured the percentage of hematopoietic stem cells (those circulating in blood) and mesenchymal stem cells (those derived from umbilical cord tissue). They also evaluated biochemical factors in cord blood plasma.

"We need more research to understand why premature infants who later are diagnosed with bronchopulmonary dysplasia are born with more hematopoietic and mesenchymal stem cells," says Dr. Mestan. "Their stem cells might not be functioning properly, or maybe they are not mobilized effectively to differentiate into healthy blood or tissue cells."

Clinically, the increase in cord stem cells, if validated by more studies, might be one of the risk factors for bronchopulmonary dysplasia.

"As we get better at predicting this disease and have more tools to intervene, we'll be able to individualize management of preemies and deliver the right treatment at the right time to improve outcomes," says Dr. Mestan.

More information: Sonali Chaudhury et al. Variations in Umbilical Cord Hematopoietic and Mesenchymal Stem Cells with Bronchopulmonary Dysplasia. *Front. Pediatr* (2019) DOI: 10.3389/fped.2019.00475

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