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Type of stem cell found to reside in transplanted lungs

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A new study involving a type of stem cells from the lungs of transplant patients demonstrates for the first time that these progenitor cells reside in adult organs and are not derived from bone marrow, which leads to the possibility that the cells may be able to help with the rejection of donated organs and with various kinds of lung disease.

The study by University of Michigan Health System researchers is significant because of the large number of lung transplant patients who experience chronic rejection of donated lungs, with rejection rates of about 60 percent during the first five years after transplantation.

The researchers studied mesenchymal stem cells (MSCs), a type of progenitor cell that most commonly originates in the bone marrow. In this study, lead author Vibha N. Lama, M.D., M.S., and her research team found that the MSCs in lung transplant patients are not derived from bone marrow, but rather that they reside – sometimes for many years – in the lungs. The researchers also found that these cells have the capacity to differentiate into multiple connective tissue cell types.

One of the most telling findings was that, in cases where the transplant donor and recipient were not of the same sex, nearly all the MSCs (about 97 percent) originated in the donor, indicating that they were present in the tissue since the time of transplantation. "We were able to isolate the cells derived from the donor as far as 11,5 years after transplantation," says Lama, assistant professor in the Division of Pulmonary and Critical Care Medicine at the U-M Medical School. "We discovered the

existence of a population of MSCs that reside and self-renew in the tissues of the adult lung – something that might hold true for other organ systems as well.

"Potentially the most important outcome of our finding is that it could lead to an understanding about therapeutic options using MSCs that reside in adult organs," Lama continues. "These lung-derived cells are different from MSCs derived from bone marrow in the expression of various genes, which makes us believe that they are specific to the organ they are isolated from."

The study appears online March 8 in advance of publication in the April print issue of the Journal of Clinical Investigation.

MSCs are widely seen as a potential source of therapies for numerous diseases and conditions, such as heart disease, cystic fibrosis, graft-versus-host disease, muscular dystrophy, and as a possible source for improved recovery of cancer patients undergoing chemotherapy.

Lama's laboratory currently is working on another study involving the lung-derived MSCs that shows potential importance of these cells in lung transplantation. That study is not yet complete, but so far it indicates a very strong ability of these MSCs to suppress the immune cells that are involved in organ rejection. In addition to helping prevent organ rejection, other possible uses for the lung-derived MSCs could be therapies related to heart attack and pulmonary fibrosis, Lama says.

MSCs are termed progenitor cells; that is, they can differentiate into only limited number of cell types such as bone, cartilage and fat cells. However, previous laboratory studies have demonstrated the beneficial effect of these cells in various diseases, such as models of heart attacks and pulmonary fibrosis.

The current study of MSCs included 172 bronchoalveolar lavage fluid samples collected and analyzed from 76 lung transplant recipients at the U-M Health System. The ability to isolate these cells with relative ease from lavage fluid is a very significant finding as it provides a potential source to isolate MSCs, says Victor J. Thannickal, M.D., associate professor of Internal Medicine in the Division of Pulmonary and Critical Care Medicine and senior author on this study. "The specific roles of these cells in chronic lung diseases are yet to be fully defined, but will be an active area of research in years to come."

Source: University of Michigan Health System