UT SOUTHWESTERN MEDICAL CENTER NEWS

Media Contact: Amanda Siegfried
214-648-3404
amanda.siegfried@utsouthwestern.edu

Molecular 'marker' on stem cells aids research, perhaps therapies

DALLAS – Dec. 5, 2006 – A sugar molecule present on embryonic stem cells also has been found on the surface of a type of adult stem cell, a discovery that may help researchers isolate and purify adult stem cells for use in therapies aimed at bone healing, tendon repair and cartilage regeneration, researchers at UT Southwestern Medical Center report.

The molecule, called SSEA-4, was found on the surface of certain stem cells in bone marrow that give rise to fat, cartilage and bone. These so-called mesenchymal cells are a tiny component of bone marrow; the vast majority of bone marrow is made up of hematopoietic stem cells, which give rise to blood and immune cells.

Dr. Rita Perlingeiro, assistant professor in the Center for Developmental Biology and of molecular biology, said detecting SSEA-4 will aid in singling out the mesenchymal stem cells, or MSCs, for more detailed scientific study as well as for possible medical applications. The cells have shown promise in early clinical studies elsewhere, where scientists tested their use to repair bone defects and to attenuate the effects of bone loss in diseases such as osteoporosis.

The study is available online and will be published in the Feb. 15 issue of the journal *Blood.*

Although mesenchymal cells were discovered in the 1970s, researchers still use decades-old methods to isolate them from bone marrow, said Dr. Perlingeiro, who led the research.

Exploiting the sugar molecule as a biological marker will boost researchers' ability to obtain a purer, more homogeneous population of MSCs. That's an important consideration, for example, in applications such as tissue engineering, where only bone-generating cells are needed. Such cells are being tested by a number of researchers for their ability to grow fat, cartilage and bone on special biomaterial-based scaffolding, with the goal of producing soft tissue for reconstruction or augmentation, or to shore up bones left fragile by age or disease.

"With a purer cell population, you should have a more effective therapy," Dr. Perlingeiro said.

The SSEA-4 molecule was known to be on the surface of embryonic stem cells, as well as on embryonic carcinoma cells, the malignant counterparts of embryonic stem cells.

Dr. Perlingeiro's ongoing studies also suggest that the SSEA-4 molecule might be present in

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other tissues, leading to the intriguing possibility that the SSEA-4 molecule could be a marker for "stemness," she said.

"The discovery of this molecule on MSCs was surprising, and is important to further our understanding of the biological nature of adult stem cells," Dr. Perlingeiro said. "We are also interested in learning whether SSEA-4 is expressed on other stem cells, such as those for muscle.

"It could actually be useful where we see less of it, as in tissues with very few stem cells. This marker could help us separate out those rare cells more easily."

She and her team also are investigating the SSEA-4 molecule's relationship to cancer stem cells, those cells in a tumor that behave like stem cells in that they self-renew and maintain the cancer even if most of the tumor is destroyed by radiation or chemotherapy.

"Is the expression of this marker elevated in a tumor? If so, perhaps it might be useful to identify cancer stem cells, but we don't know yet," Dr. Perlingeiro said. "That would be a very beneficial application, not just for guiding therapy, but also for early cancer detection and perhaps prevention."

Other researchers in the Center for Developmental Biology involved in the research were co-lead authors Drs. Eun Ji Gang and Darko Bosnakovski, both postdoctoral research fellows; and Camila Figueiredo, a Ph.D. student. Jan Visser from ViaCell Inc. also contributed.

The research was supported by the Dr. Bob and Jean Smith Foundation.

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