Personal stem cell banks could be staple of future health care

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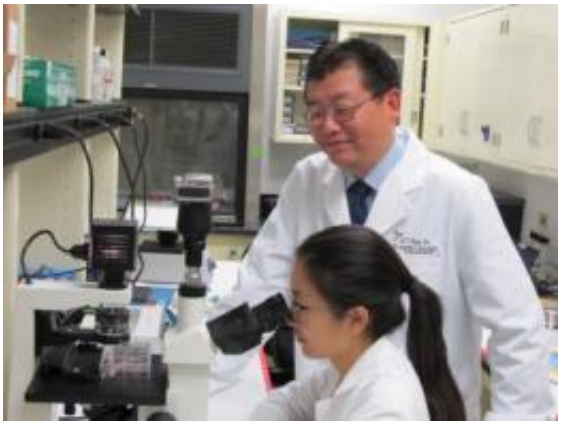

Drs. Xiao-Dong Chen and Qian Wang of The University of Texas Health Science Center San Antonio are members of the research team that discovered a young microenvironment could stimulate old stem cells to expand more rapidly. Credit: UT Health Science Center San Antonio

Old stem cells can be rejuvenated by being placed in a young microenvironment, research from The University of Texas Health Science Center San Antonio shows. This raises the possibility that patients' own stem cells may one day be rescued and banked to treat their age-related diseases.

Stem cells are immature cells that have the potential to convert into bone, muscle, blood vessels, nerve fibers, and other body cells and tissues. It's no wonder medical science seeks to utilize these versatile

cells to restore tissues deteriorated by age, disease or injury.

Older stem cells are not as robust as young ones, however - a challenge to clinicians who seek to use patients' own stem cells to treat age-related diseases.

"The number and quality of those cells decline with age, that is very clear," said Xiao-Dong Chen, M.D., Ph.D., a stem cell researcher at the UT Health Science Center. "And, using the patient's own cells can impact results."

Dr. Chen's team recently made a discovery in mice that, if translated to humans, could solve this predicament.

Old cells expand when grown on a young scaffold of tissue

Dr. Chen suspected that giving stem cells a youthful environment for growth would cause them to regenerate faster. His team extracted mesenchymal stem cells from the bone marrow of 3-month-old mice and 18-month-old mice. The group also obtained extracellular matrix (ECM) from mice of both ages. ECM is a scaffold of connective tissue, such as collagen, which constitutes a majority of the body's structure.

The lab team seeded half of the older stem cells on ECM from the 3-month-old mice and half on ECM from the 18-month-old mice. Likewise, half of the young stem cells were seeded on the young ECM and half were seeded on the old ECM.

Young and old cells showed a 16.1-fold and 17.1-fold expansion, respectively, when grown on ECM from young mice, compared to a 4.1-fold and 3.8-fold expansion when grown on ECM from old mice.

Finding confirmed in rodent implants

Next, under the skin of mice, Dr. Chen's group implanted artificial scaffolds seeded with stem cells of both ages that had been grown on young or old ECM. These were left to grow for eight weeks. The researchers targeted bone formation. When the implants were removed, the team found that old cells that had been grown on a young ECM produced just as much bone as young cells, while old cells grown on an old ECM produced no bone. The results were published in the *FASEB Journal* earlier this year.

"If this research transfers successfully to clinical application in humans, we could establish personal stem cell banks," Dr. Chen said. "We would collect a small number of older stem cells from patients, put those into our young microenvironment to rescue them - increasing their number and quality - then deliver them back into the patient."

This stem cell rescue and infusion could be done as often as disease treatment requires it, he said. The next step is to repeat the study in human stem cells and ECM.

Dr. Chen, an associate professor of comprehensive dentistry in the Health Science Center Dental School, discussed the finding at the Strategies for Engineered Negligible Senescence conference (SENS, http://www.sens.org/conferences/sens5) held at Queens' College in Cambridge, U.K.

Provided by University of Texas Health Science Center at San Antonio

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