Potential biomarker identified to screen quality of donor's stem cells before harvesting

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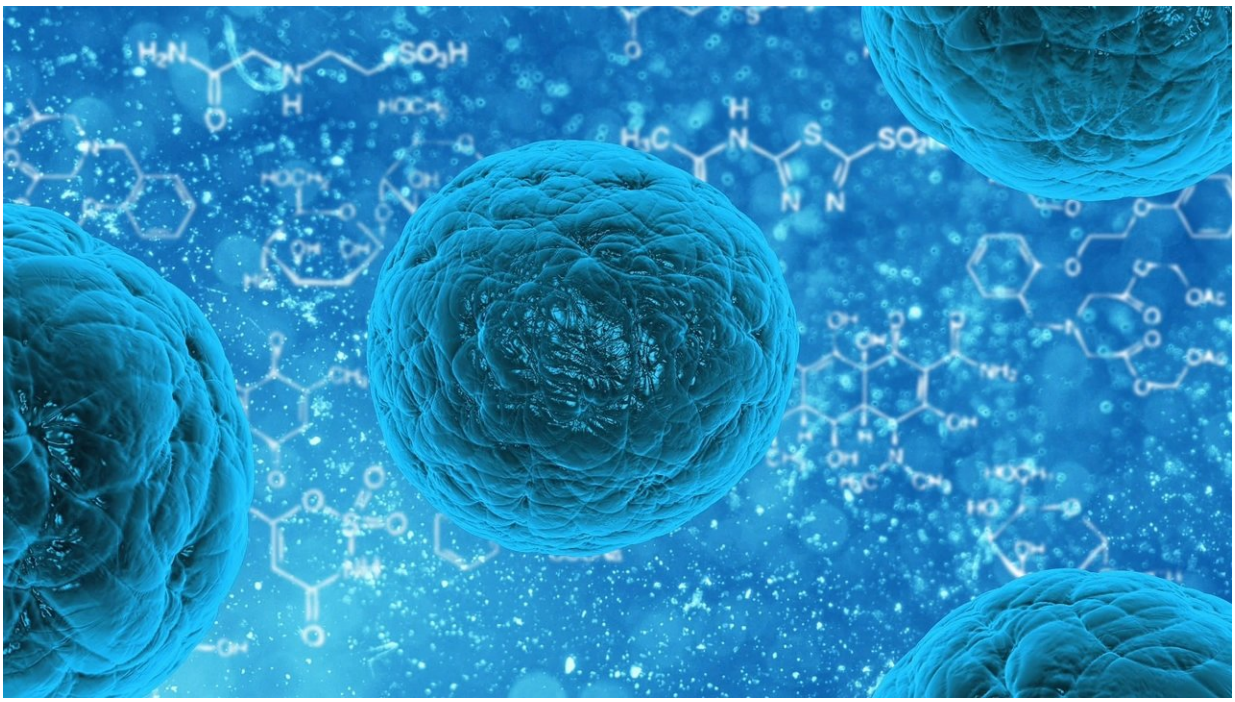

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A new study released today in *Stem Cells* addresses a significant problem that has been confronting human mesenchymal stem cell (hMSCs) therapy. While hundreds of clinical trials involving thousands of patients are under way to test hMSCs' ability to treat everything from heart

disease to brain injury, there has been no way to determine prior to the donor undergoing a painful and expensive surgical harvesting of bone marrow whether or not it would be worth the effort. However, this new study, conducted by scientists at the Agency for Science, Technology and Research (A*STAR), Singapore, identifies a potential biomarker for prescreening donors for their MSCs' growth capacity and potency.

"With the global stem cell market predicted to reach over US$270 billion by 2025 (according to a report published by Transparency Market Research), there is a pressing need for effective biomarkers to be used in the screening of stem cells from prospective donors. This need is boosted by the rapid growth of regenerative medicine, with its pallet of cells, genes and engineered tissues," said Dr. Simon Cool, of A*STAR's Institute of Medical Biology and co-corresponding author of the study. That is what sparked this new investigation.

In an earlier study, this same laboratory had classified hMSCs from age and sex-matched human donors into high- and low-growth capacity groups and established criteria for identifying stem cells with enhanced potency. "These hMSCs showed increased proliferative potential that correlated with enhanced clonogenicity, a higher proportion of smaller-sized cells with longer telomeres, elevated expression of certain cell surface markers, and most importantly, improved ability to mediate ectopic bone formation," said the study's co-corresponding author, Lawrence Stanton, Ph.D., who at the time of the study was a member of A*STAR's Genome Institute of Singapore (and is now with Qatar Biomedical Research Institute).

The team's latest investigation sought to build upon that information by performing molecular analyses of these cells to better understand what accounted for their improved utility. Microarray analysis revealed that hMSCs with a genomic deletion of glutathione S-transferase theta (GSTT1)—part of a superfamily of genes that bring together glutathione

and toxins to safely remove them from the body—show high-growth capacity. The GSTT1-null hMSCs also exhibit an enhanced ability to clone themselves and grow into full colonies, and they have longer telomeres. Both of these factors are important determinants of MSC potency.

"We believe our study highlights the utility of GSTT1 as a potential biomarker for MSC scalability and may prove useful in selecting potential donors for the creation of high quality hMSC cell banks to improve stem cell therapies," Dr. Cool said.

"The ability to pre-screen donors for a marker that corresponds to better growth of MSCs in vitro is truly important", said Dr. Jan Nolta, Editor-in-Chief of *STEM CELLS*. "Many teams have sought screening tools like this, which could prevent lot failure for clinical batches of MSCs that don't expand robustly. Until now, there has been no way to evaluate that prior to marrow harvest."

More information: Padmapriya Sathiyanathan et al, A genomic biomarker that identifies human bone marrow-derived mesenchymal stem cells with high scalability, *Stem Cells* (2020). DOI: 10.1002/stem.3203

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