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Out of body experience for stem cells may lead to more successful transplants

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New research finds that growing blood stem cells in the laboratory for about a week may help to overcome one of the most difficult roadblocks to successful transplantation, immune rejection. The study, published by Cell Press in the August issue of the journal *Cell Stem Cell,* may lead to more promising therapeutic strategies for transplanting blood stem cells.

Hematopoietic stem cells (HSCs) are cells that can give rise to all of the different types of blood cells. Transplantation of HSCs has been used to treat leukemia, lymphoma, and other types of cancer, as well as some autoimmune diseases. However, there is a significant risk that the transplanted cells will fail to be incorporated into the host, or that the new cells will be rejected by the immune system and the patient will develop life-threatening "graft-versus-host" disease. Although scientists have identified some causes of transplant failure, many questions remain unanswered. "The resolution of these questions will promote the understanding of the immunology of blood-forming stem cells and other stem cells and greatly improve the practice of transplantation," explains senior study author, Dr. Cheng Cheng Zhang from the University of Texas Southwestern Medical Center.

Dr. Zhang and colleagues had previously shown that they could successfully grow isolated mouse and human HSCs in the laboratory for transplantation and that there was a change in many of the proteins expressed on the surface of the cells. The researchers wondered whether this 'out of body experience' might change the functional properties of the cells as well and make them better suited for transplantation. They

were specifically interested in clinically relevant "allogeneic" transplants, transplants between individuals who are genetically different, including siblings and unrelated donor/recipient pairs. Dr. Zhang's group transplanted freshly isolated HSCs or HSCs that were grown in the lab into mice and discovered that the HSCs that spent about a week growing in the lab were less likely to be rejected and more likely to be successfully incorporated into the recipient's blood.

The researchers went on to look at the mechanism that underlies this effect, and found that the lab-grown HSCs started to produce a specific immune system inhibitor on their surface that contributed to the improved transplantation efficiency. "This work should shed new light on understanding the immunology of HSCs and other stem cells and may lead to development of novel strategies for successful allogeneic transplantation of human patients," concludes Dr. Zhang. "If donor human HSCs can be expanded in culture and engraft non-matched or low-matched patients without graft-versus-host disease, this strategy will possibly lead to an ultimate solution to problems in allogeneic transplantation."

Provided by Cell Press