

Theory of single stem cell for blood components challenged

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Components of the blood or hematopoietic system derive from stem cell subtypes rather than one single stem cell that gives rise to all the different kinds of blood cells equally, said scientists from Baylor College of Medicine in a report that appears in the current issue of the journal *Cell Stem Cell*.

"While previous reports in journals have hinted at the possibility of stem cell subtypes, this study represents the clearest data to show that is true," said Dr. Margaret Goodell, director of the [Stem Cells](#) and Regenerative Medicine (STaR) Center at BCM. "From a scientific point of view, it's making us re-evaluate the view of the stem cells that come from adults. It challenges the dogma that there is one type of stem cell."

She and the report's first author, Dr. Grant A. Challen, a postdoctoral associate in the Center for Cell and Gene Therapy at BCM, said that the stem cell subtypes they identified meet the strictest criteria.

To accomplish this, Challen, Goodell and their colleagues used a special dye technique to discriminate the different hematopoietic stem cell subtypes - myeloid, which have a preference for giving rise to [red blood cells](#), macrophages (non-specific immune cells that engulf foreign bodies) and similar cells; and lymphoid, which similarly preferentially give rise to the body's [immune system cells](#).

By transplanting single stem cells into individual mice, Challen was able to confirm that these subtypes exist and act as the researchers had

thought. The subtypes also maintain a stable population of the stem cells over time, another characteristic of these [progenitor cells](#).

"We cannot rule out that there is a single progenitor cell to both subtypes," said Goodell. "We don't know where to look for it. Maybe it does not exist or maybe it exists only when the bone marrow begins to be made but does not persist into adulthood."

The finding has implications for treatment.

"People have been looking for purer and purer stem cell types," Goodell said. "In doing that, they may not be getting all the stem cell types they need. Maybe in the clinic, it is better to have less pure types."

"You may need a spectrum of stem cells to create a complete blood system," said Challen.

In bone marrow or peripheral blood stem cell transplants for cancers or blood disorders, doctors often wipe out a patient's own bone marrow and replace it with stem cells that can repopulate the [bone marrow](#). Scientists are constantly improving that system.

As animals age, their proportions of stem cell subtypes change, Challen said. "The myeloid cells have a slower rate of baseline turnover and a higher rate of self renewal. They persist over time, such that the myeloid-biased stem cells become more prevalent with time. This may have implications for how different types of cancers become more prevalent with age."

The two types react differently to the presence of transforming growth factor beta, Challen said. One type increases and the other decreases.

Challen said it is also important to remember the big question. "Does this

translate to humans as well? Some markers may be different, but I think it will."

Goodell holds the Vivian Smith Chair of Regenerative Medicine at BCM.

More information: www.cell.com/cell-stem-cell/

Provided by Baylor College of Medicine

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