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'Fingerprints' help find genes involved in differentiation

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A database that includes the molecular profiles of the major components of the blood system – including the stem cells and the cells differentiated from them – enabled researchers at Baylor College of Medicine (BCM) in Houston to identify at least two genes involved in the differentiation process for two different kinds of blood cells.

In a report that appears in the journal Cell Stem Cell today, Dr. Margaret A. Goodell, professor of pediatrics and director of BCM's STem Cells and Regeneration Center (STaR), and her colleagues described how they used their database to determine what was unique to each blood cell and what was common to all the cell types.

Understanding differentiation and what signals cause the early or progenitor cells to become the more specialized tissues that make multicellular organisms – such as mammals – possible is of vital concern to scientists and particularly stem cell biologists.

In this case, the scientists identified between 100 and 400 genes uniquely expressed in each cell type and termed these "lineage fingerprints," because they mark the different cells that arise from the various stem cells.

"With unique genes, some will be responsible for generating those cell types," said Goodell. She and her colleagues caused two of the genes (Zfp105 from the natural killer or NK cell lineage, and Ets2 from the monocyte (white blood cells with a singe nucleus that surround and

ingest foreign materials) lineage to overexpress or make more than usual amounts of protein.

“They ended up driving differentiation,” said Goodell. That means that genes encouraged progenitor or early forms of the cells to become the mature or final blood cells that carry out specific tasks in the blood system.

“We are hoping that if we screen more of these genes that we can identify others that cause differentiation,” she said.

In the future, she said, scientists might consider ways to use the genes to help generate the differentiated cells in the laboratory as a particular form of treatment or developing drugs to block the action of the genes. Overproduction of certain blood or immune system cells can lead to cancer or autoimmune disease.

The three-year study involved considerable teamwork, said Goodell, with individuals in the lab taking responsibility for studies involving the different populations of blood cells.

Source: Baylor College of Medicine