Stem cell success points to way to regenerate parathyroid glands

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An early laboratory success is taking University of Michigan researchers a step closer to parathyroid gland transplants that could one day prevent a currently untreatable form of bone loss associated with thyroid surgery.

The scientists were able to induce embryonic stem cells to differentiate into parathyroid cells that produced a hormone essential to maintaining bone density. The laboratory results in live cell cultures, published in *Stem Cells and Development*, need to be tested in further pre-clinical studies.

Parathyroid glands, four glands each the size of a rice grain that lie next to the thyroid in the neck, are easily damaged when surgeons operate on patients with cancerous or benign thyroid tumors. Without their calcium-regulating hormone, patients can develop osteomalacia, a severe form of bone loss similar to rickets that affects tens of thousands of people in the United States with muscle cramps and numbness in the hands and feet.

"We used human embryonic stem cells as a model for ways to work out the recipe to make parathyroid cells," says Gerard M. Doherty, M.D., chief of endocrine surgery and Norman W. Thompson Professor of Endocrine Surgery at U-M Medical School.

The research illustrates the payoff of rapidly increasing knowledge about how embryonic stem cells give rise to other kinds of cells. That knowledge can be the springboard for influencing other cells to regenerate damaged parts of the body.

Doherty's team used embryonic stem cells from a Bush administration-approved embryonic stem cell line to test a way to produce functioning, differentiated parathyroid cells to transplant into a patient and restore function.

With the recipe worked out, Doherty's team anticipates developing a treatment that doesn't use embryonic stem cells.

"We anticipate taking a person's own cells and making them into parathyroid cells," Doherty says. Using the patient's own cells should eliminate the risk of rejection.

Having demonstrated a method for leading embryonic stem cells to produce parathyroid cells, the team hopes to be able to repeat those steps using cells from the patient's own thymus gland. The method involves no genetic modification of cells, a key goal of Doherty's team.

"We want to have a process that will allow us to reintroduce cells into the patient's body safely," Doherty says.

Any successful treatment in people is five to 10 years away.

More information: *Stem Cells and Development*, September 2009,18(7): 1071-1080.

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