Common steroid medications hold promise for tissue repair

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A class of drugs commonly used for asthma, inflammation and skin injury also may hold promise for tissue-repairing regenerative medicine, according to Duke University Medical Center researchers.

In studies on cells from mice, the drugs, a kind of steroid hormone called glucocorticoids, appear to be promoting and protecting stem cell populations that perform tissue repair.

"We found that these common compounds could help to produce populations of (nerve-repairing) neuronal stem cells anad may even have a protective effect on the new stem cells, which could assist in tissue repair processes," said senior author Wei Chen, Ph.D., assistant professor in the Duke Department of Medicine. "Next we would like to study how these drugs work in specific conditions, starting with spinal cord injury repair and neural regeneration in the setting of Parkinson's disease."

The research was published online in the Proceedings of the National Academy of Sciences the week of May 3.

Chen said the findings are exciting, because millions of people have taken the glucocorticoid drugs, and the drugs are well known to be safe. He foresees new roles for these drugs to help grow new blood vessel networks after heart attack, to improve wound healing in people with diabetes, and to stimulate hair growth.

"This work is an excellent example of basic science research having the potential to positively impact patients in unexpected ways," said H. Kim Lyerly, M.D., George Barth Geller Professor of Research in Cancer and Director of the Duke Comprehensive Cancer Center. "This discovery may pave the way to better therapies for conditions from spinal cord injury to neuron degeneration. In addition, it allows us to look at cancer risk and potential cancer therapies in new ways that may benefit patients and their families."

The Duke researchers were searching for a medication that activates a cell-signaling pathway called "Hedgehog" that is critical to stem cell growth. They found that these glucocorticoid drugs -- especially fluticasone, halcinonide, clobetasol and fluocinonide -- stimulated a receptor called Smoothened, which in turn helped to stimulate stem cell growth and protect neuronal cells.

Chen said Smoothened works by activating the Hedgehog pathway, which in turn regulates stem cells, and is important in embryo growth and mature tissue integrity and repair. Although genetic mutations of Smoothened are linked with skin cancer, these drugs that activate the pathway have a proven safety record over more than two decades. Researchers and clinicians have not found any evidence of cancer association with glucocorticoid drugs, Chen said.

The PNAS paper is a proof of principle that the glucocorticoids used in asthma might work for asthmatic tissue remodeling in lung injury models, Chen said. "Asthma drugs like fluticasone provide a chemical means to treat inflammation," Chen said. "No one thought that fluticasone could help asthmatic patients because it might be doing something to protect new cells."

"Using medicinal chemistry, we hope to be able to create effective and safe compounds that will be new tools for the science of regenerative

medicine," Chen said.

Provided by Duke University Medical Center