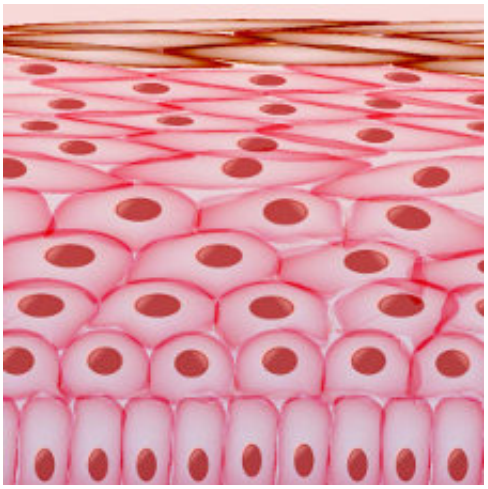
MedicalXpress

Turning brain cells into skin cells

October 18 2017



Credit: Tel Aviv University

A new study published in *Nature Communications* reveals that it is possible to repurpose the function of different mature cells across the body—and harvest new tissue and organs from these cells.

The research tracks the transformation of genetically manipulated cells into melanocytes, which are responsible for the production of skin pigment and essential to the body's auditory system.

The study, based on mouse models, was led jointly by Prof. Carmit Levy of the Department of Human Molecular Genetics and Biochemistry at Tel Aviv University's Sackler School of Medicine and Dr. Jacob Hanna of the Weizmann Institute of Science.

Reversing the irreversible

"When cells develop, they differentiate into different organs with varying functions: bone, intestine, brain, and so on," Prof. Levy says. "Our study proves, for the first time, that this process is not irreversible. We can turn back the clock and transform a mature cell that already plays a definite role in the body into a cell of a completely different kind.

"The applications of this are endless—from transplants, which would eliminate long waiting lists and eliminate the common problem of immune system rejection of 'foreign' organs; to maybe one day curing deafness: taking any cell in the body and transforming it into melanocytes to aid in the restoration of hearing. The possibilities are really beyond the scope of the imagination," Prof. Levy continues.

The scientists took cells from different parts of the mouse—stomach, intestine, connective tissue, heart and brain—and placed these cells in a solution activating the genetic switch MITF (Microphthalmia-associated transcription factor), which is responsible for the production of melanocytes. Through this method, a stomach cell was turned into a skin cell.

"All of our genes are in all our cells, but genetic mechanisms allow them to manifest in the appropriate place while remaining dormant everywhere else," says Dr. Hanna. "Each cell has a kind of 'switch.' We activated the MITF switch to create melanocytes from cells designated for other purposes."

The generation of an entire genetically manipulated mouse is new and affords a scientific breakthrough that may save lives in the future, Prof. Levy concludes. "Future developments based on this method may enable the transformation of one tissue taken from the patient's own body into

another tissue to replace the damaged organ, for example. Curing hearing loss is also a promising direction for this research because melanocytes are essential to our auditory system."

More information: Danna Sheinboim et al, OCT4 impedes cell fate redirection by the melanocyte lineage master regulator MITF in mouse ESCs, *Nature Communications* (2017). DOI: 10.1038/s41467-017-01122-1

Provided by Tel Aviv University