Researchers create new stem cell screening tool

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Stem cell research is the next great leap in medicine. In the future, new tissue grown in a laboratory could replace a failing heart, or new cells take the place of damaged cells in the brain. Rather than using stem cells from embryonic sources, which opens difficult ethical and complicated scientific issues, scientists have been looking to adult human stem cells, culled from a person's own body. Adult stem cells are now being cultivated from various tissues in the body -- from skin, bones and even wisdom teeth.

At the forefront in this research is a team of scientists from Tel Aviv University and Scripps Research Institute in California. They recently reported a breakthrough on a new classification system for identifying pluripotent stem cells in human tissue. News about this system recently appeared in the prestigious scientific journal *Nature*.

Pluripotent stem cells have the potential to differentiate into every distinct cell type in the developed human body. They hold great promise for use in drug development and the treatment of many devastating disorders.

"There is a huge interest in scientists taking skin cells or other body cells of a person, and then turning them into stem cells for creating new neurons in the brain," says Igor Ulitsky, a Ph.D. student at Prof. Ron Shamir's lab in the Blavatnik School for Computer Science, Tel Aviv University, who pioneered some of the research techniques. "Using a person's own stem cells is both ethically acceptable, and in some cases

even better for regenerating tissue than embryonic stem cells."

Tel Aviv University research played a central role, creating new bioinformatics algorithms to analyze the data and put together the pieces of the puzzle. The result is, in effect, an encyclopaedia describing different stem cell types and their characteristics.

Before this breakthrough, made possible by international collaboration, scientists were baffled by how to distinguish different stem cell types. "Our lab helped devise a method to classify stem cells according to their machinery," Ulitzky explained. "Stem cells have small but significant differences between them, and knowing the potential properties of each kind is valuable for advancing this promising field of research."

With rapid advances in the field of stem cells — including methods to induce pluripotence in various cells, such as those that comprise human skin — the question of how to define pluripotence has become increasingly critical. This is especially the case for human cell lines, which for both ethical and scientific reasons cannot be treated as those from other species.

"There has been no ethically acceptable equivalent test that could prove pluripotency in human cell preparations," said Franz-Josef Mueller, M.D., an investigator at Scripps. "Many have been purported to be multi- or pluripotent, but there has been no practical way to define pluripotency in human cells."

Using a collection of about 150 human stem cell samples, the researchers created a database of global gene expression profiles and discovered that all of the pluripotent stem cell lines showed a remarkable similarity in the analysis, while other cell types were more diverse.

The analysis by Shamir's lab revealed a protein-protein network common

to pluripotent cells, pointing to what may be one of the key building blocks of the machinery that enables these transformative cells to differentiate into multiple cell types. Next, the researchers plan to investigate the regulation of this protein network and how it might be used to advance the development of human gene therapies.

Source: American Friends of Tel Aviv University