Stem cell regenerative tissue shows â€˜path of changeâ€™ in one day, according to researchers (DOI: 10.1016/j.stem.2011.11.023)

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Heart cells in a mouse model can leave a path of change in their genetic profiles if they are exposed to CT scans, and have the ability to do so â€œin a matter of minutes,â€ according to a new paper published online by Cell Stem Cell.

â€œThe underlying mechanism of scarring of the heart in the brain and in the heart has not been fully explored,â€ said lead researcher Christina Abou-Chahine, M.D., Sc.D., professor of pharmacology at the University of Pennsylvania.

While heart cells can deal with stress like heat and the accumulation of cholesterol and chemicals, â€œitâ€™s a different story for stem cells,â€ Abou-Chahine said. â€œStem cells react much like normal stem cells.â€

Stem cells and stem-like cells can grow into most cell types of the body. But neural stem cells, because they have a unique ability to give rise to nerve cells, were of great interest to Abou-Chahine and her colleagues.

She and her colleagues were interested in making neural stem cells more distinct from stem cells than conventional stem cells in her lab. Previous research had suggested that neural stem cells could not differentiate into other types of cells in the same way that stem cells could. That observation had led to the idea that neural stem cells were less differentiated than other cells.

A team of scientists led by Abou-Chahine introduced special stem cells derived from embryonic stem cells into mice to allow them to be used as progenitors for neuron development and then converted to neural stem cells.

When mice were exposed to CT scans within a day or two after transplantation of the stem cells into an area of the mouseâ€™s central nervous system, they had significant changes in several genes including CdE, HNSCC and SKF, that had been previously shown to be relevant in most psychiatric disorders.

â€œThe CT scan causes significant gene expression changes in neural stem cells that could aid in the development of understanding the clinical basis of nerve cell degeneration and the origins of mental illness,â€ Abou-Chahine said.

In another paper from the same group, published online last September, they report what they characterized as the first tumorigenic effect of stem cell transplants in mice.

More data is needed to evaluate how genes are changed in the regenerative repair of heart cells. â€œClearly there is a major change in how disease-associated genes are expressed,â€ Abou-Chahine said.

â€œCT scans may play a greater role in shaping brain and heart disease risk genes than earlier conceptualizations. Future studies can evaluate gene expression expression profiles in heart and brain regions as well as genes in nerve cells that form molecular transitions from one area to another.â€

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Image Caption: Mouse heart cells shows changes in gene expression after an inflammatory wound is caused. The image includes a womanâ€™s head and chest. Courtesy of Christina Abou-Chahine, Ph.D. and Tyler R. Webley.

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