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Researchers Hope To 'Reprogram' Stem Cells With Human Heart Tissue

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Spanish researchers have employed for the first time adult cells extracted from a human heart to turn stem cells from adipose tissue into cardiac myocytes. In other words, they achieved to "reprogram" adult stem cells, which might improve treatments for heart disease therapeutical.

At present, the use of stem cells in treatments for heart disease is one of the most common practices. However, working with stem cells without targeting heart tissue negatively affects the efficacy of treatments. Therefore, inducing cell differentiation into cardiac muscle (cardiomyocytes) may be one of the best options in the treatment of these pathologies.

For the purpose of this study, researchers isolated adult human stem cells from lipos aspiration. Subsequently, these cells were temporarily permeabilized and exposed to a human-auricle cell extract. Then, these cells were recovered in culture.

Morphological Changes

After 21 days in culture, the cells differentiated towards a cardiac myocyte phenotype, which was demonstrated by expression of morphological changes (appearance of binuclear cells with striated fibers and ramifications), detection of cardiospecific markers through immunofluorescence, and the presence of cardiac muscle-related genes that were analyzed through RT-PCR; and finally, by expression of reverse transcription. Thus, mesenchimal stem cells acquired a cardiac phenotype.

This study was conducted by Macarena Perán, Juan A. Marchal, Elena López, Manuel Jiménez-Navarro, Houria Boulaiz, Fernando Rodríguez-Serrano, Esmeralda Carrillo, Gema Sánchez-Espin, Eduardo de Teresa, David Tosh y Antonia Aránega, researchers from the University of Jaen (Spain), the University of Granada, the Hospital Clínico Universitario of Malaga and the University of Bath (United Kingdom). It is going to be published on the Journal Cytotherapy, the official reporting organ of the International Society for Cellular Therapy (ISCT).

This technique could be used in the future for regeneration of cardiac muscles through the use of cells directly extracted from the patient. However, physicians have remarked that, at present, this research is in its earlier stages, and it will be a long time until it has any therapeutical use.

Currently, researchers are preparing a new approach for introducing the cell extract into the target cell (by using a cell microinjector) that will allow them to obtain a larger number of viable differentiated cells, which is essential for their having any therapeutical use. The following step is to use animal models to validate differentiated cells' functionality. Finally, a number of clinical trials should be conducted to assess the viability of this technique in human patients.

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