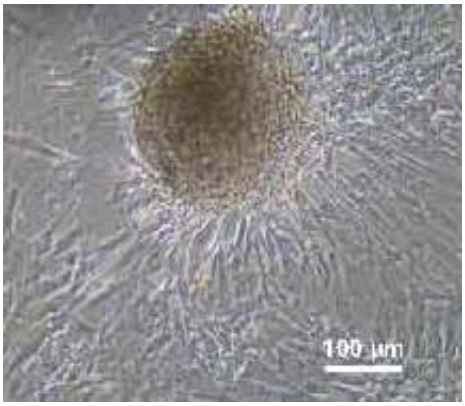
Adult stem cells change their epigenome to generate new organs

October 2 2012



Adult stem cells obtained from fat.

A study developed by researchers at the IDIBELL, led by Manel Esteller, has identified epigenetic changes that occur in adult stem cells to generate different tissues of the human body.

The team led by Manel Esteller, director of the Cancer Epigenetics and Biology Program in the Bellvitge Biomedical Research Institute (IDIBELL), Professor of Genetics at the University of Barcelona and ICREA researcher, has identified epigenetic changes that occur in adult stem cells to generate different body tissues. The finding is published this week in *The* American Journal of Pathology.

The genome of every single cell in the human body is the same,

regardless of their appearance and function. Therefore the activity of the tissues and organs and its disorders in complex diseases, such as cancer, cannot be fully explained by the genome. It is necessary something more, and part of the explanation is provided by epigenetics, which is defined as "the inheritance of DNA activity that does not depend on strict sequence of it." That is, if genetics is the alphabet, spelling would be the epigenetics, which refers to chemical changes in our genetic material and their regulatory proteins. The most known epigenetic mark is the addition of a methyl group to DNA. Thus, the epigenome is getting all the epigenetic marks of a living being.

Adult stem cells have an enormous potential to regenerate damaged organs and their use also avoids ethical complications involving embryonic stem cells, as well as technical problems arising from induced stem cells. In this study, researchers have isolated stem cells from body fat and transformed them into muscle and bone cells. Then, it was necessary to know how much resembled are the cells created in the laboratory with those present in one individual and if they were biologically secured enough to be implanted in patients. The study shows that the epigenome of the cells obtained in culture closely resembles that of skeletal muscle cells and they are spontaneously present in nature, although not completely identical.

A key point of the study is that muscle and bone cells produced in the laboratory do not have the tumour epigenome derived from these tumour tissues (rhabdomyosarcoma and osteosarcoma, respectively) so they are safe from a biological perspective. The study coordinator, Manel Esteller, stresses that the research "demonstrates the usefulness of epigenetics in determining the degree of maturity and biosecurity of differentiated tissues used in regenerative medicine against different diseases."

More information: DNA Methylation Plasticity of Human Adipose-

Derived Stem Cells in Lineage Commitment. Berdasco M, Melguizo C, Prados J, Gomez A, Alaminos M, Pujana MA, Setien F, Ortiz R, Zafra I, Aranega A, Esteller M. *The American Journal of Pathology*, published online 01 October 2012. www.journals.elsevierhealth.co … a/article/S0002-9440%2812%2900658-X/abstract

Provided by IDIBELL-Bellvitge Biomedical Research Institute