Greater versatility of adult stem cells thanks to 3-D lab experiments

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A type of adult stem cell is now proving itself more versatile for research and therapies thanks to revolutionary 3D experiments. These cells have already shown great promise for repairing damaged bone and cartilage but until now have been fairly limited in the types of cells they can form in the laboratory.

Dr Paul Genever from the University of York will be speaking later today (31 March) at the annual UK National Stem Cell Network science meeting. He will tell the gathered audience of world-class scientists about his work to grow mesenchymal stem cells (MSCs) – currently one of the leading candidates to be used in stem cell therapies – as tiny spheres. Under these conditions MSCs show potential to become a variety of different cell types including, possibly, the early precursors to heart muscle cells. The work is funded by the Biotechnology and Biological Sciences Research Council (BBSRC) and Smith & Nephew.

MSCs are common in children and adults and quite easy to find in blood, bone marrow, and many other tissues. They are already being used to repair bone in a small number of patients with severe fractures or bone disease.

Dr Genever's experiments hope to recreate the microscopic 3D environment that stem cells would normally occupy inside our bodies and so give an accurate approximation of the factors that might influence the ability of MSCs to eventually produce different types of cell for regenerative medicine.

Dr Genever said "In the past we've grown MSCs in 2D layers in the lab and they are only really strongly inclined to become bone, fat or cartilage – they are very useful for research and therapy, but in both cases would largely be limited to these three cell types.

"Our 3D technique aims to recreate the nutrients, oxygen levels and mechanical forces that these cells would normally experience inside our bodies. By growing the cells as 3D spheres of microscopic size instead of in a 2D layer, they specialise their roles more rapidly and more completely and also appear to be able to become a greater range of cell types. This shows that they are quite a bit more versatile than we thought and so are a very exciting prospect for the use of these cells in therapies."

The spheres used are made of aggregates of MSCs and are tiny, measuring only 200-300 micrometers across – about half the size of a dust mite. Within these spheres it is possible to monitor the effects of interactions between several cells and between cells and other supporting structures. The MSCs can also be combined with other types of cells that they would usually be associated with such as endothelial cells, which are found on the surfaces of blood vessels.

Professor Douglas Kell, Chief Executive, BBSRC said "Stem cells are a vital part of normal development and healthy repair. Stem cell biology is subtle and complicated and this discovery will help to ensure that results from laboratory experiments offer a good approximation of what is happening with stem cells under normal circumstances inside humans and other animals."

Provided by Biotechnology and Biological Sciences Research Council