Sweet news for stem cell's 'Holy Grail'

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(Phys.org)—Scientists have used sugar-coated scaffolding to move a step closer to the routine use of stem cells in the clinic and unlock their huge potential to cure diseases from Alzheimer's to diabetes.

Stem cells have the unique ability to turn into any type of human cell, opening up all sorts of therapeutic possibilities for some of the world's incurable diseases and conditions. The problem facing scientists is how to encourage stem cells to turn into the particular type of cell required to treat a specific disease.

But researchers at the University of Manchester's School of Materials and Faculty of Life Sciences have developed a web-like scaffold, coated with long-sugar molecules, that enhances stem-cell cultures to do just this. The scaffold is formed by a process known as 'electrospinning', creating a mesh of fibres that mimic structures that occur naturally within the body.

The team's results – presented in the Journal of Biological Chemistry - are particularly promising, as the sugar molecules are presented on the surface of the fibres, retaining structural patterns important in their function. The sugars are also 'read' by the stem cells grown on the surface, stimulating and enhancing the formation of neuronal cell types.

Lead author Dr Catherine Merry, from Manchester's Stem Cell Glycobiology group, said: "These meshes have been modified with long, linear sugar molecules, which we have previously shown play a fundamental role in regulating the behaviour of stem cells. By combining

the sugar molecules with the fibre web, we hoped to use both biochemical and structural signals to guide the behaviour of stem cells, in a similar way to that used naturally by the body. This is the Holy Grail of research into developing new therapeutics using stem cell technology."

The group anticipate that the combination of the sugar molecules with the fibre web will aid both the growth of stem cells and the formation of different cell types from the stem cell population.

Possible applications include tissue engineering, where the meshes could support cells differentiating to form bone, liver or blood vessels, for example. The meshes also have potential therapeutic implications in the treatment of diseases such as multiple osteochondroma (MO), a rare disease creating bony spurs or lumps caused by abnormal production of these sugar molecules.

Co-author Professor Tony Day, from Manchester's Wellcome Trust Centre for Cell-Matrix Research, said: "This cross-faculty collaboration provides exciting new possibilities for how we might harness the adhesive interactions of extracellular matrix to manipulate stem cell behaviour and realise their full therapeutic potential."

Provided by University of Manchester