Scientists develop technique to rejuvenate cells from older osteoarthritis patients

Published on August 20, 2015 at 6:59 AM

A research team at York has adapted the astonishing capacity of animals such as newts to regenerate lost tissues and organs caused when they have a limb severed.

The research, which is funded by a £190,158 award from the medical research charity Arthritis Research UK, is published in Nature *Scientific Reports*.

The scientists, led by Dr Paul Genever in the Arthritis Research UK Tissue Engineering Centre in the University's Department of Biology, have developed a technique to rejuvenate cells from older people with osteoarthritis to repair worn or damaged cartilage thus reducing pain.

There is currently no treatment to prevent the progression of osteoarthritis, and people with severe disease often need total joint replacement surgery.

A patient's own bone marrow stem cells are, however, a valuable source of potential treatment as they can generate joint tissue the body will not reject when re-implanted. Nevertheless, as people grow older the number of stem cells decreases and those that remain are less able to grow and repair tissue.

Cells in newts can change in response to injury -- a process known as dedifferentiation. The cells aggregate and return to a stem cell-like state to allow them to increase in numbers and generate the specialised cells needed for new tissue formation

But this form of tissue regeneration does not occur in humans, so the researchers recreated similar conditions in the laboratory by growing human cells as 3D aggregates.

The scientists cultivate the spheroid clusters of cells, which are just visible to the naked eye, in tiny cavities. The process involves reverting cells to an embryonic state. In doing so, the cells eat their own constituents and consequently reduce in size.

Dr Genever said: "Using this technique, we have shown that human cells can also be dedifferentiated to an early embryonic stage. They are then capable of generating new tissues. We were able to use pharmaceuticals to induce cell self-eating effects and stimulate dedifferentiation though not as effectively as 3D culture, so we need to do more work on this.

"The next stage is to find out more about the dedifferentiation process so that we can find the right treatment to encourage tissue repair in the damaged joint. That is our aim."

Lead author, Dr Rebecca Pennock, who worked on the study at the University of York, is funded by Arthritis Research UK and previously by the Biotechnology and Biological Sciences Research Council. The research also involved scientists in the Hull York Medical School Centre for Cardiovascular and Metabolic Research at the University of Hull.

Osteoarthritis is the most common form of joint disease worldwide. In the UK, around a third of people aged 45 years and over, totalling 8.75 million people, have sought treatment from their GP for the condition. The condition causes pain and stiffness in the joints due to cartilage at the ends of bones wearing away.

Dr Stephen Simpson, director of research and programmes at Arthritis Research UK added: "This is exciting, novel work in the field of regenerative medicine, which although in its early experimental stages, could take us a step closer to our ultimate goal of a more effective and much-needed new treatment for the very many people who live with this painful joint condition."

Source:
University of York
