MONASH University

CRC for Polymers

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A significant advance in nerve regeneration using stem cells and nanotechnology

A Monash PhD student working with the CRC for Polymers has developed a technique which has the potential to revolutionise nerve regeneration using stem cells and "smart" nanomaterials. This major advance in stem cell research also provides a boost to the search for treatments for crippling conditions, particularly Parkinson's Disease and spinal cord injury.

David Nisbet and his supervisor Dr John Forsythe, from Monash University's Department of Materials Engineering, have constructed a scaffold that supports neural stem cells and provides important signals to assist nerves to regrow.

"The scaffold is generated from plant seeds and provides a three-dimensional platform and anchor point for the cells. It functions in a similar way as the temporary scaffolding in building construction - after the scaffold had served its purpose, it degrades away leaving the cells to exist on their own natural matrix" – Mr Nisbet said.

"The stem cells help to repair nerve pathways as they extend longer nerves, when anchored on this scaffold, than when they are grown under normal conditions. This result took us by surprise and we are very excited about the therapeutic outcomes that could be obtained from our research." This major advance will help stem cell research, particularly in the areas of Parkinson's disease and spinal-cord injury.

The 3D scaffold is a "smart" material which is injected into the body as a liquid and forms a solid scaffold when it reaches body temperature. "This work intersects with nanotechnology and stem cell research, which is a very exciting combination", Mr Nisbet said.

"My scaffolds are also being investigated by colleagues at the Howard Florey Institute and the Mental Health Research Institute of Victoria." Within these Institutes, I am currently investigating the performance of these nanomaterials within the body, and the preliminary results are encouraging. We have demonstrated an ability to control inflammation once the materials are introduced into the body, and have managed to encourage native nerves to extend and growth through the scaffold."

Repairing damaged neural pathways within the brain or spinal cord will be a long and iterative process. However, Mr Nisbet currently collaborates internationally and locally with leaders in nerve regeneration. Such collaborations make it possible for rapid progress to be made, and he plans to contribute by engineering smart materials that control stem cells and encourage extensive nerve re-growth. "It is great to know that we are making a significant contribution here at Monash," he said.

Mr Nisbet's research is due to be published shortly, some of it will be presented at the World Biomaterials Conference in Amsterdam (May 08).

Mr David Nisbet is available for interview on 0419 440 048.
david.nisbet@eng.monash.edu.au