3D printing for new tissues and organs

June 18 2009

A more effective way to build plastic scaffolds on which new tissues and even whole organs might be grown in the laboratory is being developed by an international collaboration between teams in Portugal and the UK.

Writing in a forthcoming issue of the International Journal of *Computer Applications in Technology*, researchers explain how a technique known as rapid prototyping, or three-dimensional printing, could enable tissue engineering that replicates the porous and hierarchical structures of natural tissues at an unprecedented level.

Scaffold structures for tissue engineering that allow researchers to grow cells, whether skin, muscle, or even kidney, in a three-dimensional could allow medical science to create natural artificial organs. Such scaffolds are increasingly important for the future direction of regenerative medicine. However, conventional techniques have several limitations. In particular, current scaffold construction lacks full control of the often microscopic pores and their architecture.

Tissue engineering usually involves cellular implantation. Cells might be derived from the patient or a donor. They are combined in the laboratory with a degradable scaffold that can then be implanted to replace damaged tissues. The presence of the structure scaffold also triggers the body to rebuild damaged tissue. Ceramics are usually used to help rebuild bone, while polymers might be used to rebuild soft body tissues.

Paulo Bártolo and Henrique Almeida of the Institute for Polymers and Composites, at Leiria Polytechnic Institute, and Tahar Laoui of the

Department of Manufacturing and Systems at the University of Wolverhampton, are borrowing a technique from more conventional manufacturing to solve this problem.

In rapid prototyping, a computer controls a laser that cures a vat of polymer resin layer by layer and building up a solid object. It allows designers and manufacturers to rapidly produce a prototype component created on a CAD machine from anywhere in the world. But, it is the precision with which a material can be constructed that could be crucial to developing rapid prototyping as a tissue engineering technique.

The researchers suggest that rapid prototyping overcomes many of the limitations of conventional scaffold techniques, such as stereolithography, which etches a block of material into shape. Rapid prototyping might one day allow kidney, liver and muscle tissues to be constructed in the laboratory from a patient's own cells with close-to-natural detail ready for transplantation.

Source: Inderscience