

Inkjet printers can print human cells

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Made-to-measure skin and bones, which could be used to treat burn victims or patients who have suffered severe disfigurements, may soon be a reality using inkjets which can print human cells.

Scientists at The University of Manchester have developed the breakthrough technology which will allow tailor-made tissues and bones to be grown, simply by inputting their dimensions into a computer.

Professor Brian Derby, Head of the Ink-Jet Printing of Human Cells Project research team, said: "It is difficult for a surgeon to reconstruct any complex disfiguring of the face using CT scans, but with this technology we are able to build a fragment which will fit exactly. We can place cells in any designed position in order to grow tissue or bone."

This breakthrough overcomes problems currently faced by scientists who are unable to grow large tissues and have limited control over the shape or size the tissue will grow to. It also allows more than one type of cell to be printed at once, which opens up the possibility of being able to create bone grafts.

"Using conventional methods, you are only able to grow tissues which are a few millimetres thick, which is fine for growing artificial skin, but if you wanted to grow cartilage, for instance, it would be impossible," Professor Derby says.

The key to the advance which Professor Derby and his team have made is the innovative way in which they are able to pre-determine the size and shape of the tissue or bone grown.

Using the printers, they are able create 3-dimensional structures, known as ‘tissue scaffolds’. The shape of the scaffold determines the shape of the tissue as it grows. The structures are created by printing very thin layers of a material repeatedly on top of each other until the structure is built. Each layer is just 10 microns thick (1,000 layers equals 1cm in thickness).

This method allows larger tissues to be grown than previously possible. The reason for this is the way in which the cells are inserted into the structures.

Before being fed into the printer, the cells are suspended in a nutrient rich liquid not dissimilar to ink, which ensures their survival. The cells are then fed into the printer and seeded directly into the structure as it is built. This avoids any ‘sticking to the surface’ which is a major disadvantage of current methods that infuse the cells into the structure after it has been built.

“The problem is getting cells into the interior of these constructions as they naturally stick to the sides of whatever they are being inserted into. If they stick to the sides then this limits the number of cells which can grow into tissues, and the lack of penetration also limits their size. By using inkjet printing we are able to seed the cells into the construction as we build it, which means ‘sticking’ isn’t a problem,” says Professor Derby.

Professor Derby believes the potential for this technology is huge: “You could print the scaffolding to create an organ in a day,” he says.

Source: The University of Manchester

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