

# British scientists grow human liver in a laboratory

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British scientists have grown the world's first artificial liver from stem cells in a breakthrough that will one day provide entire organs for transplant.

The technique that created the 'mini-liver', currently the size of a one pence piece, will be developed to create a full-size functioning liver.

Described as a 'Eureka moment' by the Newcastle University researchers, the tissue was created from blood taken from babies' umbilical cords just a few minutes after birth.

As it stands, the mini organ can be used to test new drugs, preventing disasters such as the recent 'Elephant Man' drug trial. Using lab-grown liver tissue would also reduce the number of animal experiments.

Within five years, pieces of artificial tissue could be used to repair livers damaged by injury, disease, alcohol abuse and paracetamol overdose.

And then, in just 15 years' time, entire liver transplants could take place using organs grown in a lab.

The development provides fresh hope for the hundreds of Britons in dire need of a new liver each year.

There are currently 336 patients waiting for a liver transplant - the type of operation performed on George Best. However, in 2004, 72 people died waiting for a suitable donor.

The liver tissue is created from stem cells - blank cells capable of developing into different types of tissue - found in blood from the umbilical cord.

Working in collaboration with experts from the US, the Newcastle scientists succeeded in separating out the stem cells from blood removed from the umbilical cord minutes after birth.



**Dr Nico Forraz (left) and Prof Colin McGuckin, (below) the tissue created in the lab is actually the size of a 1p piece**

They are then placed in a 'bioreactor' - a piece of electrical equipment developed by NASA to mimic the effects of weightlessness. Inside this, the freedom from the force of gravity allows them to multiply more quickly than usual.

Then, various hormones and chemicals are added to coax the stem cells into turning into liver tissue.

So far, tiny pieces of tissue, less than an inch in diameter have been created.

However, in time, it should be possible to create larger and larger pieces of tissue, eventually creating sections capable of being transplanted into sick patients.

The Newcastle scientists believe that within two years the tissue could be used to test new drugs.

Currently, new drugs are tested in the test tube, before being tried out first on animals and then on humans.

However, the procedure is not foolproof, as was made painfully clear by the Northwick Park drugs trial earlier this year in which six healthy young volunteers were left fighting for their lives.

Using lab-grown human tissue could iron out any difficulties before new drugs are given to humans.

Colin McGuckin is professor of regenerative medicine at Newcastle University. He said: "We take the stem cells from the umbilical cord blood and make small mini-livers.

"We then give them to pharmaceutical companies and they can use them to test new drugs on.

"It could prevent the situation that happened earlier this year when those six patients had a massive reaction to the drugs they were testing."

Using mini-livers could also cut down on the number of animal experiments.

Within five years, the artificial liver could be used to directly benefit people's health.

The researchers envisage sections of artificial liver being used to keep patients needing liver transplants alive - in much the same way as a dialysis machine is used to treat kidney failure.

This technique would take advantage of the liver's remarkable ability to quickly regenerate itself.

The patient would be hooked up to an artificial liver which would take over all the functions usually carried out by their own liver.

With several 'dialysis' sessions a day over a period of several months, the patient's own liver would be afforded enough resting time to regenerate and repair any damage.

Alternatively, vital months could be bought in search for a suitable donor for transplant.

It is hoped that within 15 years, it will be possible to create sections of liver suitable for transplant into the body of those whose livers have been damaged beyond repair.

In many cases, this would replace the need for an entire liver transplant.

However, it would then be several more years before whole livers could be created in a lab for transplant.

While other researchers have created liver cells from stem cells from embryos, the Newcastle team are the first to create sizeable sections of tissue from stem cells from the umbilical cord.

They believe their technique is better suited to growing larger sections of tissue.

Use of cord stem cells is also more ethically acceptable than the use of embryonic stem cells - a process that leads to the death of the embryo.

The Newcastle researchers foresee a time when cord blood from millions of babies born each year is banked, creating a worldwide donor register for liver dialysis and transplant.

Computerised registers could then be created to match the cord blood with tissue type or immune system of patients with liver problems.

Already used to treat leukaemia, more than 11,000 British parents have so far chosen frozen their children's cord blood in a dozen such banks around the UK.

Prof McGuckin said: "One hundred million children are born around the world every year - that is 100 million different tissue types.

"With that number of children being born every year, we should be able to find a tissue for me and you and every other person who doesn't have stem cells banked."

Co-researcher Dr Nico Forraz said: "Our dream is that every metropolitan city would have such a bank.

"If you could type the blood all, you would have to do is dial it up on your computer and fly it from Bristol to Newcastle or even Newcastle to Kuala Lumpur."

The breakthrough has been welcomed by liver experts. However, they caution much more work is needed before the research is transferred from the lab to the operating theatre.

Professor Nagy Habib, of London's Hammersmith Hospital, said: "The stem cell is going to change the way we deliver treatment. However, it won't happen tomorrow."

Alison Rogers, Chief Executive of the British Liver Trust, said: "Stem cell technology represents a huge leap forward in treating many diseases. "With liver disease in particular it has the potential for tremendous advances."

A spokesman for UK Transplant, which runs the country's organ donor register, said: "There is lots going on in research that may have benefits for transplant patients.

"But, in the here and now, the obvious way to help these people is by more people adding their names to the organ donor register and to make their wishes known to their family."