Pigs cloned for organs down at the 'pharm'

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Tim Radford March 15, 2000

Five pigs born 10 days ago in Blacksburg, Virginia - but only announced yesterday by a British firm based at Roslin in Scotland - are clones that could lead to new ways to save life.

Millie, Christa, Alexis, Carrel and Dotcom are living proof of the first step towards supplies of identical pig organs genetically engineered to be compatible with the human bodies that might need them.

In a world where patients in urgent need of spare part surgery outnumber potential donors by 20 to 1, the five piglets and their successors are claimed to be "the only near-term solution to solving the worldwide organ shortage crisis."

The market in "xenotransplanted" organs - transplanted from another species - could be worth $6bn, and clinical trials with pig organs could start in four years, providing governments give the go-ahead.

The five pigs are proof that pigs can be cloned: they will enjoy a life of comfort and celebrity. Although born in the US, they were brainchildren of PPL Therapeutics, the commercial business built on the site of the Roslin institute, progenitors of Dolly the sheep.

Millie was the name long ago selected for the world's first pig clone. Christa honours Christian Barnard, who performed the first human heart transplant in 1967. Two others salute Alexis Carrel, a 1912 Nobel prizewinner who pioneered transplantation. Dotcom was so called for luck. "Any association with dotcoms right now seems to have a very positive influence on a company's valuation," said Ron James, PPL's chief executive.

The piglets are pioneers in what is now called "pharming" - the employment of animals in the human health business. PPL already has a flock of sheep producing alpha 1-antitrypsin, a human protein for cystic fibrosis sufferers, a flock producing a protein that seals wounds and stops bleeding and another making a human enzyme that breaks down fats - urgently needed by people with pancreatic damage. It is also produced in mother's milk - and could help premature babies that cannot be breast fed. None of these products is yet in use. None of their makers is a clone, but all of them have added genes.

"What cloning allows us to do for the first time is switch off genes as well," said Ron James. The next step is to switch off a pig gene called alpha 1-3 gal transferase. This sugar group on the pig tissue signals to the human immune system that the transplanted organ was foreign: there would be a massive response, the organ would be destroyed and the patient would die. There would still be risk of rejection so the next step would be to put an extra gene in the pig - switched on at the moment of surgery - to prevent clotting in the patient's blood cells, which would starve the organ of oxygen. "We are claiming that we have the most comprehensive solution we know of," said Dr James.

PPL is not the only group hoping to use genetically engineered, human-compatible pigs for transplants of hearts, lungs, liver and other organs. For the time being, the technique has been blocked while government-appointed experts consider whether animal viruses concealed in pig DNA could somehow get into the human population.

But the ability to clone pigs gives the Scottish-based group a new edge: cloning guarantees that the same genes will work in the same way in all progeny. The transfer of DNA from a parent-twin to the eggs that led to Millie, Christa, Alexis, Carrel and Dotcom followed the nuclear transfer process that led to Dolly the sheep, but involved new steps that will lead to new patent applications. The cells taken from the parent were sent to an independent labora tory for testing before the piglets were born.

"That is so we couldn't be accused of taking the cells from the pigs themselves. That means we are absolutely certain they were clones. That's the reason why - though they were born nine days ago - we've only gone public today. It took that long to check," said Dr James yesterday. "They are absolutely fine and growing rapidly, as piglets do, and their surrogate mother is also fine and feeding them happily."

Dolly was the only successful clone in 227 attempts. The PPL scientists had been working on ways to clone pigs for almost a year, making perhaps an experiment a week. This was the first to work. It did not bring human cloning any closer, he said.

"The Dolly technology has now been available to scientists for more than two years. To our knowledge, nobody has tried to make a human: it is just something the media keeps talking about. We are no nearer to doing that. We should take comfort from the fact that nobody has even tried," he said.