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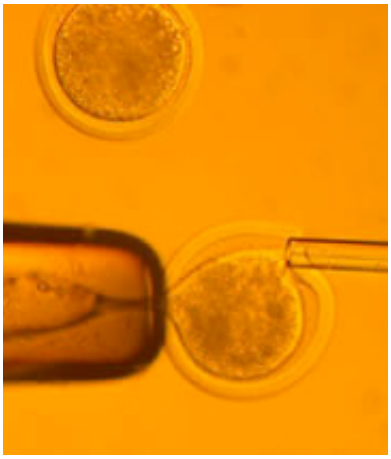
Cloned human embryos yield stem cells

Study brings therapeutic cloning one step closer.
12 February 2004

HELEN R. PILCHER



Genetic material was injected into eggs that had their own DNA removed.
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Researchers have cloned 30 human embryos and harvested stem cells from them. The technique could eventually help scientists develop replacement tissues for the treatment of many diseases, including diabetes, stroke and Alzheimer's disease.

Woo Suk Hwang from Seoul National University in South Korea and colleagues injected genetic material from adult human cells into human eggs that had their own DNA removed. The resulting embryos had the same DNA as their adult donors, making them clones. The researchers then harvested stem cells from these embryos[1].

In culture, the stem cells went on to form all of three of the main tissue types that normally appear in the beginning stages of embryonic development. When the cells were grafted into mice, they were able to form muscle, bone, cartilage and connective tissues.

"Our approach opens the door for the use of these specially developed cells in transplantation medicine," says Hwang.

Researchers hope to tailor-make stem cells for individual patients. To do this, a patient's own DNA would be injected into an egg, making a clone that can be harvested for stem cells. The cells would then be injected back into the patient, where they may be able to repair and replace damaged tissue. Because the cells are an exact tissue match, researchers think they would not be rejected.

"It's an important breakthrough," says Alistair Kent, director of the Genetic Interest Group, an organization that supports those affected by genetic diseases. "It's good news for patients as it brings us one step closer to the development of cures for some terrible diseases."

242 eggs, one set of stem cells

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The team used DNA from cumulus cells - a specialized type of cell that helps to nourish developing eggs. This genetic material was injected into 242 empty eggs taken from 16 women, yielding a total of 30 embryos.

In theory, such embryos could develop into human clones if they were successfully implanted in a woman's womb. But human cloning is illegal in many countries, and Hwang's team was only interested in using these very early embryos for therapeutic treatments. The embryos were allowed to divide in culture for just 5 to 6 days before being terminated.

Stem cells were successfully harvested from only one of the embryos. These cells have now been growing in culture for more than a year.

Mouse stem cells have been made in a similar way, but transferring the technology to humans has proved problematic. The researchers attribute their success to the use of extremely fresh donor eggs and a new, gentler method for removing the DNA from donor cells.

The embryos divided for 5 to 6 days and were then terminated.
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Therapeutic stem-cell treatments are a long way off, but the study sheds light on how adult human DNA can be reprogrammed into an embryonic state. "This will likely accelerate the development of alternative ways of reprogramming human cells," says Roger Pedersen from the University of Cambridge, UK, who studies regenerative medicine. If adult cells can be reprogrammed directly, there would be no need to create cloned human embryos for the sake of their stem cells.

Not the first human embryo clone?

Many research groups claim to have cloned human embryos before, says geneticist Robin Lovell-Badge from the National Institute for Medical Research in London. But the supporting evidence has been sketchy.

A few years ago, US biotechnology company Advanced Cell Technology reported that they had produced a cloned human embryo that divided a few times in culture, then died. But they failed to present evidence proving it was really a clone, says Lovell-Badge.

Another group has isolated stem cells from cloned human embryos made by fusing adult human cells with rabbit eggs. Huizhen Sheng from Shanghai Second Medical University and colleagues used rabbit eggs because donor human eggs are scarce. As with Hwang's research, the embryos were cultured for a few days, then terminated.

References

1. Hwang, W. S. *et al*. Evidence of a pluripotent human embryonic stem cell line derived from a cloned blastocyst. *Sciencexpress*, doi:10.1126/science.1094515 (2004). **|Article|**