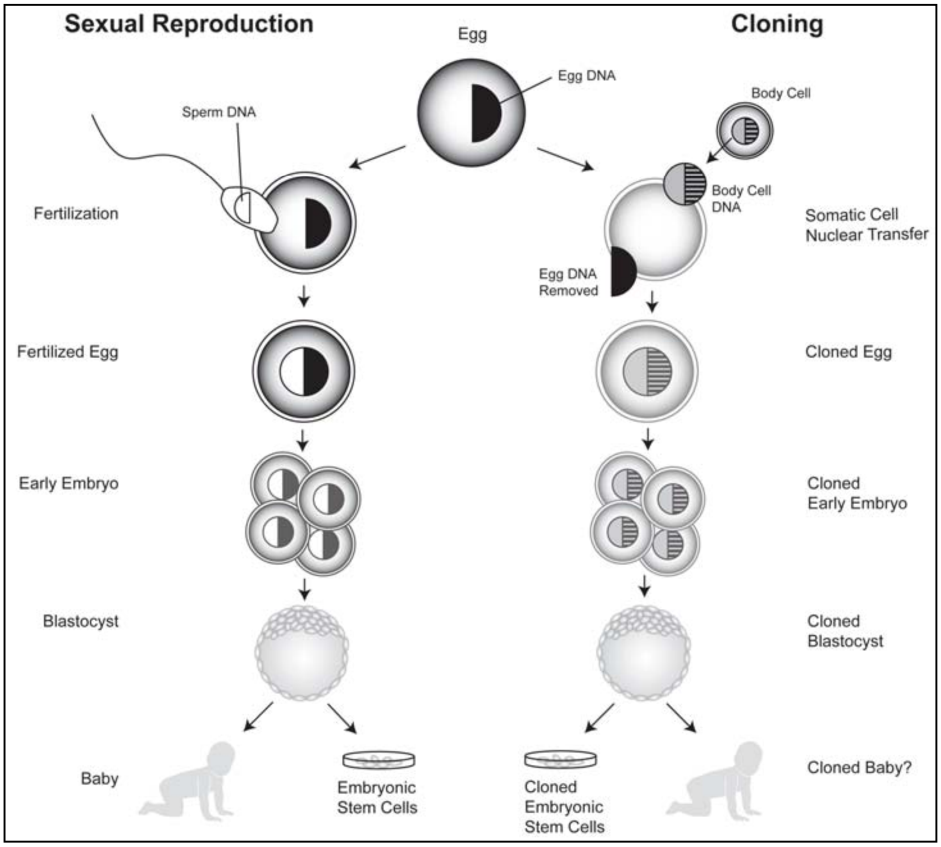
Cloning and Stem Cells

Cloning techniques can be used to create genetic duplicates or to correct genetic conditions. Cloning an organism such as an animal generates one with the exact same nuclear genome as the first. Human cloning could be done for two purposes: To generate identical offspring, known as reproductive cloning, or to generate embryos from which embryonic stem cells can be obtained, known as research cloning. Although both processes involve similar technical procedures, the end results are very different.



The process by which clones and embryonic stem cells are made is called somatic cell nuclear transfer (SCNT).

For SCNT, eggs are obtained from a woman who has been treated with hormones that cause her to generate and ovulate many eggs at one time. The eggs are collected and enucleated. Enucleation – removal of the nucleus in the egg – involves cutting a small slit in the egg and using a needle to suck out the nucleus.

Next, a somatic (body) cell collected from an adult donor is fused with the enucleated egg that has had its own DNA removed. The nucleus of the somatic cell with its DNA becomes the nucleus and DNA of the egg. The egg containing its new genome is activated and coaxed to start dividing. After five to seven days in culture, the embryo (a clone of the somatic cell donor) deveops to the blastocyst stage.

Reproductive cloning results when this cloned blastocyst is transferred into a surrogate mother. If the transferred blastocyst implants to establish a pregnancy, the resulting baby is a clone of the somatic cell donor. There have been no credible reports of any cloned human babies.

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Research cloning results when cells from the inner cell mass of the cloned blastocyst are removed and cultured in a Petri dish to form a new embryonic stem cell line. These embryonic stem cells are pluripotent, meaning they have the ability to become many different cell types normally found in an adult. Ther have been occasional reports that this technique is scientifically possible.

Stem cells are found not only in embryos but in various tissues in the adult body as well. Stem cells normally replace damaged or depleted cells. Scientists believe this function of stem cells has the potential to treat degenerative diseases. Studying how stem cells transform into specialized cell types like neurons or pancreatic cells will help scientists better understand normal human development. This will help shed light on how certain conditions such as cancer or birth defects develop when normal development goes awry.

Compiled by Audrey Huang
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