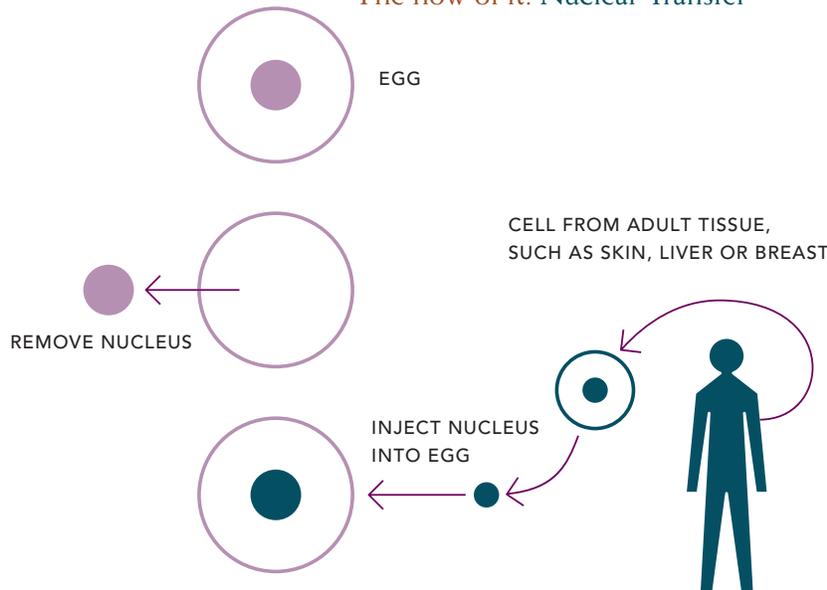


# Stem cell primer

EVERYTHING YOU WANTED TO KNOW ABOUT STEM CELLS BUT WERE AFRAID TO ASK

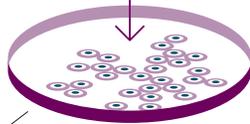
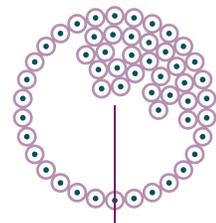
## Making embryonic stem cells

The how of it: Nuclear Transfer



IN THREE TO FIVE DAYS, THE EGG DEVELOPS INTO A SPHERE CALLED A BLASTOCYST. ITS INNER CELLS ARE STEM CELLS

NEW EMBRYONIC STEM CELL LINE



## The why of it

The embryonic stem cells currently available to most scientists are close to useless.

They fall short for research because they carry the genes of only a narrow cross section of people.

They're inadequate for disease study because they're from healthy people and, as a result, lack the mutations predisposing people to most illnesses.

They are potentially dangerous for use in therapy because they have been exposed to contamination by mouse viruses.

Given these limitations, scientists would prefer to use nuclear transfer to customize new embryonic stem cell lines for research and therapy.

## The basics

### WHAT'S A STEM CELL?

A stem cell is a master cell that can create the more specialized cells in an animal or human. Stem cells from human embryos have the potential to create any type of human cell. Stem cells from mature humans (often called "adult stem cells") can create only a subset of cell types. For example, blood-forming stem cells can make blood cells but not brain or liver cells.

### WHAT'S A CELL LINE?

A cell line is a population of identical cells that all originated from a single cell. Because cell lines multiply, scientists can grow the cells for their own research and to share with colleagues.

### WHAT'S AT STAKE?

Government funding restrictions set in 2001 thwart attempts to use stem cells to develop cures and to learn more about how humans develop. A bill supported by President Bush and passed twice by the House of Representatives would criminalize the creation or use of new stem cell lines with a \$1-million fine and 10 years in jail.

### WHAT'S THE CONTROVERSY?

The stem cells that many scientists consider especially promising for research and medicine come from early stage embryos called blastocysts. However, the harvesting process destroys the blastocyst, leading some people to liken the procedure to the taking of a life.

### WHAT DOES STEM CELL RESEARCH HAVE TO DO WITH CLONING?

The only connection is that creating a new line of stem cells and attempting to clone an animal have the same first steps: replacing the nucleus of an egg cell with the nucleus of a mature human cell and stimulating that egg to form a blastocyst.

### Research

By studying how embryonic stem cells develop into mature cells, such as those that make up our bone, blood and skin, researchers can learn how those cells function and what goes wrong when they are diseased.

### Therapy

Doctors hope to use embryonic stem cells to replace cells damaged from injury or disease. This approach could help patients with conditions including Alzheimer's or Parkinson's diseases or spinal cord injury.

### Disease study

Researchers can use embryonic stem cell lines derived from people with genetic diseases such as diabetes, cardiovascular disease or various types of cancers to better understand and treat the diseases.