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## Human Cloning

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### POLICY BRIEF

## Human Cloning

Updated January 2003

### Summary

The issue of human cloning has been the subject of much public debate since the [birth of the cloned sheep Dolly](#) was announced in 1997. The profound ethical questions surrounding the prospect of the birth of a human clone have received much scrutiny. In recent months, the debate has included the topic of [human stem cell research](#), which scientists believe could benefit from experimentation using the procedure pioneered by the scientists who produced Dolly.

### Nuclear Transplantation

This procedure is known as nuclear transplantation, or somatic cell nuclear transfer. It involves removing the nucleus (which contains a cell's DNA) from an egg cell, and transplanting the DNA from an adult cell into the enucleated egg. Under certain conditions, the egg then begins to replicate as though it were a fertilized embryo.

If this entity is implanted into a uterus, it has the potential to develop into a full organism which would have the same DNA as the donor of the adult cell. In other words, the organism would be a "clone." This procedure is known as "reproductive cloning."

After the egg divides for several days, it produces embryonic stem cells, which are primitive cells that can theoretically develop into virtually any type of cells in the organism, from blood cells to skin cells. Scientists believe that research on human stem cells could lead to new cures for many diseases. The use of nuclear transplantation to produce human stem cells is often referred to as "research cloning" or "therapeutic cloning."

### The Link to Stem Cell Research

The issues of stem cell research and cloning are closely linked. Researchers in the private sector have conducted experiments on human embryonic stem cells after extracting them from excess embryos left over from fertility treatments. They hope one day to use these cells for tissue transplants, and one of the potential obstacles for such a procedure is rejection of the implanted cells by the patient's immune system. Through nuclear transplantation, stem cells could be created with the same genetic makeup as the patient, which some scientists believe would reduce or eliminate the risk of immune rejection.

### Legislative Debate

There is widespread opposition in the U.S. to the birth of a human clone (reproductive cloning). While a few groups argue that cloning is a legitimate form of reproduction, opposition to these arguments is nearly unanimous in the U.S. Congress, due to both ethical and safety concerns.

In July 2001, the House of Representatives passed the [Weldon-Stupak bill](#), which criminalizes nuclear transplantation in humans, whether for reproductive or research purposes. This bill was introduced in the Senate as the [Brownback-Landrieu bill](#) and has been [endorsed by President Bush](#).

This legislation, however, has raised the ire of many scientists, who argue that it will unduly restrict scientific research. Many

who argue that it will unduly restrict scientific research. Many science groups back the [Specter–Feinstein bill](#), which would prohibit reproductive cloning but allow nuclear transplantation research to go forward. It would impose criminal penalties on anyone who attempts to implant the product of nuclear transplantation into a woman's uterus.

(Click [here](#) to view AAAS's position on human cloning.)

### Arguments Against Nuclear Transplantation Research

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[Proponents](#) of a ban on nuclear transplantation such as the Brownback–Landrieu legislation raise two main arguments. Religious conservatives argue that human embryos should be afforded a moral status similar to human beings and should not be destroyed, even in the course of conducting research. They also argue that permitting nuclear transplantation would open the door to reproductive cloning, because a ban only on implantation would be difficult to enforce. In this second argument, conservatives are joined by a coalition of environmental, women's health, and bioethics groups who are not unalterably opposed to nuclear transplantation, but believe that it should not be permitted until strict regulations are in place.

### Arguments For Nuclear Transplantation Research

[Proponents](#) of a ban on reproductive cloning that would permit nuclear transplantation research, such as the Specter–Feinstein bill, include a coalition of science organizations, patient groups, and the biotechnology industry. These groups argue that the moral status of a human embryo is less than that of a full human being, and must be weighed against the potential cures that could be produced by research using nuclear transplantation. They contend that a ban on implantation on the product of nuclear transplantation would be no more difficult to enforce than a ban on nuclear transplantation itself. They argue further that criminalizing scientific research, which has been done only very rarely in the past, would set a bad precedent.

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### AAAS Resources

- [AAAS releases report: Regulating Human Cloning](#) (April 3, 2003; pdf)
- [Expressing Strong Concern at Human Cloning Reports, AAAS Cautions Against Overreaction](#) (January 2, 2003)
- [AAAS Board of Directors' Statement on Human Cloning](#) (February 14, 2002)
- [Senate Postpones Action on Cloning Ban](#) (From the December 2001 issue of [Science and Technology in Congress](#))
- [Senate Braces for Cloning Debate](#) (From the February 2002 issue of [Science and Technology in Congress](#))
- [Cloning Comes Down to the Wire](#) (From the May 2002 issue of [Science and Technology in Congress](#))
- [Human Cloning Attempt Prompts Governmental Reactions](#) (From the Winter 2002 issue of [Professional Ethics Report](#))
- [Clone Fingerprints](#) (RealAudio clip from [Science Update](#), 12/24/02)
- Information on Related Topics:
  - [AAAS Policy Brief: Stem Cell Research](#)
  - [AAAS report on inheritable genetic modifications](#)

From past issues of [Science and Technology in Congress](#):

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- [Cloning Genie Out of the Bottle?](#) (April 2001)
- [Human Cloning Debate Reignites](#) (February 1998)
- [President's Commission Issues Cloning Recommendations](#) (July 1997)
- [Cloning Raises Tough Policy Questions for Congress](#) (April 1997)

Past AAAS events:

- [Chair of President's Bioethics Council Speaks at AAAS](#) (April 24, 2002)
- [Seminar Explores the Scientific and Ethical Concerns in Human Cloning](#) (October 25, 2001)
- [Forum on Cloning](#) (June 25, 1997)

From [Science Magazine](#):

- [U.S. Cloning Debate: Hatch Signs On to Pro-Research Bill](#)  
(News Summary, May 10, 2002, subscription required)
- [Human Cloning: Report Backs Ban; Ethics Panel Debuts](#)  
(News Summary, January 25, 2002, subscription required)
- [Legislate in Haste, Repent at Leisure](#) (Editorial, October 26, 2001)

#### Federal Government Resources

- [President Bush's statement on human cloning](#) (April 10, 2002)
- [Human Cloning and Human Dignity: An Ethical Inquiry, President's Council on Bioethics report](#) (July 2002)
- [Cloning Human Beings, National Bioethics Advisory Commission report](#) (June 1997)
- [Food and Drug Administration statement](#)
- [Human Genome Project fact sheet](#)

#### Congressional Hearings, Legislation, and Statements

- [List of congressional hearings held on human cloning](#)
- [Human Cloning Prohibition Act of 2001](#)  
(Brownback-Landrieu bill, S. 1899)
- [Human Cloning Prohibition Act of 2002](#) (Specter-Feinstein bill, S. 2439)
- [Human Cloning Prohibition Act of 2001](#) (Weldon-Stupak bill, H.R. 2505)
- [Cloning Prohibition Act of 2001](#) (Greenwood-Deutsch bill, H.R. 2608)
- [Senator Orrin Hatch's statement on human cloning](#) (April 30, 2002)
- [Senator Bill Frist's statement on human cloning](#) (April 2002)

#### National Academy of Sciences Reports

- [Scientific and Medical Aspects of Human Reproductive Cloning](#) (January 18, 2002)
  - [Glossary of Cloning Terms](#)
- [Stem Cells and the Future of Regenerative Medicine](#)  
(September 11, 2001)

#### Other Background Resources

- [Yahoo! News cloning page](#)
- [Washington Post cloning page](#)
- [New York Times: Science Times, December 18, 2001](#)
- [MSNBC Health Library: Cloning](#)
  - "Beyond Dolly: The Human Cloning Dilemma"
- [New Scientist Special Report: Cloning and Stem Cells](#)
- [Reason Magazine's cloning and stem cell resources](#)
- [ReligiousTolerance.org cloning page](#)
- [Cloning primer from the Association of Reproductive Health Professionals](#)
- [Roslin Institute's cloning page \(creator of Dolly\)](#)
- [Listing of state human cloning laws from the National Conference of State Legislatures](#)
- [U.N. committee working toward international cloning ban](#)
- [Database of Global Policies on Human Cloning and Germ-line Engineering compiled by Global Lawyers and Physicians](#)
- [Cloning Adam's Rib: A Primer on Religious Responses to Cloning from the Pew Forum on Religion and Public Life](#)  
(March 2002; pdf)
- [Cloning Opposed, Stem Cell Research Narrowly Supported in poll by the Pew Research Center](#) (April 9, 2002; pdf)

#### Groups opposed to nuclear transplantation research ("research cloning")

- [Americans to Ban Cloning](#)
- [Family Research Council](#)
  - [American Renewal](#)
- [National Right to Life Committee](#)
- [U.S. Conference of Catholic Bishops](#)

#### Groups supporting a moratorium on nuclear transplantation research

- [Boston Women's Health Book Collective](#)
- [Center for Genetics and Society](#)

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- [Policies on Cloning Adopted by Other Countries](#)
- [Friends of the Earth](#)
- [International Center for Technology Assessment](#)

Groups supporting nuclear transplantation research

- [Coalition for the Advancement of Medical Research](#)
- [American Society for Cell Biology](#)
  - [Statement by 40 Nobel Laureates Regarding Cloning](#)
- [Association of American Medical Colleges](#)
- [Association of American Universities](#)
  - [Comparison of Senate cloning bills \(pdf\)](#)
- [CuresNow](#)
- [Federation of American Societies for Experimental Biology](#)
  - [Human cloning FAQ](#)
- [Biotechnology Industry Organization](#)
- [The Franklin Society](#)
- [Union of Orthodox Jewish Congregations of America](#)

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