



## policy points

**The Cloning Debate** Most scientists oppose attempts to clone humans in the near future, but some also oppose laws to prevent cloning which could interfere with research to fight disease and understand aging.

BY JEFF ATKINSON



July 5th marked the fifth birthday for Dolly, the cloned sheep. The an-

nouncement of the creation of Dolly riveted the world's attention on the possibility of human cloning. Scientists, religious leaders, ethicists, and lawmakers have been pondering whether cloning and cloning technology is a good thing. Some states have banned human cloning, and Congress is considering multiple bills on the subject.

Since Dolly's cloning, four other types of mammals have been cloned: goats, cattle,

pigs, and mice. The creation of Dolly was the first time asexual cloning was accomplished by using the nucleus of a somatic cell from an adult animal to create an animal that matured to full development. Cloning animals using embryo cells—sexual cloning—has been practiced

for more than ten years.

Some scientists are eager to make humans the sixth cloned mammal, although most scientists involved in the field strongly urge holding off on cloning humans until the technology improves and the risks are reduced.

### At the starting gate

Among those at the forefront of trying to clone the first human are Panos Zavos, MD and Severino Antinori, MD. Zavos is a former University of Kentucky professor and currently directs a fertility program in Lexington, Kentucky. Antinori, a fertility specialist in Italy, achieved notoriety in recent years by helping post-menopausal women (including a 62-year-old woman) bear children. Zavos and Antinori, who work together, said that they hope to clone the first human within two years and that they have at least 700 couples ready to participate in the work. A religious group called the Raelians also are

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### California's Cloning Law

**In response to the cloning of Dolly the sheep, several state legislatures passed laws banning cloning of humans.**

**The following is the text of California's law:**

**SECTION 1.** It is the intent of the Legislature to place a five-year moratorium on the cloning of an entire human being in order to evaluate the profound medical, ethical, and social implications that such a possibility raises. It is not the intent of the Legislature that this moratorium apply to the cloning of human cells, human tissue, or human organs that would not result in the replication of an entire human being. During this moratorium period, the State Director of Health Services should be called upon to establish a panel of representatives from the fields of medicine, religion, biotechnology, genetics, law, bioethics, and the general public to evaluate those impli-

cations, review public policy, and advise the Legislature and the Governor in this area...

**SECTION 5.** The California Health and Safety Code is amended to provide as follows:

**SECTION 24185:** (a) No person shall clone a human being. (b) No person shall purchase or sell an ovum, zygote, embryo, or fetus for the purpose of cloning a human being. (c) For purposes of this section, "clone" means the practice of creating or attempting to create a human being by transferring the nucleus from a human cell from whatever source into a human egg cell from which the nucleus has been removed for the purpose

of, or to implant, the resulting product to initiate a pregnancy that could result in the birth of a human being.

**SECTION 24187:** For violations of Section 24185, the State Director of Health Services may, after appropriate notice and opportunity for hearing, by order, levy administrative penalties as follows:

(a) If the violator is a corporation, firm, clinic, hospital, laboratory, or research facility, by a civil penalty of not more than one million dollars (\$1,000,000) or the applicable amount under subdivision c, whichever is greater. (b) If the violator is an individual, by a civil penalty of not more than two hundred fifty thousand dollars (\$250,000) or the applicable amount under subdivision c, whichever is greater. (c) If any violator derives pecu-

niary gain from a violation of this section, the violator may be assessed a civil penalty of not more than an amount equal to the amount of the gross gain multiplied by two.

(d) The administrative penalties shall be paid to the General Fund.

**SECTION 24189:** This chapter shall remain in effect only until January 1, 2003, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2003, deletes or extends that date. [The law also provides that cloning of a human beings is unprofessional conduct that can result in loss of professional and business licenses.] ■

active in seeking to clone humans.

Under current cloning technology, the success rate is low and the risks are high. Before Dolly was cloned, Ian Wilmut, PhD of the Roslin Institute in Midlothian, UK, the co-creator of Dolly, made more than 200 unsuccessful attempts. For cloning of other animals, the success rate generally has been less than five percent.

#### Risks of cloning

Among the complications that regularly arise in cloning attempts: defects in lungs, circulatory system, kidneys, and brain, along with placental malfunction, immune system deficiencies, and large offspring syndrome. Most cloned animals have spontaneously aborted,

and many that are born alive die within days of birth. For the mother of the cloned animal, there is risk when the clone is aborted and even greater risk if the clone is abnormally large.

Writing in *Science Magazine* (March 30, 2001), Wilmut and Rudolf Jaenisch, PhD of the Whitehead Institute for Biomedical Research and Department of Biology at MIT, in Cambridge, Massachusetts, said: "We believe that attempts to clone human beings at a time when the scientific issues of nuclear cloning have not been clarified are dangerous and irresponsible."

A report from the National Bioethics Advisory Commission in 1997, requested by President Clinton after the creation of

Dolly was announced, reached the same conclusion: "At present the use of this technique to create a child would be a premature experiment that would expose the fetus and the developing child to unacceptable risks." The report is available on line at

<http://bioethics.gov/pubs/cloning1/cloning.pdf>

Scientists have not yet determined all of the reasons that attempts at cloning pose so many risks. Jaenisch and Wilmut state, however, that "The most likely explanation may be failures in genomic reprogramming.... During nuclear cloning, the reprogramming of the somatic donor must occur within minutes or, at most, hours between the time that nuclear transfer is completed

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and the onset of cleavage of the activated egg begins,” whereas in the normal course of reproduction, the reprogramming process takes place over a much longer period of time.

### Laws banning cloning

As of May 2001, five states have enacted laws banning human cloning. According to the National Conference of State Legislatures, the states are: California, Louisiana, Michigan, Rhode Island, and Virginia. (You can read the California law in the sidebar on page 16.) The laws impose civil penalties for violations relating to human cloning. Penalties range from \$50,000 in Virginia to \$10 million in Louisiana and Michigan. Michigan also imposes criminal penalties.

The US government currently prohibits use of federal funds to conduct research on human cloning, and at least seven bills have been introduced in Congress that would ban cloning nationwide. Following the recommendation of National Bioethics Advisory Commission, many of the laws and proposed laws have sunset provisions by which the laws will expire after a certain period of time, typically five years, so that the issue can be reevaluated after the science of cloning has progressed and there has been more opportunity to debate the moral and ethical issues.

Outside the United States, at least fourteen countries have banned cloning, including Japan, Australia, Israel, the United Kingdom, and other countries that are members of the Council of Europe.

### Limiting research

The scope of laws banning cloning is a controversial issue. Some laws, such as California's, are comparatively narrow

and seek to prohibit only the cloning of an entire human being. The laws do not prohibit the cloning of human cells, tissues, or organs.

Other proposals, however, such as the as the “Human Cloning Prohibition Act of 2001” (S 790), introduced by Sen. Sam Brownback (R-Kan.) would block any cloning of embryos for research purposes or production of stem cells, even though the embryo would not be used to produce a full human being.

Critics of such proposals, including Jerome Kassirer, MD, and Nadia Rosenthal, PhD, both of the *New England Journal of Medicine*, said it is inappropriate for Congress to ban a single type of medical or scientific research. Writing in the journal (Mar. 26, 1998), Kassirer and Rosenthal said: “Research on somatic-cell nuclear transfer might yield numerous benefits. Studies of stem cell differentiation could provide valuable information about the mechanism of aging or the causes of cancer.”

In the United States and abroad, cloning research is likely to continue. Within a few years, it may be possible to clone human beings without significant danger to the cloned individual or the person who carries the clone. That still leaves the question of whether cloning is ethical.

### Issues of autonomy

Advocates of cloning cite general principles of reproductive freedom and personal autonomy. Society already allows the use of high-tech means of reproduction, including in-vitro fertilization. In many (but not all) states, surrogate parenting arrangements are permissible by which a surrogate mother carries a child that is genetically related to two other people, but not herself, and turns over the child to the couple after birth.

For some advocates, cloning is just one more option for reproduction. Richard Dawkins, writing in the *London Evening Standard* (Feb. 25, 1997) commented, “Heaven's foundations don't quiver every time a pair of identical twins is born.” However, Dawkins also acknowledged potential negative consequences of cloning.

In some cases, there are medical and psychological reasons for seeking to reproduce by cloning. If one member of a couple had a serious genetic disorder, such as Tay-Sachs disease or cystic fibrosis, the couple may wish to have a child cloned from the member of the couple who did not have the disorder and thus avoid having the genes of an anonymous donor become part of their child.

### Religious views differ

Critics of human cloning fear the creation of a cloned human will mark a downward turning point in the development of humankind. Persons who were cloned may be viewed by some (including perhaps the cloned individuals themselves) as products that were purchased and made-to-order to fulfill someone else's needs and destiny rather than their own.

The Catholic Medical Association opposes human cloning. In a position paper, the organization said: “The cloning of human beings would be a violation of the natural moral law... It destroys the dignity of human nature by treating the human person as a material commodity to be manipulated according to whim and fancy. Man appoints himself to displace God in creation.”

The United Church of Christ favors allowing, at minimum, research to continue on nonreproductive uses of cloning. In a letter to Congress, the leaders of the church said: “As Christians we believe that science and medicine should be used

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for the sake of those who are sick and suffering, and that research toward that end should receive our support.” The church also supported a temporary moratorium on reproductive human cloning.

### Family relationships

Human cloning raises the prospect of a variety of unusual (or distorted) family relationships. Among scenarios contemplated by ethicists and commentators:

- Parents lose a child in an auto accident and decide to clone a new child, using the first child’s genetic material. Will the expectations for the child and the child’s ability to grow in a normal way be unduly confined by the child’s genetic origin?
- The parents create a child using the genes of one of the parents. As the child matures and assumes the appearance and perhaps personality traits of the parent from whom the child was cloned, how will the parent of the opposite sex react to the child who is a younger clone of the spouse? Will the potential for incest or problematic relationships increase? If the parents divorce, will the parent of the opposite sex of the child be more likely to reject the child who looks like (and perhaps acts like) the former spouse?
- A man or woman grieves the death of a parent and decides to use the parent’s genetic material to clone a child. In what ways will the parent-child relationship be distorted if a person is raising the genetic duplicate of his or her own parent from birth?
- A narcissistic billionaire wants to achieve immortality (or something approaching it) and arranges for a series of clones to provide spare parts and even a full body replacement into which to transplant his brain should the need arise.

If cloning becomes available, society will need to sort out the degree to which there should be limits on the

persons who can be cloned. Should it be permissible, for example, to clone or have an auction for the rights to clone—Stephen Hawking, Tiger Woods, Madonna, Saddam Hussein, Timothy McVeigh . . . or Bill Clinton?

### “Brave New World”

It is likely to be several years before technology is ready to deliver scenes from Aldous Huxley’s 1932 book, *Brave New World* in which humans are made-to-order to fulfill different roles in society. State and federal lawmakers may take a go-slow approach and temporarily ban cloning of human beings while allowing cloning research to continue.

Society will need to continue the debate of whether cloning violates “natural law” or is just one more useful step in the innate ability of humans to shape their environment.

With or without laws prohibiting cloning, the next decade probably will introduce us to the first cloned human beings. The front pages of newspapers and lead stories of television news programs will capture the event, but market demand for cloned human beings is not likely to be high. Reproduction by more traditional methods is still likely to be preferred.

The larger question will be: What shall we do with the technology that arises from cloning and genetic manipulation? Most will agree that it is desirable to use technology to eliminate disease and defects. But the line of demarcation between eliminating defects and using biology to shape the talents and personalities of humans may not always be clear. These issues should be another part of our debate. ■

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