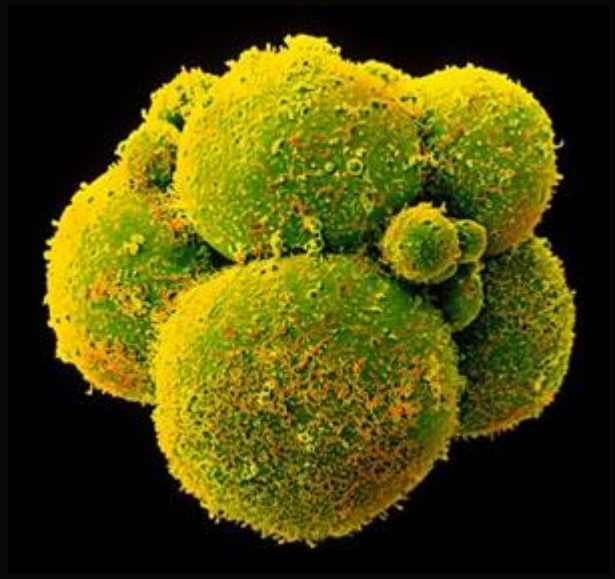
Nobel Laureate James Watson once stated “No one should be thought of as alive until about three days after birth,” adding that parents could then “be allowed the choice” to keep their baby or “allow” their baby to die (1973, p. 13).

The other Nobel Laureate of that famed partnership, Francis Crick, stated: “No newborn should be declared human until it has passed certain tests regarding it genetic endowment and that if it fails these tests it forfeits the right to life” (as quoted in Smith, 2000, p. 55).

Dr. Albert Liley

Dr. Albert Liley, the renowned physiologist known as the "Father of Fetology" has stated, "Biologically, at no stage of development can we subscribe to the view that the unborn child is a mere appendage of the mother. Genetically, the mother and baby are separate individuals from conception."

Has human life ever stopped since God started it with Adam??



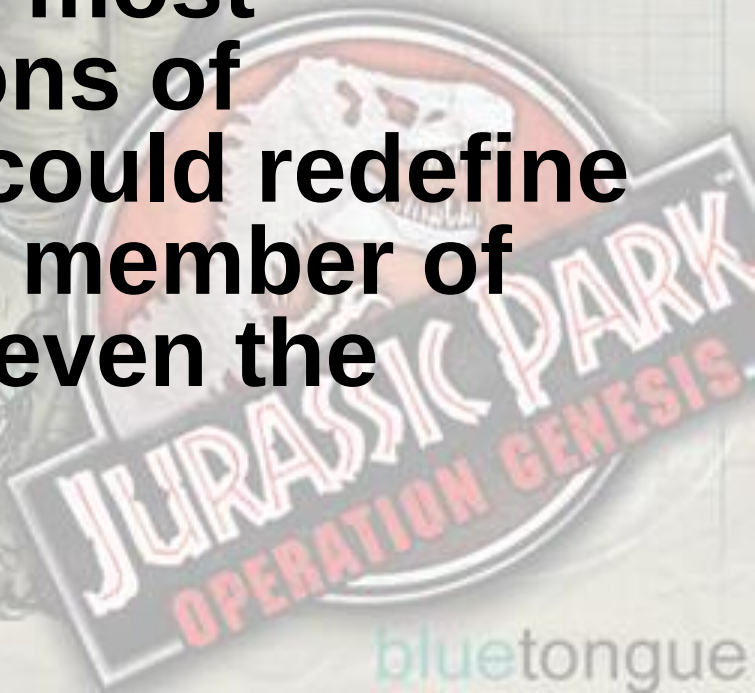
Conception and the Beginning of Life

- Infertility options continued
  - Surrogacy
    - Use of surrogate—a woman who agrees to carry a child to term
    - Used when mother is unable to carry embryo to term
    - Gestational surrogacy—when surrogate is not related to embryo
    - Traditional surrogacy—when surrogate is related to embryo

HUMAN CLONING

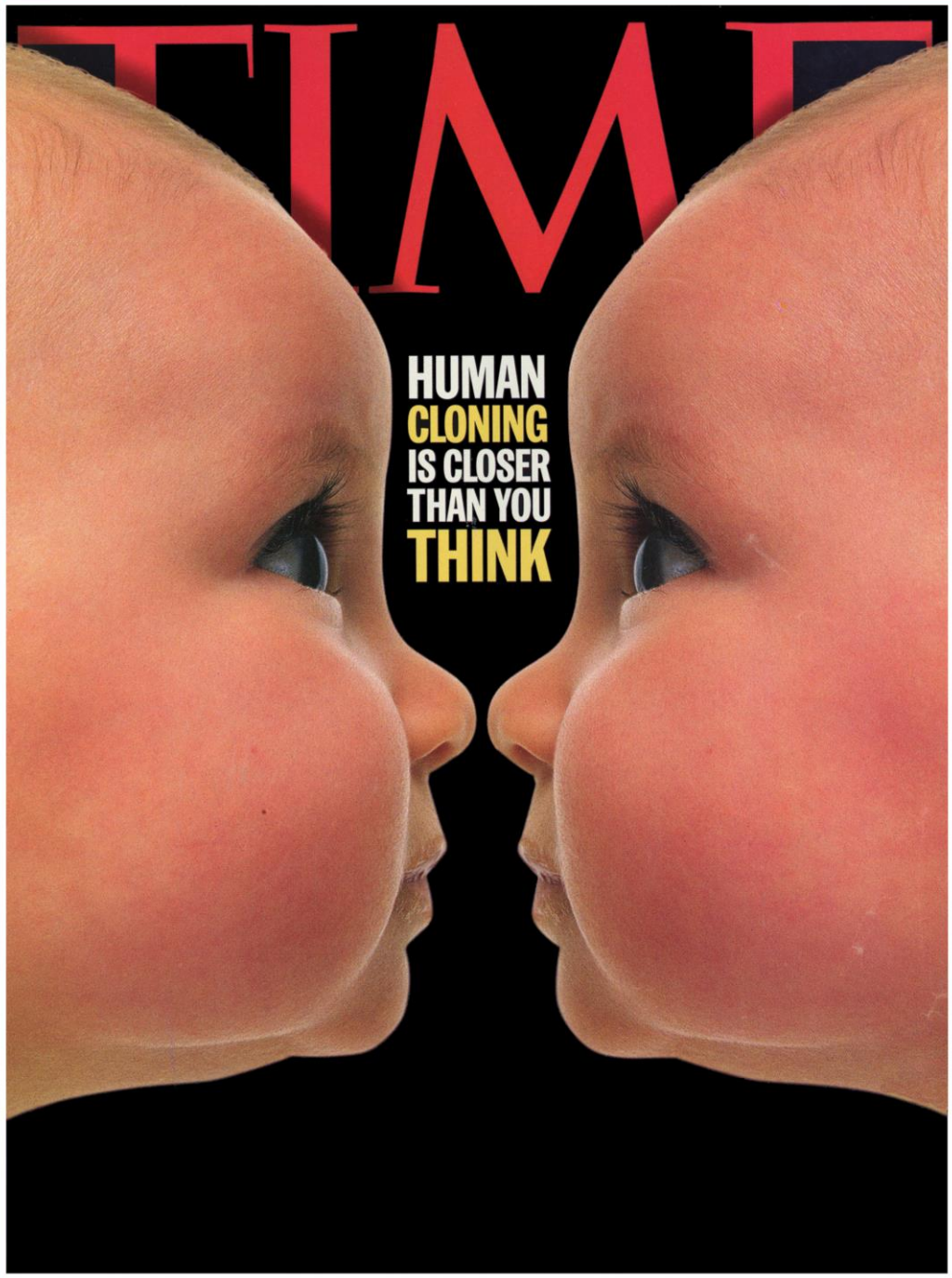
An Important Issue:

- What was once the stuff of science fiction now confronts us.
- Cloning is among the most challenging innovations of biotechnology, for it could redefine what it means to be a member of the human family, or even the human race.



FEBRUARY 19, 2001

TIME



HUMAN CLONING IS CLOSER THAN YOU THINK

HUMAN CLONING

Perception vs. Reality

As with many issues in science, cloning is a Perception vs. Reality issue.

HUMAN CLONING

Perception vs. Reality

Perception= awareness or belief based on your ideas and experiences.

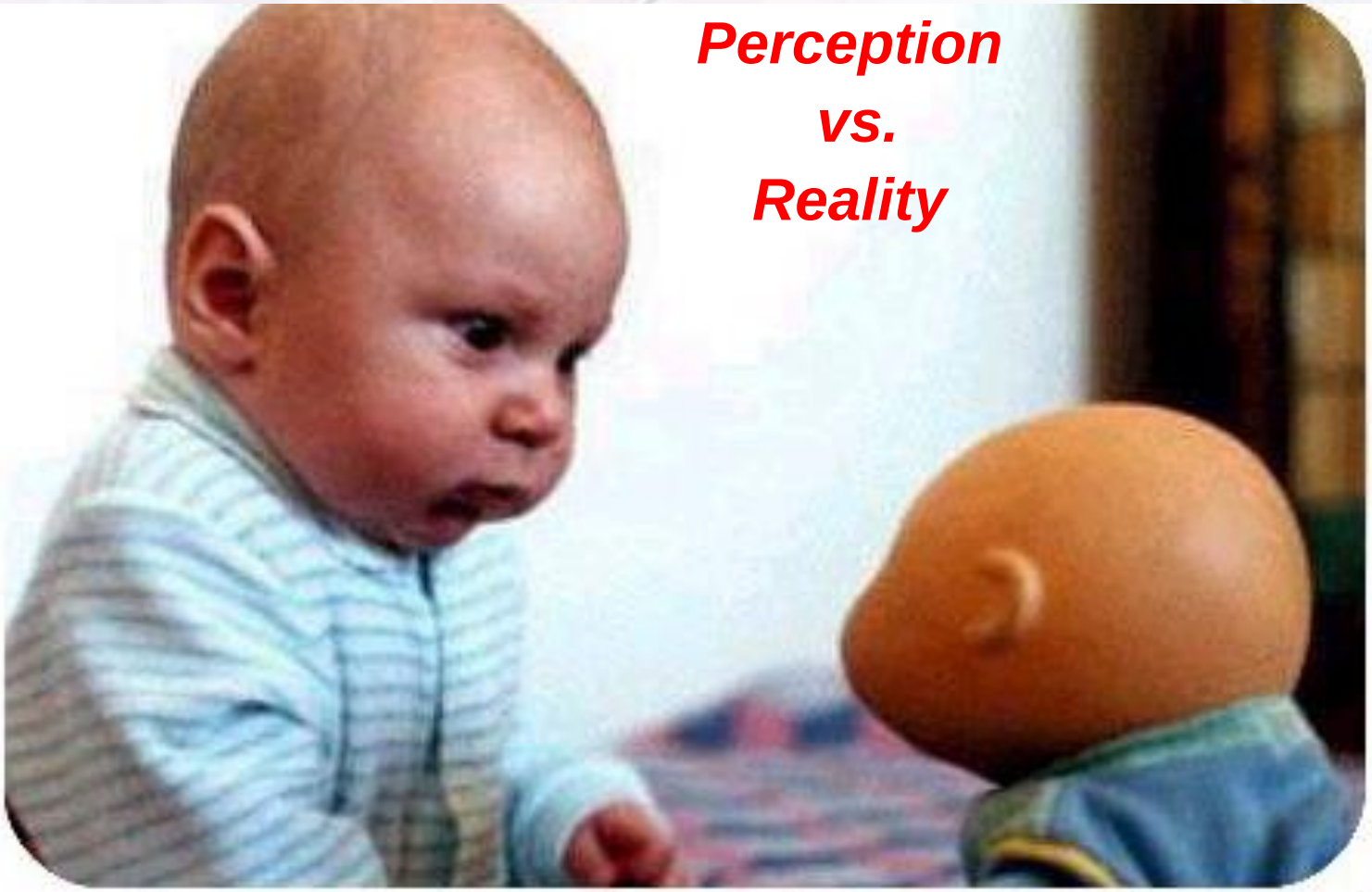
Reality= truth that is not dependent upon what you think or even understand.

Examples:

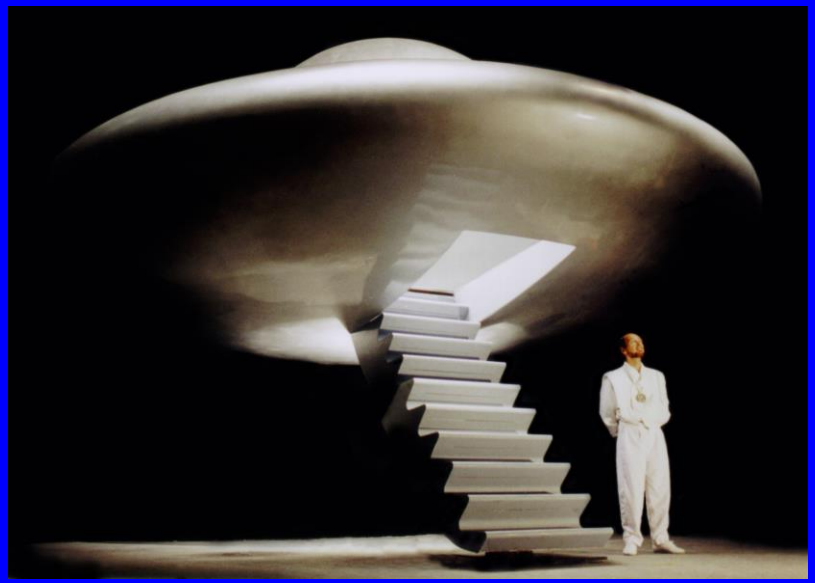
- Gravity?
- Hot or Cold?
- Right and Wrong?

Can the two ever be the same?

HUMAN CLONING



On December 27th, 2002, Dr. Brigitte Boisselier of Clonaid announced that she and her fellow scientists had produced the first human clone — a little girl named “Eve.” Just a few days later, Clonaid announced the birth of a second human clone.



Rael (who believes that humans were cloned by intelligent life forms from outer space) and his Clonaid scientists have yet to produce proof of a human clone.

“Cloning, particularly of something so complex as a mammal, cannot be done with an adult cell.”

Dr. James Watson
Nobel Laureate
(People, April 1, 1978, p. 96)

HUMAN CLONING

Today's Objectives:

- What is Cloning?
- What is Human Cloning?
- How is it done?
- Two types of Cloning.
- Ethical and Physical Ramifications.
- Stem Cells and Cloning.
- Conclusion.

HUMAN CLONING

What is Cloning?

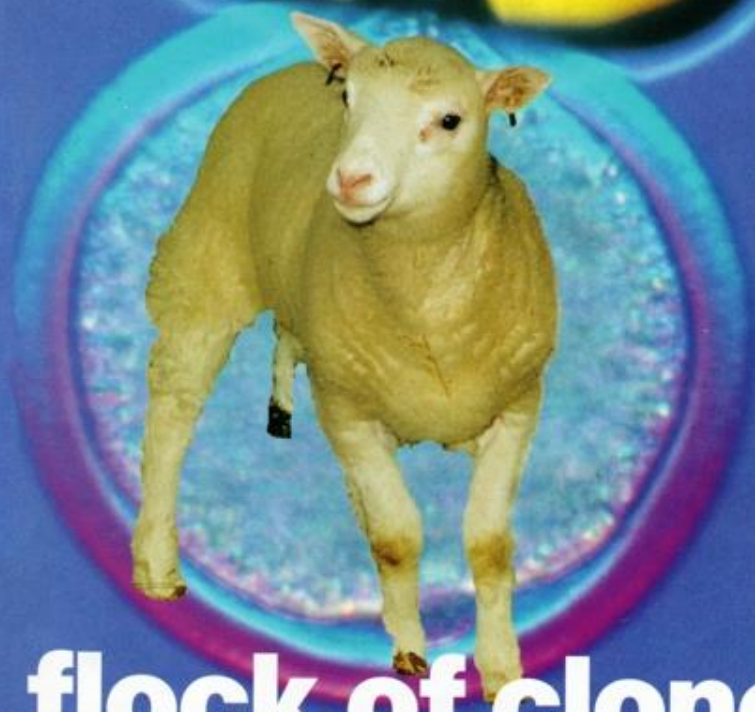
- It is the process of creating an identical copy of an original.
- Cloning in general has been around for many years.
- Although cloning occurs naturally, cloning typically refers to an identical copy produced by conscious design.

27 February 1997

International weekly journal of science

nature

$10.00



A flock of clones

Extrasolar planets Fading from view

Climate cycles Eccentricity finds a role

Archaeology Hunting 400,000 years ago

New on the market
Genetics

WHAT HAVE SCIENTISTS CLONED SO FAR?

SHEEP

GOATS

PIGS

CATTLE

MICE

HORSES

MULES

DEER

CATS

RABBITS

HUMAN CLONING

What is Human Cloning?

- Human Cloning is the creation of a genetically identical copy of an existing, or previously existing human.
- One of the hottest topics of debate in political, religious, scientific, and bioethics circles.

HUMAN CLONING

How is Human Cloning done?

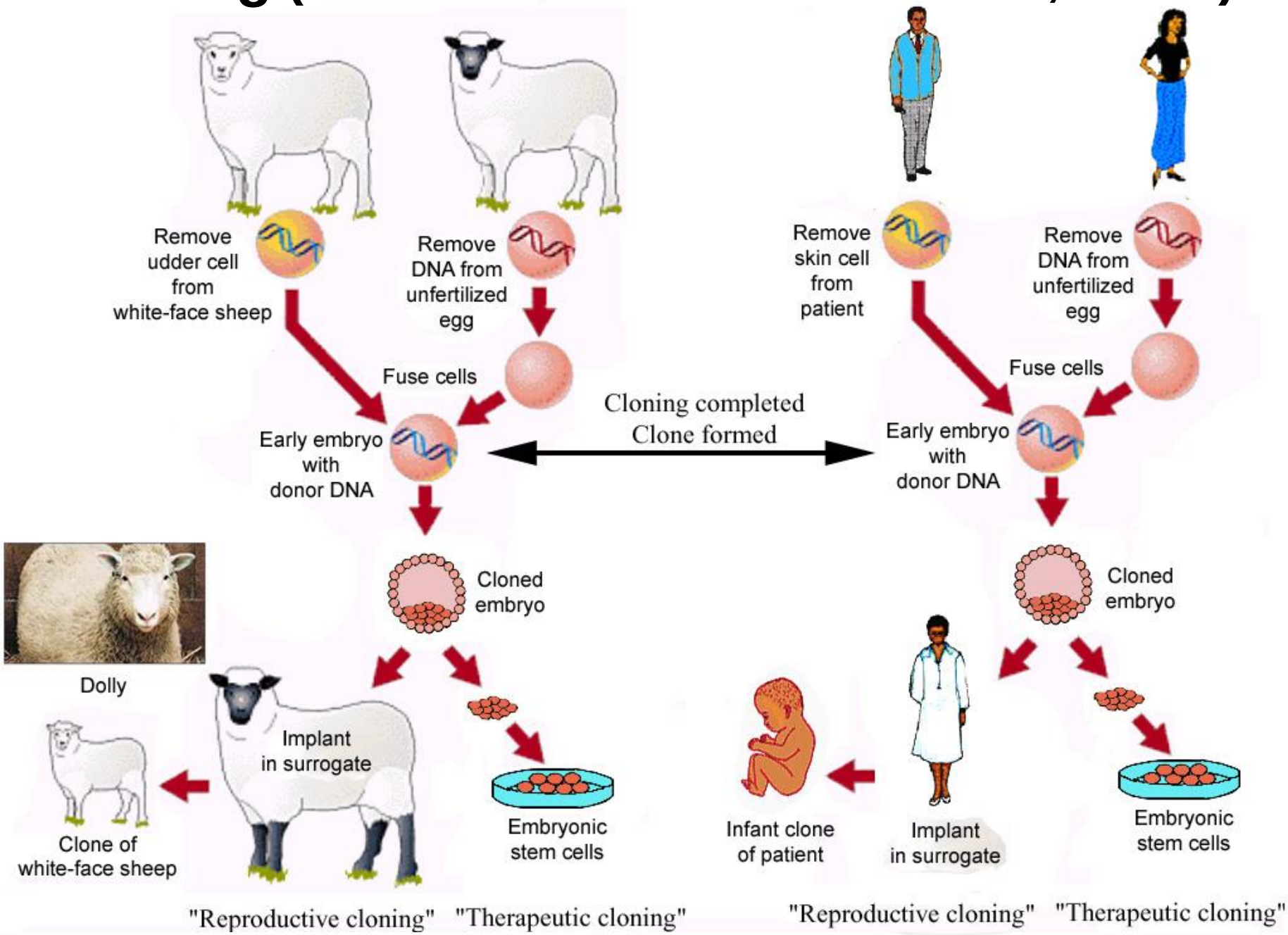
The common method used in human cloning is referred to as either:

"nuclear transplantation"

or

"somatic cell nuclear transfer (SCNT)"

Cloning (Somatic Cell Nuclear Transfer, SCNT)

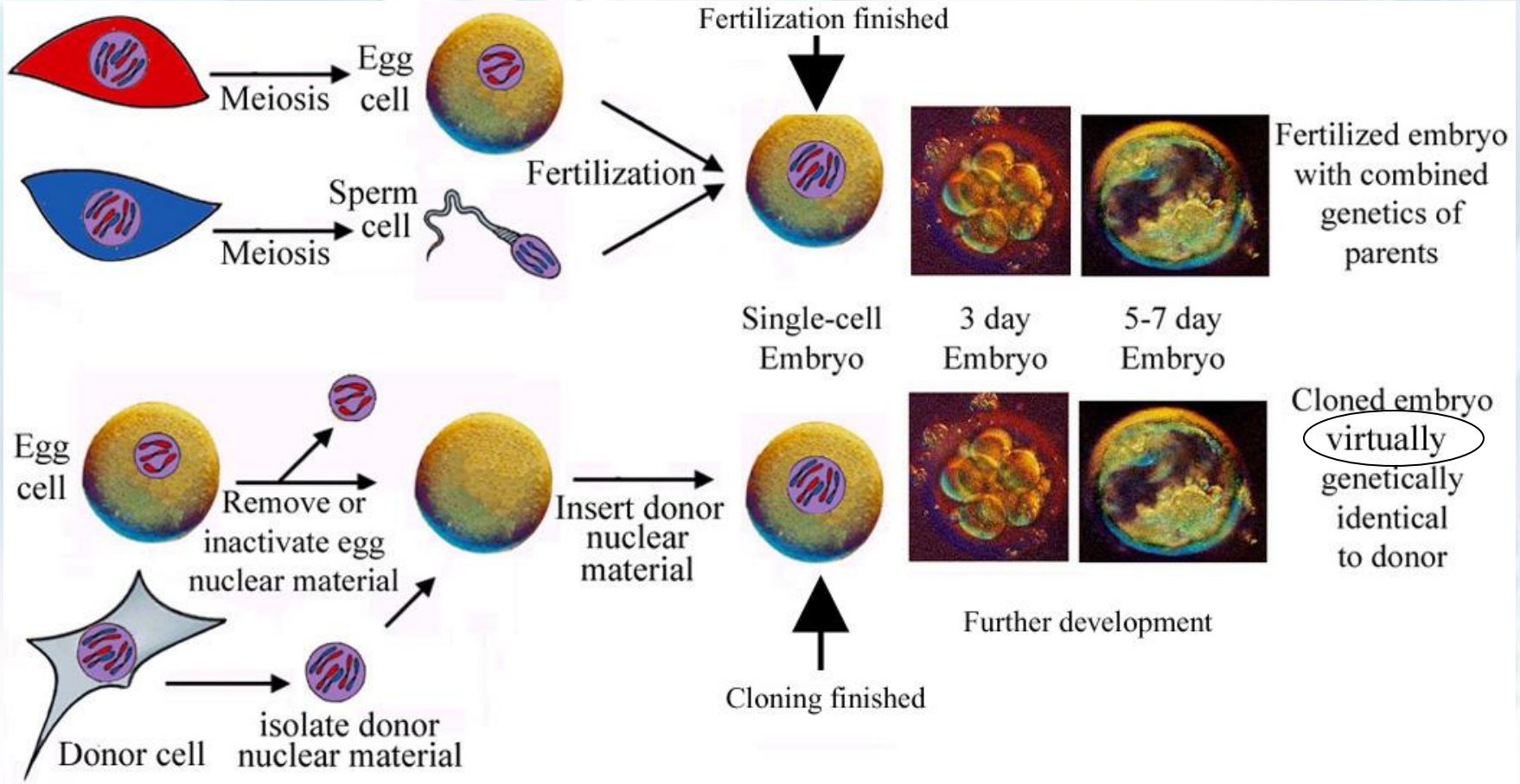


HUMAN CLONING

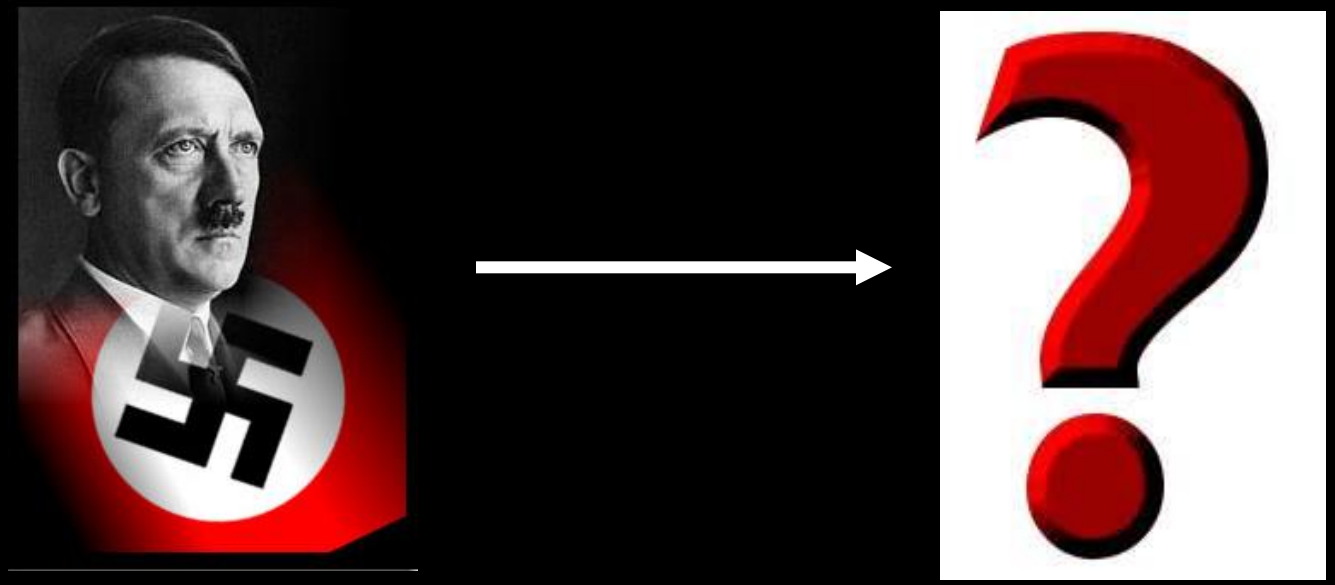
How is SCNT different than sexual reproduction?

HUMAN CLONING

Sexual Reproduction vs. Cloning (SCNT)



WHAT WOULD YOU GET IF YOU COULD CLONE A HUMAN?



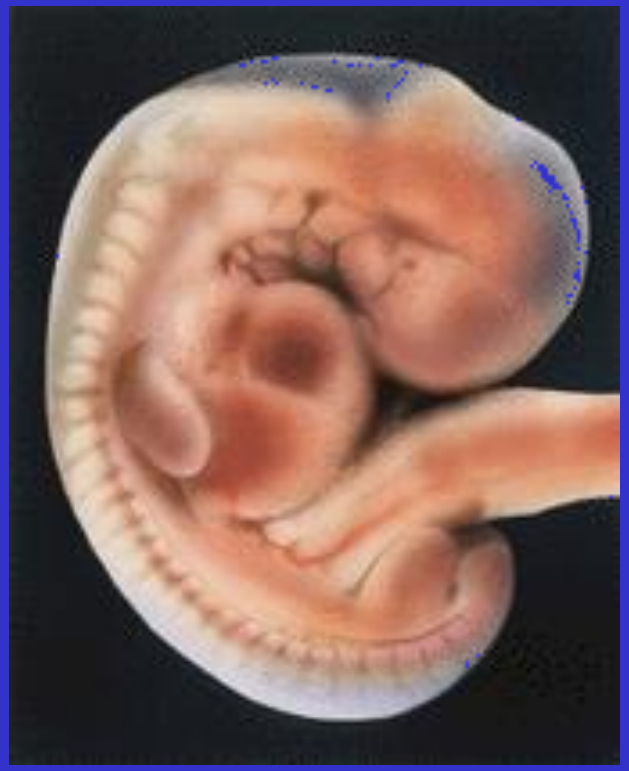
An exact genetic duplicate—
not an exact duplicate!

CLONING'S "GALLERY OF HORRORS"

- In 1998, scientists at Advanced Cell Technology of Boston, Massachusetts, reported that they had created a "transgenic" cow-human hybrid embryo.
- In 1999, Japanese researchers acknowledged that they had produced 27 more cow-human embryos.
- In 2001, New Zealand scientists reported the first cloned pig-human embryo.
- And then…

DOWN THE SLIPPERLY SLOPE…

The July 2001 issue of Fertility and Sterility reported that the Howard and Georgeanna Jones Institute for Reproductive Medicine in Norfolk, Virginia, paid women volunteers somewhere between $1,200 to $2,000 each to donate their eggs — eggs that then were fertilized with donor sperm to form embryos that then were destroyed intentionally in order to "harvest" their stem cells.



Thus, scientists are now creating life for the sole purpose of destroying it!

HUMAN CLONING

Two Intents of Cloning:

Reproductive Cloning

vs.

Therapeutic Cloning

HUMAN CLONING

How they are different:

Reproductive Cloning: After SCNT, the new life is implanted in a surrogate mother and allowed to grow and be born.

Therapeutic Cloning: After SCNT, instead of implanting the cloned embryo, researchers use the cells as raw material for experiments or as a collection source for specific types of cells; namely, stem cells.

HUMAN CLONING

How they are the same:

Both types of cloning, reproductive and therapeutic, produce life.

Once again, a Perception vs. Reality issue.

IMPLICATIONS OF HUMAN CLONING

- Cloning could be used to provide children for unmarried people.
- If the husband (or wife) carried a genetic “defect,” the spouse could be cloned to provide healthy offspring.
- Parents could pre-select the sex (and numerous other attributes) of their children.
- Women’s liberation certainly would be complete, since no male would be needed for reproductive purposes. The old Cockney saying, “It takes a man to make a girl,” no longer would hold true.
- Large batches of human clones could be made for statistical studies.

IMPLICATIONS OF HUMAN CLONING

- Clones could be produced in order to harvest “spare parts” for transplants (e.g., bone marrow, organs, etc.).
- People enamored of their own importance could ensure that exact genetic duplicates of themselves were brought into existence via cloning — by tens, hundreds, or thousands if they so desired — guaranteeing them an “immortality” of sorts (at least in body if not in spirit).
- Single adults could produce children.
- Homosexual couples could produce children.
- When cloning single males or homosexuals, a surrogate mother would be required.
- Likely, thousands of cloned embryos would die, mutate, or end up being destroyed to achieve a **single** success.

HUMAN CLONING

Cloning Creates Life:

- "The Commission began its discussions fully recognizing that any effort in humans to transfer a somatic cell nucleus into an enucleated egg involves the creation of an embryo, with the apparent potential to be implanted in utero and developed to term."

  Cloning Human Beings: Report and Recommendations of the National Bioethics Advisory Commission (Rockville, MD: June 1997), p. 3

- "The first product of SCNT is, on good biological grounds, quite properly regarded as the equivalent of a zygote, and its subsequent stages as embryonic stages in development."

  Human Cloning and Human Dignity: An Ethical Inquiry, Report of the President's Council on Bioethics, July 2002; p.50

HUMAN CLONING

Defining embryos as "life" brings in of course another debate.

<u>At least ask yourself these questions:</u>

- Does an embryo fit the definition of an organism? If not, what is it?
- What characteristics define "Life", and does an embryo fit this definition?

*Any high school level science text book can answer these basic questions.

Perception vs. Reality applies here as well.

HOW MANY HUMAN EMBRYOS WILL BE REQUIRED TO PRODUCE A SINGLE SUCCESSFUL CLONE?

ORGANISM	NUMBER OF EMBRYOS REQUIRED TO PRODUCE ONE LIVING CLONE
Cat	87
Cattle	10
Goat	112
Horse	841
Human	???
Mouse	942
Mule	334
Pig	110
Sheep	277
Rabbit	1084

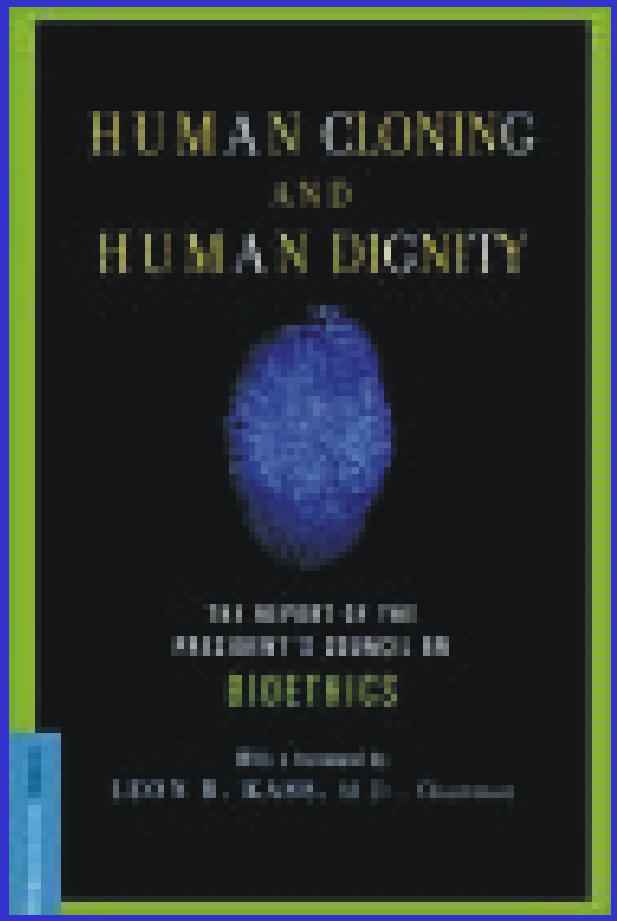
BY LAW, TWO SAFEGUARDS MUST BE IN PLACE BEFORE ANY EXPERIMENT CAN BE PERFORMED ON A HUMAN BEING

1. Has the person upon the experiment is to be performed provided written “informed consent”?

2. Is the experiment to the subject’s benefit?

WHAT ABOUT CLONING AND “INFORMED CONSENT”

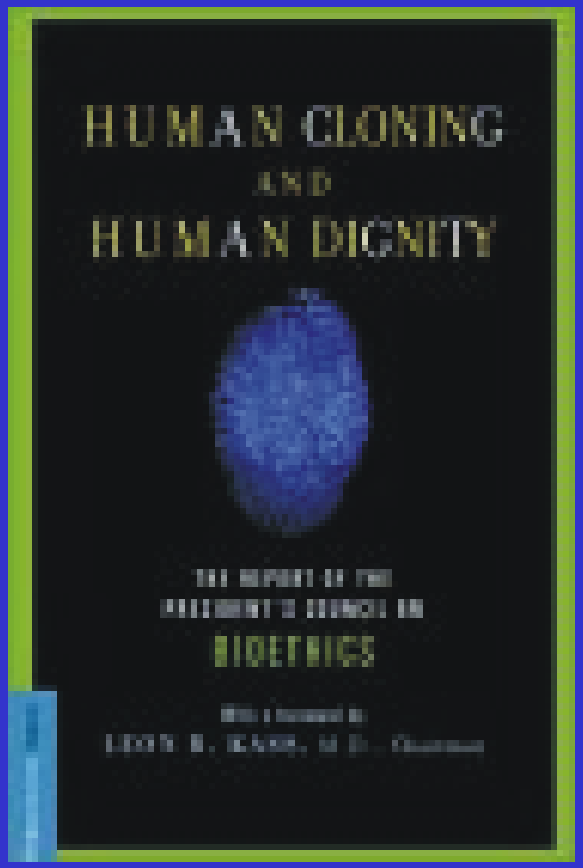
HUMAN CLONING AND HUMAN DIGNITY: *THE REPORT OF THE PRESIDENT'S* COUNCIL ON BIOETHICS



"Consent from the cloned child-to-be is of course impossible to obtain…. An attempt to clone a human being would potentially expose a cloned individual-to-be to great risks of harm…. Given the risks, and the fact that consent cannot be obtained, the ethically correct choice may be to avoid the experiment. The fact that those engaged in cloning cannot ask an unconceived child for permission places a burden on the cloners, not on the child" (p. 105)

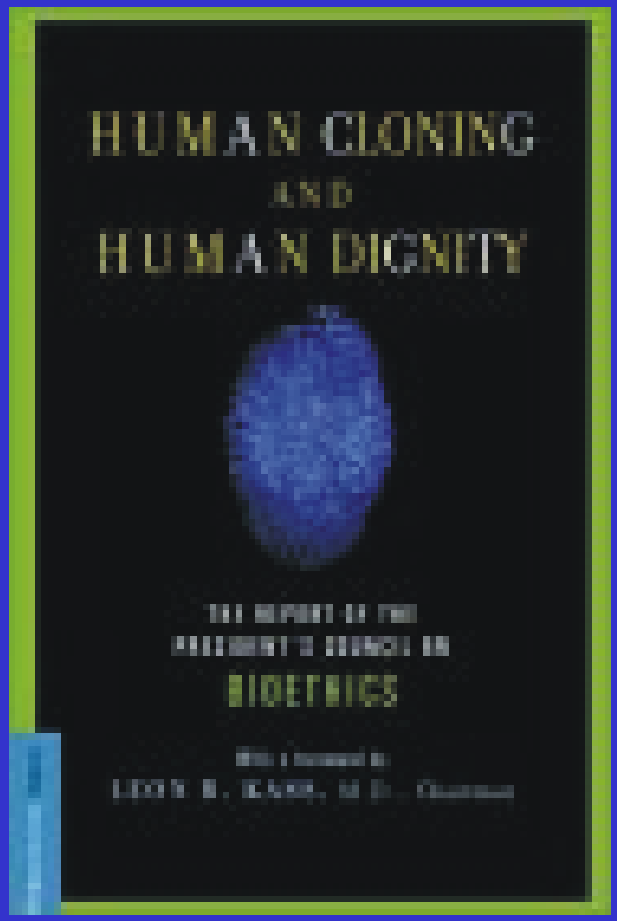
IS CLONING TO THE SUBJECT'S BENEFIT?

THE PRESIDENT'S NATIONAL BIOETHICAL ADVISORY COMMISION



"Any attempt to clone human beings via somatic cell nuclear transfer techniques is uncertain in its prospects, **is unacceptably dangerous to the fetus and, therefore, morally unacceptable**…. It is morally unacceptable for anyone in the public or private sector, whether in a research or clinical setting, to attempt to create a child using somatic cell nuclear transfer. Indeed, the Commission believes **it would violate important ethical obligations were clinicians or researchers to attempt to create a child using these particular technologies, which are likely to involve unacceptable risks to the fetus and/or potential child** (1997, emp. and italics added).

HUMAN CLONING AND HUMAN DIGNITY: *THE REPORT OF THE PRESIDENT'S* COUNCIL ON BIOETHICS



"The Council holds unanimously that cloning-to-reproduce-children is unethical, ought not to be attempted, and should be indefinitely banned by federal law, regardless of who performs the act, or whether federal funds are involved….

We hold that the case for treating the early-stage embryo as simply the moral equivalent of all other human cells is simply mistaken" (p. LIV).

HUMAN CLONING

Why clone humans in the first place?

Reproductive Cloning:

- To mass produce organisms with “desired” qualities.
- Recovery of lost loved ones
- Infertility: cloning a copy of themselves
- Eugenics: a social philosophy which advocates the improvement of human hereditary traits through social intervention.

Plato to Darwin to Hitler to Connecticut 1896 to Buck vs. Bell 1927 US Supreme Court to today..

What is the biblical answer?

HUMAN CLONING

Reproductive Cloning: Is this a problem?

Ethically:

What rights would a clone actually have?

Who is the parent? Scientists or donors?

Who is responsible when things go wrong?

Could a cloned human be killed if he or she were found to be defective or unwanted?

Would a clone be treated different in society, assuming anyone would know?

When would a clone have legal or human rights?

Could a “black market” arise for “desirable fetuses” (athletes, singers, etc)?

What if a living or deceased person were cloned without his or her knowledge or consent?

Chimeras (ki-MER-ahs) -mixtures of two or more individuals in a single body.

Physically:

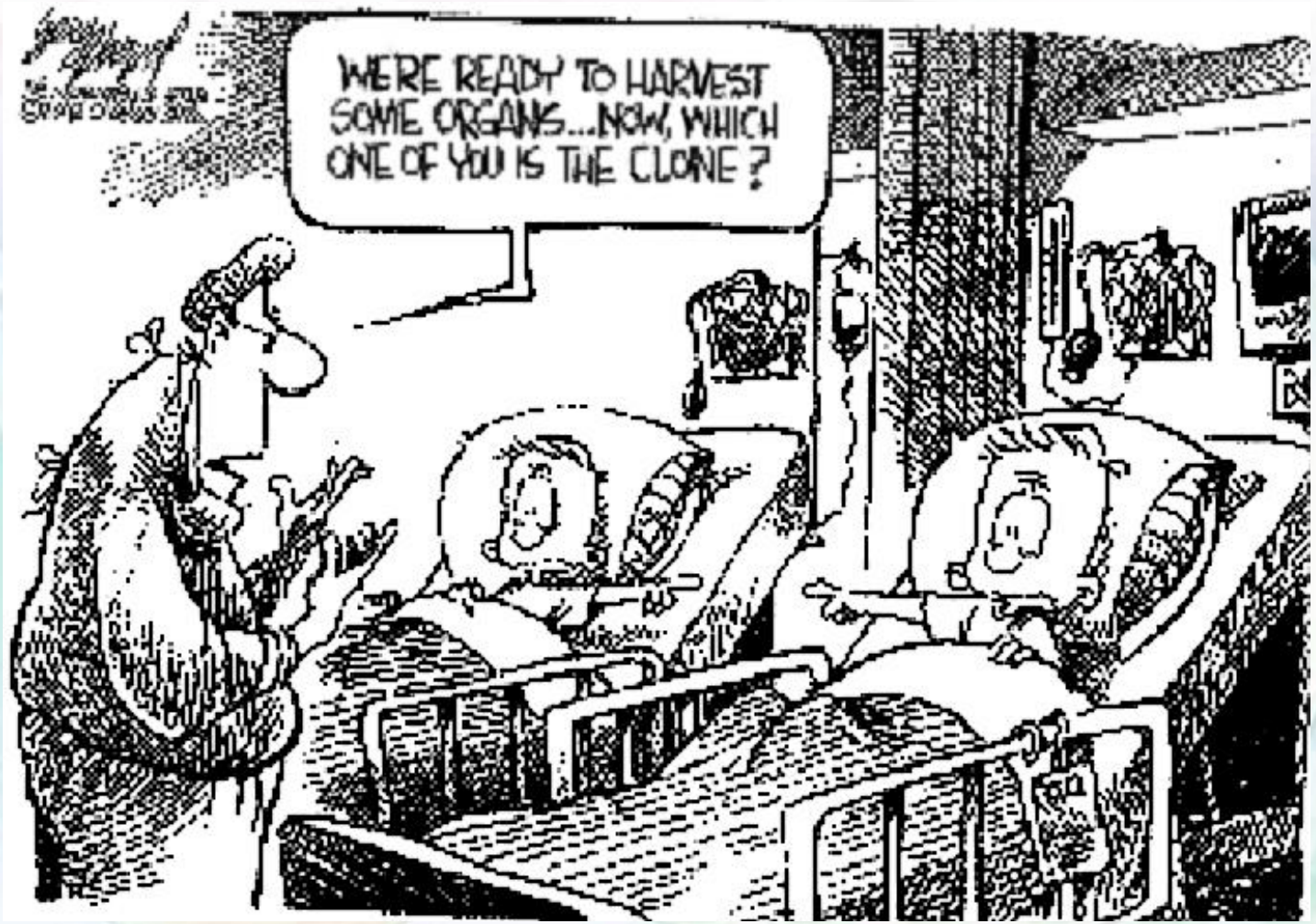
Most animal embryo clones are horribly deformed and die.

The few that live long enough to be implanted in an animal’s uterus die soon afterward.

The anomalies that have survived to birth are prone to genetic disease.

Cloned mammals often have over-sized internal organs and limbs.

Somatic cells age each time they divide. Shorter life spans for clones?..


WE'RE READY TO HARVEST SOME ORGANS...NOW, WHICH ONE OF YOU IS THE CLONE?

HUMAN CLONING

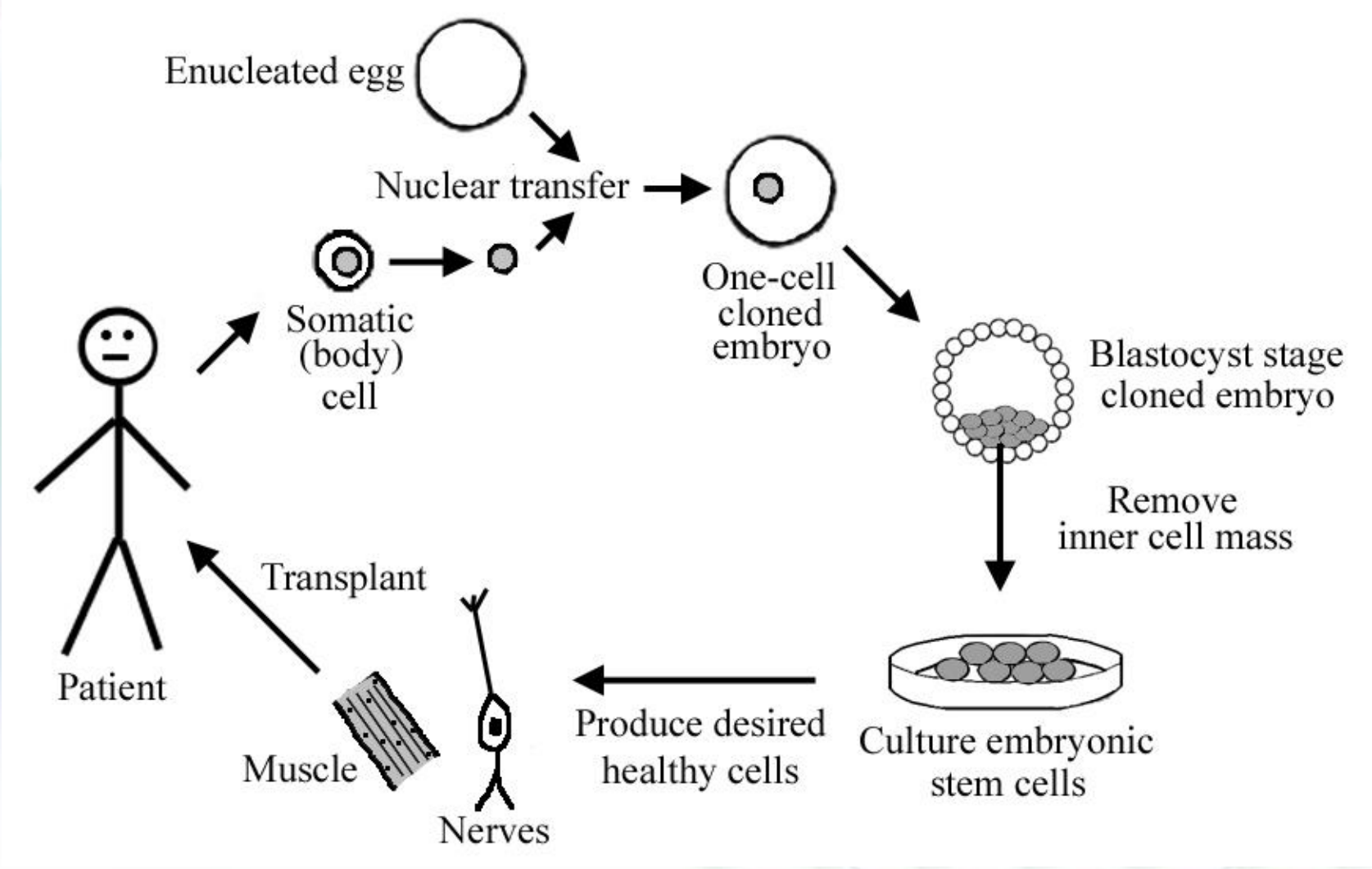
Why clone humans in the first place?

Therapeutic Cloning:

- Reproduction of organs or organ systems
- To cure disease through the collection of Stem Cells

How is Therapeutic Cloning done?

Theoretical Concept of "Therapeutic Cloning"



HUMAN CLONING

Therapeutic Cloning: Is this a problem?

Ethically:

-Embryos are created with the purpose of destroying them.

-If reproductive cloning were banned, which is what many scientists and politicians “agree” to, would the government forcibly have a cloned embryo aborted?

-Cloning proponents claim that cloned embryos are not “humans”.

-Who do the cloned cells belong to? Who decides the fate of these clones? Are the clones “property”.

-Therapeutic cloning will lead to reproductive cloning.

-Therapeutic cloning places women at risk (both ethical and physical):

HUMAN CLONING

Therapeutic Cloning: Is this a problem?

Ethically: Therapeutic cloning places women at risk

- Because both cloning and embryonic stem cell production are extremely inefficient, a tremendous number of eggs will be required.
- For example, to treat only the 17 million Diabetes patients in the U.S.:
- Will require at least 1.7 billion human eggs
  (Optimistically 100 human eggs/patient, estimated cost US$100,000-200,000)
  Mombaerts P, "Therapeutic cloning in the mouse", *Proceedings of the National Academy of Sciences USA* 100, 11924-11925; 30 Sept 2003;
  Prentice DA, Stem Cells and Cloning, 1st edition, San Francisco: Pearson Education/Benjamin-Cummings, July 2002
- Collecting 10 eggs/donor (using very dangerous hyper-stimulation drugs)
  Will require at least 170 million women - childbearing age donors
  Health risks—High-dose hormone therapy and surgery to obtain eggs risks the donor's health and future reproductive success
  Commercial exploitation—of women globally..

HUMAN CLONING

Therapeutic Cloning: Is this a problem?

Physically:

-Where will the egg donors come from to treat disease?

-Embryonic stem cells (ESC's) are often rejected

-ESC's can and have become tumors and cancers in patients

-ESC's have produced NO cures or treatments as is the hope..

HUMAN CLONING

The Home Stretch…

- Do the Ends justify the Means?
  - What if we could clone a human child, should we?
  - What if the claims of future cures were true?
- Is there still hope for cures to disease outside of Embryonic Stem Cell Research?

HUMAN CLONING

The Home Stretch…

- Since the excuse for allowing scientists to pursue therapeutic cloning is to obtain valuable stem cells, if there are other—or better—sources for stem cells, then the dangers and indignities of cloning cannot be justified. And, there are much better sources.
- Stem cells from adults and umbilical cord blood are already being used to treat numerous kinds of cancer and diseases, to regenerate muscle tissue, and to form cartilage and bone tissue. Adult stem cells bypass the problem of donor rejection, as the patient is the donor, and are a quicker source for stem cells than the laborious, unnecessary step of creating an embryo. There is no need to go through the immoral and dangerous process of cloning when stem cells can be safely obtained directly from the patient..

HUMAN CLONING

Conclusion

Human life is precious, no matter how big or small. It is not a commodity, or something to be mass produced. Human life is unique.

We all were created in God's image with a purpose.

What's yours? What will you do about it?

And the angel of the Lord said, Behold thou art with fetus?

And the angel of the Lord said, Behold thou art with fetus? and shalt bear a son.

Genesis 16:11

with child

And the angel of the Lord said, Behold thou art with child, and shalt bear a son.

Genesis 16:11

The Soul

In Christianity, it is often the soul which confers rights on an entity

Today, many Christians maintain that the soul arrives at the moment of conception

Thomas Aquinas

- The soul arrives around the third month (quickening)
- Matter has to be sufficiently developed in order to receive it

If the soul arrives at some point after conception, then hESC research may be morally permissible.

- Some Catholic theologians do not see ensoulment prior to the primitive streak at 14 days.

Jewish thought generally sees stem cell research as permissible because it considers the embryo to be genetic material until implanted in a uterus.

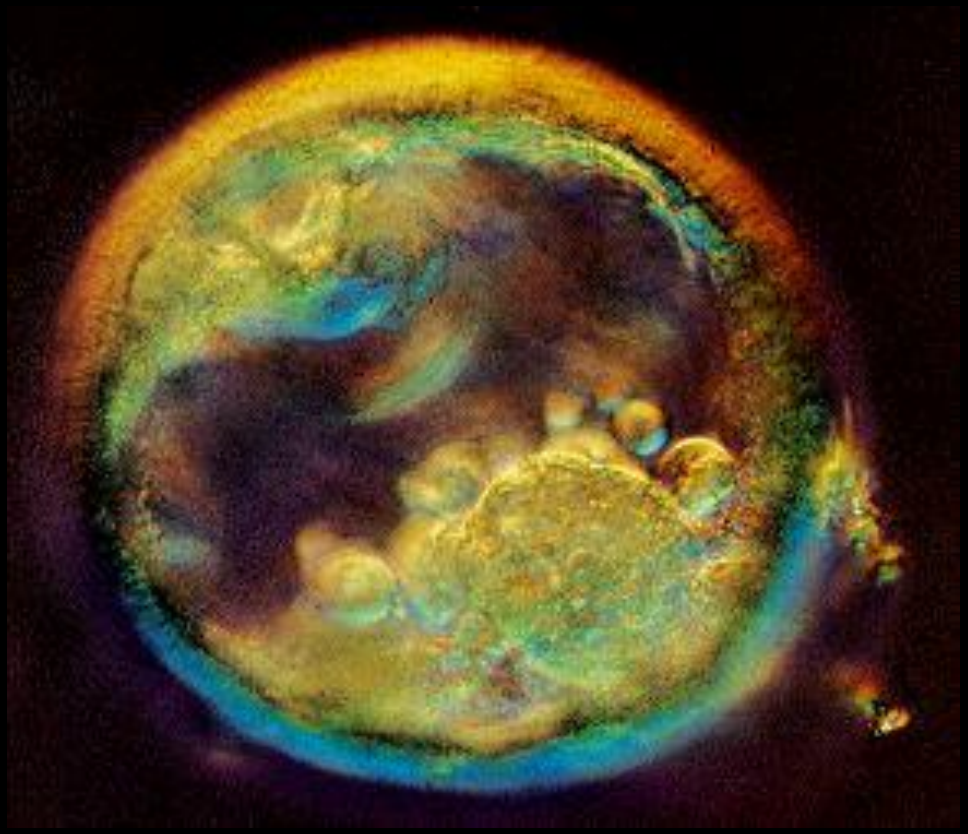
Some Protestant religions support stem cell research.

WOULD A CLONED HUMAN BEING HAVE A SOUL?

James 2:26 — “The body, apart from the spirit, is dead.”

Thus, a body that is living must possess a soul.

So, what about the value of life and stem cell research?



Stem Cells

Stem cell research offers the promise of important cures, but so far these seem to be at the price of the destruction of embryos.

The Dickey Amendment

The Dickey Amendment, named for its author, former Representative Jay Dickey of Arkansas, has been attached to the Health and Human Services authorization bill each year since 1995.

SEC. 510.

(a) None of the funds made available in this Act may be used for—

(1) the creation of a human embryo or embryos for research purposes;

or

(2) research in which a human embryo or embryos are destroyed, discarded, or knowingly subjected to risk of injury or death greater than that allowed for research on fetuses in utero under 45 CFR 46.208(a)(2) and section 498(b) of the Public Health Service Act (42 U.S.C. 289g(b)).

(b) For purposes of this section, the term ‘human embryo or embryos’ includes any organism, not protected as a human subject under 45 CFR 46 as of the date of the enactment of this Act, that is derived by fertilization, parthenogenesis, cloning, or any other means from one or more human gametes or human diploid cells.

The Bush Policy

For Immediate Release: August 9, 2001

Fact Sheet: Embryonic Stem Cell Research

"As a result of private research, more than 60 genetically diverse stem cell lines already exist" I have concluded that we should allow federal funds to be used for research on these existing stem cell lines " where the life and death decision has already been made", This allows us to explore the promise and potential of stem cell research" without crossing a fundamental moral line by providing taxpayer funding that would sanction or encourage further destruction of human embryos that have at least the potential for life."

-- George W. Bush

No federal funds will be used for:

1. the derivation or use of stem cell lines derived from newly destroyed embryos;
2. the creation of any human embryos for research purposes; or
3. the cloning of human embryos for any purpose.

Another Perspective

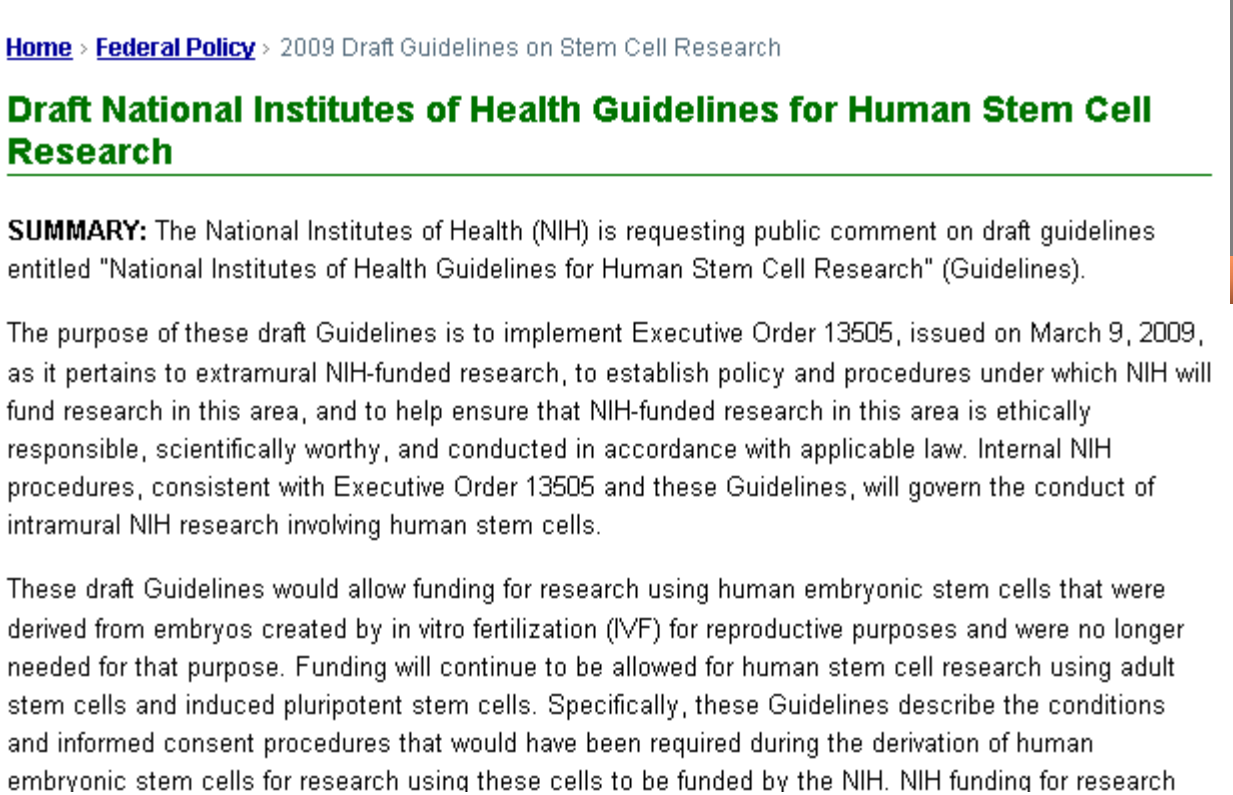
"The simple proposals that are now widely accepted by the majority of ethicists and scientists alike are as follows:

Allow the use of spare IVF embryos to develop more human stem cell lines. These are entities that do not possess a single neuron and are ready to go and can create tens of thousands of cell lines. Put another way, a piece of DNA is not a human being. A human being is an entity with a functioning brain consisting of billions of neurons with trillions of synapses that develops over time and with crucial interactions with the environment."

Allow biomedical cloning (SCNT) to go forward. This laboratory procedure has been tested and it works. SCNT can only be carried out in a laboratory and the 14-day-old entity that results from the procedure also has not a single neuron. After the specific stem cells are harvested by 14 days, the remaining tissue is disposed of."

Michael S. Gazzaniga, Ph.D.

The Obama Policy



Home › Federal Policy › 2009 Draft Guidelines on Stem Cell Research

Draft National Institutes of Health Guidelines for Human Stem Cell Research

SUMMARY: The National Institutes of Health (NIH) is requesting public comment on draft guidelines entitled "National Institutes of Health Guidelines for Human Stem Cell Research" (Guidelines).

The purpose of these draft Guidelines is to implement Executive Order 13505, issued on March 9, 2009, as it pertains to extramural NIH-funded research, to establish policy and procedures under which NIH will fund research in this area, and to help ensure that NIH-funded research in this area is ethically responsible, scientifically worthy, and conducted in accordance with applicable law. Internal NIH procedures, consistent with Executive Order 13505 and these Guidelines, will govern the conduct of intramural NIH research involving human stem cells.

These draft Guidelines would allow funding for research using human embryonic stem cells that were derived from embryos created by in vitro fertilization (IVF) for reproductive purposes and were no longer needed for that purpose. Funding will continue to be allowed for human stem cell research using adult stem cells and induced pluripotent stem cells. Specifically, these Guidelines describe the conditions and informed consent procedures that would have been required during the derivation of human embryonic stem cells for research using these cells to be funded by the NIH. NIH funding for research

"…allow funding for research using only those human embryonic stem cells that were derived from embryos created by in vitro fertilization (IVF) for reproductive purposes and were no longer needed for that purpose."

"…NIH funding of the derivation of stem cells from human embryos is prohibited by the annual appropriations ban on funding of human embryo research…otherwise known as the Dickey-Wicker Amendment. "

Obama, 2

Eligibility of Human Embryonic Stem Cells Derived from Human Embryos: Human embryonic stem cells may be used in research using NIH funds, if the cells were derived from human embryos that were created for reproductive purposes, were no longer needed for this purpose, were donated for research purposes, and for which documentation for all of the following can be assured:

1. All options pertaining to use of embryos no longer needed for reproductive purposes were explained to the potential donor(s).
2. No inducements were offered for the donation.
3. A policy was in place at the health care facility where the embryos were donated that neither consenting nor refusing to donate embryos for research would affect the quality of care provided to potential donor(s).
4. There was a clear separation between the prospective donor(s)'s decision to create human embryos for reproductive purposes and the prospective donor(s)'s decision to donate human embryos for research purposes.
5. At the time of donation, consent for that donation was obtained from the individual(s) who had sought reproductive services. That is, even if potential donor(s) had given prior indication of their intent to donate to research any embryos that remained after reproductive treatment, consent for the donation should have been given at the time of the donation. Donor(s) were informed that they retained the right to withdraw consent until the embryos were actually used for research.
6. Decisions related to the creation of human embryos for reproductive purposes were made free from the influence of researchers proposing to derive or utilize human embryonic stem cells in research. Whenever it was practicable, the attending physician responsible for reproductive clinical care and the researcher deriving and/or proposing to utilize human embryonic stem cells should not have been the same person.

Obama, 3

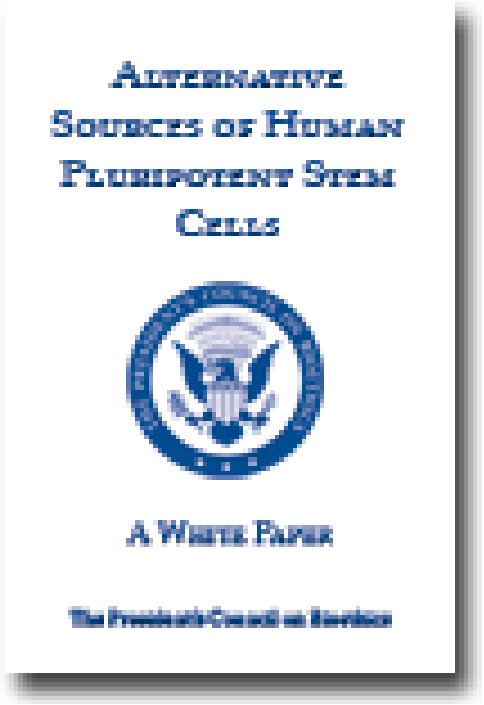
7. Written informed consent was obtained from individual(s) who sought reproductive services and who elected to donate human embryos for research purposes. The following information, which is pertinent to making the decision of whether or not to donate human embryos for research purposes, was in the written consent form for donation and discussed with potential donor(s) in the informed consent process:

a. A statement that donation of the embryos for research was voluntary;
b. A statement that donor(s) understood alternative options pertaining to use of the embryos;
c. A statement that the embryos would be used to derive human embryonic stem cells for research;
d. Information about what would happen to the embryos in the derivation of human embryonic stem cells for research;
e. A statement that human embryonic stem cells derived from the embryos might be maintained for many years;
f. A statement that the donation was made without any restriction or direction regarding the individual(s) who may receive medical benefit from the use of the stem cells;
g. A statement that the research was not intended to provide direct medical benefit to the donor(s);
h. A statement as to whether or not information that could identify the donor(s) would be retained prior to the derivation or the use of the human embryonic stem cells (relevant guidance from the DHHS Office for Human Research Protections (OHRP) should be followed, as applicable; see OHRP's Guidance for Investigators and Institutional Review Boards Regarding Research Involving Human Embryonic Stem Cells, Germ Cells, and Stem Cell-Derived Test Articles (37.8 KB PDF; get Adobe Reader) and Guidance on Research Involving Coded Private Information or Biological Specimens, or successor guidances); and
i. A statement that the results of research using the human embryonic stem cells may have commercial potential, and a statement that the donor(s) would not receive financial or any other benefits from any such commercial development.

The Report of the President's Council on Bioethics

The President's Council on Bioethics
White Paper: Alternative Sources of Pluripotent Stem Cells

The President's Council on Bioethics
Washington, D.C., May 2005



- **Available on-line at:**
- http://www.bioethics.gov/reports/white_paper/index.html

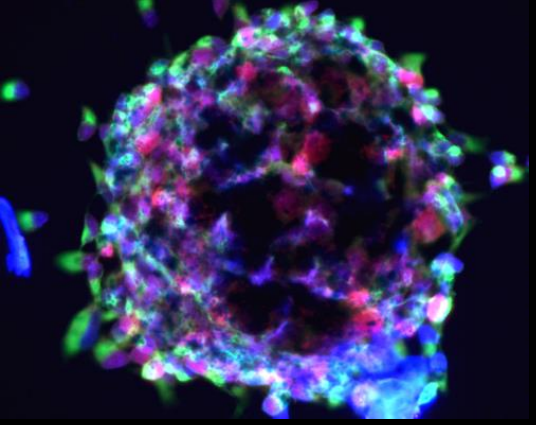
The Challenge

Given the Dickey amendment and President Bush's statement of August 8, 2001, the question was whether there were any ways of obtaining hESC without destroying human embryos.

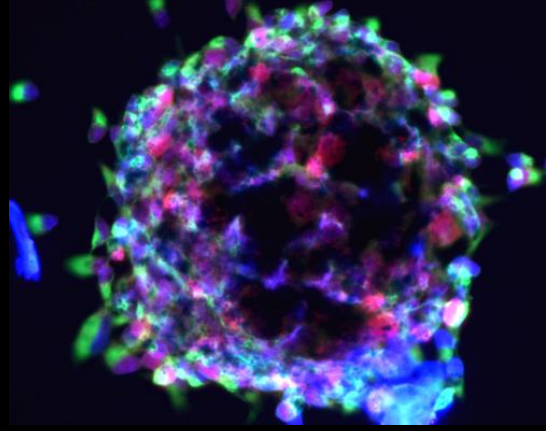
The situation became worse as it became clear that perhaps only a dozen of the sixty existing and federally-sanctioned stem cell lines could in fact be used.

Even those lines were less than optimal, since they were derived through techniques that resulted in contamination from animal cells.

This came to be known as the quest for "alternative sources of human pluripotent stem cells." Could science, in other words, provide ways of obtaining these cells without destroying human embryos?



Stem Cells



<u>Four places we get stem cells from:</u>

1. Adult tissue
2. Umbilical Cords
3. Left-over embryos from in vitro fertilization
4. Aborted Fetuses

Adult Stem Cells

www.stemcellresearch.org

Most promising source for treatments

Able to generate virtually all adult tissues

Can multiply almost indefinitely, providing numbers sufficient for clinical treatments

Proven success in laboratory culture

Proven success in animal models of disease

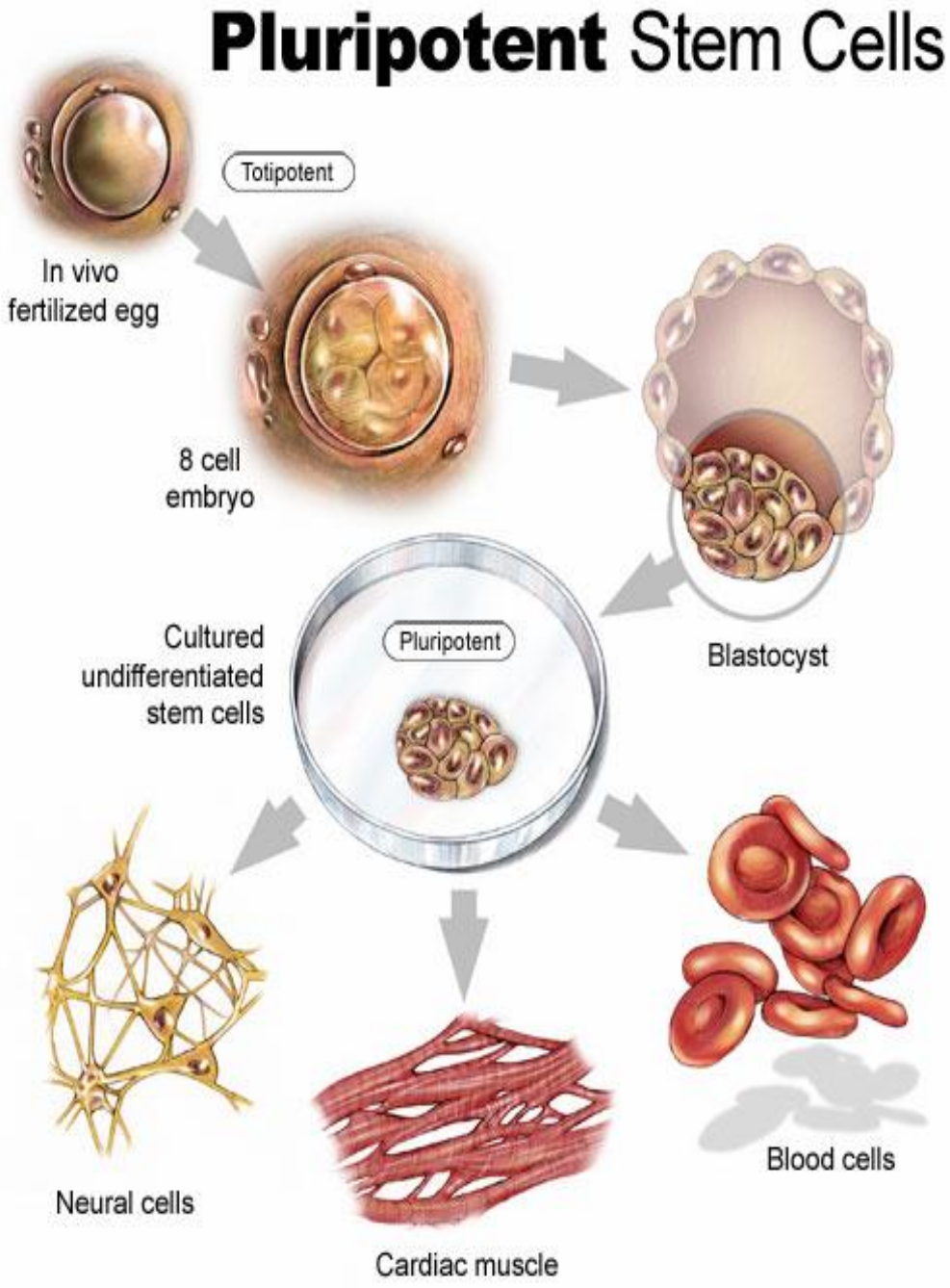
Proven success in current clinical treatments

Ability to “home in” on damage

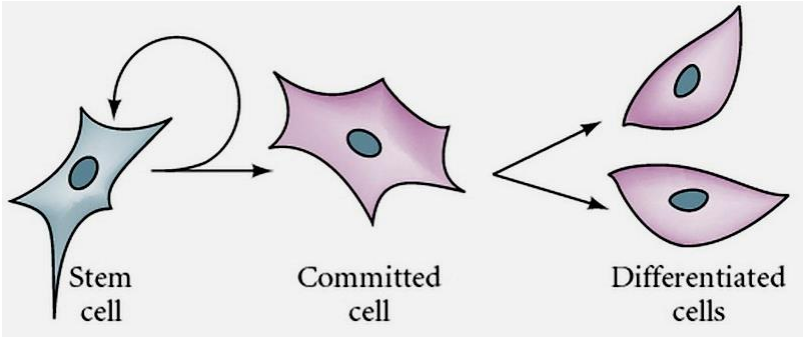
Avoid problems with tumor formation

Avoid problems with transplant rejection

Avoid ethical quandary

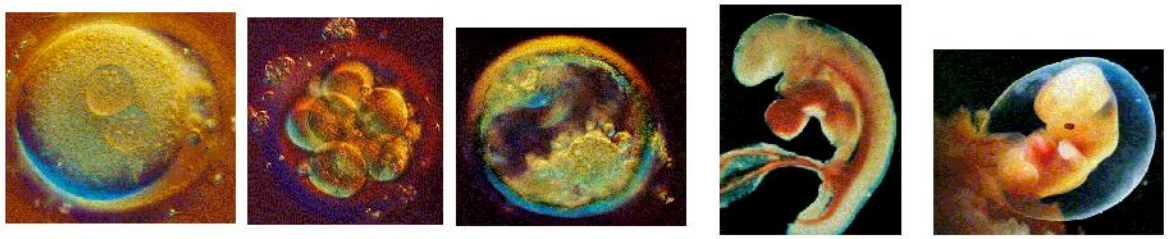


Scientists want pluripotent stem cells—cells that can become a variety of tissues.



Stem Cells

Human Developmental Continuum ⟶



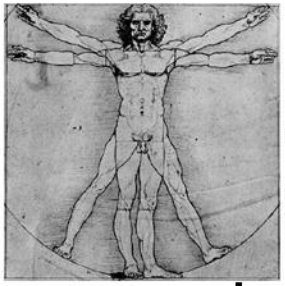
Single-cell Embryo | 3-day Embryo | 5-7 day Embryo | 4-week Embryo | 6-week Embryo

Embryonic Stem (ES) cells
Totipotent

Embryonic Germ (EG) cells
(primordial germ cells)
Pluripotent

Fetal Tissue Stem cells
Pluripotent or Multipotent

Infant



Adult

"Adult" Stem cells
Pluripotent or Multipotent

Teratocarcinoma (germ cell tumor)

Embryonal Carcinoma (EC) cells
Pluripotent

Cord Blood Stem cells
Placental Stem cells
Pluripotent or Multipotent

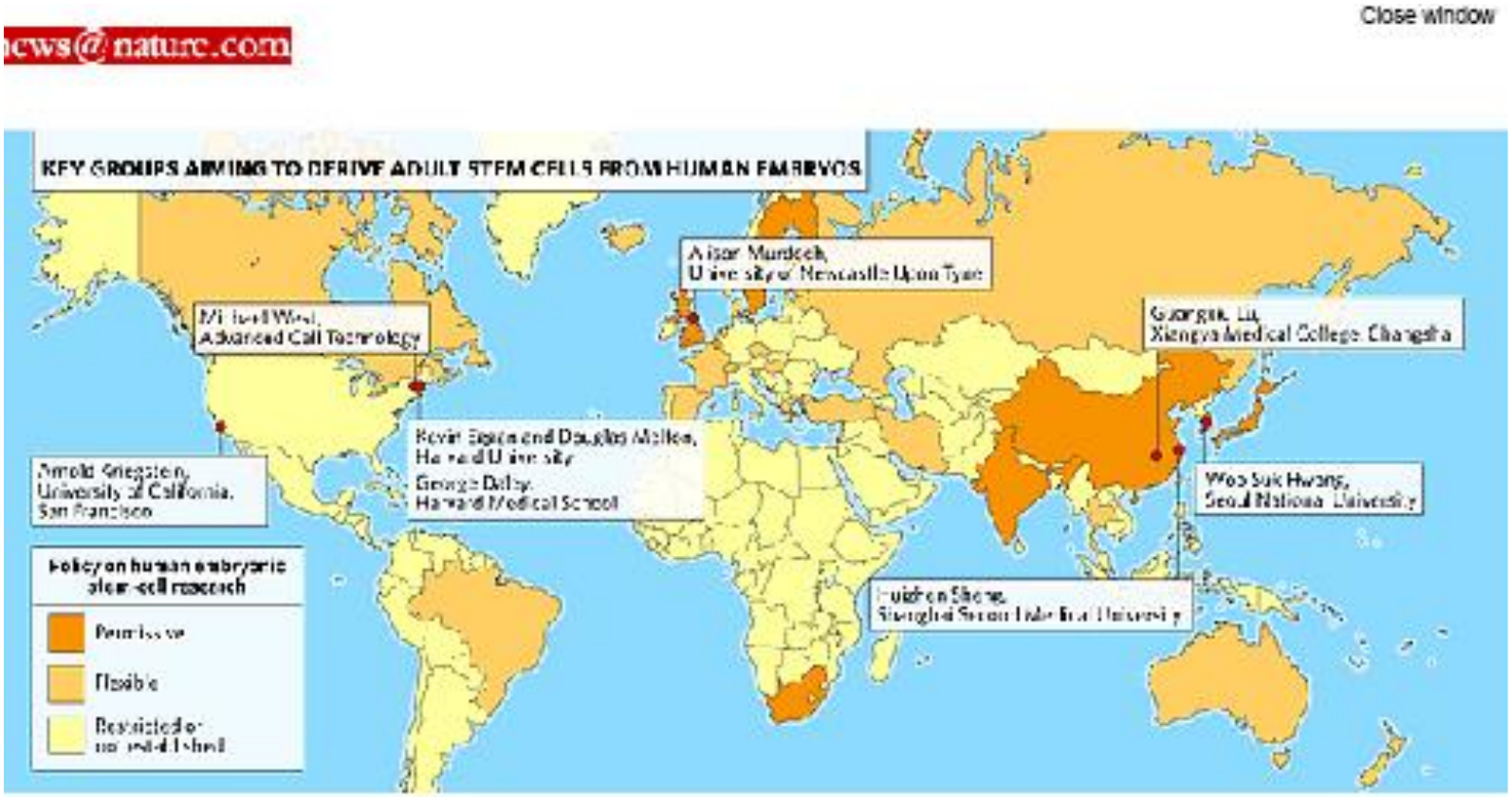
Parthenogenesis

Essentially involves tricking a human egg into thinking it had been fertilized when it had not.

The egg would then develop to the 50-100 cell stage, at which point hESCs could be extracted.

Are these really embryos? Could they actually develop as human beings? There is no way to answer that question without implanting the embryo, and this is itself a morally dangerous step.

A Global Perspective



Research that is forbidden in the United States may be carried out in a number of other countries throughout the world.

Are embryonic stem cells the only source for pluripotent stem cells?

The common argument is that only embryonic stem cells are “pluripotent”—meaning only embryonic stem cells have not yet differentiated, and thus can become almost any cell in the body. However, peer-reviewed research has proven otherwise. If politicians would do their homework they would know that in 2001, scientists already had successfully purified pluripotent adult neural stem cells from brain tissue (Rietze, et al., 2001, 412:736).

Rietze, Rodney L. Helen Valcanis, Gordon F. Brooker, Tim Thomas, Anne K.Voss, and Perry F. Bartlett (2001), “Purification of a Pluripotent Neural Stem Cell from the Adult Brain,” *Nature*, 412:736-738.

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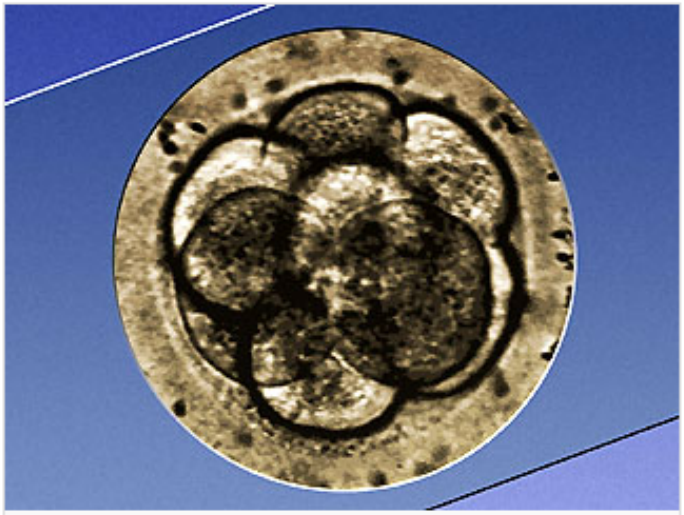
Viable Stem Cells Found in Amniotic Fluid

Monday, January 08, 2007

Associated Press

E-MAIL STORY | PRINTER FRIENDLY VERSION



AP

An eight-cell embryo superimposed on a microscope slide.

Stem cell researchers reacted with enthusiasm and reservations to a report that scientists have found stem cells in amniotic fluid, a discovery that would allow them to sidestep the controversy over destroying embryos for research.

Researchers at Wake Forest University and Harvard University reported Sunday that the stem cells they drew from amniotic fluid donated by pregnant women hold much the same promise as embryonic stem cells.

They reported they were able to extract the stem cells from the fluid, which cushions babies in the womb, without harm to mother or fetus and turn their discovery into several different tissue cell types, including brain, liver and bone.

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New Frontiers:
Alternative Sources of Pluripotent Stem Cells from Amniotic Fluid

washingtonpost.com

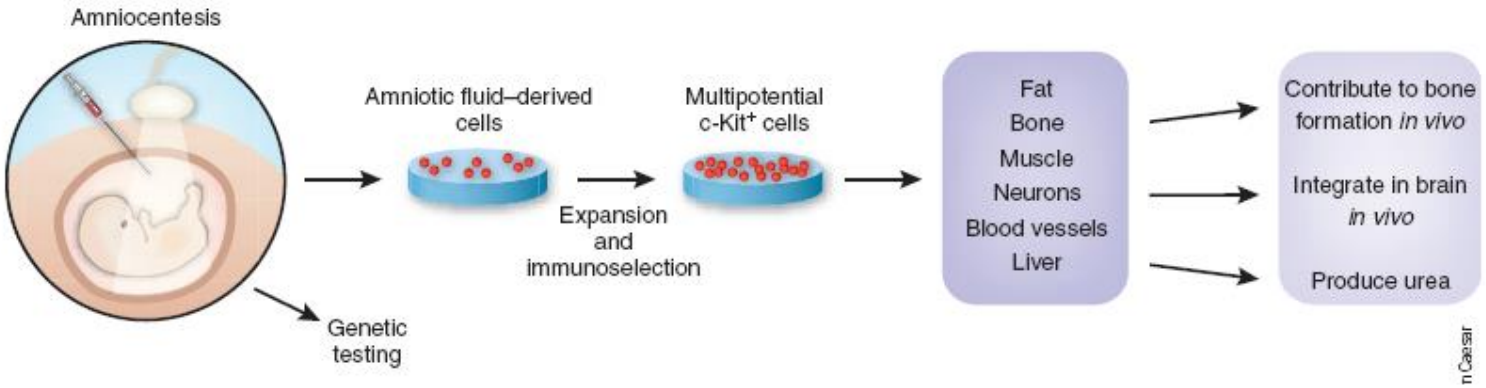
Scientists See Potential In Amniotic Stem Cells

They Are Highly Versatile And Readily Available

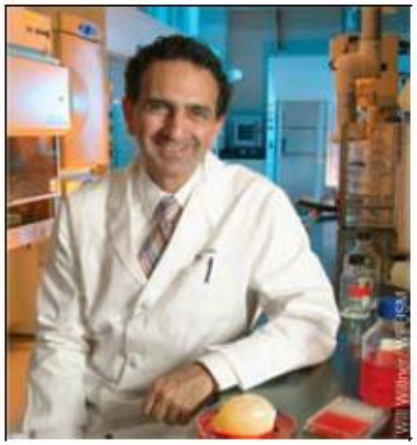
By Rick Weiss
Washington Post Staff Writer
Monday, January 8, 2007; A01

A type of cell that floats freely in the amniotic fluid of pregnant women has been found to have many of the same traits as embryonic stem cells, including an ability to grow into brain, muscle and other tissues that could be used to treat a variety of diseases, scientists reported yeste

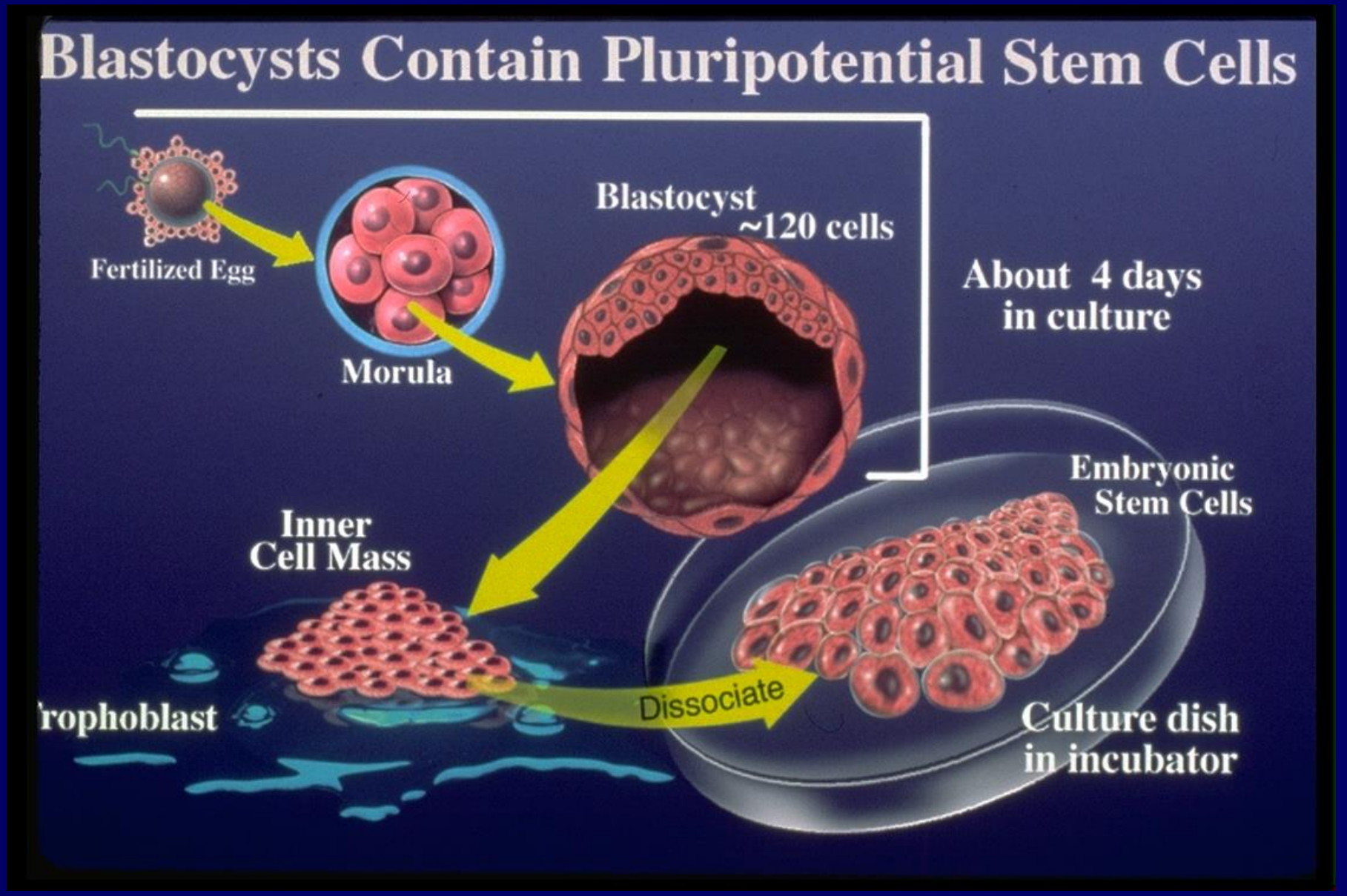
Developing Stem Cell Lines



The process of deriving stem cell lines from amniotic fluid



Anthony Atala

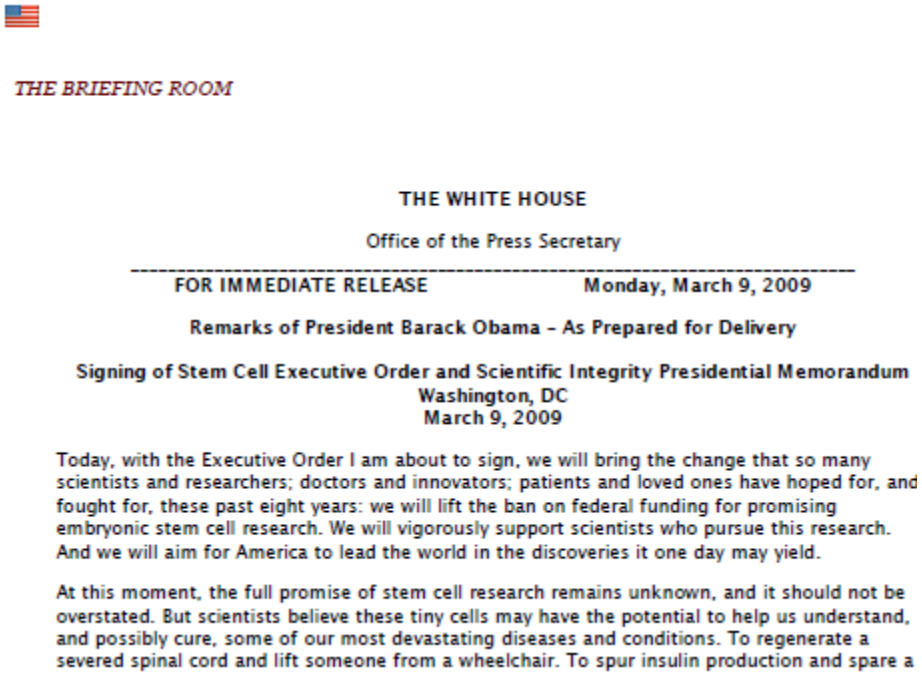

Blastocysts Contain Pluripotential Stem Cells
Fertilized Egg
Morula
Blastocyst
~120 cells
About 4 days
in culture
Embryonic
Stem Cells
Inner
Cell Mass
rophoblast
Dissociate
Culture dish
in incubator

Introduction

The debate over the ethics of stem cell research continues in the United States.

After an eight-year moratorium on the development of new stem cell lines, on March 8, 2009 the Obama administration approved the use of new stem cell lines in research.

Our purpose is to situate the arguments within larger theoretical terms.



THE BRIEFING ROOM

THE WHITE HOUSE

Office of the Press Secretary

FOR IMMEDIATE RELEASE **Monday, March 9, 2009**

Remarks of President Barack Obama – As Prepared for Delivery

Signing of Stem Cell Executive Order and Scientific Integrity Presidential Memorandum
Washington, DC
March 9, 2009

Today, with the Executive Order I am about to sign, we will bring the change that so many scientists and researchers; doctors and innovators; patients and loved ones have hoped for, and fought for, these past eight years: we will lift the ban on federal funding for promising embryonic stem cell research. We will vigorously support scientists who pursue this research. And we will aim for America to lead the world in the discoveries it one day may yield.

At this moment, the full promise of stem cell research remains unknown, and it should not be overstated. But scientists believe these tiny cells may have the potential to help us understand, and possibly cure, some of our most devastating diseases and conditions. To regenerate a severed spinal cord and lift someone from a wheelchair. To spur insulin production and spare a

Consequentialism vs. Deontology

Consequentialist moral theories maintain that the rightness or wrongness of an action is dependent on its consequence

- How do we measure these consequences?
- Consequences for whom?

Deontological moral theories maintain that the rightness of wrongness of an action is dependent on its conformity to certain fundamental rules.

- What are the fundamental rules?

Consequentialist Considerations

Human stem cell (hSC) research offers great promise of cures for otherwise incurable conditions: spinal cord injuries, ALS, Alzheimer's, Parkinson's, etc.

The Deontological Case

Utility does not trump basic rules

If the embryo is a human, then it has a right to life

It the embryo has a right to life, it cannot be destroyed any more than we could intentionally kill a few children to save many others.

Consequentialist Rejoinder

Benefits of hESC research potentially far outweigh costs.

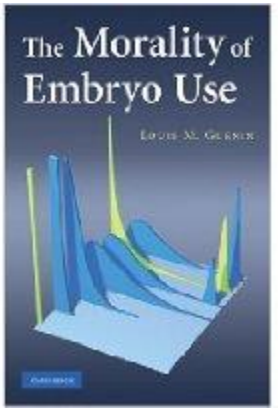
Embryos would otherwise have been discarded anyway after they have been abandoned following IVF treatment.

- About 400,000 frozen embryos in the United States alone
- Isn’t it better to put these frozen embryos to some good use rather than just destroy them?

Consequentialism Rejonder, 2

- **Lou Guenin, who teaches ethics at Harvard Medical School, argues that:**
- **“We have a duty, when our means allow, to aid those who suffer. If we spurn epidosembryo [human embryonic stem cell] research, not one more baby is likely to be born. If we conduct research, we may relieve suffering. Therefore epidosembryo research is permissible and praiseworthy.”**

- **ESSAYS ON SCIENCE AND SOCIETY “Morals and Primordials.” *Science* 1 June 2001: Vol. 292. no. 5522, pp. 1659 – 1660.**
- **Louis Guenin, *The Morality of Embryo Use* (Cambridge: Cambridge University Press, 2008).**



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Adult stem cells effective in tissue repair

Stroke—Adult stem cells from brain, bone marrow, and umbilical cord blood provide therapeutic benefit after stroke. First clinical trials under way.

*Shyu W-C *et al.*, "Functional recovery of stroke rats induced by granulocyte colony-stimulating factor-stimulated stem cells", *Circulation* 110, 1847-1854, 2004

*Willing AE *et al.*, "Mobilized peripheral blood stem cells administered intravenously produce functional recovery in stroke", *Cell Transplantation* 12, 449-454; 2003

*Arvidsson A *et al.*; "Neuronal replacement from endogenous precursors in the adult brain after stroke"; *Nature Medicine* 8, 963-970; Sept 2002

*Riess P *et al.*; "Transplanted neural stem cells survive, differentiate, and improve neurological motor function after experimental traumatic brain injury"; *Neurosurgery* 51, 1043-1052; Oct 2002

*Li Y *et al.*; "Human marrow stromal cell therapy for stroke in rat"; *Neurology* 59, 514-523; August 2002

*Chen J *et al.*; "Intravenous administration of human umbilical cord blood reduces behavioral deficits after stroke in rats"; *Stroke* 32, 2682-2688; November 2001

Adult stem cells effective in tissue repair

Spinal Cord Injury—Adult stem cells capable of re-growth and reconnection in spinal cord. Clinical trials started in Portugal, South Korea and Australia.

**Kang K-S *et al.*, A 37-year-old spinal cord-injured female patient, transplanted of multipotent stem cells from human UC blood, with improved sensory perception and mobility, both functionally and morphologically: a case study, *Cytotherapy* 7, 368-373, September 2005

*Sigurjonsson OE *et al.*, Adult human hematopoietic stem cells produce neurons efficiently in the regenerating chicken embryo spinal cord, PNAS 102, 5227-5232, 5 April 2005

*Lu J *et al.*, Olfactory ensheathing cells promote locomotor recovery after delayed transplantation into transected spinal cord, *Brain* 125, 14-21, 2002

*Ohta M *et al.*, Bone marrow stromal cells infused into the cerebrospinal fluid promote functional recovery of the injured rat spinal cord with reduced cavity formation, Experimental Neurology 187, 266-278, 2004

*Hofstetter CP *et al.*, "Marrow stromal cells form guiding strands in the injured spinal cord and promote recovery", *Proc Natl Acad Sci USA* 99, 2199-2204; Feb 19, 2002

*M. Sasaki *et al.*, "Transplantation of an acutely isolated bone marrow fraction repairs demyelinated adult rat spinal cord axons," *Glia* 35, 26-34; July 2001

*A. Ramon-Cueto *et al.*, "Functional recovery of paraplegic rats and motor axon regeneration in their spinal cords by olfactory ensheathing glia," *Neuron* 25, 425-435; Feb 2000.

*M.S. Ramer *et al.*; "Functional regeneration of sensory axons into the adult spinal cord," *Nature* 403, 312-316; Jan 20, 2000.

*Shihabuddin *et al.*; "Adult spinal cord stem cells generate neurons after transplantation in the adult dentate gyrus," *J Neurosci* 20, 8727-8735; Dec 2000.

*Barnett *et al.*; "Identification of a human olfactory ensheathing cell that can effect transplant-mediated remyelination of demyelinated CNS axons," *Brain* 123, 1581-1588, Aug 2000

*A. Ramon-Cueto *et al.*, "Long-distance axonal regeneration in the transected adult rat spinal cord is promoted by olfactory ensheathing glial transplants," *J Neurosci* 18, 3803-3815; May 15, 1998

Adult stem cells effective in tissue repair

Diabetes—Pancreatic, liver, intestinal, spleen or bone marrow cells can form insulin-secreting islets. FDA approval of first clinical trial, Denise Faustman, Harvard.

*Sapir *et al.*, Cell-replacement therapy for diabetes: generating functional insulin-producing tissue from adult human liver cells, *Proceedings of the National Academy of Sciences USA* 102, 7964-7969, 17 May 2005

*Seaberg BM *et al.*, "Clonal identification of multipotent precursors from adult mouse pancreas that generate neural and pancreatic lineages", *Nature Biotechnology* 22, 1115-1124, Sept 2004

*Oh S-H *et al.*, "Adult bone marrow-derived cells transdifferentiating into insulin-producing cells for the treatment of type I diabetes," *Laboratory Investigation* 84, 607-617, 1 May 2004

*Kodama S *et al.*, "Islet regeneration during the reversal of autoimmune diabetes in NOD mice", *Science* 302, 1223-1227; 14 Nov 2003

*Hess D *et al.*, "Bone marrow-derived stem cells initiate pancreatic regeneration", *Nature Biotechnology* 21, 763-770; July 2003

*Steptoe RJ *et al.*; "Transfer of hematopoietic stem cells encoding autoantigen prevents autoimmune diabetes"; *Journal of Clinical Investigation* 111, 1357-1363; May 2003

*Suzuki A *et al.*; "Glucagon-like peptide 1 (1-37) converts intestinal epithelial cells into insulin-producing cells"; *Proc Natl Acad Sci USA* 100, 5034-5039; 29 April 2003

*Ianus A *et al.*; *In vivo* derivation of glucose competent pancreatic endocrine cells from bone marrow without evidence of cell fusion; *Journal of Clinical Investigation* 111, 843-850; March 2003

*Yang L *et al.*; "*In vitro* trans-differentiation of adult hepatic stem cells into pancreatic endocrine hormone-producing cells"; *Proceedings of the National Academy of Sciences USA*, 99, 8078-8083; 11 June 2002

*S. Ryu *et al.*; "Reversal of established autoimmune diabetes by restoration of endogenous ß cell function," *J. Clin. Invest.* 108, 63-72; July 2001

*Ramiya VK *et al.*; "Reversal of insulin-dependent diabetes using islets generated in vitro from pancreatic stem cells," *Nature Medicine* 6, 278-282, March 2000.

Adult stem cells effective in tissue repair

Heart Damage—Bone marrow, muscle, and heart stem cells repair heart.

**Ince H *et al.*, Prevention of left ventricular remodeling with granulocyte colony-stimulating after acute myocardial infarction, *Circulation* 112, I-73-I-80, 30 August 2005
*Dawn B *et al.*, "Cardiac stem cells delivered intravascularly traverse the vessel barrier, regenerate infarcted myocardium, and improve cardiac function", *Proceedings of the National Academy of Sciences USA* 102, 3766-3771, 8 March 2005
*Yoon Y-s *et al.*, "Clonally expanded novel multipotent stem cells from human bone marrow regenerate myocardium after myocardial infarction", *Journal of Clinical Investigation* 115, 326-338, February 2005
**Wollert KC *et al.*, "Intracoronary autologous bone-marrow cell transfer after myocardial infarction: the BOOST randomised controlled clinical trial", *Lancet* 364, 141-148, 10 July 2004
**Britten MB *et al.*, "Infarct remodeling after intracoronary progenitor cell treatment in patients with acute myocardial infarction"; *Circulation* 108, 2212-2218; Nov 2003
**Perin EC *et al.*; "Transendocardial, autologous bone marrow cell transplantation for severe, chronic ischemic heart failure"; *Circulation* 107, r75-r83; published online May 2003
**Stamm C *et al.*; "Autologous bone-marrow stem-cell transplantation for myocardial regeneration"; *The Lancet* 361, 45-46; 4 January 2003
**Tse H-F *et al.*; "Angiogenesis in ischaemic myocardium by intramyocardial autologous bone marrow mononuclear cell implantation"; *The Lancet* 361, 47-49; 4 January 2003
**Strauer BE *et al.*; "Repair of infarcted myocardium by autologous intracoronary mononuclear bone marrow cell transplantation in humans"; *Circulation* 106, 1913-1918; 8 October 2002
*Orlic D *et al.*, "Mobilized bone marrow cells repair the infarcted heart, improving function and survival"; *Proceedings of the National Academy of Sciences USA* 98, 10344-10349, 28 August 2001.

Adult stem cells effective in tissue repair

Parkinson's Disease—Neural stem cells can form all neuronal types, migrate throughout brain to repair damage, and prevent loss of neurons associated with Parkinson's disease.

*Liker MA *et al.*; "Human neural stem cell transplantation in the MPTP-lesioned mouse"; *Brain Research* 971, 168-177; May 2003

*Åkerud P *et al.*; "Persephin-overexpressing neural stem cells regulate the function of nigral dopaminergic neurons and prevent their degeneration in a model of Parkinson's disease"; *Molecular and Cellular Neuroscience* 21, 205-222; Nov 2002

*Ourednik J *et al.*; "Neural stem cells display an inherent mechanism for rescuing dysfunctional neurons"; *Nature Biotechnology* 20, 1103-1110; Nov 2002

Using the patient's own adult neural stem cells, a group at Los Angeles Cedars-Sinai Medical Center report a reversal of symptoms in the first Parkinson's patient treated.

Lévesque M and Neuman T, "Autologous transplantation of adult human neural stem cells and differentiated dopaminergic neurons for Parkinson disease: 1-year postoperative clinical and functional metabolic result", American Association of Neurological Surgeons annual meeting, Abstract #702; 8 April 2002

Injecting growth signals into the brain stimulates the patients' own adult neural stem cells, provided a 61% improvement.

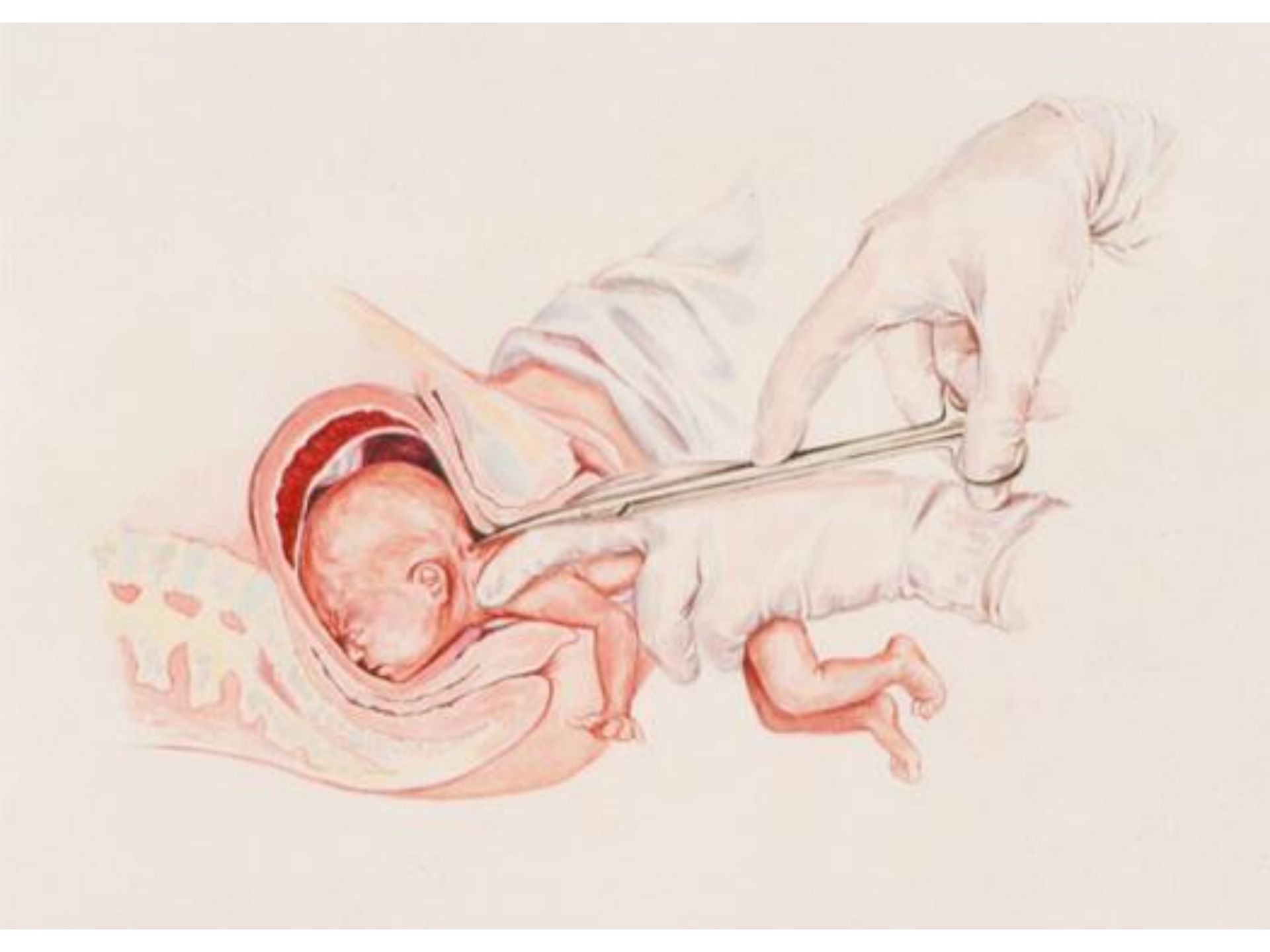
*Gill SS *et al.*; "Direct brain infusion of glial cell line-derived neurotrophic factor in Parkinson disease"; *Nature Medicine* 9, 589-595; May 2003 (published online 31 March 2003)

Current Clinical Uses of Adult Stem Cells

- **Cancers**—Lymphomas, multiple myeloma, leukemias, breast cancer, neuroblastoma, renal cell carcinoma, ovarian cancer
- **Autoimmune diseases**—multiple sclerosis, systemic lupus, rheumatoid arthritis, scleroderma, scleromyxedema, Crohn's disease
- **Anemias** (incl. sickle cell anemia)
- **Immunodeficiencies**—including human gene therapy
- **Bone/cartilage deformities**—children with osteogenesis imperfecta
- **Corneal scarring-**generation of new corneas to restore sight
- **Stroke**—neural cell implants in clinical trials
- **Repairing cardiac tissue after heart attack**—bone marrow or muscle stem cells from patient
- **Parkinson's**—retinal stem cells, patient's own neural stem cells, injected growth factors
- **Growth of new blood vessels**—*e.g.*, preventing gangrene
- **Gastrointestinal epithelia**—regenerate damaged ulcerous tissue
- **Skin**—grafts grown from hair follicle stem cells, after plucking a few hairs from patient
- **Wound healing**—bone marrow stem cells stimulated skin healing
- **Spinal cord injury**—clinical trials currently in Portugal, Italy, S. Korea
- **Liver failure**—clinical trials in U.K.

Diseases Treated in Human Patients

What does 4-6 inches represent?



Supreme Court Upholds Partial Birth Abortion Ban Act

Wednesday, April 18, 2007

Associated Press

E-MAIL STORY | PRINTER FRIENDLY VERSION

WASHINGTON — The Supreme Court upheld the nationwide ban on a controversial abortion procedure Wednesday, handing abortion opponents the long-awaited victory they expected from a more conservative bench.

The 5-4 ruling said the **Partial Birth Abortion Ban Act** that Congress passed and President Bush signed into law in 2003 does not violate a woman's constitutional right to an abortion.

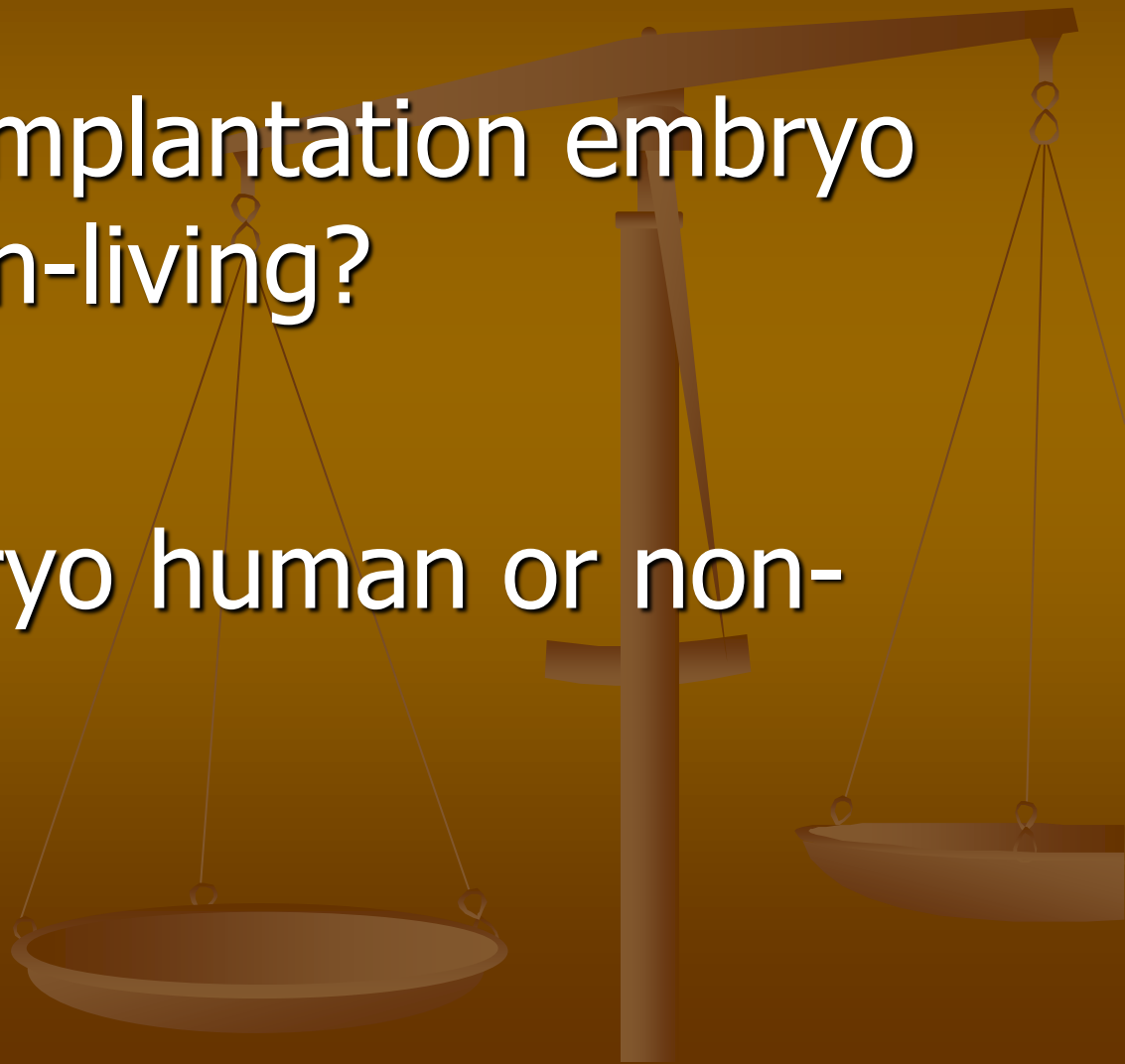
Click here to read the full Partial Birth Abortion Ban Act.

The opponents of the act "have not demonstrated that the Act would be unconstitutional in a large fraction of relevant cases," Justice Anthony Kennedy wrote in the majority opinion.

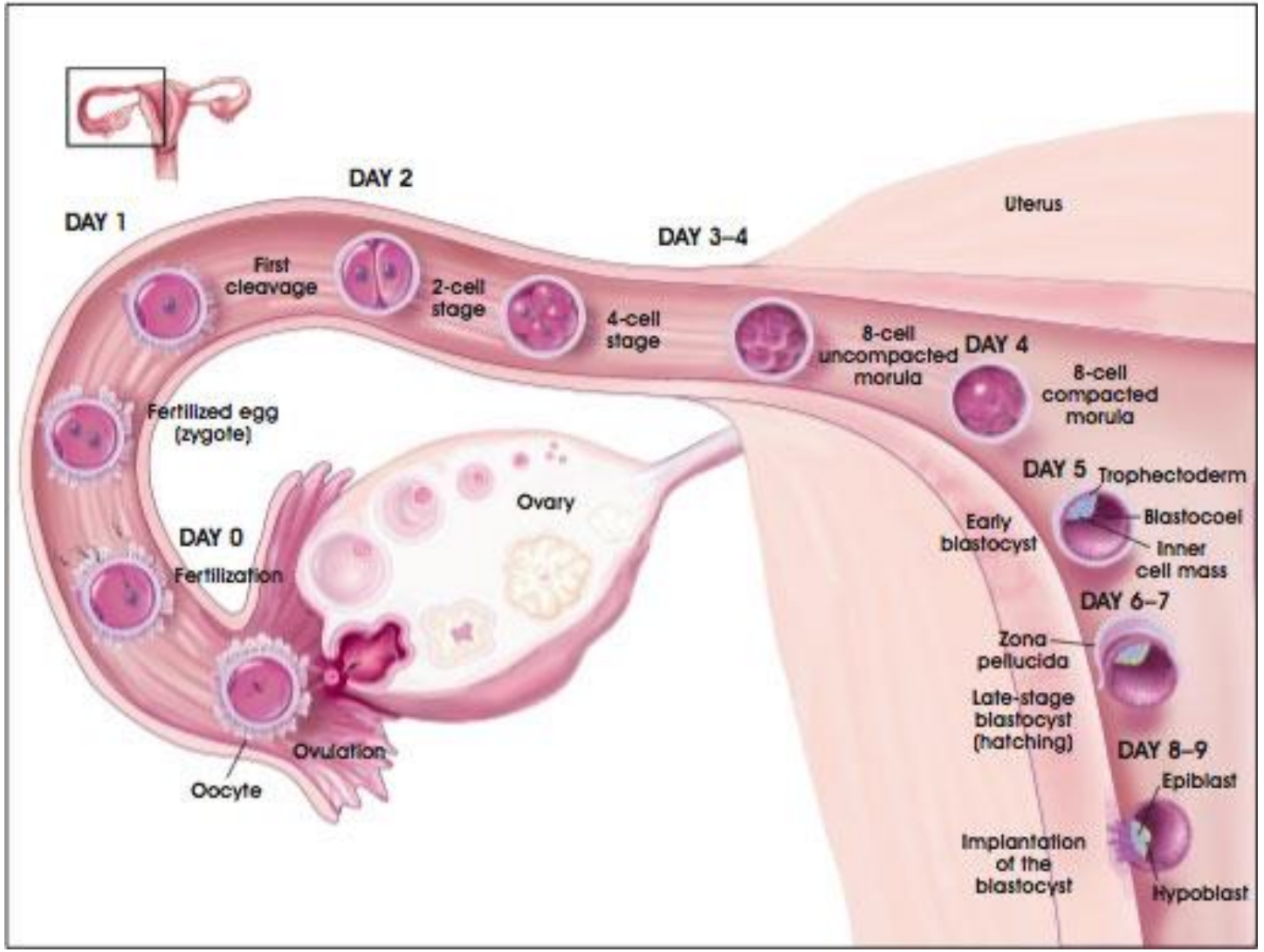
In discussing stem cells and ethics, two questions should be asked about the beginning of life:

1. Is the pre-implantation embryo living or non-living?

2. Is the embryo human or non-human?



Location doesn't change the fact that this is life.



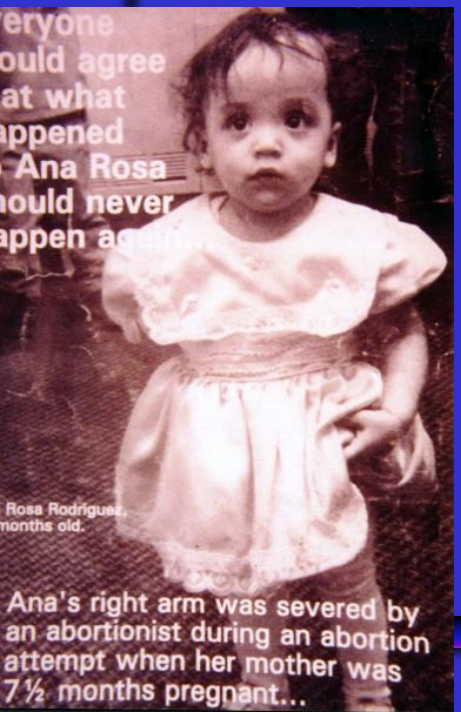
Consider…

Does an embryo have to be in the womb for a woman to be pregnant?

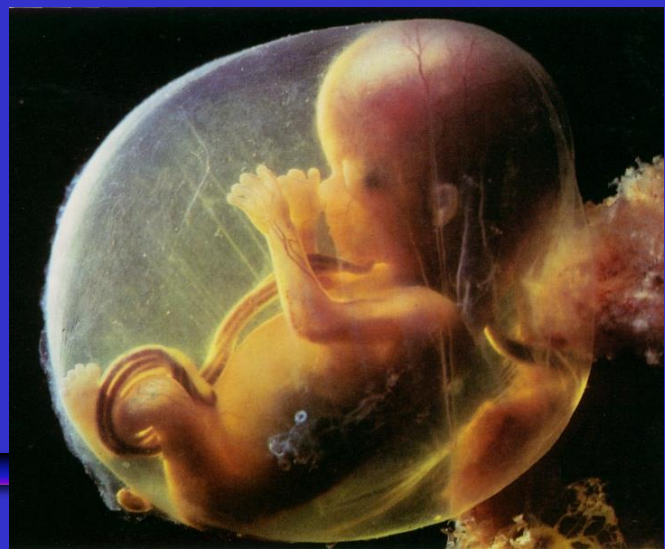
No. Ectopic pregnancies, which basically mean a pregnancy which has implanted in the wrong place, exist outside of the womb. Even though the location of the offspring is outside of the womb, it is still considered a pregnancy. This only goes to illustrate that pregnancy need not occur in the womb.

Cursed be he that taketh reward to slay an innocent person. Deut. 27:25

Cursed be he that taketh reward to slay an innocent person. And all the people shall say, Amen.



Deut. 27:25



We must remember…

- Genesis 1:26-27 informs us that we were made in the image and likeness of God—the Giver of life as He is described in Acts 17:28.
- We must keep in the forefronts of our minds that if we continue to allow human life to be devalued, we are in essence, reducing the value of God's gift of His only begotten Son.