

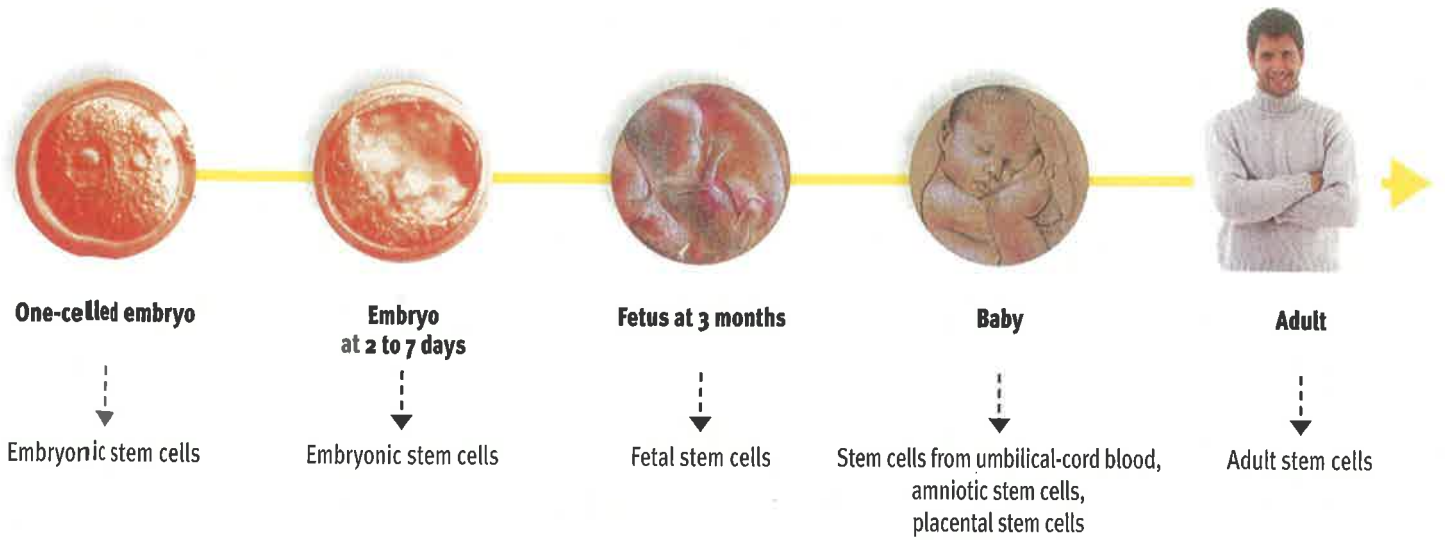
Stem cell research: What are the stakes?

Stem cells are immature, undifferentiated cells that are capable of developing into many types of cells, which make up different tissues in the adult organism. They are “mother cells” obtained and cultivated for the research and treatment of some illnesses.

There are several kinds of stem cells: adult, umbilical, placental, fetal, induced pluripotent, and embryonic.

These cells are leading to interesting therapeutic results in some diseases. Of these types listed, only the use of human embryonic stem cells is immoral because they are obtained by destroying human embryos. The use of fetal cells may also be problematic if obtained through direct abortion.

Types of human stem cells and their relation to human development



Sources of stem cells

3 types of stem cells

1. Totipotent stem cells:

These, from the cells of an embryo up to the morula stage, are capable of generating all types of the organism's cells, including the placenta, but not a new organism.

2. Pluripotent stem cells:

These are capable of generating all types of the organism's cells, except the placenta.

3. Multipotent stem cells:

These are capable of generating a large number of cells but not all.

- > adult stem cells
- > umbilical stem cells
- > amniotic and placental stem cells
- > fetal stem cells

Where do stem cells come from?

Adult stem cells are extracted from adults and children (from the skin, muscles, blood, bone marrow, fat, etc.).

Umbilical stem cells come from umbilical cord blood.

Amniotic and placental stem cells come from the amniotic fluid and placenta.

Fetal stem cells come from aborted fetuses and from miscarriages.

Where do pluripotent stem cells come from?

Embryonic stem cells are extracted from so-called surplus embryos conceived through assisted reproductive technology and then abandoned for use in research. The frozen embryos are thawed and allowed to develop for 6 to 7 days, to the blastocyst stage. They are then destroyed so that their cells can be extracted.

Induced pluripotent stem cells are adult cells (for example, skin cells) that have been deprogrammed so as to become undifferentiated. They can then be reprogrammed to develop into many different types of cells; hence their name: induced pluripotent stem cells, or IPS cells.

This important discovery made by Prof. Shinya Yamanaka in 2006 makes it possible to obtain pluripotent cells without destroying human embryos. For this he won the 2012 Nobel Prize for Medicine, which he shares with Sir John B. Gurdon.

Stem cells and cellular therapy

"Cellular therapy" refers to cell grafts or implants aimed at restoring the function of a tissue or an organ when it is impaired. These therapies have benefited from recent scientific advances with stem cells.

Adult stem cells are already being used for the treatment of blood diseases (forms of leukemia) to repair wounds and burns, to repair tendons and to engineer tissues (reconstituted trachea). Some adult stem cells, especially from umbilical cord blood, make it possible to restore cells in the walls of blood vessels. Some are now being evaluated for the treatment of cerebral infantile palsy (infant cerebral motor infirmity), Krabbe's disease, and other conditions. Although these therapies have benefited from advances with stem cells and hold promise for regenerative medicine (the reconstitution of organs), stem cells will not cure all diseases.

Stem cells and research

Human embryonic stem cells and induced pluripotent stem cells are being used to treat patients in clinical trials. They serve to model illnesses and to screen molecules, useful in pharmaceutical research.

Recent studies show that induced pluripotent stem cells could also produce therapeutic results (e.g., recent authorization issued to a Japanese laboratory for a clinical research program to treat AMD (age-related macular degeneration)).

It is important to remember the ethical distinction between embryonic stem cells and IPS cells. The use of embryonic stem cells is always immoral because it requires the destruction of human embryos.

Pros and cons: embryonic stem cells and induced pluripotent stem cells

Embryonic stem cells

Induced pluripotent stem cells

+ Same capacities for proliferation and differentiation	
- Cause cancerous tumors	
- So far, no approved clinical application	
+ Of interest for molecular screening and modeling diseases	
- The patient's immune system rejects them because they are from somebody else's body	+ Not a problem if they are the patient's own cells
- Pathological models not targeted at the patient's ailment	+ Potential for generating IPS targeted at the patient's ailment
- You have to destroy human embryos to get them	+ No ethical problem for use

Frequently asked questions

“Can we use cord blood?”

Yes. Umbilical cord blood is rich in stem cells and very useful as a substitute for bone marrow grafts, especially for children.

According to the Herbert Irving Comprehensive Cancer Center's *The Nuts and Bolts of Bone Marrow Transplants*, “In 1991, more than 7,500 people underwent BMTs [bone marrow transplants] nationwide. Although BMTs now save thousands of lives each year, 70% of those needing a BMT using donor marrow are unable to have one because a suitable bone marrow donor cannot be found.”

“Can we use animal embryos for research?”

Yes. In order to study embryonic development, researchers can use animal embryos; this poses no ethical problem.

Professor Shinya Yamanaka made the revolutionary discovery of induced pluripotent stem cells through his work on embryonic mice. The destruction of human embryos is not necessary in order to make scientific progress and improve our knowledge.

“Is human cloning okay?”

No. Cloning is a manipulation aimed at asexually reproducing a human being genetically identical to the original. The nucleus of an ovum is replaced by the nucleus of a somatic cell (i.e., not a gamete) of the human being who is to be cloned. In theory, scientists distinguish reproductive cloning (which aims to reproduce a human being who is supposed to be born) from so-called therapeutic cloning (whereby the development of the embryo is stopped at the age of one week so as to use his stem cells for research). In reality there is no difference. Both are immoral.



Can they make thousands of copies of me for research?

Ethical reflections

Using human embryos for research

Research on a human embryo is unethical because it destroys and exploits a human being. It is even more objectionable since there are alternatives, such as research using induced pluripotent stem cells and animal embryos.

Conscientious objection

In some parts of the world, health care workers are protected from participating in immoral acts, including any act that would cause the death of a human fetus or embryo. In the United States, the Church Amendments, named after former senator Frank Church (D-ID), were enacted in the 1970s to protect health care workers and faith-based hospitals from being required to participate in abortions or sterilizations as a condition for receiving federal funds. These protections are increasingly challenged in the United States, with proposed legislation that undermines the right of conscientious objection.

New slaves

Now that human embryos are being made available for research, one class of human beings is being exploited to satisfy the needs of other humans.

Whatever the manner of conception, whether by fertilization or by cloning, the developing embryo is a living being. If it is a human embryo, it is a human being.

Militants from the Greenpeace movement demonstrating in front of the German parliament against the prospect of patenting human life.



Research with adult stem cells

Why persist in conducting research on human embryos, which has not proven effective and is unethical, since it destroys an embryo, whereas adult stem cells and IPS cells are promising and pose no ethical problem?

Do we have the right to slow progress toward the discovery of treatments by financing research that is less promising?

Cloning

All countries agree that reproductive cloning is a crime. But some countries accept cloning for research purposes. In so-called "therapeutic cloning," however, a human embryo is created by cloning, only to be destroyed and used as research material. In both "reproductive" and "therapeutic" cloning a new human embryo is created by illicit means. Both are immoral practices.

Patenting embryos

On September 16, 2011, the U.S. Congress passed a ban known as the Weldon Amendment, which prohibits the patenting of genetically engineered human embryos. Tony Perkins, president of the Family Research Council, stated, "While biotechnology offers great hope for treatments and science should be explored, it must always be in the service of humanity, not the other way around. We must never lose sight of the fact that all human life, including human embryos, deserves legal protection" (Steven Ertelt, "Congress Approves Bill Banning Patenting of Human Embryos," LifeNews.com, September 15, 2011).

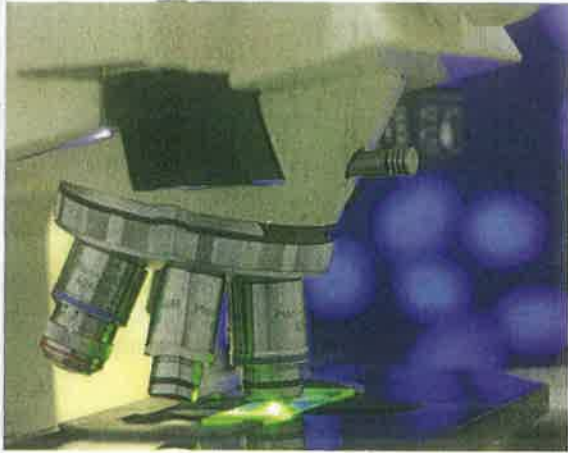
Testimony

Ian Wilmut is the first researcher in the world to have cloned a mammal, Dolly the sheep.

After the discovery of induced pluripotent stem cells in 2006, he announced that he was giving up cloning.

“Before the discovery of IPS cells, we were trying to derive stem cells from embryos produced by cloning. To date, no one has succeeded. But now, the dedifferentiation of somatic cells [IPS cells] has demonstrated that the same objective could be attained by using the patient’s somatic cells directly. There is a major therapeutic advantage with IPS cells: they are genetically identical to the patient, allowing us to model pathologies and rapidly to discover medications to treat the symptoms of the sickness in advance. The cloning technique is therefore no longer a current technique. If science offers ways that are faster, more interesting and effective, in my opinion we should follow them.”

From genethique.org, May 2009



“As you did it to one of the least of these my brethren, you did it to me.”

Matthew 25:40

What the Church says...

Dignity of the human person from conception

“The body of a human being, from the very first stages of its existence, can never be reduced merely to a group of cells.... The human being is to be respected and treated as a person from the moment of conception; and therefore from that same moment his rights as a person must be recognized, among which in the first place is the inviolable right of every innocent human being to life.”
Dignitas personae, no. 4

A human embryo is not biological material

“Regarding embryos as biological material, ‘producing’ them and then ‘using’ their stem cells for purposes of research is absolutely immoral.... Research on adult stem cells is a different matter, since they cannot develop into human beings. Medical interventions on an embryo are justifiable only if they are made with the intention of healing, if the life and unimpaired development of the child are assured, and if the risks involved are not disproportionately great.” *YOUCAT*, no. 385

The Church celebrates and defends life

“You have fashioned and made me.... You have granted me life and steadfast love; and your care has preserved my spirit.” (Job 10:8-12).
“How can anyone think that even a single moment of this marvellous process of the unfolding of life could be separated from the wise and loving work of the Creator, and left prey to human caprice?”

Evangelium vitae, no. 44

“The present Encyclical... is therefore meant to be a precise and vigorous reaffirmation of the value of human life and its inviolability, and at the same time a pressing appeal addressed to each and every person, in the name of God: respect, protect, love, and serve life, every human life! Only in this direction will you find justice, development, true freedom, peace, and happiness!”

Evangelium vitae, no. 5