

## STEM CELL PRIMER

**WHAT IS A STEM CELL?** It is a cell, having in it the incredible ability to replicate and make any type of cell required to build or repair an organism. It is responsible for our growth from a single cell to a mature adult. Our bodies use stored stem cells to repair tissue damage throughout our lives. This amazing ability gives hope to stem cell therapies.

**WHAT IS A STEM CELL LINE?** A stem cell line is a family of constantly dividing cells, the product of a single parent group of stem cells.

**WHY ARE STEM CELLS SO IMPORTANT TO RESEARCH?** Stem cells have the ability to repair tissue damage, for example, to replace damaged heart tissue after a heart attack.

**ARE THERE DIFFERENT KINDS OF STEM CELLS?** Yes. Traditionally there are two kinds of stem cells: EMBRYONIC and ADULT. EMBRYONIC stem cells (ESC) are taken from the unborn embryo and fetus. All other stem cells fall into the category of ADULT stem cells (ASC), including stem cells obtained from amniotic fluid, umbilical cord blood, and from an adult or born child: bone marrow, skin, nose, eyelid, teeth, hair, blood, etc. These categories are disjoint and therefore keep moral and immoral stem cell research separated.

**WHY IS EMBRYONIC STEM CELL RESEARCH (ESCR) CONSIDERED IMMORAL?** The human being in the embryonic stage of development dies as the result of taking his or her embryonic stem cells. An embryonic stem cell implant could only be successful by cloning the patient to avoid rejection. Of course, cloning is also immoral.

Dr. Beverly B. Nuckols of lifeethics.org may have a better way of naming these categories clearly keeping moral and immoral stem cell research separated.

"I've always thought of the two groups as divided into:

1. Destructive Research - that depends on the intentional destruction of individual human beings at any age is unethical vs.
2. Non-destructive Research - ethical research methods that do not intentionally cause injury to human beings.

Most people call the first "embryonic" and the others "adult."

Technically, "embryonic" means the cells came from embryos - in humans, that's up to 8 weeks gestation. Umbilical and amniotic fluid cells are ethical, non-destructive stem cells that are technically "fetal stem cells." These fall into the non-destructive category.

However, most of the "fetal cells" used in research come from harvesting the bodies of children who are aborted, between the age of 8 weeks and term. These are sold as tissue cultures by commercial labs. Some of the cultures have been cultivated for 20 or 30 years and the genes and growth habits have been studied so they can be counted on to do what they are supposed to do.

Sometimes the "fetal" tissues are harvested after a natural miscarriage. These are considered ethical. I don't think there are any commercially available standard tissue cultures from miscarriages."

So, research using fetal stem cells obtained from the unborn fetus fit into the categories of EMBRYONIC and DESTRUCTIVE. Other research using fetal stem cells that come from the umbilical cord and amniotic fluid, which are not part of the unborn, is not immoral and fit well into the ADULT and NON-DESTRUCTIVE categories. Fetal stem cell research overlaps the categories as the morality of it depends on where the fetal stem cells come from. Therefore, "fetal" stem cell does not make a good category from the pro-life point of view as we aim for a clear-cut categorization based on morality.

**WHAT IS A PLURIPOTENT STEM CELL?** Simply put, stem cells are named pluripotent and multipotent depending on how many different cells they can turn into.

1. Multipotent stem cells can turn into several other cell types. Most adult stem cells (ASC) are multipotent.
2. Pluripotent stem cells can turn into nearly all the 200 plus cell types found in the adult body as the embryonic stem cells (ESC) of the human embryo do under the ideal conditions of the womb. (In fact, this has only ever happened in the womb, never in the laboratory, which has never been mentioned in the media to my knowledge.) A few adult stem cells (ASC), found in the umbilical cord, the nose and bone marrow, have the properties of being pluripotent and are currently being researched to find their true potential. These findings have had next to no publicity.

**WHAT IS AN INDUCED PLURIPOTENT STEM CELL (iPS CELL)?** iPS cells are obtained by reprogramming an ordinary somatic (body) cell, such as a skin cell, back to a stem cell like it originated from in the pluripotent state. The stimulants needed to do this do not have to come from the unborn!

This is very important because research, using pluripotent stem cells, does not have to use human embryonic stem cells (hESC). So, iPS stem cell research is ethically non-controversial, as it does not require the destruction of human life or the use of human cloning.

**ARE iPS CELLS CONSIDERED ADULT OR EMBRYONIC OR DO WE NEED A THIRD CATEGORY?** The new iPS cells are reprogrammed adult cells induced to be stem cells with pluripotent abilities. Therefore, they could be thought of as research on adult stem cells as long as the stimulates do not come from the unborn. The media has totally confused people by describing the iPS cell as becoming an embryonic

stem cell. An adult cell cannot become an embryonic stem cell. Perhaps a third category is needed as suggested by Gene Tarne from Do No Harm, [www.stemcellresearch.org](http://www.stemcellresearch.org):

"iPS cells ... are not really adult stem cells, as they are not stem cells isolated and cultured from pre-existing tissue, nor are they embryonic stem cells as they do not come from the destruction of an embryo. Rather, they are truly pluripotent stem cells that can be derived by reprogramming an ordinary body cell, such as a skin cell, back to a pluripotent state, virtually identical to the pluripotent state of an embryonic stem cell."

You may want to take a look at my 2-page report on [iPS Cells](#) for a more in depth look at iPS cells and the issues surrounding them.

**WHAT ARE TOTIPOTENT CELLS?** Totipotent cells are capable of self-directed, organized development, such as the human zygote, which is able to make both the body and the placenta. Cloning creates a new human embryo that is also capable of self-directed, organized development. To create human embryos either way (union of sperm and egg or cloning) with the intention of destroying them or using them for the benefit of others is immoral. Embryonic stem cells are not totipotent.

**WHAT IS CLONING?** Instead of creating a human embryo through the union of an egg and a sperm, a somatic cell is bound with an egg through a procedure named SCNT for Somatic Cell Nuclear Transfer. When used in embryonic stem cell research, SCNT is referred to as "therapeutic cloning" to make it sound different than "reproductive cloning" in hopes of side stepping questions of morality. This tactic worked well to get Californians to pass Proposition 71, which provided \$3 billion in funding for embryonic stem cell research (ESCR). "Therapeutic" cloning and "reproductive" cloning describe the use of the cloned embryo. The process of creating the embryo is the same. The fact is that an embryo is made that is capable of self-directed, organized development. Dr. Beverly B. Nuckols of [lifeethics.org](http://lifeethics.org) states it well:

"Even if he or she will be killed or die naturally in a few days, it's not right to create human beings with the intention of destroying them or using them for the benefit of others and to their own harm."

**WHAT IS THE MORAL ISSUE?** Some people believe that scientific research should not be limited by subjective or arbitrary standards of ethics or morality. Americans do not believe in the Communist philosophy that the end justifies the means. Destroying a life to help a life has Nazi overtones that Americans want no part of. Proponents of ESCR and cloning get around this argument by saying that the ends, by far, outweigh the destructive means; or, they say that they don't believe that the embryo or clone is a human being. Ironically, all scientists KNOW, NOT BELIEVE, KNOW that the embryo and the clone is a human being. One who bows to that argument might come back with, "yes it is a human being but it is not a person." Yet the term human being comes from being human, which implies personhood. Responsible Americans, be they teachers, lawyers, or blue-collar workers, draw the line on reaching their goals when the means are immoral. We expect scientific researchers and the Bio-Tech industry to do the same.

**WHAT ARE THE OTHER ISSUES?** Mainly, ESCR and cloning are legal. The laws are not in place to protect humanity. There is more.

Proponents of embryonic stem cell research (ESCR) consider the fact that ASC cannot turn into every cell type found in the body a limitation and insist that ASC are therefore inferior. However, while each line of multipotent ASC is more limited than the "ideal" embryonic stem cell line, there are many kinds of ASC multipotent lines.

Proponents of embryonic stem cell research report that adult stem cells grow much too slow to be of any real value, whereas ESC's grow very fast. These same proponents will not mention that in the laboratory ESCs grow uncontrollably into tumors, mostly cancerous. In our fast paced society "fast" sounds good and the media leaves it at that.

Proponents of ESCR have had such a great influence on the press that the press has pretty much ignored the accomplishments of ASCR and the therapies that have helped hundreds of thousands of patients in 73 treatment areas. Articles reporting cures using adult stem cells attribute the cure to stem cell research (SCR) in general, leaving out the word "adult." It is not unusual that the success of adult SCR go to embryonic SCR. The reader or listener is misled into believing that there are therapies from embryonic stem cell research when there have been none.

Legislation for funding iPS cells will have to be carefully worded to exclude embryonic stem cell inducing or the tax payer will be duped into paying for embryonic stem cell research.

Pluripotent adult stem cells have been found in the bone marrow, nose, and umbilical cord. The only real press coverage of these finds have been reporting on umbilical cord blood banks and even this coverage has been filled with false statements.

It is ironic that proponents of embryonic stem cell research tout EMBRYONIC SC to be superior to ADULT SC when ADULT SCR has provided therapies and EMBRYONIC SCR has not helped anyone after 25 years of research and billions of dollars spent. The billionaires and large corporations who have lost their investment go after our tax dollars selling the "potential" hype to the media and on to the voters. ESCR is failed research. These investors now lobby for our tax money. They know that once they get their foot in the door, it's all a matter of budget, and with their lobbyist efforts the funds are virtually unlimited. They use the life issues debate to get pro-abortion advocates to back up their request for our tax dollars.