

## Stem Cell Research

Ted Thrasher

Ted and his wife Julia have 2 children. Ted is a graduate of the McCloud School of Preaching and has labored with churches in Oklahoma and Missouri. He currently preaches at the church in Olathe, Kansas. He is a fellow laborer with the work in the Mid-West School of Biblical Studies, International Bible Studies Lectures and the Mid-West Lectures. He is an instructor in the Online Academy of Biblical Studies.

### INTRODUCTION

We live in an age of great scientific wonders and advancements which is fraught with many ethical and moral questions and few clear answers from the leaders of the fields of science, economics, philosophy, politics and even religion. We also live in an age of great immorality and worldliness, where money is the god of many people and sin is considered by many to be normal, acceptable and even preferable to a life of righteousness. Being in the midst of this world, we, as Christians, cannot afford to disengage, but instead we must be able to chart a course which is true and right, while at the same time realizing the potential of and effectively using those things which are right and good in the scientific realms. We understand that true science and true religion do not conflict, because true science is but man's discovery and application of God's wisdom in His creation. However, problems arise whenever false religion or false science, or both, are held up as true and practiced.

Thankfully, unlike those who follow the ways of this world or false religion, we are not at sea without a compass. We have the great moral compass which God has given us through His inspired Word, the Bible, to guide us safely through the rocky straits of this life and lead us safely to our Heavenly home. We must rely upon It as we take Its principles, apply them to the questions of life and reach conclusions which are right and true in guiding our lives and the lives of others.

One of the major areas of ethical and moral concern in recent years is in the scientific field of genetics and reproductive techniques and research. Stem cell research has been in the midst of this concern due to the nature of how some stem cells are produced and the use of some stem cells in genetic experiments. The moral issues of human cloning and *in vitro* fertilization techniques are also connected to this controversy because of the way some stem cells are acquired for research and use.

Stem cells have been touted as one of the most important discoveries to advance medical science in our generation, perhaps in medical history! They are being used at this time in the treatment of cancer patients and other serious illnesses where conventional medical treatment has not worked well.

Those doing research in this field hold high hopes that in the future stem cells used in genetic therapy may be able to cure or significantly alleviate the suffering of people with brain disorders, heart disease, liver disease, diabetes, skin disorders and perhaps even to grow genetically matched human tissue replacements. Pharmaceutical companies hope that stem cells may help them more

efficiently test medications in the developmental stages. Some scientists hope to unlock more of the secrets of biology through stem cell research, to better treat or even avoid certain diseases.

There can be no doubt that this is exciting and hope inspiring news when considered from the aspect of those who are suffering from life-threatening and debilitating illnesses. Could it be possible, that instead of treating diseased tissue with surgery or medications, doctors could just inject some genetic material and have it replace the diseased tissue in time? That is the good intentioned hope and efforts of many doing stem cell research.

However, there are other areas of stem cell research where it would seem that some are not so well intentioned because of what it costs in terms of human life to acquire the stem cells. Further the misguided use of stem cells by some to genetically engineer what have been termed “designer babies” or even worse to fall back to the Hitler-like atrocities of eugenics in an attempt to build a master race of superior human beings, is repulsive and sickening to morally discerning people. Further, it seems that some are seeking to practice cloning techniques, while placing it under the heading of stem cell research for the betterment of mankind and the alleviation of pain and suffering.

Where should we, as Christians, stand on the moral issue of stem cell research and use? How can we cut through the moral fog and steer a true and safe course in this area of science? In our lesson, at this hour, we wish to examine some of the facts concerning stem cell research and use, and expose some principles to guide us in this area. We will ask and answer the questions: (1) What are stem cells? (2) What are the sources of stem cells? (3) What are stem cells used for? and (4) What are the moral and ethical issues involved in the research and use of stem cells from a Biblical perspective?

## I. WHAT ARE STEM CELLS?

In order to understand what stem cells are, it is helpful to understand the nature of cells and somewhat of how they work, as well as the different types of stem cells. Essentially a cell is nature’s building block and has the capability to divide, as well as to be able to “specialize” and become a certain kind of cell in the body. It is now known that the cells in our bodies contain the genetic material (DNA) which can instruct the cell to be a specific part of our bodies.

Have you ever wondered why you grow hair on your head and fingernails on your fingers? Or if you have a cut on your finger why it mends back as finger tissue, rather than eye tissue? The reason is that the specific genes in those cells have been “switched on” to specialize the cell to be a hair or a fingernail or part of the finger. Even though they had the ability to be some other type of cell, the genes in them have been selected to be that specific body part, while the other genes are “switched off.”

From the moment of conception, when the egg is fertilized by the sperm, our cells start to divide and produce other cells, and in each division the cells start to become smaller and more specialized as various body parts of the embryo develops. In the second day, the fertilized egg, which is about six-thousandths of an inch in diameter, will divide and form the blastocyst, which is a hollow fluid filled membrane in which the cells continue to divide. Within three days of conception the human embryo

will have divided four times and be sixteen cells in number. At the end of a month, it will be one-eighth of an inch long and the cells will number in the millions. At the end of nine months, if all goes well, the fetus is ready to be born as a human baby.

The process of cell specialization in embryonic development has been likened to that of the development of a country, such as the United States. Consider the beginning as one big country without any divisions. It is divided into areas such as North, South, East and West, then into the various states with their boundaries, then the counties, districts, cities, sub-divisions, houses or buildings, rooms or offices, and parts of the rooms or cubicles. Each cell becomes more specialized with each division.

Stem cells, in the embryonic stages, are the non-specialized cells or those cells which are in the blastocyst from about three to seven days and thus they have not developed into any specific type of cell or (as the process is called) “differentiated” into a certain type of cell. They have been called nature’s “blank slates” because they can develop into any kind of cell by the genes in each stem cell being selectively “switched on” to specialize the cell to become any human cell. In later development, such as in late term fetuses and even later in children and adults, they are somewhat more specialized, but researchers are now finding that they can still be changed to a degree to become various types of specialized body cells.

There are essentially three different types of stem cells, as they are identified by the scientific community as to their degree of specialization:

1. **Totipotent** stem cells are the least specialized and fundamental type of stem cells, since they are capable of becoming any kind of cell in the development of the embryo and the tissue surrounding the embryo to the full grown fetus. The embryo itself is considered to be totipotent or capable of developing into a complete organism.
2. **Pluripotent** stem cells are those cells which can develop into almost any part of the body. They have the capacity to affect more than one organ or tissue in development. Thus, they are not fixed or locked in as to potential development, but can still differentiate into various specialized types of tissue and organ elements. These are the most commonly sought after stem cells from embryos.

They have some supposed scientific advantages over other stem cell types. They can divide over and over without forming tumors. Depending on which source one takes, there are between sixty to seventyfive stem cell lines in existence which can be kept alive indefinitely. They supposedly respond easier to stimulus to change them to specialized cells than some other types. They can divide unequally, with one cell being more specialized, while the other is a stem cell. The down side is that they are more likely to be rejected by the immune system of one being treated with gene therapy using them.

3. **Multipotent** stem cells are those cells which have developed into certain general types of body cells, such as blood cells, skin cells, brain cells, and so forth. They are capable of becoming more

specialized into the various cells needed. For instance blood stem cells can specialize into the different kinds of blood cells: white blood cells, red blood cells and platelets. They are sometimes called the progenitor or precursor cells since they can give rise to diverse cell types in response to environmental cues. At one time it was thought that they could not be changed from their various general types, but researchers have found that some can be changed into specialized cells from different general types (such as some brain stem cells can be specialized into muscle or blood cells). These are sometimes called “adult” stem cells and they exist in the human body from the developed fetus through adulthood.

## II. WHAT ARE THE SOURCES OF STEM CELLS?

At the present time, there are essentially five different sources of stem cells. Keep in mind that even though we list these sources, that does not mean that they are all either legal or ethical sources.

1. **Adult bone marrow, brain tissue**, and some other types of tissue, such as fat, muscle and bone. These are usually collected from a donor or the patient receiving the treatment in order that the genetic makeup of the stem cells will match the person being treated and thus minimize the possibility of immune rejection in the person being treated with them. These stem cells are called “adult” stem cells, not because they necessarily come from adults instead of children, but in contrast to stem cells taken from other sources, such as human embryos.

2. **Umbilical cord blood** taken from the umbilical cord of a newly born baby. This was the source of the stem cells used in the treatment of Molly Nash, a young Colorado girl in need of a bone marrow transplant. In order to overcome the problem of rejection, the doctors needed stem cells from a close genetic match. So, her parents decided to try *in vitro* fertilization and as a result her brother, Adam was born from whose umbilical cord blood the stem cells were obtained to treat Molly in October of 2000. Despite the good use of the stem cells obtained, a life was brought into this world, not for Adam’s intrinsic worth, but to be used and exploited as a donor for his stem cells to save his sister, Molly. Further, several other lives in the embryonic stages were taken in the IVF screening process to find the closest genetic match. Of course, the liberal media exulted of the great love and bonding of this family, but it was a blatant act of selfishness and murder of innocent life and not scientifically necessary.

This source of stem cells is readily available. If parents are willing to give informed consent for the use of umbilical cord blood to obtain stem cells, then it would be a better source in comparison to embryonic sources. However, this also raises the question of whose consent needs to be considered as well. Should parents be willing to sign over the genetic material of their babies upon birth to be used in developing new cell lines or for the treatment of others? Does the child have a right to have his/her genetic future preserved? Further, on the scientific side, these cells are not as highly valued as the pluripotent cells from earlier developmental sources.

3. **Aborted fetuses**. With informed consent, a woman who chooses to murder her fetus by abortion can choose to “donate” the fetus for the harvesting of the organs, tissue, blood and stem cells. Of course, it is possible that a fetus might be aborted or die from other causes than intentional abortion

and the fetus could be donated for this cause, but this is rare in comparison to the number of intentionally aborted fetuses in this nation. Further, this is not the most sought after source of stem cells because of the difficulty of obtaining the type of consent necessary, the immoral stigma attached to abortion and the type of stem cells obtained from fetuses are not considered as good by scientists who would rather obtain pluripotent stem cells, rather than multipotent stem cells.

**4. Human embryos “left over” from *in vitro* fertilization procedures.** In these cases, the embryos are produced by taking several human eggs from a woman donor and fertilizing them with the sperm from a male donor. When the embryos get to the blastocyst stage, they are screened and the “best” selected to be implanted in a woman’s womb. The remaining embryos are then destroyed, or if donated, the stem cells are harvested and used for treatments, research or developing new stem cell lines.

On August 9, 2001, President Bush called for the end of federal funding for stem cell research to groups who destroy human embryonic stem cells based upon the argument that life starts at conception. However this did not cover research on the stem cells already developed from the destruction of embryos prior to August 9, 2001. So, in April, 2002, about \$3.5 million of federal money was awarded for embryonic stem cell research to several organizations.

The advocates of this source of stem cells argue that since the unwanted embryos are going to be destroyed anyway, then it is acceptable, and in some cases, immoral, not to use them for stem cell research. Actor Christopher Reeves, who played Superman, argued that it would be wrong to throw away embryos like garbage when they could be used to save lives through stem cell research.

In addition to the excess embryos created by IVF clinics, there are a few documented cases where some have actually payed women for eggs to create human embryos for the express purpose of destroying them and harvesting their stem cells. With this step downward into the pits of moral darkness, the proponents of this source have opened a new door in the exploitation of women and murder of innocent human life, which some in our government are now attempting to close. These researchers have reached the low point in science where life is created as a commodity to be harvested and the remains discarded like an empty corn husk.

**5. Human embryos created by cloning.** This is where the nucleus of an egg is removed and then the nucleus of a somatic cell is transplanted into the egg to produce an embryo. The resulting embryo is allowed to progress to the blastocyst stage, and then it is destroyed when the stem cells are removed for research purposes. Proponents in favor of this source of stem cells basically argue that the embryo is not life until it is attached to the womb or that it is not truly a human life until further development takes place. Some place an arbitrary fourteen day time limit on this procedure past which the embryo must be destroyed to prohibit the cloning of developed human fetuses.

This process is also known as “therapeutic cloning.” This is where the moral and political debate over embryonic stem cell research centers at the present time. Many who are completely opposed to human cloning to produce new born children, are in favor of this method being used to produce human embryos for stem cell research. But though most in the scientific community reject human

cloning to produce a full term clone, they readily admit that the practice of cloning to produce stem cells could easily lead to better cloning techniques (if scientists could practice it legally and with the help of federal funds) which could lead to a full term clone. Further, they admit that it would be virtually impossible to control all the cloned embryos and keep some unscrupulous group of scientists from producing a full term cloned human. In Scotland, cloning for embryonic stem cell research has been legalized and clinics are gearing up to start producing new stem cell lines from these sources next year.

On January 28, 2002, Senator Sam Brownback of Kansas, along with Senators Bond and Inhofe, introduced S. 1899 to prohibit human cloning and the cloning of embryos for stem cell research. On April, 20, 2002, President Bush heartily backed this bill, which the House passed by a margin of over one-hundred votes in 2001 in the House version of it. President Bush called upon the Senate to support this bill. Unfortunately, on May 1, 2002, Senator Arlen Specter, along with Senators Kennedy and Clinton, introduced S. 2439, which prohibits cloning for the purpose of transplanting the embryo in a woman, but supports cloning to produce embryos to be used for stem cell research. So, the political and scientific ethical debate continues at this time over this source of stem cells for research.

### III. FOR WHAT ARE STEM CELLS USED?

Stem cells have been heralded as the panacea of medical science of the 21<sup>st</sup> century. Some good results of stem cell research can be seen in the treatment of cancer patients and other diseases. Yet we find the more we learn about what is claimed and hoped for versus the actual results, the more we realize that it is a science in its earliest stages and by no means totally understood or controlled. Those experimenting with this type of research do not know the possible outcome over time or the genetic impact it may have on future generations upon those who reproduce following genetic engineering or those who are treated with gene therapy.

There are at least six different ways that stem cells can be used. Again, this does not mean that all of these are good, moral or even legal, but they are possible uses of stem cells.

**1. Somatic cell therapy or gene therapy.** This is where the diseased tissue is hopefully replaced after stem cells are injected in an attempt to start the normal growth of tissue to replace the diseased tissue. In some cancer treatments, the cancer cells are killed with chemo-therapy or radiation and then the stem cells are transplanted to replace the cancerous cells and regenerate the tissue to its normal function. In the treatment of Parkinson's disease, the dopamine producing areas of the brain are injected with stem cells in an effort to replace the diseased cells and once again produce dopamine in the brain. Research on rebuilding heart tissue following a heart attack and research on the pancreas for the secretion of insulin in diabetic patients are other areas of stem cell use at this time.

**2. Germ-line changes** or changes in the reproductive cells of an individual or individuals in order to affect the genetic make up of the next generation or their offspring. The common reason for this use of stem cells would be to prevent birth defects or correct genetic defects in the children of those with known genetic traits which would certainly pass to their children and perhaps bring about illness,

disease or pre-mature death in their children. While this may be more acceptable than some of the other uses of stem cells, it still opens the door to genetic screening and raises the issue of the quality of life and man's effort to pick his offspring for their so-called desirable genetic traits versus undesirable. While one might not purposely bring a child into the world who would be destined to suffer horribly or be deformed, there are other good alternatives to germ-line genetic changes, such as adoption.

**3. Genetic engineering.** This is an attempt to use stem cells to enhance the genetic make up of already healthy individuals so that they can be stronger, taller, more mentally alert, or more attractive in some ways. Although some may argue that this is equivalent to plastic surgery, it actually goes much deeper. It affects cellular changes in a person's body with unknown side effects. Further, no one knows at this time the effect this might have upon the lineage of a genetically engineered person. There is no medical benefit in attempting to use precious stem cells to enhance normal healthy people by using, at best, a risky procedure, when they could be used to treat those who can be helped with stem cell treatment and who are suffering from disease and illness.

**4. Eugenics.** This is an effort to change the genetic makeup of a group of people in an effort to improve the stock or to produce a line of people who have superior genetic features. It can also be used to produce offspring with certain preferred genetic traits and to control certain genetic characteristics such as gender, eye color, skin type, hair and other features, through genetic selection or alteration. This was the concept of Hitler as he attempted to produce a superior race to rule the world. The difference is that now it can be done in the test tube instead of using men and women to naturally produce children.

One overseas cloning factory now boasts that you can come to them and go home pregnant with the child of your dreams. Welcome to the age of designer babies where you can shop for a baby and pick out your son or daughter's traits like shopping for a new car or clothing. Woe, to those who go down this slimy path to destruction and those who promote and provide it. How disgusting and perverted this is to reasonable and morally minded people!

**5. Pharmaceutical testing.** Those doing research on medications to treat illnesses and promote health could test proposed medications on some lines of stem cells in an attempt to determine if they might be effective in the treatment of humans. This would hopefully speed the process and eliminate further testing on some medications which are ineffective or harmful without having to advance them to other testing. This could lower the cost of developing effective medications.

**6. Biological knowledge.** Stem cells can be used to increase the knowledge base of how cells and genes work and promote scientific advances in other areas of genetic treatments and help to detect and avoid genetic outcomes which could be detrimental to either the patient or the offspring. Further this could help to discover the deeper secrets of human development from conception to death.

#### IV. WHAT ARE THE MORAL ISSUES OF STEM CELL RESEARCH AND USE?

There are many complex and difficult political, social and economic concerns in this branch of science. However, our concerns should be with the Biblical principles which guide us in our decisions. There are basically two areas of concern in this field of science: (1) The source of the stem cells used for research and use and (2) The use of the stem cells.

**1. The source of stem cells.** The crux of the moral problem here has to do with embryonic stem cells which are obtained by stripping the stem cells of tiny embryos, whether they are produced by IVF or by cloning procedures and the use of intentionally aborted fetuses as a source. There is no problem, per se, with obtaining stem cells from umbilical cord blood or from adults or children with their informed consent. The argument is essentially the same as that for the abortion issue or when does life begin, although there are other concerns for the future “genetic life” of one whose blood is used.

It is clear from the Bible that life begins at conception and man does not have the right to take innocent life. God recognizes that a person is living while in his mother’s womb. David recognized this truth in **Psalms 139:13-16**. Certainly, the infant who grew into the man, John the Baptist was very much alive at six months in Elizabeth’s womb (Luke 1:41-44). God recognizes the cry of murdered life (Genesis 4:10) and surely thousands of babies and embryos (which possess the potential to develop to full term babies) have been murdered at the hands of abortionists, doctors in IVF clinics and scientists in laboratories for research purposes.

God’s law protects innocent human life and the Bible clearly teaches the sanctity of life, or that each life, even at the microscopic level, is to be respected and treated with dignity, since it is created in the image of God. **Genesis 9:6** says, “Whoso sheddeth man’s blood, by man shall his blood be shed: for in the image of God, made he man.” Disregard for the sanctity of life in one stage, creates contempt for it in other stages. Human life in the laboratory, in the womb, in the cradle, in youth, in maturity, in old age, where do we draw the line when we start murdering innocent life?

Some argue that life does not begin with the fertilization of the egg or that the cloned embryo is not really life, until it is implanted in a woman’s womb. However, if that is case, then why do the same people want to set a time limit to destroy the cloned embryo after fourteen days of development? They know that it has the *potential* to develop into further stages of human life, just as the embryos being destroyed from fertilization, if implanted in the womb, could develop into a full term fetus. Truly, the legs of the lame are not equal!

Of course, some do admit they are destroying life, but reason that it would be destroyed anyway, so why not put it to some good use? This is pragmatism or the faulty concept that the end justifies the means. In other words, our killing the embryo to produce stem cells justifies the killing of it much more than just killing it. Paul answered this false reasoning in **Romans 3:7-8**, “For if the truth of God hath more abounded through my lie unto his glory; why yet am I also judged as a sinner? And not rather, (as we be slanderously reported, and as some affirm that we say,) Let us do evil, that good may come? Whose damnation is just.” The end of producing stem cells to help others, does not justify killing innocent human life in the embryonic stage.

Further, we protect even those who deserve to die, such as those sentenced to death for crimes they have committed, from this type of barbarous death. We do not take a death row inmate and start carving him up to harvest his organs and body parts for medical uses. We have enough respect for life to treat it with dignity, even when one is condemned to die.

Another problem area with cloned embryos is that they are produced asexually or without a father or mother. This is a blatant disregard for God's law of procreation, which from the beginning has been one man and one woman joined together in marriage, who enjoy the privileges of the marriage bed and bring children into this world through normal sexual relations (Genesis 1:28; 2:18-25; Hebrews 13:4). Some argue that twins (or at least one of them) are produced asexually when the cells divide into two identical embryos. However, this is not done without the fertilization of a human egg, as is cloning.

Still another area of concern with cloning embryos is the necessity of eggs to use in the cloning process. This is an effort to create life to exploit it and to gain either economically or scientifically. It is a form of prostitution, when women sell their eggs to research laboratories to produce cloned embryos from them. In an effort of some to get around the limited supply of human eggs, some are now using animal eggs from cows and pigs to create cloned embryos.

**2. The use of stem cells.** In this area there may be fewer concerns, but they are still grave in their consequences. Certainly the use of stem cells when used properly to treat disease, to test medications in development and to further the knowledge of biology is not unethical, immoral or wrong from a Biblical perspective. There may be some individual cases, even in these categories that would be wrong, if done for the wrong motivation or at the expense of another's health or spiritual well being. But, the proper use of stem cells, per se, in these areas would not be wrong.

However, the use of stem cells in the areas of genetic engineering or eugenics is morally and Biblically wrong from the perspective that human life is being altered at the genetic level to make changes which are motivated for evil purposes and which may adversely affect generations to come. These, as well as cloning, are a violation of God's law of procreation because life is being created without the normal sexual relations of a man and woman. Further, some of the procedures used in genetic engineering use multiple embryos which are destroyed in order to achieve the desired results. Obviously, this would involve the taking of several innocent human lives to accomplish.

Further, there is the possibility that the outcome of some of these attempts, just as in cloning attempts, may turn out to produce genetic deformities or other genetic defects in generations to come. The truth is those experimenting with this just do not have all the answers.

### CONCLUSION

Stem cell research and use seems to have great potential to benefit mankind, but as with many other sciences, such as nuclear physics, it has great potential for destruction as well in the wrong hands. In fact this research has resulted in the destruction of innocent human life and improper use with unknown consequences at the hands of some researchers who disrespect moral principles.

In **1 Thessalonians 5:20-21**, Paul wrote, "Prove all things; hold fast that which is good. Abstain from all appearance of evil." Let us prove or test all things by the standard of God's Word and abstain from and stand opposed to those things which violate God's laws for the sake of science or any other cause, while at the same time, we carefully embrace and use those things which are proven to be right and good according to God's Word. To do otherwise is to chart a course which will lead to destruction.

### Bibliography

Thompson, Bert & Harrub, Brad (2001) *"Human Cloning And Stem-Cell Research - Science's 'Slippery Slope'"* [Part III], Reason and Revelation, 21[10]:73-79.  
<http://www.ApologeticsPress.org>

Lee, Patrick & George, Robert P. (2001) *"Reason, Science, & Stem Cells - Why killing embryonic human beings is wrong."* National Review Online.  
<http://www.nationalreview.com/comment/comment-george072001.shtml>

Hedrick, Dr. Mark (September 24, 2001) *"Life Must Take Priority Over Research Source"* UCLA Bruin, Los Angeles, California.

National Institutes Of Health (May 2000) *"Stem Cells: A Primer"* Washington D.C.  
<http://www.nih.gov/news/stemcell/primer.htm>

Prentice, David A. (2001) *"The Science of the Cloning Debate: Latest Developments"* Power Point slides for Senate briefing. Indiana State University, Department of Life Sciences.  
<http://www.stemcellresearch.org/info/senatebriefing6-7.pdf>

Bush, George W. (August 9, 2001) *"Embryonic Stem Cell Research"* White House, Washington D.C. <http://www.whitehouse.gov/news/releases/2001/08/print/20010809-1.html>

National Institutes of Health (April 2002) *"NIH Grants Infrastructure Awards For Human Embryonic Stem Cell Research"* Washington D.C.  
<http://www.nih.gov/news/pr/apr2002/od-26.htm>

Brownback, Sam (January 28, 2002) *"Human Cloning Prohibition Act of 2001"* Senate Bill S. 1899, Washington D.C. <http://www.senate.gov> (reference bill number in search)

Specter, Arlen (May 1, 2002) *"Human Cloning Prohibition Act of 2002"* Senate Bill S. 2439, Washington D.C. <http://www.senate.gov> (reference bill number in search)

Bush, George W. (April 10, 2002) *"President Bush Calls on Senate To Back Human Cloning Ban"* White House, Washington D.C.  
<http://www.whitehouse.gov/news/releases/2002/04/print/20020410-4.html>

President's Council on Bioethics (July 2002) *"Human Cloning and Human Dignity: An Ethical Inquiry"* Washington D.C. <http://www.bioethics.gov/cloningreport/research.html>

Templeton, Sarah-Kate (August 26, 2002) *"Human Embryo stem cells to be used for research"* Sunday Herald, Glasgow, Scotland. <http://www.sundayherald.com/27171>