

8-2002

## Survey Attitudes Toward Stem Cell Research

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# SURVEY ATTITUDES TOWARD STEM CELL RESEARCH

Ejinkonye C. Anekwe



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Columbus State University  
College of Arts and Letters  
The Graduate Program in Public Administration

Survey Attitudes Toward Stem Cell Research

A Thesis in  
Public Administration

by

Ejinkonye C. Anekwe

Submitted in Partial Fulfillment  
of the Requirements  
for the Degree of

Master of Public Administration

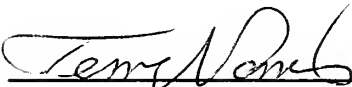
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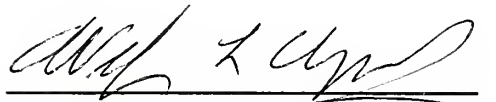
**A THESIS**

**Submitted by Ejinkonye C. Anekwe  
in partial fulfillment of the requirements  
for the degree of Master of Public Administration**


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## ACKNOWLEDGEMENTS

First, I would like to thank God, The Creator, from whom all good things come. I would also like to thank Dr. Norris (Thesis Advisor, Columbus State University) for providing inspiration and guidance on my thesis. Thank you, Dr. Chappell (Dean, College of Arts and Letters, Columbus State University), for approval of my topic and guidance in making this project come to fruition. I would like to give special thanks to my mother, Emma J. Anekwe, my grandmother, Eliza W. Maddox, and my brother, Obiora N. Anekwe, for their love and patience, and for believing in me. This thesis is dedicated to them for keeping me on the straight and narrow path. I also dedicate this thesis to the memory of my grandfather, SFC (Ret., US Army) Arthur A. Maddox (deceased), for being a father figure in my life and for encouraging me to strive for the best.

## ABSTRACT

In the following research study, a self-administered questionnaire was utilized to assess opinions regarding embryonic stem cell research based on three objectives: willingness to accept stem cells, educational background, and religion. A total of 113 fixed-alternative questionnaires were distributed to a diverse group of respondents. Nonprobability sampling using the accidental approach was performed. Support of stem cell research was dependent on Question 9, which asked what people thought about the cloning of human embryonic stem cells. The data revealed that most respondents from all groups surveyed opposed stem cell research. Neither education nor religion was a major determinant in the opposition to stem cell research.

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## **INTRODUCTION/STATEMENT OF PROBLEM**

Presently, there is a debate over the use of human embryonic stem cells to treat life-threatening illnesses. Supporters of stem cell research believe that stem cells, or undifferentiated, pluripotent embryonic cells, can provide treatments for diseases such as spinal cord injury and Alzheimer's Disease. Opponents, especially among many Roman Catholics and Fundamentalist Christians, feel that stem cell research would result in the destruction of the human embryo, which many Christians regard as a living thing. The purpose of this survey research is to examine the viewpoints of college-educated persons versus non-college-educated persons, as well as the viewpoints of Catholics versus non-Catholics.

## LITERATURE REVIEW

### Definition of Stem Cells

To discuss the parameters of stem cell research, a detailed scientific explanation of stem cells is needed. Stem cells are undifferentiated cells that can divide without limit (while the animal is alive). Once a stem cell divides, it has two possibilities: The cell can remain a stem cell or divide into a differentiated cell (Alberts et.al., 1989: 967). Stem cells are found primarily in two-week old embryos called blastocysts. However, stem cells are also found in fetal liver and spleen, as well as in mature bone marrow. Stem cells give rise to over 200 cell types in the human body (Golden, 2001: 28). For example, the muscle satellite cells form skeletal muscle, while the epidermal stem cell forms keratinized epidermal cells. Stem cells that give rise to one type of differentiated cell are unipotent, while other stem cells give rise to a small number of cell types. These cells are oligopotent. Stem cells that give rise to many cell types are referred to as pluripotent (Alberts et al., 1989: 968). The following paragraphs provide detailed information regarding stem cell formation.

Human stem cells are formed after fusion of an egg and sperm. After the egg and sperm fuse to form a zygote, the zygote then undergoes multiple divisions to form an embryo (Alberts, 1989: 874). The zygote, or two-celled organism, then undergoes a series of mitotic divisions (cleavage) about 36 hours after fertilization (Fox, 1993: 619). Each set of divisions double the number of cells. For example, two cells become four cells, which then doubles to eight cells. At the eight-cell stage, the embryo resembles a clump (Sadler, 1995: 33). This eight-cell embryo at this point (60 hours after fertilization) is called a

morula (Fox, 1993: 619). The morula then forms two important layers. The first layer, or inner cell mass, will give rise to the embryo. The second layer, or outer cell mass, will form the trophoblast, which will later give rise to the placenta (Sadler, 1995: 33). The inner cell mass contains the embryonic stem cells, which will eventually form the fetus and the child (Silver, 2001: 23).

By the fourth day, the morula undergoes further mitotic divisions to form 64 cells. At this point, the embryo is unattached to the uterine wall. Two days later, the embryo is converted into a structure called the blastocyst. A blastocyst consists of a hollow ball of cells. The blastocyst is divided into the two layers, the embryoblast (formerly the inner cell mass) and the trophoblast (formerly the outer cell mass). The trophoblast then flattens and forms on the epithelial wall of the blastocyst. This section will form the placenta, which will supply the embryo with nutrients (Sadler, 1995: 33). On the sixth day after fertilization, the blastocyst attaches to the uterine wall, with the inner mass projecting against the endometrium. By the seventh day, the blastocyst is completely buried in the endometrium (Fox, 1993: 619-620).

As mentioned earlier, the inner cell mass of a blastocyst contains the embryonic stem cells. After the blastocyst is embedded in the endometrium, the placenta starts to form, and the embryo begins to undergo differentiation, in which the stem cells become specialized cell types (Fox, 1993: 621). Specialization of cell types usually begins as the blastocyst forms two distinct germ layers. The outer germ layer, or ectoderm, will form organs such as the skin as well as the nervous system. The inner germ layer, the endoderm, will form the gut and its derived organs (Fox, 1993: 622). The middle layer, or mesoderm, will form in the third week of embryonic development. This layer will give rise to the

blood vessels, heart, kidneys, gonads, muscle, lymphatic system, and other internal organs (Sadler, 1995: 78-79).

Fetal tissue is not the only place where stem cells form and eventually differentiate. Mature (adult) tissue, such as the epidermis of the skin, can create stem cells when there is a need to replace differentiated cells that are unable to divide. These differentiated cells reach a terminal state in which cell division ceases (Alberts et al., 1989, 967). As a result, the stem cell produces cells that can undergo cell differentiation. In other words, stem cells replace older, differentiated cells.

Another source of stem cells is the bone marrow of adult humans. Blood cells are continuously replenished by stem cells. Since blood cells have a short life span, it is necessary for blood cells to be replenished to ensure proper transport of oxygen to vital organs and the removal of wastes from these organs (Alberts et al., 1989: 973). The hemopoietic, or blood-forming stem cell, is a pluripotent cell that gives rise to a variety of red and white blood cells (Alberts et al., 1989: 973). Hemopoietic stem cells first form in the mesoderm of the yolk sac at the third week of embryonic development. From this time period, the hemopoietic stem cells differentiate into blood cells and blood vessels (Sadler, 1995: 78). By the third month of fetal development, hemopoietic stem cells migrate from the yolk sac to the liver and the spleen. From months three to seven, hemopoiesis (blood formation) occurs in the liver and spleen. During this time period, the bone marrow assumes the function of blood formation. By birth, the liver and spleen cease their role as hemopoietic organs (Kuby, 1997: 48). As a human being matures, hemopoietic stem cells are continuously produced in the bone marrow, allowing blood to be replenished with the formation of fresh blood cells (Alberts et al., 1989: 973).

## Research Involving Stem Cells

Scientists have been researching stem cells for over two decades. However, research involving the use of stem cells for medicinal purposes has been explored quite recently. The defining moment concerning human stem cells came in November 1998 at the University of Wisconsin-Madison. There, a researcher by the name of James Thomson succeeded in isolating human embryonic stem cells from surplus embryos at a fertility clinic (Golden, 2001: 27). To avoid federal restrictions imposed on the University of Wisconsin-Madison, Thomson set up a laboratory with Geron Corporation, a Menlo Park, California, based biotechnology firm in 1995. Thomson, with the help of a part-time assistant, began researching the usability of human embryonic stem cells in medicine.

According to Thomson, frozen embryos were produced by in vitro fertilization (IVF) from individuals who consented to the research after approval from an institutional review board (Thomson, 1998: 1146). These embryos were cultured until the blastocyst stage was reached. Fourteen inner cell masses were isolated from the blastocysts. The embryonic stem cell lines were derived from the selection and expansion of individual cell colonies (Thomson, 1998: 1146). The cells were found to express high levels of telomerase activity. Telomerase is an enzyme that adds telomere repeats to chromosome ends, which maintains the length of chromosomes. Because of this, telomerase is responsible for lengthening life spans in cells. Human diploid somatic cells do not exhibit telomerase. In fact, telomeres shorten in human chromosomes as they age. In contrast, germ cell lines and embryonic tissues contain high levels of telomerase. Thus, the increase of telomerase activity in embryonic stem cell lines indicated that these cell lines have a greater replicative life span than somatic cells (Thomson, 1998: 1146).

The human stem cell lines were found to form the three germ layers: ectoderm, mesoderm, and endoderm (Thomson, 1998: 1147). The results of Thomson's research indicated the usability of human embryonic stem cells in the treatment of diseases such as Parkinson's Disease and juvenile-onset diabetes mellitus, which results from the death or dysfunction of one or more cell types (Thomson, 1998: 1147). Replacement of dead or defective cell types by embryonic stem cells, according to Thomson, "could offer lifelong treatment" (Thomson, 1998: 1147).

Thomson's research signaled a new direction in the area of medical research. Thanks to Thomson and his colleagues, human embryonic stem cells were found to revitalize diseased cell types. However, ideological debates began to rage because of stem cell research. First, John Gearhart, a researcher at Johns Hopkins University, published results indicating he cultivated stem cells from the gonads of aborted embryos (Andrews, 1999: B5).

A third group of researchers, led by James Robl at the University of Massachusetts announced that human cheek cells, fused with an enucleated cow egg resulted in an embryo. The embryo divided five times, but no further work was done on the human-cow hybrid. Out of the three groups of scientists, Thomson became the most credible source because Gearhart conceded that Thomson was ahead in researching stem cells (Golden, 2001: 27), while Robl did not publish his results (Andrews, 1999: B5).

As a result of extensive scientific research on embryonic stem cells, Thomson became a celebrity in the stem cell debate. In addition, the issue of stem cell research has become an ethical one, bringing religious and moral opinions from all sides. Proponents of embryonic stem cell research, including Thomson, believe that embryonic stem cells

“should be useful in human developmental biology, drug discovery, and transplantation medicine (Thomson, 1998: 1145).” Even though Thomson was a non-practicing Congregationalist, Thomson believed that research involving human embryos could be used for benefiting human life. Embryos from aborted fetuses, Thomson reasoned, were going to be thrown away. Thomson felt that discarded embryos could be saved, frozen, and induced to replicate, forming a supply of “immortal” stem cells (Thomson, 2001: 27).

Opponents of embryonic stem cell research are numerous in number and include researchers, lawyers, political scientists, religious denominations, and political representatives. These groups either oppose the use of embryonic stem cells for research or seek to limit the uses of embryonic stem cell research. Some opponents, especially fellow researchers, prefer the use of adult stem cells (for example, stem cells from the bone marrow) for research. At this point, a detailed summary of federal responses to the stem cell issue is needed. The following paragraphs will discuss federal reaction to the research of Thomson, Gearhart, and Robl, paying particular attention to Thomson’s research.

#### Position of the Federal Government

Soon after Thomson, Gearhart, and Robl successfully isolated embryonic stem cells, an ethical debate began, reaching all the way to the White House. In 1999, federal agencies, such as the National Institutes of Health (NIH), supported stem cell research (Andrews, 1999: B5). However, a federal law created in 1996 and backed by abortion opponents in Congress, the National Right to Life Committee and the National Conference of Catholic Bishops, banned government agencies from performing embryonic research

and banned the use of federal funds to perform embryonic research (Gottlieb, 2000: 527). Furthermore, nine states banned human embryonic research entirely, with 16 states banning the sale of parts of embryos and fetuses, which, according to Andrews, “would prevent the commercial use of stem cells from embryos (Andrews, 1999: B5).”

Responding to federal and state bans on embryonic research, the NIH attempted to find out if research using embryonic stem cell violated any federal laws; in other words, NIH wanted the federal government to relax the ban on embryonic research. In response to NIH’s request, federal lawyers informed NIH that embryonic stem cell research would not violate the ban on embryonic research if the cells in question were already isolated in the laboratory. Furthermore, the federal government stated that its ban on acquiring fetal tissue prevented government agencies from paying for the tissue. Researchers receiving federal funds could, however, use private biotechnology corporations as suppliers for embryonic stem cells (Andrews, 1999: B5).

As a result of loopholes in federal laws, the NIH was allowed to use embryonic stem cells in research. Private researchers were also allowed to use embryos for research and to supply those embryos to NIH. According to Andrews, several universities, fertility clinics, and private companies wanted to know if they could evade federal bans through loopholes. Private corporations, such as Geron Corporation (the financial supporters of Thomson) saw their stock prices soar 31% (Andrews, 1999: B6). At the time Andrews’ article was written, there was debate over whether private corporations should fund embryonic stem cell research.

Since embryonic stem cell research was a relatively new research specialty, the federal government itself needed to rethink its ban on embryo research. Research by



Thomson and Robl introduced unprecedented events in human research. For example, Robl's research resulted in a human-cow hybrid embryo. As with Thomson, Robl's research was funded by a private company, Advanced Cell Technology. Furthermore, many researchers stated that the human-cow-egg technique did not involve fertilization. In 1999, President Clinton asked the National Bioethics Advisory Commission (NBAC) for an opinion on the matter. The NBAC felt that there was insufficient evidence that the human-cow hybrid matched the commission's definition of a human embryo. As a result, there was confusion at the federal level over what constituted embryonic stem cell research. By September 1999, the NBAC reported that the isolation of embryonic stem cells after infertility treatments was justifiable only if "no less morally problematic alternatives are available for advancing the research" (Prentice, 2001: 2). However, present claims of scientific alternatives to stem cells were not supported by NBAC. NBAC did state that in the near future, alternatives might be developed. In addition, NIH developed guidelines to conduct stem cell research. Within the proposed guidelines were protections for couples whose in vitro embryos could be used for stem cell research. There was a concern among NIH that doctors could prescribe medication that could induce the production of excess embryos, some of which would be used for research (Andrews, 1999: B7).

Since 1999, the federal government has debated lifting the ban on embryonic research. As mentioned earlier, the NIH recommended lifting the ban. Also, private corporations have been performing embryonic research, circumventing federal restrictions, since private corporations did not receive federal funds for embryonic research. Proponents felt that embryos that would otherwise be discarded should be used for

research. Opponents felt that the use of embryos for research was immoral and equal to murder. In August 2000, the federal government announced that it would provide federal funding of embryonic stem cell research. The federal government stated that as long as the embryos were donated or, in certain cases, derived from aborted fetuses, these cells could be used for research (Gottlieb, 2000: 527). President Clinton felt that the new guidelines would have staggering benefits for patients suffering from life-threatening diseases. The NIH, which in 1999 suggested the relaxation of the federal ban, stated that it would fund embryonic research only if couples in the course of fertility treatments created the embryos. However, those couples could not use these embryos. (Gottlieb, 2000: 528). NIH also stipulated that embryos from fertility clinics would be the same ones discarded after treatment, so those embryos could be used for research purposes. In addition, researchers must specify to the donor whether personal information will be revealed. This measure was developed in case a researcher needed to contact the donor if he/she has an infectious disease. Donors could not specify where their embryos could go or to whom they would go. Furthermore, embryos could not be sold (Gottlieb, 2000: 528).

The new federal guidelines for stem cell research allowed researchers to receive federal funds to perform embryonic research. However, scientists were limited because embryos could not be sold, but were to be donated for research. Also, scientists were required to inform donors if those donors suffered from any infectious diseases. The new guidelines did not ease opposition; in fact, it increased opposition from antiabortion groups. These groups referred to embryonic stem cell research as immoral and illegal (Gottlieb, 2000: 527).

The debate at the federal level continued through 2001. By this time, the Stem Cell Research Act of 2001, signed by Senators Specter and Harkin, became law. The Stem Cell Research act supports embryonic stem cell research, as long as the research did not result in “creation of human embryos” (Prentice, 2001: 2). The debate over stem cell research raged even when President George W. Bush came into office. Rather than publicly state his opinion, President Bush quietly wrestled with the issue. At one point, Bush was to decide whether the federal government should lift its ban on embryonic stem cell research. At times, Bush compared the decision to that of sending troops into battle (Gibbs and Duffy, 2001: 16). Bush even met with leaders of the Roman Catholic Church. These leaders, including Pope John Paul II, oppose the use of embryonic stem cells for research (Thomas, 2001: 28). On August 9, 2001, President Bush, in a televised address to the nation, announced that the federal government would allow embryonic stem cell research on stem cells already isolated. Any stem cell line created before August 9, 2001 would fall under the new federal policy. Although Bush did not totally block federal funding for stem cell research, he limited the number of stem cell lines to 65 cell lines, which is the number of cell lines believed to have been already isolated (Gibbs and Duffy, 2001: 16).

Bush’s decision to allow limited embryonic stem cell research on existing cell lines received support from political and moral conservatives. Supporters of Bush’s decision, especially some conservative politicians like Senator Santorum, felt that the decision was “the first one of relief” (Lacayo, 2001: 23). Compromise on the stem cell issue represented a victory among conservatives. Many felt that the existing cell lines could be used for research and that the desire to create more cell lines through “destruction of human embryos” would be “alleviated” (Lacayo, 2001: 23). Abortion opponents, including Pat

Robertson, founder of the Christian Coalition, and James C. Dobson, president of Focus on the Family, also supported Bush's decision. Laura Eschevarria, spokeswoman for the National Right to Life Committee, said, "We are delighted that President Bush's decision prevents the federal government from becoming a party to any further killing of human embryos for medical experimentation" (Barnes, 2001: 2633).

To monitor the uses of the 65 approved cell lines, President Bush appointed Dr. Leo Kass, a conservative bioethicist from the University of Chicago, to lead an advisory panel on stem cell research. Kass, who opposes cloning, has been seen as ambivalent towards the issue of embryonic stem cell research. Kass favors the use of adult stem cells, which he felt would lessen the controversy over using embryos in research (Orekin and Cooper, 2001: 32).

Bush's decision to allow federal funding of existing cell lines had its critics. Many objections came from scientists seeking to perform research on embryonic stem cells. In the August 27-September 2, 2001 weekly of the Washington Post National Weekly Edition, scientists questioned if the cell lines are enough for research purposes. Several scientists referred to Bush's policy as "ridiculous policy." Other scientists argue that only a dozen cell lines have been identified in scientific journals. New cell lines may have been produced, but these lines are not included in scientific literature (Connolly et al., 2001: 29). Furthermore, the ethnicity of the 60 cell lines are believed to be of Asian ancestry, which may limit research on African and European subjects. Private companies and labs in several countries control access to the stem cell lines. Bush's policy will apply to these cell lines, but companies can control access to the cells, since the companies own the cells.

Another complication may lie in the fact that more cell lines could be created. If a university or company creates an additional cell line, there is concern whether Bush will allow additional cell lines (Connolly et al., 2001: 29). Bush stated in his speech that the federal government would not fund additional cell lines. As of August 28, 2001, NIH has identified 64 stem cell colonies. So far, 10 international companies and research labs have created 64 stem cell colonies that are eligible for use by federal standards. Of the 10 labs, four are in the United States, two are in India, and two are in Sweden. Israel and Australia each have one lab (Columbus Ledger Enquirer, 2001: A-12). In India, for example, a Bombay lab reported that four cell lines double every 36 hours, forming six to eight passages. These cell lines are free of disease and can multiply without diversifying into specific cell types (Columbus Ledger Enquirer, 2001: A-11). At this point, President Bush is faced with the prospect of additional cell lines and deciding whether to accept embryonic cell lines derived from embryos destroyed after August 9, 2001.

### Religious and Moral Views on Embryonic Stem Cell Research

A crucial issue regarding stem cell research is the moral and religious viewpoints of using stem cells from aborted fetuses. Many religious and antiabortion groups, along with several national and international leaders, are concerned about the implications of stem cell research. Some opponents favor the use of adult stem cells (derived from the bone marrow) in place of embryonic stem cells. Proponents of embryonic stem cell research also grapple with the issue of aborting fetuses. Some proponents, such as Thomson, feel that these discarded embryos, which would be destroyed at abortion clinics, could be used to treat life-threatening illnesses. At present, the debate over the uses and

implications of embryonic stem cell research is far from over. In fact, the following information in this section describes the various religious and moral viewpoints regarding embryonic stem cell research.

What is a living thing? When does life begin? Is a two-week old human blastocyst considered living? Would it be immoral or ungodly to sacrifice a two-week embryo in order to save a life? Ever since the advent of modern medicine more than 2000 years ago, scholars and religious leaders have been debating the existence and the importance of human life. Knowledge about human embryos can be traced to the time of the ancient Greeks, who expanded the medical field to include the Hippocratic Oath. This oath states that a doctor will not give a deadly drug to anyone if he is asked to (Lenoir, 2000: 439). From this oath, abortion opponents can infer that abortion constituted, in part, the administering of a deadly drug to kill an unborn fetus. Christian views on life and abortions started quite early. One of the earliest Christian references to human embryonic life was the Canon Law of Gratiani (circa 1150A.D). The Roman Catholic law stated that abortion (homicidium) before animation was a crime (Lenoir, 2000: 440). However, the Canon Law of Gratiani did not make any specific distinction between different stages of fetal development. The Roman Catholic position on life and abortion has been upheld and reaffirmed since the Canon Law of Gratiani was written. At the present time, the Vatican still opposes abortion. As for embryonic stem cell research, the Vatican opposes the issue for the following reasons; first, the Vatican sees embryonic stem cells as “the moral equivalent of a fully developed person and therefore worthy of social respect and legal protection (Woodward, 2001: 31).” Second, the Vatican believes that research involving embryos leads to their destruction (Lampman, 2001: 1). Finally, the Roman Catholic

Church remembers how Nazi doctors experimented on Jewish prisoners during World War II. This experimentation, according to the Church, resulted in the violation of human dignity (Woodward, 2001: 31).

Several Protestant faiths have expressed some opposition to embryonic stem cell research. Other Protestant faiths, however, support limited federal funding of embryonic stem cells. According to David H. Smith, the author of "Creation, Preservation, and All the Blessings," Protestants believe in the choice not to reproduce (contraception), but question human cloning because "it tends to reduce the family to a parental attainment of children" (Smith, 1999: 573). Thus, there is a danger of exploiting children as a result of cloning. As for embryonic stem cell research, Protestant faiths such as the Anglican Church have doubts regarding the issue. According to Smith, one Anglican might support embryonic stem cell research, while another Anglican may not support it (Smith, 1999: 576). Furthermore, many Anglicans feel that the issue of stem cells is a new and unknown field that needs to be studied further. As for Southern Baptists and United Methodists, both denominations share the views of the Roman Catholic Church, that human life is formed at the moment of conception (Lampman, 2001: 2). In fact, many Baptists often base their belief on a section from the Book of Jeremiah in which God said, "Before you were in your mother's womb I knew you (Lampman, 2001: 2)."

As for non-Christian denominations, the opinion towards embryonic stem cell research varies according to each denomination's view regarding life. For example, The Jewish Reform Movement wrote President Bush in July of 2001, urging the use of federal funds to save persons afflicted with life-threatening diseases (Lampman, 2001: 2). In addition, Richard Address, director of family concerns for the American Hebrew

Congregation, stated that according to Jewish tradition, a fetus is not considered human until it is 40 days old (Lampman, 2001: 3). Furthermore, the American Hebrew Congregation believes that God endowed humans with the ability to make this technology (stem cell research). As for Muslims, many Muslim scholars express disagreement over whether ensoulment (the placement of a spirit into a human being) takes place 40 or 120 days after conception. However, Abulaziz Sachedina, an Islamic scholar at the University of Virginia, stated that stem cell research is “acceptable in Islamic law, due to its therapeutic benefits (Lampman, 2001: 3).”

Now that the viewpoints of the world’s major religions have been addressed, how does the American public feel about the use of embryos to save human lives? A Gallup poll conducted in July 2001 showed that 57% of Americans did not know enough about stem cell research to support or oppose it. Still, 54% of Americans believe that stem cell research is morally wrong, but 69% felt it may be necessary to perform stem cell research (Lampman, 2001: 2). Also, many Americans believe in the good that stem cell research can produce rather than having embryos sit in cold storage. As a result, many Americans have more sympathy towards using stem cells to treat Alzheimer’s Disease than for a “stranger’s anonymous fertilized egg” (Woodward, 2001: 32). As for American Roman-Catholics, 72% of White Catholics favor the use of stem cell research (Evans et al., 2001: 29).



Among political leaders, those who categorized themselves as Catholic or conservative Christian also had varied views on stem cell research. Secretary of Health and Human Services Tommy Thompson, a pro-life supporter, is a Roman Catholic. However, Thompson backs stem cell research. Part of his support was for the economic development of Wisconsin, since Thompson was the Governor of Wisconsin. Biotechnology firms, he felt, could revitalize Wisconsin's fledgling economy. Another reason for Thompson's support was his personal experiences with his wife, who is a breast cancer survivor. Breast cancer cannot be cured by stem cell research, but Thompson believes that many other diseases could be cured with the use of embryonic stem cells (Thomas et al., 2001: 29).

Senator Orin Hatch (R-Utah), a Mormon, backs stem cell research. Hatch publicly urged President George W. Bush to support embryonic research. Other conservative senators, such as Senator Strom Thurman (R-South Carolina), also support stem cell research. Some politicians, however, are still opposed to federal funding of stem cell research. As of August 2001, the U.S. House of Representatives passed a measure that would ban cloning. The bill, sponsored by Dave Weldon (R-Florida), stipulates a fine of \$1 million and up to 10 years of jail time for those who engage in human cloning. At the moment, it is unclear if this bill will affect embryonic stem cell research. Scientists who support and engage in embryonic stem cell research worry that the bill, if passed by the Senate, would outlaw embryonic stem cell research (Holden, 2001: 1025). In a recent article in *The Southern Cross*, a Catholic newspaper, Cardinal Anthony J. Bevilacqua called for the U.S. Senate to pass a bill outlawing stem cell research involving embryos. Bevilacqua said that the Senate's inaction on the issue is "morally irresponsible." He wants the Senate to follow the lead of the U.S. House of Representatives, which passed a bill that would outlaw research

on embryos in August 2001. Bevilacqua also asked President Bush to sign the bill (Southern Cross, 2002: 2).

Internationally, several countries are struggling with the issue of embryonic stem cell research. In August 2001, the Japanese government allowed scientists to conduct research on embryonic stem cells under the guidelines of a top-level advisory board. In Germany, President Johannes Rau and Chancellor Gerhard Schröder have been debating whether to allow the importation of embryonic stem cells into the country for research purposes. Rau opposes embryonic research because he feels that life and death should not be left to scientists. Rau also believes that Germany's Nazi past should not be repeated. Schröder, on the other hand, supports embryonic stem cell research, as long as it is used to treat diseases such as Alzheimer's (Koenig and Vogel, 2001: 1811-1813). Regardless of the position of both Rau and Schröder, few representatives in the German Bundestag (Lower House) support importing embryonic stem cells because importation violates the German Embryo Protection Law, which strictly limits research on human embryos (Koenig and Vogel, 2001: 1813). In Canada, new guidelines for conducting embryonic stem cell research were passed in March 2002. These guidelines, set by the Canadian Institutes of Health Research, ban human embryonic cloning. However, government-funded scientists can conduct stem cell research using embryos discarded from fertility treatments or abortions. In fact, these guidelines will allow Canadian scientists to develop new embryonic stem cell lines. In contrast, American scientists are not allowed to develop new cell lines, but to conduct research using existing cell lines (Columbus Ledger-Enquirer, 2002: A-8).

Some embryonic stem cell opponents, including several researchers, suggest the use of adult stem cells for research. One researcher, Dr. David A. Prentice, a professor of Life Sciences at Indiana State University, testified before The U.S. House of Representatives Oversight Hearing on “The Ethics of Cloning” on June 7, 2001. Prentice advocated the use of adult stem cells because he felt the use of embryos led to their destruction. Also, Prentice felt that adult embryonic stem cells are also capable of forming various cell types. Prentice cited the examples of adult stem cells from the brain that can differentiate into heart, lung, intestine, kidney, and liver tissues (Prentice, 2001: 4). Adult stem cells, according to Prentice, have been used in the treatment of human diseases, such as systemic lupus, multiple sclerosis, rheumatoid arthritis, anemias, immunodeficient diseases, and the regeneration of corneas (Prentice, 2001: 4). Other researchers support the use of adult stem cells over embryonic stem cells. Some, such as Dr. Fred Gage of the Salk Institute for Biological Studies in La Jolla, California, have even isolated and cultured neural stem cells from adult cadavers shortly after death (Vogel, 2001: 1821). Despite some successes regarding adult stem cell culturing, recent studies have cast doubt on the usability of adult stem cells. Two studies, led by Austin Smith of the University of Edinburgh and Naohiro Terada of the University of Florida, found that adult stem cells did not transform into new tissue. In the two studies, adult stem cells were derived from mice and placed in a laboratory dish with mouse brain and bone marrow cells. Instead of transforming into brain and bone marrow cells, the adult cells merged with their neighbor’s genetic material. The phenomena may have fooled scientists into thinking that adult stem cells can transform into other cell types. This recent discovery has led scientists to conclude that adult stem cells may not have the same potential as embryonic stem cells.

Therefore, the debate over embryonic stem cells will continue indefinitely (Columbus Ledger-Enquirer, 2002: A1, A-3).

The opinions of scientists, religious leaders, and politicians towards embryonic stem cells are as diverse as the medical research using these cells. Although official Christian doctrine, for example, forbids abortion, many religious leaders favor limited federal funding of embryonic stem cell research. Likewise, many conservative politicians who otherwise oppose abortion, feel that stem cell research involving embryos could lead to therapies for life-threatening human diseases. In addition, several countries, such as Japan and Germany, are cautious to allow research based on their past activities involving human research. The debate over embryonic stem cell research is just beginning and will likely continue for quite some time. Support or opposition to such research depends on the religious, moral, and scientific beliefs of the individual.

## **OBJECTIVES/HYPOTHESES**

### Research Objectives:

1. To examine if people approve of the idea of using embryonic stem cells for medical purposes.
2. To discover whether support for human stem cell research is impacted by a college education.
3. To discover if support for human stem cell research is less among Catholics than non-Catholics.

### Alternative Hypotheses:

1. Most people will support human stem cell research that leads to medical treatment of life-threatening diseases.
2. A greater number of college-educated persons than non-college educated persons will support human stem cell research that is used for medical treatment.
3. A greater number of non-Catholics than Catholics will support human stem cell research.

### Operationalized Definitions:

- A. "Most people" will be defined as greater than 50% of the 113 respondents surveyed.
- B. "College-educated" will be defined as those completing at least 2 years of college.
- C. "Catholic" will be defined as those respondents belonging to the Roman Catholic Church, the Greek Orthodox Church, or any Orthodox or Catholic faith.
- D. "Non-Catholic" will be defined as Protestants, Christian denominations (CME, AME, Southern Baptist) and non-Christian.

## METHODOLOGY

### Research Method

The research method employed in the stem cell survey was the questionnaire. The types of questions in a survey include fixed alternative and open-ended questions. Fixed alternative questions require the respondent to choose from a fixed selection of questions, while open-ended allows respondents to answer in sentence form in order to write their own responses (Fitzgerald and Cox, 1998: 88-89). The questionnaire method is advantageous because it involves less time and fewer trained staff to administer the survey (Fitzgerald and Cox, 1998: 87). Another advantage to using questionnaires is the low cost of circulating the surveys. Furthermore, questionnaires grant anonymity to the respondent, ensuring confidentiality. However, the questionnaires are successful only if the respondent is literate, because some respondents may not understand the language and format of the questions. Also, the response rate can be low due to the fact that many respondents fail to return the questionnaires in the mail (Fitzgerald and Cox, 1998: 88).

### Data Collection

The sampling method utilized was nonprobability sampling. Nonprobability sampling was chosen because it was economic and convenient. However, there was a significant risk for error. The type of nonprobability sampling used was accidental (Fitzgerald and Cox, 1998: 81-82). One hundred thirteen questionnaires containing 14 fixed-alternative questions were devised, printed, and circulated anonymously to available respondents. The respondents were then instructed on filling out the questionnaire.

The surveys were distributed to individuals from various ethnic, socioeconomic, and religious backgrounds. During Fall Semester 2001, 50 survey forms were circulated and completed by the respondents. During Spring Semester 2002, an additional 63 questionnaires were circulated and completed. After the questionnaires were circulated and completed, every response was analyzed.

Of the 113 respondents who participated in the stem cell survey, the sample population was 56.8% female and 52.2% of the respondents were under 39 years of age. In addition, 82.5% of the respondents were African-American. Also, the median income of the respondents ranged from \$15,001 to \$30,000 a year, representing 30.9% of the sample. As for education, 85.5% of the respondents either attended college or graduated from college. Finally, almost equal numbers of respondents were Protestant (42.9%) or Catholic (41.8%).

#### Data Analysis

Tabulation consisted of grouping responses from each question into appendices and contingency tables. The first group consisted of tables were derived from Objectives 1-3. The tables were then labeled Appendices B, C, and D. All appendices were placed at the end of the report. In Appendix B, the total responses of the questionnaires were derived from adding the results of the previous study (Fall 2001) to that of the present study (Spring 2002). In Appendix C, all responses to Questions 7-14 (Stem Cell Questions) were totaled and placed under the category of "Education." In Appendix D, Questions 7-14 (Stem Cell Questions) were totaled and placed under the category of "Religion."



Appendix B was used to describe Objective 1. Appendix C was used to describe Objective 2. Appendix D was used to describe Objective 3.

The second group of tables consisted of values derived from Appendices B, C, and D. A contingency table is a two-dimensional data grid consisting of one set of variables across the top of the grid and the values of another variable down the side of the grid (Fitzgerald and Cox, 1998: 159). In Alternative Hypothesis 1, the first set of contingency tables described the support of stem cells based the opinions of “most people.” In Alternative Hypothesis 2, a set of contingency tables was used to describe the relationship between education and support of stem cell research. In Alternative Hypothesis 3, a set of contingency tables was drawn to reflect the differences in support of stem cell research among Catholics and non-Catholics.

The numerical values of each set of contingency tables for this research were calculated in the following manner:

1. Raw numbers indicated the number of respondents from each group answering the question.
2. Percentages of those raw numbers were in parentheses. The percentages were located adjacent to the raw numbers.
3. Total numbers (and percentages) of respondent groups were listed at the bottom of each table.

4. The results were interpreted in percentages.
5. Support of stem cell research was dependent on Question 9 (What do you think about the cloning of stem cells).
6. Contingency tables and explanations of the other questions were listed after Question 9.

## RESULTS

### Findings Keyed to Alternative Hypothesis 1:

Alternative Hypothesis 1 stated that more people would support human stem cell research that leads to medical treatment of life-threatening diseases. The data that explained this alternative hypothesis were derived from Appendix B, which was entitled Total Responses (2001-2002). Appendix B was selected for Alternative Hypothesis 1 because the table consisted of responses from all respondents. As mentioned earlier, Question 9 was used as a primary indicator of support of stem cell research. The contingency tables, as well as explanations for the rest of the questions, Questions 7-14, were listed after Question 9.

### # 9 Cloning Human Embryonic Stem Cells

|               |     |       |
|---------------|-----|-------|
| Support       | 19  | 17.6% |
| No Opinion    | 25  | 23.1% |
| Don't Support | 64  | 59.2% |
| Total         | 108 | 100%  |

Question 9 was answered by 108 respondents. The largest number of respondents, 59.2%, stated that they did not support the cloning of stem cells. Thus, the data failed to support Alternative Hypothesis 1. The majority of all respondents do not support stem cell research. Additional data explaining the variances from the remainder of survey questions are listed below:

## Alternative Hypothesis 1

The remaining survey questions that were also pertinent to Alternative Hypothesis 1 included the following:

### # 7 Benefits of Scientific Research

|            |     |       |
|------------|-----|-------|
| Agree      | 97  | 87.3% |
| No Opinion | 10  | 9%    |
| Disagree   | 4   | 3.6%  |
| Total      | 111 | 100%  |

Question 7 asked the benefits of scientific research to society. Of the 111 respondents who answered the question, the majority of them (87.3%) agreed that scientific research was beneficial to society.

### #8 Heard of Stem Cell Research

|       |     |       |
|-------|-----|-------|
| Yes   | 92  | 85.9% |
| No    | 15  | 14%   |
| Total | 107 | 100%  |

Question 8 (Have you heard of stem cell research) was answered by 107 respondents. The highest number (85.9%) of those surveyed have heard of stem cell research.

### #10 Should Stem Cells be Cloned

|           |     |       |
|-----------|-----|-------|
| Yes       | 32  | 28.8% |
| Undecided | 44  | 39.6% |
| No        | 35  | 31.5% |
| Total     | 111 | 100   |

Question 10 (Should stem cells be cloned for research) was answered by 111 respondents, with 39.6% of respondents undecided, 31.5% stating that stem cells should not be cloned, and 28.8% of respondents stating that they would support stem cells.

### #11 Stem Cell Catalog

|           |     |       |
|-----------|-----|-------|
| Yes       | 54  | 49%   |
| Undecided | 32  | 29.1% |
| No        | 24  | 21.8% |
| Total     | 110 | 100%  |

Question 11 (Stem cell catalog) was answered by 110 respondents. Forty-nine percent of respondents stated that a stem cell catalog should be kept.

### #12 Hospitals Using Cloned Stem Cells

|           |     |      |
|-----------|-----|------|
| Yes       | 56  | 50%  |
| Undecided | 30  | 27%  |
| No        | 25  | 22.5 |
| Total     | 111 | 100% |

One hundred eleven respondents answered question 12 (Hospitals using cloned stem cells). Fifty percent of respondents stated that hospitals should use cloned stem cells.

### # 13 Is Cloning of Stem Cells Immoral

|           |     |       |
|-----------|-----|-------|
| Yes       | 36  | 32.7% |
| Undecided | 39  | 35.5% |
| No        | 35  | 31.8% |
| Total     | 110 | 100%  |

Question 13 (Is cloning of stem cells immoral) was answered by 110 respondents. An almost equal distribution was observed. The highest number of respondents, 35.5%, were undecided, The next highest number of respondents, 32.7%, stated that cloning is immoral. Finally, 31.8% respondents did not believe that the cloning of stem cells is immoral.

### # 14 Would You Accept Stem Cell Tissue

|           |     |       |
|-----------|-----|-------|
| Yes       | 50  | 45.4% |
| Undecided | 37  | 33.6% |
| No        | 23  | 20.9% |
| Total     | 110 | 100%  |

Question 14 (Would you accept stem cell tissue) was answered by 110 respondents. More respondents (45.4%) stated that they would accept stem cell-derived tissue than those (20.9%) who said that they would not accept stem cell-derived tissue. Also, 33.6% of respondents were undecided on the issue.

### Findings Keyed to Alternative Hypothesis 2

Alternative Hypothesis 2 dealt with whether a greater number of college-educated persons than non-college educated persons will support stem cell research. The results for

this section were derived from Appendix C (Education). The respondents in this category were divided into the following groups:

NC: No College

C: College (attended college or obtained a college degree)

Throughout this section, NC and C was used to denote No College and College, respectfully. A Contingency table detailing Question 9 (What do you think about the cloning of human embryonic stem cells) was used as a primary determinant of support among both college-educated and non-college educated persons. This table will be listed first. Next, a detailed discussion of the results will follow the contingency table.

Afterwards, a set of contingency tables, as well as detailed explanations for the remaining questions was listed.

#### # 9 Cloning Human Embryonic Stem Cells

|           | NC        | C          | Total      |
|-----------|-----------|------------|------------|
| Yes       | 1 (6.3%)  | 18 (20%)   | 19 (17.9%) |
| Undecided | 6 (37.5%) | 17 (18.9%) | 23 (21.7%) |
| No        | 9 (56.3%) | 55 (61.1%) | 64 (60.4%) |
|           | 16 (100%) | 90 (100%)  | 106 (100%) |

Question 9 was answered by 106 respondents. A greater number of college-educated people (20%) than non-college educated people (6.3%) supported cloning of human embryonic stem cells. However, greater numbers of both non-college and college educated respondents were opposed to the cloning of human embryonic stem cells. In fact,

the majority of respondents from both categories, 56.3% of non-college educated and 61.1% of college-educated respondents, did not support stem cell research. As a result, neither college-educated nor non-college educated respondents supported stem cell research.

Thus, the data failed to support Alternative Hypothesis 2.

The next set of contingency tables will provide information on Questions 7-8 and Questions 10-14. Those tables, as well as detailed explanations, are listed below.



## Alternative Hypothesis 2

The remaining survey questions that were also pertinent to Alternative Hypothesis 2 included the following:

### # 7 Benefits of Scientific Research

|            | NC         | C          | Total      |
|------------|------------|------------|------------|
| Agree      | 14 (87.5%) | 79 (86.8%) | 93 (86.9%) |
| No Opinion | 2 (12.5%)  | 8 (8.79%)  | 10 (9.4%)  |
| Disagree   | 0 (0%)     | 4 (4.4%)   | 4 (3.7%)   |
|            | 16(100%)   | 91 (100%)  | 107 (100%) |

Question 7 (Benefits of scientific research) was answered by 107 respondents. The vast majority of both non-college attending respondents and college-attending respondents agreed that scientific research was beneficial to the well being of society. In fact, 87.5% of non-college educated respondents and 86.6% of college-educated respondents believed that scientific research was beneficial to society.

### # 8 Heard of Stem Cell Research

|     | NC        | C          | Total      |
|-----|-----------|------------|------------|
| Yes | 9 (56.3%) | 82 (90.1%) | 91 (85.9%) |
| No  | 7 (43.7%) | 9 (9.9%)   | 16 (14.9%) |
|     | 16 (100%) | 91 (100%)  | 107 (100%) |

Question 8 (Heard of stem cell research) was answered by 107 respondents. Both non-college educated and college-educated respondents have heard of stem cell research. However, 90.1% of college-educated respondents have heard of stem cell research, while 56.3% of non-college educated respondents have heard of the research. This means that a

higher percentage of college-educated respondents than non-college educated respondents have heard of stem cell research.

#### # 10 Should Stem Cells Be Cloned

|           | NC        | C          | Total      |
|-----------|-----------|------------|------------|
| Yes       | 5 (31.3%) | 25 (27.2%) | 30 (27.8%) |
| Undecided | 7 (43.8%) | 36 (39.1%) | 43 (39.8%) |
| No        | 4 (25%)   | 31 (33.7%) | 35 (32.4%) |
|           | 16 (100%) | 92 (100%)  | 108 (100%) |

Question 10 (Should Stem Cell be cloned for research) was answered by 108 respondents. Almost equal numbers of non-college educated respondents (43.8%) and college-educated respondents (39.1%) were undecided regarding the use of stem cells for scientific research.

#### #11 Stem Cell Catalog

|           | NC         | C          | Total      |
|-----------|------------|------------|------------|
| Yes       | 10 (62.5%) | 43 (47.3%) | 53 (49.5%) |
| Undecided | 4 (25%)    | 27 (29.7%) | 31 (28.9%) |
| No        | 2 (12.5%)  | 21 (23.1%) | 23 (21.5%) |
|           | 16 (100%)  | 91 (100%)  | 107 (100%) |

Question 11 (Stem Cell Catalog) was answered by 107 respondents. Both groups of respondents supported a stem cell catalog, with 62.5% of non-college educated respondents and 47.3% of college-educated respondents answering the question.

### #12 Hospitals Using Cloned Stem Cells

|           | NC         | C          | Total      |
|-----------|------------|------------|------------|
| Yes       | 11 (68.8%) | 45 (48.9%) | 56 (51.8%) |
| Undecided | 2 (12.5%)  | 27 (29.3%) | 29 (26.8%) |
| No        | 3 (18.8%)  | 20 (21.7%) | 23 (21.3%) |
|           | 16 (100%)  | 92 (100%)  | 108 (100%) |

Question 12 (Hospitals using cloned stem cells) was answered by 108 respondents. Of those respondents, 68.8% of non-college educated respondents and 48.9% of college-educated respondents stated that they would support hospitals' use of stem cells.

### # 13 Is Cloning of Stem Cells Immoral

|           | NC        | C          | Total      |
|-----------|-----------|------------|------------|
| Yes       | 4 (25%)   | 30 (33%)   | 34 (31.5%) |
| Undecided | 7 (43.8%) | 31 (33.4%) | 38 (35.2%) |
| No        | 5 (31.3%) | 31 (33.4%) | 36 (33.3%) |
|           | 16 (100%) | 92 (100%)  | 108 (100%) |

Question 13 (Is cloning of stem cells immoral) was answered by 108 respondents. Significant numbers of both non-college educated respondents and college-educated respondents were undecided. In fact, 43.8% of non-college educated respondents were undecided, followed by 33% of college-educated respondents.

### # 14 Would You Accept Stem Cell Tissue

|           | NC        | C          | Total      |
|-----------|-----------|------------|------------|
| Yes       | 8 (50%)   | 40 (44.4%) | 48 (45.3%) |
| Undecided | 6 (37.5%) | 30 (33.3%) | 36 (33.9%) |
| No        | 2 (12.5%) | 20 (22.2%) | 22 (20.8%) |
|           | 16 (100%) | 90 (100%)  | 106 (100%) |

The final question, Question 14 (Would you accept stem cell tissue), was answered by 106 respondents. Significant numbers of both non-college educated and college-educated respondents said that they would accept stem cell-derived tissue. For example, 50% of non-college educated respondents and 44.4% of college-educated respondents stated that they would accept stem cell-derived tissue if placed in a life-threatening situation.

#### Findings Keyed to Alternative Hypothesis 3

Alternative Hypothesis 3 dealt with religious preference. Here, the hypothesis was whether more non-Catholics than Catholics would support stem cell research. Responses were derived from Appendix D (Religion). Answers in this category were divided into two groups:

P=Protestant

C=Catholic

The group entitled "Others" was omitted from the contingency tables because the study focused primarily on Catholic and Protestant views towards stem cell research. Thus,

the total number of Protestant and Catholic respondents answering the questions are lower than the total numbers of respondents in Appendix D. As in Alternative Hypotheses 1 and 2, a contingency table was drawn for Question 9. Question 9 (What do you think about the cloning of human embryonic stem cells) was used as a primary determinant of support between Catholics and Protestants. A detailed explanation accompanied the table. Afterwards, a set of contingency tables was drawn for the remaining questions (Questions 7-8, and Questions 10-14), followed by a detailed explanation of the tables.

### # 9 Cloning Human Embryonic Stem Cells

|           | P          | C          | Total      |
|-----------|------------|------------|------------|
| Yes       | 6 (15%)    | 7 (18.9%)  | 13 (16.9%) |
| Undecided | 9 (22.5%)  | 6 (16.2%)  | 15 (19.5%) |
| No        | 25 (62.5%) | 24 (64.9%) | 49 (63.6%) |
|           | 40 (100%)  | 37 (100%)  | 77 (100%)  |

Question 9 (What do you think about the cloning of stem cells) was answered by 77 Protestant and Catholic respondents. Almost equal numbers of Protestants and Catholics did not support the cloning of stem cells, with 62.5% of Protestants and 64.9% of Catholics responding. Thus, the data failed to support Alternative Hypothesis 3.

A set of contingency tables for the remaining questions, followed by detailed explanations, are listed below.

### Alternative Hypothesis 3

The remaining survey questions that were also pertinent to Alternative Hypothesis 3 included the following:

#### # 7 Benefits of Scientific Research

|            | P          | C          | Total      |
|------------|------------|------------|------------|
| Agree      | 37 (88.1%) | 35 (89.7%) | 72 (88.9%) |
| No Opinion | 4 (9.5%)   | 3 (7.7%)   | 7 (8.6%)   |
| Disagree   | 1 (2.4%)   | 1 (2.6%)   | 2 (2.5%)   |
|            | 42 (100%)  | 39 (100%)  | 81 (100%)  |

Question 7 (Benefits of scientific research) was answered by 81 Protestant and Catholic respondents. Of those respondents, 88.1% of Protestants and 89.7% of Catholics believed that scientific research is beneficial to society.

#### # 8 Heard of Stem Cell Research

|     | P          | C          | Total      |
|-----|------------|------------|------------|
| Yes | 33 (78.6%) | 33 (86.8%) | 66 (82.5%) |
| No  | 9 (21.4%)  | 5 (13.2%)  | 14 (17.5%) |
|     | 42 (100%)  | 38 (100%)  | 80 (100%)  |

Question 8 (Heard of stem cell research) was answered by 80 Protestant and Catholic respondents. There was not a significant difference between Protestants and Catholics when it came to awareness of stem cell research. In fact, nearly the same numbers of Protestant respondents (78.6%) as Catholic respondents (86.8%) have heard of stem cell research.

### # 10 Should Stem Cells be Cloned

|           | P          | C          | Total      |
|-----------|------------|------------|------------|
| Yes       | 11 (26.2%) | 9 (24.3%)  | 20 (25.3%) |
| Undecided | 14 (33.3%) | 17 (45.9%) | 31 (39.2%) |
| No        | 17 (40.5%) | 11 (29.7%) | 28 (35.4%) |
|           | 42 (100%)  | 37 (100%)  | 79 (100%)  |

Question 10 (Should stem cells be cloned for research) was answered by 79 Protestant and Catholic respondents. Both groups reported an equal distribution of responses. For instance, 26.2% of Protestant respondents stated that stem cells should be cloned for research, whereas 33.3% of Protestants were undecided. Also, 40.5% of Protestants did not want stem cells to be cloned for research. As for Catholic respondents, 24.3% of Catholic respondents stated that stem cells should be cloned for research, 45.9% were undecided, and 29.7% of Catholic respondents did not want stem cells to be cloned for research. The data indicated that a majority of both Catholics and Protestants did not support stem cell research.

### # 11 Stem Cell Catalog

|           | P          | C          | Total      |
|-----------|------------|------------|------------|
| Yes       | 21 (50%)   | 20 (52.6%) | 41 (51.3%) |
| Undecided | 11 (26.2%) | 10 (26.3%) | 21 (26.3%) |
| No        | 10 (23.8%) | 8 (21.1%)  | 18 (22.5%) |
|           | 42 (100%)  | 38 (100%)  | 80 (100%)  |

Question 11 (Stem cell catalog) was answered by 80 Protestant and Catholic respondents. A majority of Protestants and Catholics supported a stem cell catalog. For

example, 50% of Protestant respondents and 52.6% of Catholic respondents support stem cell catalogs.

### # 12 Hospitals Using Cloned Stem Cells

|           | P          | C          | Total      |
|-----------|------------|------------|------------|
| Yes       | 25 (59.5%) | 15 (38.5%) | 40 (49.4%) |
| Undecided | 9 (21.4%)  | 14 (35.9%) | 23 (28.4%) |
| No        | 8 (19%)    | 10 (25.6%) | 18 (22.2%) |
|           | 42 (100%)  | 39 (100%)  | 81 (100%)  |

Question 12 (Hospitals using cloned stem cells) was answered by 81 Protestant and Catholic respondents. Most Protestants (59.5%) support hospitals' use of cloned stem cells. By contrast, there was a slightly even distribution among Catholic respondents, with 38.5% supporting hospitals' use of cloned stem cells, 35.9% undecided, and 25.6% not supporting hospitals' use of cloned stem cells. This indicates that Catholics surveyed were apprehensive towards hospitals' use of cloned stem cells.

### # 13 Is Cloning of Stem Cells Immoral

|           | P          | C          | Total      |
|-----------|------------|------------|------------|
| Yes       | 13 (31.7%) | 16 (41%)   | 29 (36.3%) |
| Undecided | 17 (41.5%) | 10 (25.6%) | 27 (33.8%) |
| No        | 11 (26.8%) | 13 (33.3%) | 24 (30%)   |
|           | 41 (100%)  | 39 (100%)  | 80 (100%)  |

Question 13 (Is cloning of stem cells immoral) was answered by 80 Protestant and Catholic respondents. There was a slightly even distribution observed for both groups. For example, 31.7% of Protestant respondents stated that the cloning of stem cells was



immoral followed by 41.5% of Protestant respondents who were undecided. Also, 26.8% of Protestant respondents did not think that cloning was immoral. As for Catholics, 41% stated that cloning was immoral, 25.6% were undecided, and 33.3% stated that the cloning of stem cells was immoral. The even distribution meant that both Protestants and Catholics were undecided over the immorality of stem cell research.

#### # 14 Would You Accept Stem Cell Tissue

|           | P          | C          | Total      |
|-----------|------------|------------|------------|
| Yes       | 19 (46.3%) | 15 (39.5%) | 34 (43%)   |
| Undecided | 14 (34.1%) | 14 (36.8%) | 28 (35.4%) |
| No        | 8 (19.5%)  | 9 (23.7%)  | 17 (21.5%) |
|           | 41 (100%)  | 38 (100%)  | 79 (100%)  |

Finally, Question 14 (Would you accept stem cells) was answered by 79 Protestant and Catholic respondents. The distribution was not even among both groups, but slightly more respondents stated that they would accept stem cells. For example, 46.3% of Protestants and 39.5% of Catholics stated that they would accept stem cells if placed in a life-threatening situation. However, significant numbers of Protestants (34.1%) and Catholics (36.8%) were undecided on the issue. Also, smaller numbers of Protestants (19.5%) and Catholics (23.7%) stated that they would not accept stem cell tissue, even in life-threatening situations.

## CONCLUSIONS

The results of the research generated the following conclusions:

1. Under the category of general responses, a majority of participants surveyed did not support stem cell research. This indicated that most people are apprehensive to the use of human embryos, even if stem cell research can potentially save people's lives. Thus, Alternative Hypothesis 1 was rejected.
2. As far as educational differences were concerned, a majority of both non-college educated and college-educated respondents did not support stem cell research. However, there was not a significant difference between college-educated and non-college educated persons in their opinions towards stem cell research. Because both groups of respondents opposed stem cell research, and because there was not a significant difference between both groups in terms of support, Alternative Hypothesis 3 was rejected.
3. Alternative Hypothesis 3 dealt with religious differences in regard to the support of stem cell research. A significant majority of Catholics and Protestants opposed stem cell research. There was no significant difference between Protestants and Catholics in regard to supporting stem cell research. Because the majority of both groups opposed stem cell research, and because there was no significant difference between the groups, Alternative Hypothesis 3 was rejected.

The research demonstrated that as a whole, the support of stem cell research was not entirely dependent on education and religion. The author believes that people are generally well informed about stem cell research, and that college education does not significantly impact one's views towards the subject. Similarly, one's religious preference does not significantly affect his/her views towards stem cell research. There was, however, opposition to stem cell research among both college-educated and non-college educated respondents, as well as opposition from both Protestants and Catholics. A question that asked about awareness of stem cell research (Question 8) indicated that most respondents have heard of stem cell research. In addition, most college-educated and non-college educated persons were aware of stem cell research. However, more college-educated persons than non-college educated persons were aware of stem cell research. As for religion, a significant majority of both Protestants and Catholics were aware of stem cell research. There was no significant difference between the two groups in terms of awareness.

Even though most respondents, regardless of educational background and religious preference, opposed stem cell research, there were variable differences in terms of support based on morality. For instance, when asked if stem cell research was immoral (Question 13), the general group of respondents were evenly divided, with the largest percentage of them undecided. As for education, the respondents from both groups were evenly distributed, with a significant number undecided. Slightly more non-college educated respondents than college-educated respondents were undecided on the issue of immorality.

As far as religion was concerned, close to half of Protestants were undecided over whether stem cell research was immoral, while close to half of Catholics believed that

stem cell research was immoral. This indicated that Catholics were slightly more inclined to believe that stem cell research was immoral than Protestants. This may be due to the beliefs of the Vatican, that stem cell research was tantamount to abortion.

Question 14 dealt with whether people will accept stem cells if confronted with a life-threatening illness. Close to half of the general group of the respondents said that they would accept cells derived from stem cell tissue. As far as education was concerned, half of non-college-educated respondents and close of half of college-educated respondents stated that they would accept tissue derived from stem cells. There was no significant difference between the groups. As for religion, a significant number of both Protestants and Catholics said that they would accept stem cell-derived tissue. There was not a large difference between both groups.

The significant number of undecided opinions seem to indicate that many people are apprehensive about supporting an issue that could potentially change the course of research involving human subjects. For example, almost half of the respondents surveyed were willing to accept tissue derived from human embryonic stem cells. Because of this fact, many individuals may want Congress, government agencies and private research corporations to restrict embryonic stem cell research. Simply put, many people need to be assured that stem cell research can result in products that are safe to the public. Before one is willing to accept stem cells, he/she will want to know the possible side effects of transplanted tissue cloned from embryonic stem cells. Research institutes need to examine the risk factors of stem cell research and to see if some patients are eligible for such tissue transplants. Furthermore, people need to be educated further on the subject of stem cell research. According to the study, most respondents were aware of the subject of embryonic

stem cell research. However, the abundance of undecided responses on the questionnaires indicated that the respondents did not have extensive knowledge of stem cell research. Thus, the public needs to understand the possible risks of accepting embryonic stem cell tissue. This can be accomplished by accessing information from government agencies and private research companies. Government agencies and private research corporations, in turn, need to provide more access to information on the subject, including possible risk factors. Through education and more research, the author believes that the public will become comfortable with accepting tissues derived from embryonic stem cells.

It can be concluded that many people are aware of stem cell research through various media and are willing to discuss the subject in an objective manner. Even though many people believe that stem cell research was moral, and that a significant number of people would indeed accept stem cell-derived tissue, a majority of respondents, regardless of education and religious preference, did not support stem cell research. As a result, all alternative hypotheses were rejected. Several theories may explain this phenomenon. First, many people believe that stem cell research may need to be studied further. Second, there may be fear that stem cells could be used to clone humans. Despite the opposition, there was no unilateral opposition to stem cell research. Among all respondents surveyed, at least half of the respondents opposed stem cell research. This fact, coupled with variances in opinions regarding morality and willingness to accept stem cells in hospitals, indicates that people are willing to at least think about the topic of stem cell research before making a decision. Also, religion and education did not significantly affect peoples' opposition to stem cell research.

The controversy surrounding stem cell research is not going to be resolved in the near future. In fact, the debate is expanding. Many researchers are interested in expanding human embryonic stem cell lines, even though members of the U.S. Senate threatened to introduce a bill that would ban stem cell research altogether. The Vatican has maintained its stance on embryonic stem cell research, stating that the research is similar to abortion. The debate has even spilled into mainstream America. On an encore presentation of John Stossel's ABC report, "Tampering with Nature" (Stossel, 2002), which aired June 14, 2002, Stossel said that people are afraid to tamper with nature because of what pop culture says about it (Stossel, 2002). Tampering with nature does place fear in many people due to misinformation and assumptions. Proponents of stem cell cloning, such as Virginia Pastrelli, stated that cloning has benefits. If a child has bad teeth, Pastrelli said, we would give that child braces. Similarly, according to Pastrelli, determining the genetic outcome of your children is a way of ensuring that the child develops well (Stossel, 2002). Opponents say that cloning and genetic determination harkens back to the days of Nazi Germany, in which the Nazi-dominated government sponsored eugenics programs to create a master "Aryan" race (Stossel, 2002).

Although most people today would not advocate cloning humans, the fear that a laboratory or an overzealous individual of questionable moral character may attempt to clone a human is very real. Recently, scientists at Advanced Cell Technology Laboratory in Worcester, Massachusetts successfully demonstrated that a skin cell from one cow, cloned it, and transferred it into another cow. Amazingly, the embryo grew into a fetus. Although the fetus was removed and harvested for tissue, the fact is that mammals can be cloned and can undergo fetal development (Krauthammer, 2002: 54). If cows can be

cloned, as well as sheep and kittens, then the possibility that humans can be cloned is not far-fetched. So the question remains; does a person support stem cell research? Does that person think it is moral? If someone were on the verge of death, and knew that stem cell tissue could potentially save and prolong their lives, would they accept it? These questions are not easy to answer, and they probably will not be answered anytime soon.

## LIMITATIONS

There were several limitations to the research. One limitation was sample type and size. The author should have expanded the survey to include different neighborhoods, churches, synagogues, and mosques. The survey utilized in the research sampled two businesses, two universities, the author's church, and the author's family. Another limitation involved the wording of the questionnaire, particularly in the questions involving education and religion. For example, the criteria for education were limited to a 4-year college degree. In fact, many people who earn a 2-year degree or a technical degree are considered college-educated. As for the question pertaining to religion, the word "Protestant" could have been defined explicitly in the survey. Even though the author explained the definition of Protestant, some respondents wrote their denomination on the survey. Thus, some respondents were confused with certain terminology. Also, more religious categories were not placed on the questionnaire. For instance, categories, such as Baptist and Methodist, were not placed on the survey.

A further limitation was the use of non-probability, accidental sampling. As mentioned earlier, non-probability sampling yields a high error rate because of inaccuracies in sampling populations without discussing an exact probability. For example, the author did not determine that a Catholic person has a 1 in 4 chance of supporting stem cell. Also, the use of accidental sampling relied on a random sampling of respondents, rather than a predetermined sample.



## RECOMMENDATIONS

Several recommendations are needed for this research. One suggestion is to expand the scope of the survey to include a greater number of neighborhoods, churches, synagogues, mosques, and businesses. Also, the author could expand the educational category to include respondents who earned 2-year college degrees. Also, the religious category could be expanded to include denomination such as Baptist and Methodist. Also, greater emphasis should be placed on Jewish and Muslim religious groups because these religions state that stem cell research is moral and a method of utilizing God-given intellectual abilities.

Other recommendations include the use of probability sampling, such as simple random sampling (Fitzgerald and Cox, 1998: 74). Types of probability sampling, such as simple random sampling, will give each element an equal chance of being selected (Fitzgerald and Cox, 1998: 74). Thus, probability sampling could provide greater accuracy in data collection among different groups.

Future researchers should realize several factors when conducting a survey. First, the questionnaire must include all demographic data (age, gender, race, income, educational level, and religion). In addition, the questionnaire should include specific questions about the research topic. The questionnaires must be administered at diverse locations in order to see if respondents from different backgrounds feel differently about a given topic. As mentioned earlier in the conclusions, the support of stem cell research was not entirely dependent on education and religion. In fact, many respondents, regardless of religion and education, opposed stem cell research. The opposition, however, was not

unilateral. For example, at least half of the respondents surveyed opposed stem cell research. On the other hand, close to half of the respondents stated that they would accept tissue derived from embryonic stem cells. Based on the conclusions, future researchers may need to further explore the reasons for opposition to stem cell research. Even though the respondents did not oppose stem cell research en masse, the respondents themselves may need to be introduced to material detailing the topic of stem cell research. Although most respondents were aware of stem cell research, there were variable responses in regard to morality and support. This indicates that many people are not fully informed on the topic. Therefore, the researcher needs to provide additional information to the respondents. At the same time, it is imperative that the researcher refrain from injecting his or her biases into the survey. By providing additional information to respondents, future researchers will be able to gather more definitive data.

What does this research suggest about biological research and public policy? For one thing, the general public is exposed to information about stem cell research on a daily basis. However, this information is presented in scientific jargon that is incomprehensible to the average reader. As a result of this problem, the reader may understand the rudimentary aspects of stem cell research, but not the biological processes. Thus, the reader may not fully understand the implications of cloning human embryos. Also, public agencies and researchers in both public and private institutions need to provide greater dialogue to the general public about the mechanisms of stem cell research and its implications. One way of conveying this message could be through the teaching of stem cell research in public schools. An elective course consisting of a curriculum based on stem cell research should be taught in a manner that does not offend any religious or

socioeconomic group. In addition to teaching stem cell research in schools, public agencies at all levels of government must provide public health programs to educate adults on the subject of stem cell research. This could be in the form of commercials, town hall meetings, and workshops at local health departments. The public, the author feels, should be informed about stem cell research in an aggressive and consistent manner. The author also feels that this approach may be expensive and could take several years to implement, but with determination and persistence, it can be accomplished. Similar programs, such as AIDS/HIV education, were successful in the 1980's and 1990's. At the present time, most Americans are aware of the causes and treatments for both AIDS and HIV. Similarly, the American public will become better informed on stem cell research if the scientific community and government collaborate in educating the public on this exciting breakthrough in technology.

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**APPENDICES**

## Appendix A

## SAMPLE QUESTIONNAIRE

1. What is your gender?  
A. Female B. Male
  
2. What is your age?  
A. 18-25  
B. 26-30  
C. 31-39  
D. 40-49  
E. 50 +
  
3. Please circle the ethnic group(s) to which you belong.  
A. African-American B. Caucasian C. Hispanic D. Asian E. Other Please  
Specify \_\_\_\_\_
  
4. What is your annual income?  
A. Less than \$15,000  
B. \$15,001-\$30,000  
C. \$30,001-\$45,000  
D. \$45,001-\$60,000  
E. Above \$60,000
  
5. What is your highest level of education?  
A. Did not complete High School  
B. Completed High School  
C. Less than 2 years of college  
D. More than 2 years of college  
E. College Degree
  
6. What religion do you belong to?  
A. Protestant (Non-Catholic)  
B. Catholic  
C. Jewish  
D. Muslim  
E. No religious affiliation

7. I think scientific research is important for the well being of our society.
  - A. Strongly Agree
  - B. Agree
  - C. No Opinion
  - D. Disagree
  - E. Strongly Disagree
  
8. Have you ever heard of embryonic stem cell research?
  - A. Yes B. No
  
9. What do you think about the cloning of human embryonic stem cells?
  - A. I support cloning
  - B. No Opinion
  - C. I don't support cloning
  
10. Should stem cells be cloned for research?
  - A. Yes
  - B. Undecided
  - C. No
  
11. Do you think scientists should keep a catalog of stem cells?
  - A. Yes
  - B. Undecided
  - C. No
  
12. Should hospitals use cloned stem cells to treat patients with life-threatening diseases?
  - A. Yes
  - B. Undecided
  - C. No
  
13. Do you think the cloning of human embryonic stem cells is immoral?
  - A. Yes
  - B. Undecided
  - C. No
  
14. If you had a life-threatening illness, would you accept human tissue grown from stem cells?
  - A. Yes
  - B. Undecided
  - C. No

**Thank you for participating in this survey. Your cooperation is greatly appreciated.**



## Appendix B Total Responses

|    |                       | Fall 2001 | Spring 2002 | Total |
|----|-----------------------|-----------|-------------|-------|
| 1. | Gender                |           |             |       |
| A. | Female                | 25        | 37          | 62    |
| B. | Male                  | 23        | 24          | 47    |
|    |                       |           |             |       |
|    |                       | 48        | 61          | 109   |
| 2. | Age                   |           |             |       |
| A. | 18-25                 | 8         | 11          | 19    |
| B. | 26-30                 | 10        | 6           | 16    |
| C. | 31-39                 | 14        | 10          | 24    |
| D. | 40-49                 | 9         | 10          | 19    |
| E. | 50+                   | 9         | 26          | 35    |
|    |                       |           |             |       |
|    |                       | 50        | 63          | 113   |
| 3. | Ethnicity             |           |             |       |
| A. | Afr-Amer.             | 44        | 46          | 90    |
| B. | Caucas.               | 5         | 9           | 14    |
| C. | Hisp.                 | 0         | 2           | 2     |
| D. | Asian                 | 0         | 1           | 1     |
| E. | Other                 | 1         | 1           | 2     |
|    |                       |           |             |       |
|    |                       | 50        | 59          | 109   |
| 4. | Annual Income         |           |             |       |
| A. | Less than<br>\$15,000 | 14        | 9           | 23    |
| B. | \$15,001-<br>\$30,000 | 18        | 16          | 34    |
| C. | \$30,001-<br>\$45,000 | 10        | 9           | 19    |
| D. | \$45,001-<br>\$60,000 | 3         | 15          | 18    |
| E. | Above<br>\$60,000     | 4         | 12          | 16    |
|    |                       |           |             |       |
|    |                       | 49        | 61          | 110   |

|    |                                 |    |    |     |
|----|---------------------------------|----|----|-----|
| 5. | Education                       |    |    |     |
| A. | No High School                  | 0  | 1  | 1   |
| B. | High School                     | 12 | 3  | 15  |
| C. | <2 Yrs. College                 | 8  | 6  | 14  |
| D. | >2 Yrs. College                 | 2  | 6  | 8   |
| E. | College Degree                  | 27 | 46 | 73  |
|    |                                 | 49 | 62 | 111 |
| 6. | Religion                        |    |    |     |
| A. | Protestant                      | 26 | 16 | 42  |
| B. | Catholic                        | 4  | 37 | 41  |
| C. | Jewish                          | 0  | 1  | 1   |
| D. | Muslim                          | 1  | 1  | 2   |
| E. | No Religion                     | 8  | 4  | 12  |
|    |                                 | 39 | 59 | 98  |
| 7. | Benefits of Scientific Research |    |    |     |
| A. | Strongly Agree                  | 24 | 34 | 58  |
| B. | Agree                           | 21 | 18 | 39  |
| C. | No Opinion                      | 5  | 5  | 10  |
| D. | Disagree                        | 0  | 1  | 1   |
| E. | Strongly Disagree               | 0  | 3  | 3   |
|    |                                 | 50 | 61 | 111 |
| 8. | Heard of Stem Cell Research     |    |    |     |
| A. | Yes                             | 43 | 49 | 92  |
| B. | No                              | 6  | 9  | 15  |
|    |                                 | 49 | 58 | 107 |

|     |                                   |    |    |     |
|-----|-----------------------------------|----|----|-----|
| 9.  | Cloning of Stem Cells             |    |    |     |
| A.  | Support                           | 10 | 9  | 19  |
| B.  | No Opinion                        | 14 | 11 | 25  |
| C.  | Don't                             | 25 | 39 | 64  |
|     | Support                           |    |    |     |
|     |                                   | 49 | 59 | 108 |
| 10. | Should Stem Cells Be Cloned       |    |    |     |
| A.  | Yes                               | 16 | 16 | 32  |
| B.  | Undecided                         | 21 | 23 | 44  |
| C.  | No                                | 13 | 22 | 35  |
|     |                                   | 50 | 61 | 111 |
| 11. | Stem Cell Catalog                 |    |    |     |
| A.  | Yes                               | 24 | 30 | 54  |
| B.  | Undecided                         | 18 | 14 | 32  |
| C.  | No                                | 8  | 16 | 24  |
|     |                                   | 50 | 60 | 110 |
| 12. | Hospitals Using Cloned Stem Cells |    |    |     |
| A.  | Yes                               | 29 | 27 | 56  |
| B.  | Undecided                         | 16 | 14 | 30  |
| C.  | No                                | 5  | 20 | 25  |
|     |                                   | 50 | 61 | 111 |

|     |                                   |    |    |     |
|-----|-----------------------------------|----|----|-----|
| 13. | Is Cloning of Stem Cells Immoral  |    |    |     |
| A.  | Yes                               | 11 | 25 | 36  |
| B.  | Undecided                         | 23 | 16 | 39  |
| C.  | No                                | 15 | 20 | 35  |
|     |                                   |    |    |     |
|     |                                   | 49 | 61 | 110 |
|     |                                   |    |    |     |
| 14. | Would You Accept Stem Cell Tissue |    |    |     |
| A.  | Yes                               | 27 | 23 | 50  |
| B.  | Undecided                         | 19 | 18 | 37  |
| C.  | No                                | 4  | 19 | 23  |
|     |                                   |    |    |     |
|     |                                   | 50 | 60 | 110 |

## Appendix C-Education

| 7. Benefits of Scientific Research           |          |          |           |
|--|----------|----------|-----------|
|  | <u>N</u> | <u>S</u> | <u>CD</u> |
| A.   | 7        | 12       | 36        |
| B.   | 7        | 5        | 26        |
| C.   | 2        | 4        | 4         |
| D.   | 0        | 0        | 1         |
| E.   | 0        | 0        | 3         |
| T=   | 16       | 21       | 70        |
| 8. Heard of Stem Cell Research               |          |          |           |
|  | <u>N</u> | <u>S</u> | <u>CD</u> |
| A.   | 9        | 16       | 66        |
| B.   | 7        | 4        | 5         |
| T=   | 16       | 20       | 71        |
| 9. Cloning of Stem Cells                     |          |          |           |
|  | <u>N</u> | <u>S</u> | <u>CD</u> |
| A.   | 1        | 4        | 14        |
| B.   | 6        | 6        | 11        |
| C.   | 9        | 11       | 44        |
| T=   | 16       | 21       | 69        |
| 10. Should Stem Cells Be Cloned for Research |          |          |           |
|  | <u>N</u> | <u>S</u> | <u>CD</u> |
| A.   | 5        | 9        | 16        |
| B.   | 7        | 6        | 30        |
| C.   | 4        | 6        | 25        |
| T=   | 16       | 21       | 71        |

| 11. Stem Cell Catalog                 |          |          |           |
|---------------------------------------|----------|----------|-----------|
|                                       | <u>N</u> | <u>S</u> | <u>CD</u> |
| A.                                    | 10       | 14       | 29        |
| B.                                    | 4        | 3        | 24        |
| C.                                    | 2        | 4        | 17        |
| T=                                    | 16       | 21       | 70        |
| 12. Hospitals Using Cloned Stem Cells |          |          |           |
|                                       | <u>N</u> | <u>S</u> | <u>CD</u> |
| A.                                    | 11       | 14       | 31        |
| B.                                    | 2        | 5        | 22        |
| C.                                    | 3        | 2        | 18        |
| T=                                    | 16       | 21       | 71        |
| 13. Is Cloning of Stem Cells Immoral  |          |          |           |
|                                       | <u>N</u> | <u>S</u> | <u>CD</u> |
| A.                                    | 4        | 6        | 24        |
| B.                                    | 7        | 7        | 24        |
| C.                                    | 5        | 8        | 23        |
| T=                                    | 16       | 21       | 71        |
| 14. Would You Accept Stem Cell Tissue |          |          |           |
|                                       | <u>N</u> | <u>S</u> | <u>CD</u> |
| A.                                    | 8        | 10       | 30        |
| B.                                    | 6        | 7        | 23        |
| C.                                    | 2        | 3        | 17        |
| T=                                    | 16       | 20       | 70        |

## Appendix D-Religion

| 7. Benefits of Scientific Research           |          |          |          |
|--|----------|----------|----------|
|  | <u>P</u> | <u>C</u> | <u>O</u> |
| A.   | 22       | 23       | 7        |
| B.   | 15       | 12       | 4        |
| C.   | 4        | 3        | 3        |
| D.   | 1        | 0        | 0        |
| E.   | 0        | 1        | 1        |
| T=   | 42       | 39       | 15       |
| 8. Heard of Stem Cell Research               |          |          |          |
|  | <u>P</u> | <u>C</u> | <u>O</u> |
| A.   | 33       | 33       | 11       |
| B.   | 9        | 5        | 3        |
| T=   | 42       | 38       | 14       |
| 9. Cloning of Stem Cells                     |          |          |          |
|  | <u>P</u> | <u>C</u> | <u>O</u> |
| A.   | 6        | 7        | 4        |
| B.   | 9        | 6        | 5        |
| C.   | 25       | 24       | 6        |
| T=   | 40       | 37       | 15       |
| 10. Should Stem Cells Be Cloned for Research |          |          |          |
|  | <u>P</u> | <u>C</u> | <u>O</u> |
| A.   | 11       | 9        | 6        |
| B.   | 14       | 17       | 4        |
| C.   | 17       | 11       | 5        |
| T=   | 42       | 37       | 15       |

| 11. Stem Cell Catalog                 |          |          |          |
|---------------------------------------|----------|----------|----------|
|                                       | <u>P</u> | <u>C</u> | <u>O</u> |
| A.                                    | 21       | 20       | 8        |
| B.                                    | 11       | 10       | 4        |
| C.                                    | 10       | 8        | 3        |
| T=                                    | 42       | 38       | 15       |
| 12. Hospitals Using Cloned Stem Cells |          |          |          |
|                                       | <u>P</u> | <u>C</u> | <u>O</u> |
| A.                                    | 25       | 15       | 8        |
| B.                                    | 9        | 14       | 3        |
| C.                                    | 8        | 10       | 4        |
| T=                                    | 42       | 39       | 15       |
| 13. Is Cloning of Stem Cells Immoral  |          |          |          |
|                                       | <u>P</u> | <u>C</u> | <u>O</u> |
| A.                                    | 13       | 16       | 2        |
| B.                                    | 17       | 10       | 5        |
| C.                                    | 11       | 13       | 8        |
| T=                                    | 41       | 39       | 15       |
| 14. Would You Accept Stem Cell Tissue |          |          |          |
|                                       | <u>P</u> | <u>C</u> | <u>O</u> |
| A.                                    | 19       | 15       | 8        |
| B.                                    | 14       | 14       | 4        |
| C.                                    | 8        | 9        | 3        |
| T=                                    | 41       | 38       | 15       |



