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Stem Cell Research: Greasing the "Slippery Slope" to Godlessness

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In November 2004, California voters passed a ballot measure providing $3 billion for stem cell research to find cures for a plethora of degenerative diseases. Many prominent individuals made pleas for the passage of this measure including California Governor Arnold Schwarzenegger, former First Lady Nancy Reagan, and actors Michael J. Fox, who suffers from Parkinson's Disease (PD), and Christopher Reeve, who died recently of complications from a spinal cord injury suffered several years ago. But what is stem cell research and why is there a controversy concerning the use of stem cells in medicine? If these cells can provide a cure for many who suffer from degenerative diseases such as Parkinson's, Alzheimer's, and diabetes, why would anyone object to stem cell research and its applications? A close examination of this issue reveals the objection is not regarding the *use* of stem cells, but from the *source* of those stem cells.

By definition, stem cells are capable of self-renewal and differentiating into many cell types to form tissues in humans and other organisms. A pre-embryo (an embryo less than 14 days old) possesses stem cells that are totipotent, which means they are capable of differentiating into any one of the 200 cell types in the human body. This potential to differentiate into any cell type of the body has encouraged scientists to pursue embryonic stem cell research for medical purposes. Stem cells persist throughout development and into the adult where they are referred to as multipotent adult stem cells. Adult stem cells are capable of differentiating into one of several (multipotent) cell types, but presumably not into any cell type (although this dogma is now being challenged). Adult stem cells can be collected from a donor or even from the individual needing treatment, whereas the collection of embryonic stem cells requires destruction of the embryo (presumbably a human individual).

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From a scientific perspective adult stem cells have several clinical advantages over embryonic stem cells. Adult stem cells are maintained throughout the body, they are currently used in many clinical applications, and if a patient uses his own adult stem cells, an immune response causing tissue rejection is avoided. Recent progress in research involving adult stem cells may make the use of the ethically challenged embryonic stem cells irrelevant.

Multipotent adult stem cells can be found in many regions of the body called stem cell niches and collecting cells from these niches neither creates a viable embryo nor harms the donor. These niches have been identified in many locations including the kidneys,[1] hair follicles,[2] nervous tissue,[3] and bone marrow.[4] From these niches several different cell types are generated to replace worn-out, diseased, or damaged cells that no longer function. The haemopoietic stem cells found in bone marrow provide a good example of adult stem cell function. These cells can differentiate into various blood cell types including erythrocytes (red blood cells), thrombocytes (platelets), and several types of leucocytes (white blood cells).[4] Additional adult stem cells found in bone marrow, the mesenchymal cells, differentiate into bone, cartilage, and fat cells.[4] Multipotent stem cells are also found in umbilical cord blood and can be collected and stored at birth with no discomfort or threat to the life of the infant or mother.[5]

Adult stem cells from these niches are currently being used to treat a number of diseases and more applications are in clinical trials. Adult stem cells from bone marrow are used to treat more than 70 diseases including leukemia and breast cancer.[6] In addition to these treatments, bone marrow transplants have been shown to supply stem cells that regenerate cells in the liver.[7] The exact mechanism has not been conclusively identified, but it likely occurs through transdifferentiation, the ability of haemopoietic stem cells to change into liver cells instead of blood cells, or the fusion of mesenchymal or haemopoietic stem cells with existing liver cells.[7] Using stem cells from another niche in the body will make it possible to treat an individual who is suffering from organ failure with their own stem cells, eliminating an immune response that frequently leads to tissue rejection of a transplanted organ. Austrian researchers have successfully treated stress induced incontinence in women using muscle-derived stem cells taken from the arm of the patient.[8] Clinical trials with neural stem cells to treat a neurodegenerative disease, amyotrophic lateral sclerosis (ALS),[9] and bone marrow stem cells to replace damaged heart tissue from the effects of myocardial ischaemia (decreased blood flow to the heart associated with heart attack)[10] have also demonstrated the potential of adult stem cell treatments. Animal models indicate that adult stem cells may be effective in treating diabetes,[11] blindness,[12] and heart failure[13] as well. These are just a few of many examples of the success of adult stem cells in regenerating damaged tissues.

Even with the success of adult stem cell research, the potential of embryonic stem cells to develop into any human cell type is the driving force of stem cell research. To acquire these cells, the trophoblast (the protective covering of the embryo) is stripped away and the inner cells are harvested after the initial zygote has undergone several divisions. These cells grow on media containing nutrients

and biochemical factors that stimulate development into various cell types. Using this technology, scientists hope to regenerate tissues and organs for those who suffer from many degenerative diseases.

An even more disturbing procedure to acquire embryonic stem cells approved by the California ballot measure is somatic cell nuclear transfer (SCNT).[14] In this procedure a nucleus is removed from a donated ovum (human egg) and a nucleus with a full set of chromosomes from a donor somatic cell (any cell of the body except sex cells) is implanted into the enucleated ovum. The developing cells from the genetically engineered individual are grown on media and extracted as described above for embryonic stem cells. The recipient of the stem cells could also be the donor of the somatic cell nucleus, making the stem cells genetically identical to the recipient and less likely to cause an immune response. Treatments using non-self embryonic stem cells would elicit an immune response by the recipient and promote the complication of using immune-suppressing drugs and tissue rejection. Unfortunately, harvesting these cells from the engineered embryo, results in the death of a sibling. This should be the very reason for using the recipients own adult stem cells, not stem cells created through SCNT.

If SCNT looks like cloning, that's because it is! Creating embryonic stem cells through SCNT for the purpose of treating diseases has been termed "therapeutic cloning" because, theoretically, the resulting cells will only be used to treat diseases. However, SCNT was the same method used to clone Dolly the sheep[15] and other animals, and although science has labeled this "reproductive cloning" the two procedures are virtually the same in the early stages.[15,16] Presently, no one has succeeded using SCNT for human therapeutic or reproductive cloning, but success in getting human stem cells through SCNT will certainly lead to the knowledge and use of human cloning.

Stem cell use will benefit man in treating a multitude of human disorders, but science and society must be careful to respect the life of the unborn by using only those cells that can voluntarily be donated from adult individuals. Scripture has much to say about man's responsibility to treat all stages of human life as sacred. The Bible teaches that man is a special creation (Genesis 1:27), life begins at conception (Jeremiah 1:5; Galatians 1:15), and the pre-born are human beings (Luke 1:41; Exodus 21:22). Furthermore, we are specifically told not to murder, which includes abortion. However, science and society are on the verge of allowing another form of abortion and using it to obtain what belongs to someone else. The Tenth Commandment tells us, "Thou shalt not covet thy neighbor's house, thou shalt not covet thy neighbor's wife . . . *nor any thing that is thy neighbor's*" (Exodus 20:17). Embryonic stem cells belong to our "neighbor," and killing an embryo for his stem cells breaks this commandment. These differing worldviews, Biblical versus secular, are eloquently spelled out in this statement by Anne McLaren in a commentary in *Nature* magazine.

> For those who believe the human embryo from the one-cell stage onwards has absolute moral value, equal to that of a newborn baby or an adult, any embryo research . . . is tantamount to murder. But life is continuous. . . . and although a new genetic constitution comes into being at fertilization, *many people feel that moral value develops gradually*.[17] [Emphasis added.]

This statement attempts to explain the justification of harvesting embryonic stem cells even though adult stem cells are readily available and effectively being used to treat diseases without the moral baggage that plagues embryonic stem research. It seems as long as an evolutionary worldview of man dominates scientific inquiry we will continue to see a disregard for the sanctity of human life and continue down the "slippery slope" towards total godlessness.

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