

Me, My God, and the Issues of My Times

Stem Cell Research

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Introduction....We all live in our particular time in history and, within our culture, face issues which cry out for Christians to be heard. We are called to be salt and light in the world, not to withdraw from it, as isolationists. When we speak, we should speak knowledgeably---knowing what Scripture says, and knowing the relevant facts in the matter at hand. Nothing removes Christian authority faster than us speaking loudly and authoritatively, but unintelligibly or incoherently because we have failed to do our homework. This is the first in a series about current issues of our day. Today we will tackle a hot issue---**Embryonic Stem-Cell Research.**

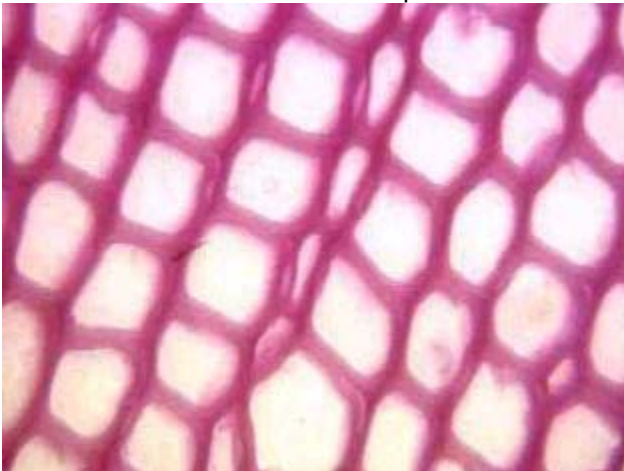
A Quick Biology /Vocabulary Lesson:

Cell

An autonomous self-replicating unit (in principle) that may constitute an organism (in the case of unicellular organisms) or be a subunit of multicellular organisms in which individual cells may be more or less specialized (differentiated) for particular functions. All living organisms are composed of one or more cells. Implicit in this definition is that viruses are not living organisms - and since they cannot exist independently, this seems reasonable.

Cell Theory.

- The **cell** is the basic unit of life- this is what is known as **cell theory**, that is that all living organisms are composed of cells, and that cells are the smallest life forms capable of self-replication. The word cell comes from the Latin word *cello*, meaning chamber, and the term cell was first used in the biological sense when Robert Hooke first observed (hundreds of years ago) the little chambers (cells) in a slice of cork plant while using one of the first crude microscopes.



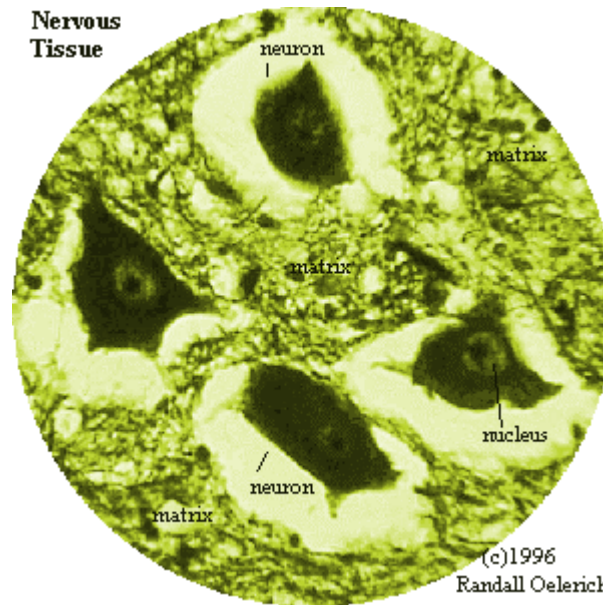
- **To really understand human anatomy, physiology and disease requires an understanding of what comprises humans...cells!** Our knowledge of cells allows us to understand many aspects of not only single celled life forms (bacteria, molds, yeasts, pond organisms, plankton, and so on) but also larger life forms (animals, humans, and so on), because even large life forms, such as yourself, are merely collections of billions of cells.
- But what **kinds of cells** exist in nature? You will learn that there are only two main categories of cells that comprise all life forms, no matter how complicated a life form may appear: **Prokaryotes** and **Eukaryotes**. If you understand these two cell types, you can learn to understand many things about cells, such as how drugs affect cells, what cancers are, and how your cells metabolize when you exercise or when you are sick. Indeed, all diseases and states of health can be explained at the cellular level, so if you understand cells, you understand the organism.
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Prokaryotes are single-celled life forms that lack a nuclear membrane (a sac-like structure in a cell that contains the cell's genetic material). Instead, the genetic material (DNA) of prokaryotes floats free in the cell. Generally the term prokaryotes is synonymous with bacterial cells, but this varies according to classification schemes (of which biologists differ in opinion, especially with regard to the single-celled life forms in nature). It is usually necessary to use a microscope to view prokaryotes; the cells are placed on a glass slide and then viewed at between 100 and 1000 magnification.

Eukaryotes are organisms having cells that possess a nuclear membrane encasing the cellular genetic material (DNA), so that the cells have a central genetic region called a nucleus.

Eukaryotes are much larger than prokaryotes, generally about 100 times larger.

- Eukaryotes include human and all other animal and plant cells, fungi (molds, slime molds, yeasts), and unicellular animals called protozoa (microscopic animals that swim in ponds, plankton that whales feed on, and blood parasites such as causative organisms of malaria, sleeping sickness, giardiasis, and so on.).
- **Metazoans**(the metazoa) are the *multi-cellular eukaryotes*, in contrast to the protozoa (single-celled animal eukaryotes) and yeasts (single-celled fungi eukaryotes). Humans and most animal life forms that you are able to see with your naked eye are metazoans.



How Big are Cells? Cells are microscopic in size, requiring microscopes for visualization. About 10 human cells could be stacked on top of one another in the thickness of a piece of paper. Human red blood cells are about 7.5 micrometers wide, and are about 5-100 times as large as bacterial cells. {a micrometer, or micron, is one millionth of a meter in length, and is abbreviated as the Greek symbol *mu* (that looks sort of like the letter u followed by m [um].)}

Look at the four *nerve cells* (neurons) in the photograph at the top; these cells (located in the spinal cord where they send electrical signals to muscle cells) are among the largest in the human body, almost visible with the naked eye. In the photograph they are magnified ~100x. The white space surrounding each cell is artifact- empty space created when the knife sectioned the tissue, peeling the cells away from the surrounding matrix (non-cellular material in which cells are located).

Stem cell

Non specialized cells that have the capacity to self-renew and differentiate into more mature cells. The stem cell gives rise to a lineage of cells. (2) More commonly used of a cell that, upon division, produces dissimilar daughters, one replacing the original stem cell, the other differentiating further

Cell line

A cell line is a permanently established cell culture that will proliferate indefinitely given appropriate fresh medium and space. Lines differ from cell strains in that they have escaped the Hayflick limit (cells dying after about 60 reproductions and become immortalized). Some species, particularly rodents, give rise to lines relatively easily, whereas other species do not. No cell lines have been produced from avian tissues, and the establishment of cell lines from human tissue is difficult. Many cell biologists would consider that a cell line is by definition already abnormal and that it is on the way towards becoming the culture equivalent of a neoplastic cell.

Adult stem-cell

A cell taken from mature tissue that can renew itself but has a limited ability to transform into specialized cell types.

Blastocyst

A preimplantation embryo consisting of 30 to 150 cells---usually most ripe for stem cells between the 4th and 6th day after the sperm has implanted the egg.

Embryo

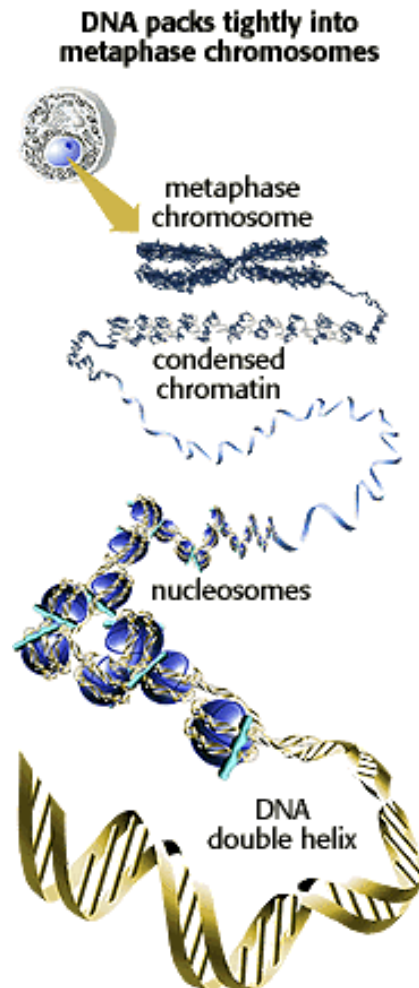
The earliest stage of development from the single cell to the implementation in the uterus. The Embryos under discussion are created “in vitro”, outside of the body, in fertility clinics by couples getting fertility assistance by “washing” the egg and sperm and joining them in a centrifuge. The Embryos are frozen until implanted, and sometimes, when couples no longer wish further implantation, are discarded. Frozen Embryos can be kept up to 7 years.

Embryonic stem cell

A cell from an embryo that has the potential to become a wide variety of specialized cell types.

Cloning

The creation of an animal or person that derives its genes from a single other individual.



DNA

The material that contains the instructions for making all of the parts of the body and determining physical characteristics (hair color, eye color, facial features, etc.)

Nucleus

The core of the cell that contains the chromosomes (DNA).

Gene

A unit of heredity that is a segment of DNA.

Pluripotent

Stem cells, located in the inner area of the blastocyst, have not yet had their ultimate form determined, such that they appear able to become any of the 220 different cell types which comprise the human body. The stem cells are therefore, “pluripotent”. Once programmed by DNA the stem cells take on the cell types of the organism described by the DNA.

Why has this become an issue now?

In November 1998 researchers at the University of Wisconsin, working under funding from Geron Corp., announced that they had cultured stem cells taken from a human embryo, stopped the development of the cells in their normal “differentiation” into organ cells, and had kept them multiplying while maintaining the pluripotency. This scientific advance appears to indicate that science may be able to direct the stem cell development into cells necessary to repair tissue in directed areas, such as nerves, brain, lungs, pancreas, arteries and heart, by programming the DNA of the stem cells on an intended basis.

The hope is that science will be able to reverse or ameliorate the effects of disease---and eventually aging---to improve those millions of people affected by debilitating diseases such as diabetes, heart illness, Parkinsons, Huntingtons, ALS, Alzheimers and damage due to accidental injury.

The problem that makes a controversy arise.

Under today’s methods, removing the stem cells from the blastocyst, or embryo, causes the embryo to die. Some (Christians, the Roman Catholic Bishops and Pope, and most Right-to-Life groups) view the Embryo as the earliest phase of human life, deserving to be respected, honored and imbued with the same rights as fully developed persons. Others take a limited view on the beginning of life, with various stages chosen as the beginning of “personhood”, for example, 16 weeks after fertilization (brain waves detected on an encephalogram), when the “fetus” would be viable outside of the mother, ½ way out of the womb, first breath. The critical question is “When does life begin?” Many believe we have passed this question, and are now in the “How much do we respect life?” phase.

Typical proponents of unlimited embryonic stem cell research: Mary Tyler Moore, Michael J. Fox, Christopher Reeves, Sen. Orin Hatch, HHS Sec. Tommy Thompson, Sen. Trent Lott, many “non-practicing” Roman Catholics.

Typical opponents of embryonic stem cell research: “Conservative Christians, “, the Pope, the national Council of Bishops, Focus on the Family (Dr. James Dobson), Family Research Council (Gary Bauer), Prison Fellowship (Chuck Colson). Sen. Sam Brownback., church-going Roman Catholics.

Why was the president involved?

Federal law prohibits the expenditure of Federal funding of any research which a) causes Embryos to be created for anything other than human reproduction purposes, or b) destroys the Embryo. In 1999 President Clinton overrode Federal law with an Executive Order which allowed the expenditure of Federal funds for embryonic stem cell research where the parents consented and were not paid for their embryos, but the embryos were clearly going to die.

What is President Bush's decision?

President Bush, through Executive Order, is allowing Federal funding of embryonic stem cell research on the "60" stem cell lines which have been developed from embryos who have already had their life terminated, but no funding for any research where the life has not yet been taken.

Key Excerpt from President Bush's Speech

"As a result of private research, more than 60 genetically diverse stem cell lines already exist. They were created from embryos that have already been destroyed, and they have the ability to regenerate themselves indefinitely, creating ongoing opportunities for research. I have concluded that we should allow federal funds to be used for research on these existing stem cell lines, where the life and death decision has already been made.

Leading scientists tell me research on these 60 lines has great promise that could lead to breakthrough therapies and cures. This allows us to explore the promise and potential of stem cell research without crossing a fundamental moral line, by providing taxpayer funding that would sanction or encourage further destruction of human embryos that have at least the potential for life. "