Tissue Engineering Abstract

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Background And History:

BACKGROUND

As defined by National Institute of Health the definitions for the areas of tissue engineering are:

1) Biomaterials:
2) Cells:
3) Biomolecules:
4) Engineering Design
5) Biomechanical Aspects of Design:
6) Informatics to support tissue engineering: *("NIH Definition of Tissue Engineering/Regenerative Medicine." Tissue Engineering Pages. 1 Oct. 2008. Stem Cell World Congress. 1 Oct. 2008 <http://www.tissue-engineering.net/index.php?seite=whatiste>.)*

HISTORY

In 1970 W.T. Green, an orthopedic surgeon in a children's hospital was responsible for conducting the firs research related to tissue engineering. He stipulated that by implanting chondrocyte cells which in simple terms are the cells that multiply into cartilege, into the spicule of a bone which is the area of the matrix where cell multiplication and growth of the bone continues, he would be able to cause cartilege to form. Although he was unsuccessful this opened the doorway to tissue engineering.

In the Mid-1980's Dr. Vacanti and Dr. Langer devised a method that would attempt to create scaffoldings for cell delivery instead of using naturally occurring scaffoldings that could not be replicated. Dr. Vacanti was able to generate functional tissue by using "synthetic biocompatible/ biodegradablepolymers configured as scaffolds seeded with viableCells".

In 1994 (TES) Tissue engineering society was founded by Drs. Charles A. and Joseph P. Vacanti officially in Boston and then in 1996 in the state of Massachusetts. By 2005 (TERMIS) the Tissue Engineering and Regenerative Medicine International Society which included both Asian and European Societies was created.

(Vacanti, Charles A. "The history of tissue engineering." Journal of Cellular and Molecular Medicine 10 (2006): 569-76.)

APPLICATIONS

RED BLOOD CELL

Embryonic Stem Cells (ESC) are being used to make red blood cells at the Mayo Clinic in Rochester, Minnesota, and at the University of Illinois. This break through may lead to a mass production of the universal donor. The blood type O is considered the universal donor and can be accepted by all other blood types.Only 8% of Caucasians had 0.3% of Asians have it.

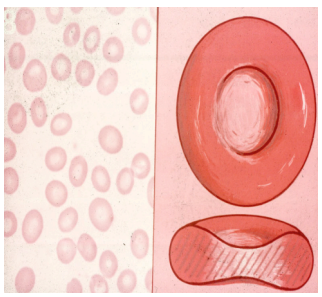
This will also help prevent the spread of diseases because the blood would be manufactured thereby disease free.

This is done by changing the ESC to haemangioblasts using nutrients and growth factors which then differentiate into red blood cells. The most integral step was cell "enucliation". Another major technique was growing the blood cells in bone marrow.

This prevents cellular reproduction which thereby preventing the blood cells from becoming cancerous. These produced blood cells are 100% effective. There have been Proposals to use skin cells to program these cells to be blood type O..

(Coghlan, Andy. "First red blood cells grown in the lab." New Scientiest. May 2008.The New Scientist.2 Oct. 2008 <http://www.newscientist.com/article/dn14565-first-red-blood-cells-grown-in-the-lab.html>.)

Cell "enucliation" occurs when the cell eject their nucleus. This is a natural process that occurs in the body however it is very difficult to reproduce. (("Hemangioblast." *Wikipedia, The Free Encyclopedia*. 28 May 2008, 19:25 UTC. 2 Oct 2008 <http://en.wikipedia.org/w/index.php?title=Hemangioblast&oldid=215562930>.)



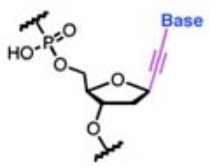
NEW SOURCES FOR STEM CELLS

Stem cells can be considered blank slates amonst cells. They are the basis from which many other cell types differentiate and also areinvolved in research for treatments for numerous conditions like cancer and alzheimers.Use of wisdom teetht to extract stem cells are advantageous because they help avoid an ethical dilemna and are easily preserved. Japanese scientists used the Mesenchymal stem cells produced from the dental pulp. Sadly however they can only differentiate into bone, fat and cartilege. They stated that they "used just three sets of genes—OCT4, SOX2, and KLF4—to program cells cultured from the center of a wisdom tooth into adult stem cells" (*Avasthi, Amitabh. "Teeth Can Yield Stem Cells, Scientists Say." 27 Aug. 2008. National Geographic. 2 Oct. 2008 <http://news.nationalgeographic.com/news/2008/08/080827-tooth-stemcell.html>.)*

NEW LETTERS IN THE DNA CODE

Four artificial letters from new artificial DNA will help convert DNA to be applicable to electronic devices. "The artificial DNA is more stable than natural DNA, which may make it a good candidate for turning into molecular electronic wires, able to conduct electrons along their length." Japanese scientists placed the new bases in the backbone of a regular DNA strand.

There is great potential for creating a larger variety of molecules when both systems are mixed and transfering information from DNA to nanotechnology.



("Four artificial new letters for the DNA alphabet." 14 July 2008. The New Scientist. 3 Oct.2008 <http://www.newscientist.com/channel/life/mg19926644.300-four-artificial-new-letters-for-the-dna-alphabet.html>.)