TISSUE ENGINEERING

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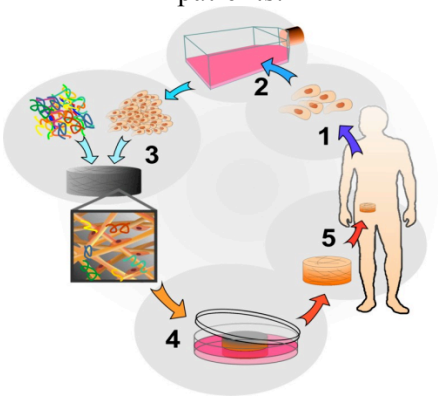
The failure or loss of an organ is a frequent problem that people around the world have faced. In order to counteract this malfunction, the fields of biology and enginerring have come into one to form a new field known as Tissue Engineering. Tissue Engineering was once commonly a field of biomaterial but has grown to be an immense field of its own. It uses naturally or synthetically dervied biomaterials to replace defective or damages tissues. These tissues can be anywhere from bone to skin to even large organs.

When discussing the mechanism of this field, numerous techniques come into play. Culturing of a variety of human cells including, muscle, skin, cartilage, bone marrow, and stem cells can act as alternates to replacing the damaged portions of the human. These synthetic of naturally derived components can be then implanted into the human body, by mean of a scaffold, and thus providing a template further allowing the body's own cells to form and grow its own new tissues. New cells attach to the scaffolds and consequently rearrange themselves until functional tissues arise. The cells proliferate, synthesize extracellular matrix, and migrate along the scaffold. As the cells make their own organization the scaffolds then degrade within the cells.

In constructing the perfect scaffold many different properties must come into play. A scaffold should have the following characteristics; three-dimensional, highly porous with an interconnected pore network for cell growth and flow transport of nutrients and metabolic waste; biocompatible with a controllable degradation and resorption rate in order to match cell and tissue growth in vitro or in vivo; appropriate surface chemistry for cell attachment, proliferation, and differentation and mechanical portions to match those of the tissues at the site of implantation (Hutmacher, D.W.)

Creating an accurate scaffold is a process that engineers have tried to perfect over years. It is so difficult due to the fact that tissues and organs are all composed of a variety of different matrix structures and cell types. As a result, the tissue or organ function is due to the cells it is comprised of. A scaffold must therefore support the growth a variety of different cell times in order for tissue growth to successfully occur. One severe tribulation is that the cells will not readily attach to the synthetic polymer surface of the scaffold mentioned earlier. Thus, it has come to be the need for a scaffold that can predominately allow the cells propagation and expression to be controlled.

In all, Tissue Engineering can offer dramatic enhancements in potential medical care for hundreds of patients as well as a decrease in medical costs. Organ transplants are time consuming and very detrimental to one health when considering the time it takes to receive an organ as well as various infectious agents such as hepatitis C and HIV further. Thus, engineered replacement organs can therefore prevent these hazards as well as being a lower cost option for patients.



Work Cited

Hutmacher, D. W. "Scaffolds in Tissue Engineering Bone and Cartilage." Biomaterials 21.24 (2000): 2529-43. SCOPUS. 18 Oct. 2009 <www.scopus.com>.

Ma, Peter F. "Scaffolds for tissue fabrication." *Department of Biologic and Materials Sciences* (2004). *Science direct*. Web. <http://www.sciencedirect.com.peach.conncoll.edu:2048/science?_ob=ArticleURL&R&_user=650709&_rdoc=1&_fmt=&_orig=search&_sort=d&_docanchor=&view=c&_acct=C000035138&_version=1&_urlVersion=0&_userid=650709&md5=4101a0c09b1b601bbb5414f233bc7726>.

"Tissue Engineering." *NIST Advanced Technology Program*. Apr. 2005. Web. 18 Oct. 2009. <http://www.atp.nist.gov/focus/tissue.htm>.

"What is Tissue Engineering?" *WiseGEEK: clear answers for common questions*. Web. 18 Oct. 2009. <http://www.wisegeek.com/contest/what-is-tissue-engineering.htm>.

Wintermantel, E., and J. Mayer. "Tissue engineering scaffolds using superstructures." *Biomaterials* 17.2 (1996): 83-91. Print.