History of injectable tissue engineering

Engineering

The advances involve researchers in a multitude of disciplines, including cell biology, bimetallism science, and Inequitable Tissue Engineering of cell material interactions. Tissue engineering aims to restore, maintain, or improve tissue functions that are defective or have been lost by deferent pathological conditions by reconstructing tissues. Inequitable Tissue Engineering Is the process of using specific tissue or organs to repair, replace or regenerate specific diseased tissue or organs without the need for surgery. Tissue engineering frequently involves stem cells.

Implanting stem cells in the appropriate location can generate cells such as bone, endows and cartilage. If the patient's own cells cannot be used cells from another human donor can be used. Tissue engineering will have a significant impact in science and medicine in the future. History and Timeline There have been references to Tissue Engineering long before the term even existed. Many point to the Renaissance painting " The Healing of Justinian by Saint Cosmos and Saint Damning" as the first example of Tissue Engineering in the human mind.

In 1438, Angelica Far depicted two saints healing a wounded soldier by replacing his leg tit what appears to be a Homograph limb, which means that the limb Is grown outside using the patient's own cells. This Is not unlike the present day organ growing Ideas. However, the oldest sign of something that resembles what we now know as Tissue Engineering comes from the Bible. Tissue Engineering as we know it today, was in the sass's when a pediatric orthopedic surgeon at the Children's Hospital, W. T. Green, MD tried to create cartilage and implant this into a mouse.

This experiment was a failure but it would later lead the way to breakthrough experiments In the field of tissue engineering. In 1985, Y. C. Fungi, an American bioengineering, drew on the traditional deflation of " tissue" as a fundamental level of analysis of living organisms, between cells and organs. Fungus ideas were rejected. However, the concept was reintroduced in 1987 by a Research Board Research to Aid the Handicapped (BRA) Program. In the early g's, two doctors of the Massachusetts General Hospital and MIT worked together to create a skin substitute by using a collagen matrix to support the growth of skin cells.

These skin cells were later successfully transferred to burn patients. A breakthrough occurred In the appropriate scaffolds rather than using naturally available scaffolds, whose chemical and physical properties could not be controlled. The use of these natural scaffolds led to unpredictable results. Dry. Vacant' designed and conducted many thorough studies attempting to generate tissue surrogates. He used a branching network of synthetic objectionable and biodegradable polymers as the scaffolds, which were then seeded with viable cells. His original paper in 1988 showed the world the promise of this up and coming field.

Five years later, he published, with Dry. Longer, a paper that might be the most cited work in Tissue Engineering. In 1993, a great breakthrough in tissue engineering occurred at a conference which was held on cutting-edge biotechnology and involved individuals from several agencies including a group of scientist at Johns Hopkins University with hopes to change Tissue Engineering and with a treatment that does away with surgery entirely. They have developed a way to inject Joints with specially designed mixtures of polymers, cells, and growth stimulator that solidify and form healthy tissue.

These searchers added cartilage cells to a light-sensitive liquid polymer and injected it under the skin on the backs of mice. They then shone ultraviolet light through the skin, causing the polymer to harden and encapsulate the cells. Over time, the cells multiplied and developed into cartilage. More recent approaches to Tissue Engineering is using Inequitable gels for implantation. This procedure is less invasive than prior attempts at Tissue Engineering. There are thousands of cases each year with traumatic injury to cartilage and bone fractures occur annually.

Adult cartilage does not normally regenerate after injury leading to complications from sports and other physical injuries. Inequitable Tissue Engineering and the Environment The environmental risks of Inequitable Tissue Engineering are generally considered to be low because most of the materials involved are biodegradable. In addition, human cells do not survive long outside controlled laboratory conditions and production conditions are strictly controlled. Additionally, in the late sass's, NASA began focusing on tissue engineering and how these materials behave in space.

Their efforts focused on development of techniques for three-dimensional cell and tissue culture. They began engineering laboratory cultures which were similar to human tissue to be used as models to conduct space research and research on deadly diseases. This eliminated the need to use human test subjects. In 1997 NASA Scientist performed an experiment in space using bovine cartilage cells. The experiment ran for three months to study the effects of space on tissue. This experiment helps to paves the way for controlled experiments with human tissues and growing human bone and muscle in space.

Tissue engineering holds so many possibilities for the future. Tissue engineering can improve individual's quality of life by enhancing tissue and organ functions. Economic Questions and considerations The Economic Benefits of Tissue Engineering greatly outweigh any negatives. Every year many people will suffer from degeneration or injury of their cartilage, leading to a reduced workforce and increased medical expenses. In addition, thousands of improvements in Inequitable cartilage repair using a cell-based tissue engineering approach will greatly benefit public health and the economy.

From 1936 to 20010 the inflation rate for medical care, as measured by the Consumer Price Index, increased more than the rate for all items. Tissue engineering has transformed the Healthcare Industry, potentially replacing conventional therapies for the repair and regeneration of diseased or damaged tissues and organs. US nursing homes suggest that Treatment for organ-loss and tissue-loss problems due to disease and accidents costs in excess of $400 billion a year. In addition, of patients suffer from pressure sores and it estimated that treatment costs $3 billion. 7 million people will e treated for Diabetic related treatment at a cost of $132 billion dollars. The cost to treat amputation and limb related injuries is $351 billion. The annual direct costs of organ replacement are now about $350 billion worldwide, or about 8 percent of global health care spending. The chart below shows how Healthcare costs have increased since 1936. Physicians are now looking to tissue engineering as a way to cut healthcare costs. Inequitable Tissue engineered materials will increase potential for healing of recalcitrant lesions, reduce wound scarring, and reduce treatment costs and hospital ATA.

Tissue engineering may well revolutionize medicine over the next ten to 15 years. Tissue engineering will reshape the $40-billion-a-year medical implant industry. Another cost saving approach is that tissue engineering mechanical organs and prosthetics can replaced by lab grown organs. The potential benefits of Tissue Engineering in improved health care and economic savings are enormous. Another potential benefit of Tissue Engineering is in the global market for Tissue Engineered products. The global market for tissue-engineered products (Tepees) is estimated to be n excess of $25 billion with revenues in the US market of $1. Billion by 2007. Over $4 billion have been invested in worldwide research and development since 1990. At the beginning of 2001 , tissue engineering research and development was being pursued by 3, 300 scientists and support staff in more than 70 startup companies or business units with a combined annual expenditure of over $600 million. Spending by tissue engineering firms has been growing at a compound annual rate of 16%, and the aggregate investment since 1990 now exceeds $3. 5 billion. There are now many overspent grants for support and research of All areas of Tissue Engineering.

Future investment will focus on supporting transformation research addressing long- term research challenges, while demonstrating an appreciation of the potential impact. The chart below demonstrates the PEEPS expenditure on Tissue Engineering. Inequitable Tissue engineering is a promising technological advancement that has made profound changes to medical practice in the areas of regenerating diseased tissues and organs instead of Just repairing them. When tissue engineering first emerged it was considered a sub-field of bio materials.