TRANSCELL BIOLOGICS

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KEYWORDS

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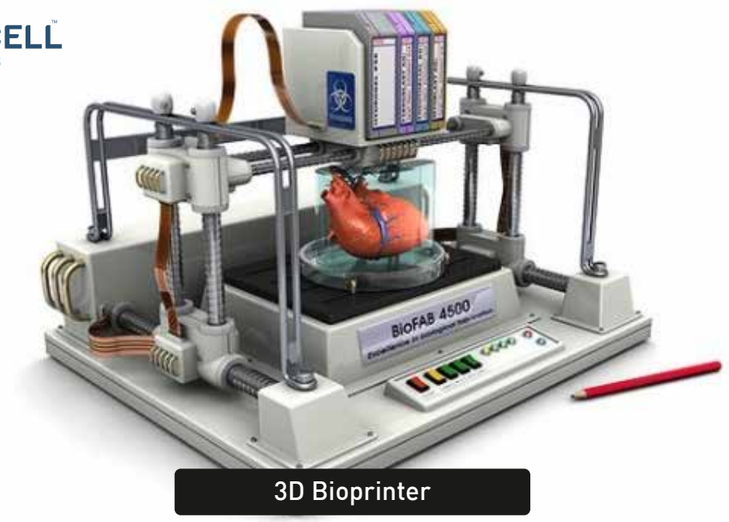
3D printing has been touted as one of the most disruptive technologies that have been making waves during the 21st century. Despite some initial negative press about the technology, it has been quickly catching up generating a lot of buzz in the industry and general public alike. 3D printing is also called additive manufacturing wherein three dimensional solid objects are produced by laying down successive layers of material until the object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object. The ease of access to 3D templates, scanners, modeling software and printers that can print 3D objects has made our lives much easier.

From printing daily objects like furniture to complicated structures such as airplane and space shuttle parts, this rather exciting new technology slowly started becoming an integral part of our lives. According to Wohlers Report 2014, the worldwide 3D printing industry is now expected to grow from $3.07B in revenue in 2013 to $12.8B by 2018, and exceed $21B in worldwide revenue by 2020. The healthcare industry has quickly realized the full potential of this technology and researchers and clinicians are taking steps towards harnessing the power of 3D printing in improving the quality of human life. In the field of healthcare, 3D printing can be used in developing prosthetics, dental and bone implants, medical instruments, tissue and simple printed organs that can be used in transplants, pharmaceuticals production, nano-scale medicine and also in the printing of complex organs. As we are already aware of the Stem cells' unique ability to produce both copies of themselves (self-renewal) and other more specialized cell types (differentiation) every time they divide, it would be exciting to see the marriage of stem cell therapy with 3D printing technology.

This newsletter is an effort to educate the reader about the potential applications of 3D printing technology using stem cells.

I am confident that the reader while appreciating the technological marvel that is 3D printing technology would also realize the potential of applying this technology in stem cell based regenerative therapies.



3D Bioprinter

Nano Dimension Announces New 3D Bioprinting Subsidiary to Develop Solutions fo rend Stage Renal Disease

Israel-based company Nano Dimension has a new announcement: the 3D printed electronics leader is creating a new subsidiary in order to advance its new 3D bioprinting initiative. In early 2016, the company partnered with Accelta, a stem cell culturing solutions provider, to successfully lab-test a proof of concept 3D bioprinter for producing stem cell-derived tissues.
Nano Dimension has been conducting market research into applications of its 3D bioprinting technology, and says that it will now be developing a platform to 3D bioprint both connective tissues and cells, which will be used to create biological structures that will function as human kidneys. The subsidiary will focus mainly on developing solutions for end stage renal diseases (ESRD) which ultimately lead to kidney failure.

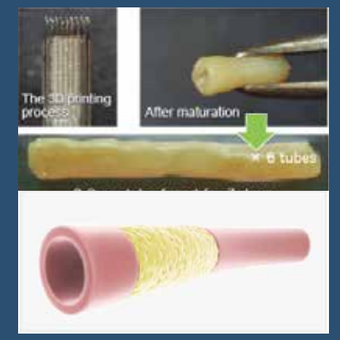
3D bioprinted myocardial path could boost heart attack recover, Korean Researchers say

A team of researchers in Korea has used a 3D bioprinter to make a myocardial therapeutic patch for treating ischemic heart disease. When attached to the heart, the 3D printed patch can generate new blood vessels and tissues. Professor Park Hoon-joon of the Seoul St. Mary's Hospital and professor Jo Dong-woo of the Pohang University of Science & Technology, two of the lead researchers on the exciting bioprinting study, announced the results of their research on February 9, claiming that their 3D printed myocardial patch could radically change the way doctors approach the treatment of ischemia, a condition that results in low blood supply to the heart muscles or other organs.

To create the 3D printed heart patch, the researchers used cardiac extracellular matrices as a 3D printable bioink, with cardiac stem cells and mesenchymal stem cells configured in a double-cell arrangement. A vascular endothelial growth factor (VEGF), a signal protein that stimulates vasculogenesis and angiogenesis, was also introduced. The researchers say that this complex arrangement could hold the key to recovery from ischemic heart disease—at present, the five-year survival rate for patients is less than 50 percent.

Soon Printing a human heart on demand will no longer be sci-fi

Around the world, start-ups — like Tokyo-based Cyfuse Biomedical — are emerging to develop such breakthroughs in the field of regenerative medicine. It is a market projected to reach $101.3 billion by 2022.



Unlike conventional medicines and treatments, regenerative medicines have the ability to restore or heal the body's own cells or create new body parts from a patient's own cells and tissues, thereby eliminating tissue rejection and the excessively long wait for a donor organ. This would be a remarkable scientific achievement, considering that in the United States alone 118,950 people are registered in the Organ Procurement Transplantation Network. Of these candidates, 22 die each day waiting for a lifesaving organ. The gap between supply and demand continues to widen, and it's a problem many medical experts have called a major health crisis. Cyfuse has also started a clinical trial of a cartilage project, transplanting its stem cell construct into damaged articular cartilage that will gradually differentiate into cartilage and bone and regenerate the tissue. Cyfuse is one of a growing number of tech start-ups trying to get a toehold in the global marketplace. The sector is blossoming due to innovations in stem cell therapy and tissue engineering. North America accounted for nearly 50 percent of revenue share of global market revenues for regenerative medicines in 2016. Europe is second, at US$24 billion, with Germany leading the region.

A new bio-ink for 3D printing with stem cell

Subadra Dravida C.E.O

Scientists at the University of Bristol have developed a new kind of bio-ink, which could eventually allow the production of complex tissues for surgical implants. The new stem cell-containing bio ink allows 3D printing of living tissue, known as bio-printing. The new bio-ink contains two different polymer components: a natural polymer extracted from seaweed, and a sacrificial synthetic polymer used in the medical industry, and both had a role to play. The synthetic polymer causes the bio-ink to change from liquid to solid when the temperature is raised, and the seaweed polymer provides structural support when the cell nutrients are introduced. The team was able to differentiate the stem cells into osteoblasts – a cell that secretes the substance of bone – and chondrocytes – cells that have secreted the matrix of cartilage and become embedded in it – to engineer 3D printed tissue structures over five weeks, including a full-size tracheal cartilage ring.

Scientists from the Universidad Carlos III de Madrid (UC3M), CIEMAT (Center for Energy, Environmental and Technological Research), Hospital General Universitario Gregorio Marañón, in collaboration with the firm BioDan Group, have presented a prototype for a 3D bioprinter that can create totally functional human skin. This skin is adequate for transplanting to patients or for use in research or the testing of cosmetic, chemical, and pharmaceutical products.
This new human skin is one of the first living human organs created using bioprinting to be introduced to the marketplace. It replicates the natural structure of the skin, with a first external layer, the epidermis with its stratum corneum, which acts as protection against the external environment, together with another thicker, deeper layer, the dermis. This last layer consists of fibroblasts that produce collagen, the protein that gives elasticity and mechanical strength to the skin.

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