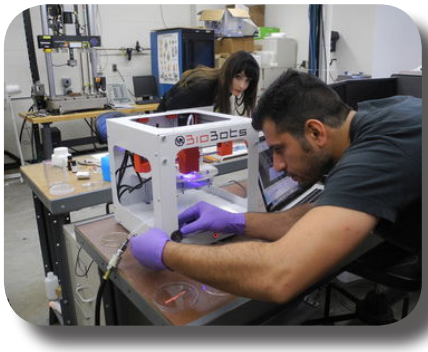
New Advancements: Exploring 3D Bioprinting

Every few generations an invention is created that changes the course of humanity. The printing press changed the way we spread ideas. The industrial revolution altered the way we produce goods. Now, our generation's paradigm shifting invention is upon us and it goes by the name of 3D bioprinting.

Why is Bioprinting Important?

3D bioprinting is thrilling because of its potential to develop living human tissue which can be used for clinical trials and to 'treat' patients. Specifically, recent advances have enabled 3D bioprinting of biocompatible materials, cells, and supporting components into complex 3D functional living tissues. 3D bioprinting is also being applied to regenerative medicine to address the need for tissues and organs suitable for transplantation. Creating viable 3D printing models of human tissue and systems may lead to more effective drug development; however organ and tissue structures vary in complexity and printing with living cells is challenging.



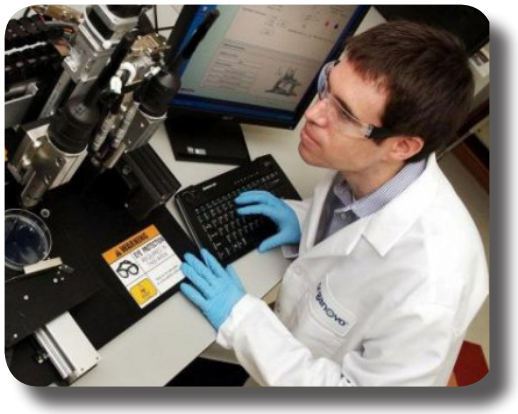
Rare and complex orphan diseases are also in the sights of 3D bioprinting companies. 3D bioprinting has already been used to treat:

- Tracheobronchomalacia
- Craniosynostosis
- Tessier's Cleft Palate

More diseases are on the horizon to be pursued with 3D bioprinting.

PHARPOINT RESEARCH

Compared to non-biological printing, 3D bioprinting involves additional complexities such as the choice of materials, cell types, growth, differentiation factors and technical challenges related to the sensitivities of living cells and construction of tissues. Several companies have recently announced their decision to explore 3D bioprinting, which certainly could provide a cheaper way to test its products for toxicity and efficacy. Organovo is working with a number of pharmaceutical and biotechnology companies to further their research. Proctor & Gamble recently launched a giant competition in Singapore asking academics to submit proposals on 3D bioprinting applications. The advantages seem obvious however it is simply too early to place that 'flag in the sand' and deem 3D bioprinting as a definite solution without conducting extensive research.



How Does Bioprinting Work?

Bioprinting works by taking cultured human cells and forming bio-ink, a material made from living cells that behaves much like a liquid. This allows people to "print" it in order to create a desired shape (1). Bio-ink is then placed into cartridges that contain a syringe, fitted with an extrusion nozzle for printing. Next, the bioprinter deposits a pattern of cells in layers, interspersed with a water-based gel known as hydrogel that is then used as a kind of scaffolding for the cells. Lastly, the printed tissue is left to grow naturally and the hydrogel is removed.

Conclusion

This initiative is one of many in the pharmaceutical and biotech industry that is being evaluated in an urgent quest to speed up drug development and lower costs. While there are many challenges, it may only be a matter of time before the far reaching drug testing approach of 3D Bioprinting will be the new standard for testing chemotherapy drugs and oral contraceptives.

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