3D printing techniques in regenerative medicine

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Introduction

3d printing also known as additive manufacturing technology has been dubbed the next big thing and be as equally wide spread as cellular telephone industry. 3d printers print objects from a digital template to a physical 3-dimensional physical object. the printing is done layer by layer (additive manufacturing) using plastic, metal, nylon, and over a hundred other materials. 3d printing has been found to be useful in sectors such as manufacturing, industrial design, jewellery, footwear, architecture, engineering and construction, automotive, aerospace, dental and medical industries tissue engineering and regenerative medicine are terms for the field in biomedicine that deal with the transformation of these fundamental ideas to practical approaches. several aspects of generating new tissues and organs out of small pieces of living specimens are now scientifically solved, but at this point it is unknown how much impact these new approaches will have on clinical medicine in the future

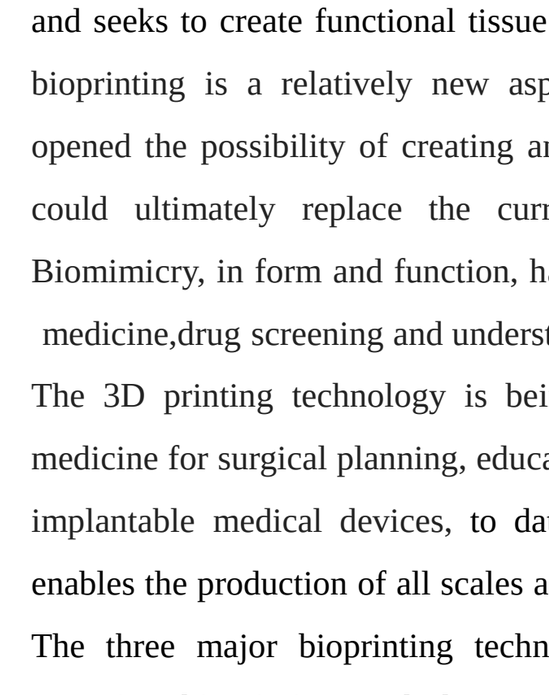
Tissue engineering

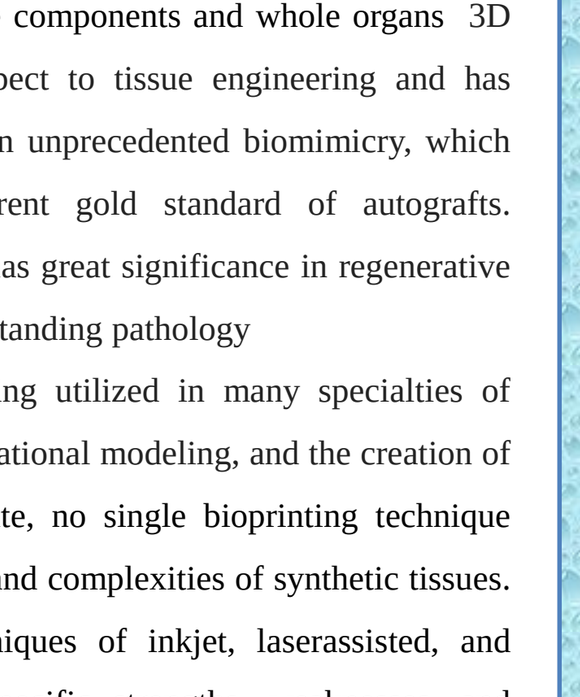
Tissue engineering, as a division of regenerative medicine, combines engineering and biological science in order to reproduce tissues and organs that can help to overcome the lack of enough donor organs. Tissue engineering applies cells into desirable biological structures in a defined framework to restore the normal function of tissues. This process includes three cornerstones, namely scaffolds, cells, and signaling factors.

Discussion

Regenerative medicine technologies aim to repair and regenerate poorly functioning organs. One goal is to achieve an immunosuppression-free state to improve quality of life, reduce complications and toxicities, and eliminate the cost of lifelong antirejection therapy. regenerative medicine has recently shown the potential to meet the two major needs of transplantation, namely the identification of a new, theoretically inexhaustible source of organs and Vessels, bladders, segments of upper airways, and urethras have been bioengineered from autologous cell .dimensional (3D) bioprinting is an emerging manufacturing technology that layers living cells and biocompatible natural or synthetic materials to build complex, This technology holds tremendous promise across a plethora of applications as diverse as regenerative medicine, pathophysiological studies, and drug testing. (skin, bone/cartilage, cardiovascular, central/peripheral nervous systems, skeletal muscle, kidney, and liver Regenerative medicine is an emerging field that centers on the restoration and regeneration of functional components of damaged tissue. Tissue engineering is an application of regenerative medicine and seeks to create functional tissue components and whole organs 3D bioprinting is a relatively new aspect to tissue engineering and has opened the possibility of creating an unprecedented biomimicry, which could ultimately replace the current gold standard of autografts. Biomimicry, in form and function, has great significance in regenerative medicine,drug screening and understanding pathology

The 3D printing technology is being utilized in many specialties of medicine for surgical planning, educational modeling, and the creation of implantable medical devices, to date, no single bioprinting technique enables the production of all scales and complexities of synthetic tissues. The three major bioprinting techniques of inkjet, laserassisted, and extrusion bioprinting each have specific strengths, weaknesses, and limitations





Conclusion

Three-dimensional printing technology has advanced significantly over the last decade, with many new processes being developed in a number of disciplines and industries. Reduced fabrication times are now available, as are newly developed materials with a variety of characteristics. The development of 3D bioprinters that use biomaterials compatible with the human body allows for the creation of highly regulated porous, interconnected structures that serve as biological substrates for human cells to proliferate and form tissues. These structures must have a number of properties, including biocompatibility, bioresorbability, and the desired mechanical behavior. In this context, sophisticated biomaterials, such as bio-inks used as raw materials in 3D bio-printers, may now create high viability cells, tissues, and can even directly create DNA. The careful adjustment of process parameters in 3D bio-printer settings, as well as the continuous introduction of novel biomaterials, provide the only feasible method to fully exploit the this technology.

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