3D Bioprinting: Progress Toward an Implantable 3D Printed Organ

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Abstract

The disparity between available donor organs and patients in need of a transplant has been the impetus to create human tissues and organs for transplantation. Efforts to biofabricate replacement organs has evolved over several decades and has included advancements in cell biology, tissue culture, tissue engineering and regenerative medicine. Further evolution toward a totally biologic organ replacement has included the technology known as 3D Bioprinting. Progress toward the fabrication of a Total Biofical Heart and a Total Biofical Pancreas using 3D Bioprinting will be discussed including the source of autologous cells to create components of the Biofical Organs. Finally, we are now exploring the use of regenerative medicine and 3D Bioprinting in space with a hope to bring these technologies to support long-term space exploration.

Biography of Presenter

Dr. Stuart K. Williams received his Ph.D. in Cell Biology from the University of Delaware followed by postdoctoral training in Pathology at the Yale School of Medicine. During the period 1980 to 1990 he held a faculty appointment at Jefferson Medical College where he was Director of Research in the Department of Surgery. In 1990 Dr. Williams joined the faculty at the University of Arizona and founded the University of Arizona Biomedical Engineering Program creating a research and educational link between the Medical School and College of Engineering. He held faculty positions jointly in Biomedical Engineering, Surgery, Physiology and Materials Science and Engineering. In 2007 Dr. Williams was selected as the Scientific Director of the newly established Cardiovascular Innovation Institute at the University of Louisville in Louisville, Kentucky. He recently established the Biofical Organs Program to create human tissues and organs for clinical therapeutics and in vitro drug testing using a patient's own cells. Central to this effort is the use of 3D bioprinting. Dr. Williams' research interests have focused on medical devices and regenerative medicine. He developed and patented the first methods to use fat-derived stem and regenerative cells for human therapeutic use. Dr. Williams has authored over 400 scientific publications including scientific papers, abstracts, book chapters and editorials. His entrepreneurial spirit has resulted in 25 issued US patents with numerous patents pending. He has founded several biotechnology companies; maintained active managerial positions and has been an active consultant to the medical device, regenerative medicine and pharmaceutical community.