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Editorial

Additive Manufacturing Technologies: A Pathway to Organ Printing

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With the advent of additive manufacturing, various processes have been developed over the years. A prominent example is bioprinting. The technology involves the use of biocompatible materials and living cells to construct functional structures and constructs that mimic the properties of human body tissues [1]. It is estimated that 20 people die every day due to a lack of organ transplantation in the United States alone [2]. With the development of new diseases and an increasing population, this number is expected to increase over time. It is possible for bioprinting to provide a solution for this issue, but it will need many modifications and development to result in a living organ with multiple cell types and materials [3].

The field of bioprinting is attracting the attention of many researchers throughout the world and is accelerating at a faster rate than initially anticipated. Due to the use of patient-specific information when developing organs, there are fewer chances of non-compatibility when implanted in patients. At present, bioprinters sold commercially are quite expensive, so many researchers are unable to purchase these printers for use in the laboratory [2]. The problem has caused scientists to develop their own do it yourself (DiY) bioprinters, resulting in faster progress in the field. As a result of this shift towards DiY systems, there have been various advances in the industry. Bioprinters (stereolithography (SLA)) were initially designed to generate prints in 0-D (zero-dimension), i.e., point to point fabrication of constructs. Despite the high precision of this bioprinting technology, the process was rather slow, as a single point of resin was cured at a time [2]. Over time, a new process was evolved to solve these challenges i.e., extrusion bioprinting, which is currently the most commonly used bioprinting technique. In addition to creating faster prints, extrusion technology avoids the limitation of using photosensitive resins in SLA bioprinters. In current developments of extrusion bioprinting, researchers are able to print multiple materials simultaneously, mimicking tissue constructs [4]. Additionally, cryobioprinting [5] and the Kanzens method [2] allow for printing structures without support and vertically, making it easier to create complicated structures. Further 2D fabrication techniques such as digital light processing (DLP), continuous liquid interface production (CLIP), and others have been developed, which have added to faster printing techniques, since 2D images are projected in a photosensitive bath, making 3D prints in a layer by layer manner [2]. As a result of these advances to achieve volumetrically printed structures, the Taylor and co-workers developed a Volumetric printing method that is based on computed tomography and intensity-modulated radiation therapy scanning mechanisms. Here, dose slices of 3D models are projected on a rotating vat to create 3D structures at a relatively faster rate in seconds to tens of seconds without support. Eventually, a concept called Xolography was created by Hecht and co-workers to print structures in a similar fashion [6, 7]. With the continuous development of bioprinting technologies and bioinks I believe that it will be possible to have patient specific functional organs in the near future.

The field of additive manufacturing is ever-expanding, to various applications of industrial and research use for example fabricating composites [8], electronics, 3D structures [9, 10], food, metals [11], haptics, 3D printed homes and others. This field is changing the way of manufacturing and will be a vital contributor to the advancement of science and society.

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