Converting a 3D Printer to a 3D Bioprinter for Modeling of a Lumbar Vertebral Body

Collins, Katie (School: Terre Haute North Vigo High School)

A 3D bioprinter is a 3D printer capable of printing human cells and tissues. Bioprinting tissues and organs using a patient's own cells could eliminate the organ shortage and the risk of rejection. The purpose of this project was to design, 3D print, and assemble the parts necessary to convert a 3D printer to an extremely low-cost 3D bioprinter, while maintaining its ability to print in traditional plastic filament. A medical CT scan of the lumbar spine was converted to a 3D model and reconstructed to 3D print a repaired L5 vertebral body to be printed with the bioprinter. While others have accomplished similar goals, this design is unique in that is exceptionally cost-effective, able to hold a larger print volume, and able to print in both plastics and biomaterials. A stepper motor from the 3D printer was used to turn a 3D printed threaded rod, which lowered an attached piece to press the syringe plunger. The damaged vertebral body was isolated and smoothed until it was solid and shared nearly the same dimensions as in the CT scan, indicating the success of that engineering goal. The print quality of the converted bioprinter was less than that of the traditional 3D printer, but the dimensions of both printed models were very similar to those of the original CT scan. By creating an affordable way to enter the field of bioprinting, research will rapidly advance and revolutionize the way medicine is practiced and researched.

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