3D printing in tissue engineering.

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Background. 3D bioprinting is an additive technology that uses bio-inks and biocompatible materials for three-dimensional tissue engineering. Bioprinting is an interdisciplinary field that combines medicine, engineering and materials science. Bioprinting can provide an alternative to autologous and allogeneic tissue implants, as well as replace animal testing for the study of diseases and the development of personalized treatments.

Materials and methods. For the bioprinter, the frame from a Computer Numerical Control (CNC) machine was used, made of metal, for the axes there are trapezoidal screws T8 and linear guide MGN 12, as motors 42HSC4416-235N8-120 are used, DVR8825 drivers are used to control the motors, Arduino Mega and RAMPS 1.4 expansion board are used as control board, the user interface was made through LCD 2004 model, we used S-300-12 as power supply. The extrusion system is based on the piston action principle, we used 28H30H0604A2 stepper motor, with DVR8825 driver, the motor is connected to a T8 trapezoidal screw and MGN12 linear guide, some interconnection parts of the extrusion system were printed on the 3D printer Ultimaker 2+ extended, made of PLA plastic, they support the syringe and tubing from an infusion system, a G20 i/v cannula is used as a nozzle.

Results. During the creation of the printer, some problems arose such as setting the extrusion speed depending on the density of the material used, the size of the nozzle and the diameter of the microperfusion system. This parameter is of great importance to achieve the desired accuracy. Also the precision of the axial movement of the extruder and the printing surface are important for creating the correct geometry.

Conclusions. 3D printing and the great diversity of materials used in this process has revolutionized the medical field, especially in the manufacture of patient-specific implants and prostheses. Bioprinting has great potential in tissue engineering applications in the research phase and current *in vitro* and *in vivo* experiments and represents a near-future solution to the needs of modern transplant medicine.

Keywords: 3D bioprinting, tissue engineering, personalized treatment, *in vitro, in vivo*.