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# Extruded starch as novel shape-memory bioresorbable biomedical device

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Starch is a wide-spread biopolymer which can be extruded as biomaterial presenting shape-memory properties. It can be manufactured into an easy implantable device that will recover its useful shape when it's above its glass transition temperature (Tg) which can be triggered at body temperature and moisture.

In preliminary studies, potato starch was extruded as a long wire (diameter 4.3 mm) with or without glycerol to modulate Tg and Young's modulus. Physical characterisations were performed after samples reached water equilibrium, about 13% wet basis, under constant relative humidity of 59% at 20°C. Samples were sterilised by gamma-rays irradiation. Adding 20% glycerol to starch decreased both Tg, from 77°C to 15°C, and Young's modulus of materials, from 1.1 GPa to 0.07 GPa. Physical properties of extruded starch and shape-memory were not strongly altered by gamma-rays sterilization unlike hydroxyapatite or poly-L-lactide biomaterials.

To evaluate acute inflammatory in vivo response, extruded wires were implanted in rats in an abdominal intramuscular position for 8 days. The histological examination of implants were performed and evidenced a fair degradation and the absence of acute inflammatory response. These preliminary results indicate that extruded shape-memory starch could be a novel material with bioresorbable abilities.