

# Acellular Biomaterials for Dental Tissue Repair

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## Abstract

Dental disease annually affects billions of patients, and while regenerative dentistry aims to heal dental tissue after injury, existing polymeric restorative materials, or fillings, do not directly participate in the healing process in a bioinstructive manner. There is a need for restorative materials that can support native functions of dental pulp stem cells (DPSCs), which are capable of regenerating dentin. A polymer microarray formed from commercially available monomers to rapidly identify materials that support DPSC adhesion is used. Based on these findings, thiol-ene chemistry is employed to achieve rapid light-curing and minimize residual monomer of the lead materials. Several triacrylate bulk polymers support DPSC adhesion, proliferation, and differentiation in vitro, and exhibit stiffness and tensile strength similar to existing dental materials. Conversely, materials composed of trimethacrylates or bisphenol A glycidyl methacrylate (BisGMA), which is a monomer standard in dental materials, do not support stem cell adhesion and negatively impact matrix and signaling pathways. Furthermore, thiol-ene polymerized triacrylates are used as permanent filling materials at the dentin-pulp interface in direct contact with irreversibly injured pulp tissue. These acellular materials have potential to enable novel regenerative dental therapies in the clinic by both restoring teeth and providing a supportive niche for DPSCs.

## Biography

Dr. Celiz's research focusses on the development of acellular biomaterials to repair or regenerate tissues. Dr. Celiz gained his PhD in Chemistry in the Melville Laboratory for Polymer Synthesis at the University of Cambridge. Dr. Celiz gained postdoctoral training at the University of Nottingham and the Wyss Institute for Biologically Inspired Engineering at Harvard University via a Marie Curie International Outgoing Fellowship (IOF). In 2017, Dr. Celiz was appointed as Lecturer (Assistant Professor) in Department of Bioengineering at Imperial College London. Dr. Celiz's research has been published in journals including *Science*, *Nature Materials* and *Advanced Materials*. Dr Celiz has been awarded several early-career awards including the Larry Hench Young Investigators Prize from the UK Society for Biomaterials and is currently a holder of a UKRI Future Leader Fellowship.

