There is a huge demand for small-diameter vascular grafts, as the majority of vascular disease cases involve small-caliber blood vessels. Recently, electrospinning has gained attention as a valuable technique for the fabrication of scaffolds for blood vessel engineering, as electrospinning produces nanofibers that closely approximate the structure of native extracellular matrix (ECM).

Accordingly, electrospun scaffolds were fabricated in a 3D tubular structure from a blend of the synthetic polymers, viscoelastic and durable polycaprolactone (PCL) and relatively fast-degrading shape memory poliglecaprone (PGC). The scaffolds were coated with a physiological biomatrix, HuBiogel^{TM}. The biohybrid graft was found to exhibit mechanical properties comparable to those of native blood vessels, and the HuBiogel^{TM} coating imparted bioactivity. The coating was crosslinked using EDC and the natural crosslinker genipin (Gp) to improve its stability in physiological conditions. This study evaluated the effects of EDC- and Gp-crosslinking on the scaffold mechanical, structural, and morphological properties. Additionally, coating stability was studied to assure the presence of collagenous biomatrix on the scaffold for effective cell-matrix interactions.

Mechanical testing showed little difference between EDC- and Gp-crosslinked scaffolds; both retained mechanical properties in the range of native human arteries (tensile strength 1-2 MPa, tensile modulus 9-12 MPa). SEM imaging revealed that while crosslinking with EDC resulted in an increase in fiber diameter compared to uncrosslinked scaffolds, Gp-crosslinking did not affect fiber diameter; the majority of fibers in EDC and Gp-crosslinked scaffolds had diameters ranging from approximately 0.9 – 1.4 microns and 0.7 – 1.2 microns, respectively. This is in the upper range of fiber diameters in native extracellular matrix. Coating stability studies using picrosirius red (PSR) stain showed that EDC-crosslinked scaffolds were more effective than Gp-crosslinked scaffolds in enhancing the stability of the biomatrix coating.