Regenerative Treatment of Stress Urinary Incontinence by Allogenic Macrophage Therapy

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Abstract: Stress Urinary Incontinence, also known as SUI, is the leakage of urine by vigorous activities such as coughing and sneezing when pressure is exerted on the urethra. SUI is prevalent as there are 2 out of 3 women affected. To prevent this, many hospitals use Mid-Urethral and Polypropylene slings in an estimated 750,000 patients/year, but these slings are not ideal and have been subjected to a significant amount of negative publicity in recent years. Developing an advanced biomaterial to promote good healing response may be an effective way to improve outcomes in tissue reinforcement surgeries that often result in SUI. Collagen, a primary protein in many tissues, was selected as the biomaterial for testing. An electromagnetic wheel and plate were used in order to generate collagen threads and then wound into scaffolds with collagen mesh. Scaffolds made from these fibers were then sterilized, seeded with macrophages, and cultured for up to 3 days in vitro. Genipin, a plant-derived compound with known anti-inflammatory properties, was used to crosslink the collagen fibers prior to seeding macrophages on the mesh. Only when the threads were crosslinked by genipin did M0 to M2 polarization occur on collagen threads, suggesting genipin that is a more active regenerative phenotype inducer than cytoskeletal elongation. As part of a platform to facilitate pro-regenerative responses, genipin-crosslinked collagen bio textiles are sufficient for macrophages' local delivery.