Development and Evaluation of a Targeted Core-Shell SPION-Based Nanoparticle Therapy for Treating Atherosclerosis

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Introduction: Existing treatments for atherosclerosis are currently limited by systemic side effects, insufficient targeting capabilities, and in nature are preventative. At the moment, there is no direct pharmacotherapy available to fight atherosclerosis at the point of injury. Developing a targeted therapy could significantly enhance therapeutic efficacy while minimizing adverse effects of current treatment standards.

Aim of Study: This stage one preclinical study aims to synthesize a targeted core-shell superparamagnetic iron oxide (SPION) based nanoparticle therapy to enhance therapeutic efficacy and to also minimize adverse effects.

Materials and Methods: This study is based on the chemical synthesis of a core-shell SPION-based nanoparticle, which focuses on optimizing its size, shape, and surface modulation with potential targeting moieties (e.g., statins, rapamycin). The nanoparticles will be assessed based on their physical properties, drug loading efficacy, and targeting specificity to further characterize these particles. Preliminary evaluations include numerous chemical and physical tests for pharmacokinetic analyses, aiming to select the most effective.

Results: This is a stage one preclinical study and the results are forthcoming. However, this study is designed to synthesize and assess the nanoparticle's size, shape, loading potential, and pharmacokinetics, and therapeutic potential to reduce atherosclerotic plaque burden. Results will be presented at the conference, highlighting our key findings on nanoparticle synthesis, optimization, and the preliminary assessments.

Conclusion: This study seeks to incorporate the field of nanotechnology into modern medicine and to further advance this field by synthesizing a novel core-shell SPION-based therapy for atherosclerosis. Our team is working to offer a promising new approach to atherosclerosis treatment, one which potentially overcomes the limitations of current available therapies and improves patient outcomes through an interdisciplinary approach, careful design, and evaluation.