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Assessment and Development of a Core-Shell SPION-Based Targeted Nanoparticle Therapy for Atherosclerosis Treatment

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Current therapeutic approaches for atherosclerosis are limited by their systemic side effects, lack of specific targeting capabilities, and are primarily preventative in nature. At the present time, there is no direct pharmacotherapy available to fight atherosclerosis at the sight of the lesion. Developing a therapy that precisely targets the point of injury could significantly enhance therapeutic efficacy while reducing the negative impacts associated with current treatment standards. The aim of this preclinical stage one study is to develop and synthesize a targeted core-shell superparamagnetic iron oxide (SPION) based nanoparticle therapy to enhance therapeutic efficacy while also minimizing adverse effects of treatment. Our methodological framework employs the chemical synthesis of a core-shell SPION-based nanoparticle with an emphasis on fine-tuning their physical attributes, such as size, shape, and surface modulation with potential targeting moieties. These nanoparticles will undergo a comprehensive analysis of their physical properties, drug loading efficacy, and targeting specificity to further characterize these particles. Early-stage assessments will involve numerous chemical and physical tests for pharmacokinetic analyses, aiming to select the most effective.

As this is a stage one preclinical study, the results are forthcoming and are yet to be reported. However, this study is designed to synthesize and assess the nanoparticle's shape, size, loading potential, pharmacokinetics, and therapeutic potential to reduce atherosclerotic plaque burden. The key findings of our study will be presented at the upcoming conference. This research seeks to bridge nanotechnology with contemporary medicine, aiming to advance the field of nanotechnology by synthesizing a novel core-shell SPION-based therapy for atherosclerosis. Our dedicated team is working to offer a promising new approach to the treatment of atherosclerosis, one which may potentially overcome the limitations of currently available therapies and improve patient outcomes through an interdisciplinary approach, careful design, and evaluation.