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Dissertation Defense

When: August 31, 2023

Time: 10:00 am

Location: Shumaker Research Building, Room 139

BioCaRGOS: Capture and Release Gels for Optimized Storage of Biologics

ABSTRACT:

Preserving the integrity of proteins and nucleic acids is paramount for scientific and medical progress. However, the high costs and impracticality of ultra-low temperature storage pose challenges. This presentation will dive into innovative approaches for storing biomolecules at room temperature, with a primary focus on sol-gel encapsulation. The presentation will describe the intricacies of maintaining biomolecule stability during storage through strategies including additives, lyophilization, and encapsulation with an emphasis on silica sol-gel encapsulation, a cutting-edge storage technique.¹ Central to this discussion is the development of BioCaRGOS, a sol-gel system designed for optimized room temperature storage.² Model biomolecules like hemoglobin and miRNA-21 have been used to demonstrate stability and compatibility with clinical procedures.^{3, 4} Efforts to enhance BioCaRGOS's compatibility with downstream applications, especially by mitigating methanol interference and silica removal, will be presented. These include assessment of the release of pancreatic cancer biomarkers from BioCaRGOS, which showcase its compatibility with droplet digital PCR.⁵ Furthermore, this talk will demonstrate the stability of heme proteins under the stress of degradation and low pH conditions using BioCaRGOS, underscoring the complexities in preserving therapeutic proteins.⁶ In summary, sol-gel encapsulation, particularly BioCaRGOS, holds promise in stabilizing and preserving biomolecules at room temperature. This method offers reliability, easy retrieval, and seamless integration with downstream applications. This research contributes to cost-effective storage solutions, eliminating the necessity for specialized freezers and curbing energy consumption in biomolecule preservation.

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