GLYCONANOCAPSULES WITH pH RESPONSIVENESS FOR ENCAPSULATION AND SMART DELIVERY OF THERAPEUTICS

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The integration of carbohydrates in nanomaterials is key to develop water-dispersible, biocompatible and targeted delivery systems. In particular, smart glyconanomaterials have received attention due to their responsiveness to specific stimuli, making them promising candidates for precise and programmable drug delivery.
Our research group has expertise in the self-assembly of poly(allylamine) hydrochloride (PAH) polymers into nanoparticles (NPs) in phosphate buffer (PB). These NPs are stable at pH 6-8 and reversibly disassemble at pH<5, making them suitable for intracellular use [1]. However, the positive charges of the protonated primary amines limit their use for biological applications. In the present work, to reduce toxicity and improve targeted release, the polysaccharide dextran (DEX) has been introduced in different molar ratios to the PAH backbone *via* chemically controlled reductive amination approach. In the case of 1:1 PAH/DEX ratio, the polymer assembles as glyconanocapsules (glyco-NCs) at PB concentrations above 5 mM [2]. As a proof of concept, the application of these novel glyco-NCs has been initially investigated for the pH-controlled delivery of bovine serum albumin (BSA) as a model protein. Ongoing studies are exploring the encapsulation of therapeutic proteins and dextran-driven cell targeting, paving the way for advanced smart drug release glyconanosystems.

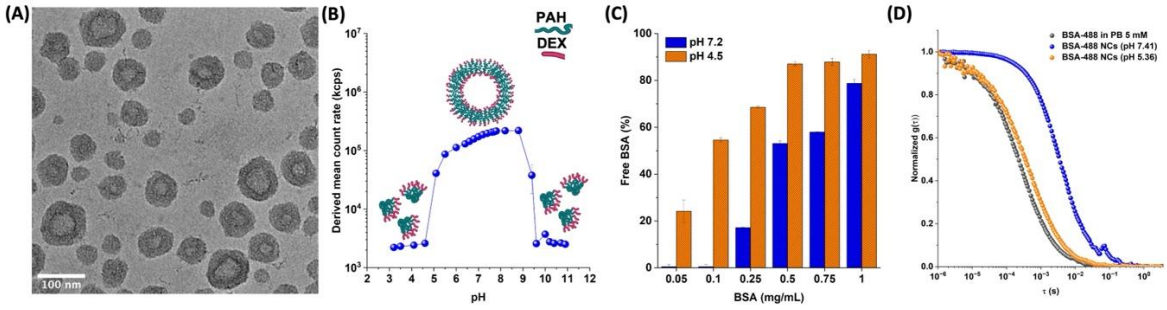

Figure 1. Glyco-NC analysis: (A) Cryo-EM showing morphology and size; (B) pH-responsiveness; (C) Bicinchoninic acid assay and (D) Fluorescence Correlation Spectroscopy for characterization of BSA encapsulation and release.

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References:

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2. A. Steffè, F. Milano *et al.*, *J. Colloid Interface Sci.* **2025**, *683*, 620-630.

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