Peptide Encapsulation in Polyelectrolyte Nanocapsules

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This work focuses on the design of novel delivery systems for beta-breaker peptides based on nanostructures. The peptide to be delivered is a short sequence homologous to the central region of amyloid beta-peptide, with proline incorporated (iAβ1 peptide). This sequence inhibits the aggregation of amyloid beta-peptide, which is alleged to be a cause of Alzheimer's disease.[1] Polyelectrolyte multilayer capsules are used to increase the peptide plasma residence time and therapeutic index.

The nanocapsules were prepared using the layer by layer self-assembly (LBL) technique.[2] The oppositely charged polyelectrolytes poly(allylamine hydrochloride) (PAH) and sodium poly(styrene sulfonate) (PSS) or poly(L-glutamic acid) and poly(L-lysine) (PLL) were assembled on polystyrene cores. After the assembly of the desired number of layers the template was decomposed with tetrahydrofurane producing a hollow capsule. The nanocapsules were characterized by Laser Scanning Confocal Microscopy (LSCM) and Dynamic Light Scattering (DLS). Nanocapsules constituted by 12 PAH/PSS layers with diameters of 1 μm were used to encapsulate FITC-labeled iAβ1 peptide at acidic pH. LSCM images show that the capsule interior remained fluorescent after washing (Figure 1).

The nanocapsules containing iAβ1 peptide were added to neuroblastoma cell cultures. LSCM images depict nanocapsules internalized by neuroblastoma cells after 3 hours incubation time.

References:

[1] Soto C., et al. Biochem. Biophys. Res. Commun., **226** (1996) 672.
[2] Donath E., et al. Angew. Chem. Int. Ed**. 37** (1998) 2202.

Figures:

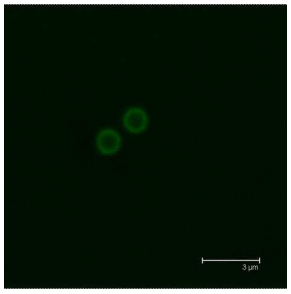

Figure 1. Confocal micrograph showing FITC-labeled peptide (MW 500–700) encapsulated in $(PAH/PSS)_6$ capsules. The scale bar is 3 μm.