Hollow Extracellular Matrix Spheres for Biomolecular Delivery

Biodegradable hollow spheres with significantly higher payload capacity than current biomolecule delivery systems

Objective

Seeking Licensing Opportunities

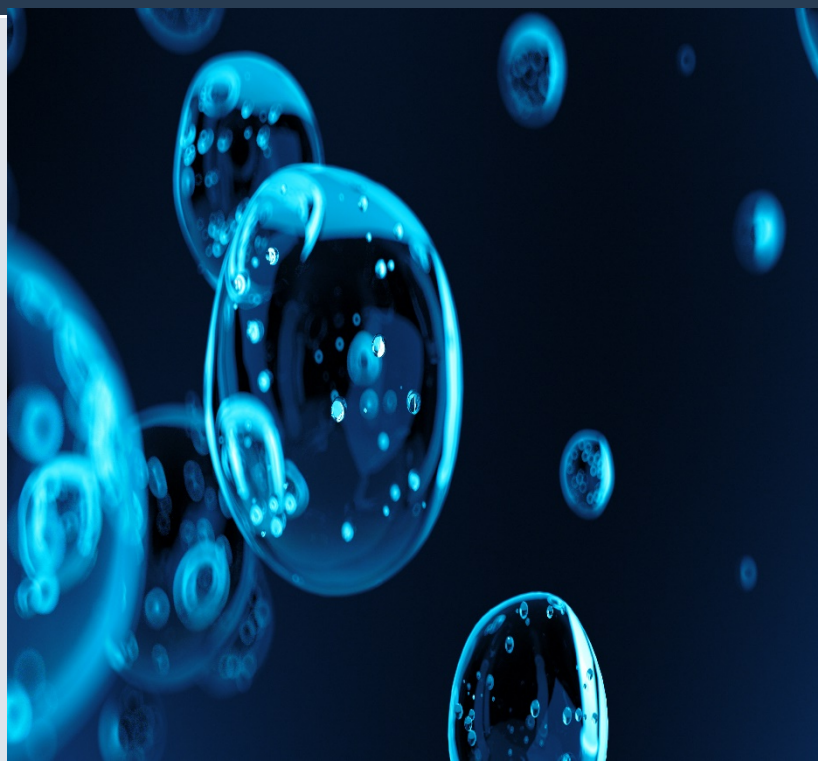
Research and IP Status

Patented, Patent application submitted
Preclinical testing has been completed

Patents

US granted patents no. 8,734,848 and 8,802,150

European patent application no. 2,276475



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Background

The limited success of current pharmaceutical therapies is due to the absence of an innovative drug delivery system which can increase the safety and efficacy levels but also improve the overall performance of the therapeutic molecule. Stability and degradability control are two critical aspects that must be developed to facilitate delivery. Controlling these parameters simultaneously is a greater challenge, and most of the current carriers such as liposomes, microparticles and microemulsions do not support this, thus limiting their applications. Moreover, another major disadvantage of synthetic carriers is their toxicity and low in vivo efficiency. This is a consequence of their poor targeting ability and their short lifetime due to the presence of surface positive charge or the inherently low stability of their shells (liposomes). These factors lead to the degradation of the supramolecular structure and removal by macrophages before the carrier arrives at the host site.

Tech Overview

Scientists at CÚRAM at NUI Galway have developed hollow extracellular matrix self-assembled hollow spheres of uniform polydispersity index. The biodegradable hollow spheres incorporate a cross-linked outer membrane and a hollow core which facilitates significantly higher payloads capacity than current biomolecule delivery systems. The hollow spheres exhibit programmable degradation profiles which provide localised sustained delivery of biomolecules at the target site. The advantage of mimicking delivery systems with extracellular matrix (ECM) is that it affects desired cellular signalling while delivering therapeutic molecules

The hollow spheres overcome the limitations of existing drug delivery systems by reducing adverse side-effect profiles, drug degradation and loss and increasing bioavailability at the site of interest. The hollow sphere technology eliminates the need for administration of high doses and/or repeated treatments associated with systemic administration. The technology facilitates optimum efficacy and safety and simplifies dosing regimens, reduces side-effects and enhances patientcompliance.

Applications

- The developed **Fibrin hollow microspheres** act as a delivery platform for neurotrophic factors (Human β-
- Nerve growth factor) with high loading efficiency and sustained release capabilities (~14 days). The developed Fibrin hollow microspheres can be used to deliver potential neurotrophic factors in number of neurodegenerative disorders, including Parkinson's disease and Alzheimer's disease,
- The developed tunable **Collagen hollow spheres** can be considered as a potent reservoir for controlled gene delivery. This system has been shown to deliver an inhibitory inflammatory therapeutic capable of modulating macrophage phenotype and thus helps in wound healing; also programmed delivery of neurotrophic factor in spinal cord injury and PD has been documented successfully.
- The developed **tuneable Elastin like Polypeptide (ELP) hollow spheres** with post-functionalization capability
- sets up a platform for use in a range of cardiovascular applications (ischemia).

Core Researcher:

Professor Abhay Pandit

For more info. contact:

Fionnuala Brown
Case Manager,
Innovation Office, NUI Galway
Fionnuala.Brown@nuigalway.ie