

Novel Microcapsules Incorporating Carbon Nanotubes for Drug Delivery

Information Summary

Reference code:	ROI 05021
Technology Overview:	Nano materials for drug delivery applications
Applications:	Functionalized drug delivery system targeting specific cancers.
Validation:	in vitro systems.
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Technology Description

A new oral delivery system has been developed using carbon nanotubes and micro/nanocapsules. Single-walled or multi-walled carbon nanotubes are attached onto the surface and/or within the core of microcapsules or nanoparticles, depending on the desired mode of delivery and target loci, leading to alternative modes of therapy. Such carbon nanotubes are functionalized to better target specific cells in the body, like in the gastrointestinal (GI) tract, solid tumors in various locations and diseased or cancerous cells. Therefore, the system could be used for applications such as targeted drug/DNA/cell delivery or systemic therapy of cancers of the colon, breast or ovaries. This invention has the advantage of promoting preferential interactions between the nanotubes on or in the capsule, the drug or drug-producing system contained within or on the surface of the capsule, and the tissue *in vivo*, which is the target of the treatment. Conventional drug delivery approaches lack this quality.

Characteristics

Incorporation of nanotubes both on and in the polymer micro/nanocapsules paves the way for incorporation of the nanotubes functionalized with biomolecules of choice for targeted delivery of biomolecules. The idea is extendable to silica and peptide nanotubes, nanofibers (polymeric or other) and other nanostructures that can be incorporated with polymer capsules for drug delivery. In addition, carbon nanotubes can also be used to adsorb matrix metalloproteinases secreted by metastasing cancerous cells in the GI tract. Professor Prakash has accumulated extensive expertise in the field of drug delivery. In addition, his laboratory is the only one to be equipped with a system that simulates *in vitro* the GI tract.

Advantages

- **Patent status:** US patent application filed.
- **Performance:** Incorporation of carbon nanotube completed. Functionalization of the carbon nanotube partially completed.
- **Safety:** Cytotoxicity and initial cell transfection studies completed.
- **Validation:** In vitro validation (stability along the GI track).
- **Flexibility:** The systems can be tailored to survive from a few days to several weeks as a function of the copolymer used (copolymer length and hydrophobic/hydrophilic ratio of the copolymer).