Journal of Materials Science and Nanomaterials

Scattering techniques and Nanomaterials for drug delivery: tuning nanostructure and tissue targeting

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Abstract

Scattering techniques are well suited for studying the physico-chemical properties of nanoparticles and aggregates in solution, meanwhile being largely non-invasive. Different probing radiations allow to access different structural and dynamical parameters on different lengthscales, spanning from the size of particles (10 -1000 nm) to the very local internal structure (0.1-1 nm). Moreover, experiments can be designed to enhance the visibility of selected regions of the nanosystems without significative chemical drawback. The combined use of laser light, X-ray and neutrons techniques will be presented as powerful tool to probe the structural properties of different nanomaterials for drug delivery.

Nanoparticles and nanoemulsions composed by a hydrophobic core stabilized by physiological lipids or surfactants have been widely proposed as efficient vectors for mucosal drug delivery. Besides optimal encapsulation, the design of the best vectors has to face key properties as tissue targeting and drug controlled release. According to the final target, the selected administration route and the delivery strategy, mucoadhesive or mucopenetrating agents profitably modulate the residence time and the interaction of nanoparticles with the mucus barrier.

The accessibility of structural properties on different lenghtscales and with enhanced selective visibility comes out to be fully functional to the description of the nanomaterials. Combined results guided the realization of formulations with the optimal structural properties and allowed for determining their propensity to interact with the mucin gel.

Biography

Elena Del Favero is associated professor of applied physics at the dept. of medical biotechnologies and translational medicine, university of milan. Her research interests focus on bio-soft matter and nanomaterials. She applies physical techniques: laser light scattering (visible, UV), calorimetry, neutron and X-ray techniques to study the structural organization and dynamics of biomimetic membranes, the structure of stimuli-responsive nanoparticles for drug delivery and controlled release, the properties of biopolymer-based scaffolds, the interaction of peptides and polymers with model membranes.

Citation: Del Favero Elena, Scattering techniques and Nanomaterials for drug delivery: tuning nanostructure and tissue targeting, Webinar on Nanomaterials, August 28-29, 2020 | Webinar, 06