Multifunctional nanovesicle-bioactive conjugates as nanomedicines

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The obtaining of particulate micro and nanostructured molecular materials at large scale and the understanding of how to manipulate them at nanoscopic and supramolecular level are currently playing a crucial role in drug delivery and clinical diagnostics. [1,2] It has been observed that polymeric nanoparticles, micelles, microemulsions, nanosuspensions, nanovesicles, and nanocapsules are efficient drug carriers that can significantly help to develop new drug delivery routes, more selective and efficient disease-detection systems, drugs with a higher permeability to biological membranes with controlled released profiles, and to enhance their targeting towards particular tissues, cells or intracellular compartments.

The potential of «bottom-up» strategies, based on molecular self-assembling, is much larger than that of «top-down» approaches for the preparation of such micro- and nanostructures. For instance, by precipitation procedures it should be possible to control particle formation, and hence particle size and size distribution, morphology and particle supramolecular structure. However, conventional precipitation/crystallizations from liquid solutions have serious limitations and are not adequate for producing such nanoparticulate materials at large scale with the narrow structural variability, high reproducibility, purity and cost needed to satisfy the high-performance requirements and regulatory demands dictated by the EMA and US FDA agencies

The solvent power of compressed fluids (CFs), either in the liquid or supercritical state, can be tuned by pressure changes. Therefore, using compressed solvent media, it is possible to obtain nanostructured materials with unique physicochemical characteristics (size, porosity, polymorphic nature morphology, molecular self-assembling, etc.) unachievable with classical liquid media. In this presentation a simple one-step and scale-up methodology for preparing multifunctional nanovesicle-bioactive conjugates will be presented. This method is readily amenable to the integration/encapsulation of multiple components, like peptides, proteins, enzymes, into the vesicles in a single-step yielding sufficient quantities for clinical research becoming, thereby, nanocarriers to be used in nanomedicine for drug delivery purposes. A couple of examples of novel nanomedicines prepared by this methodology will be presented and their advantages discussed [3-4].

References

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