Supramolecular organizations as novel nanomedicines for drug delivery

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The objective of this lecture is to give a broad overview of how nanotechnology is impacting in some areas of medicine and pharmacology. This lecture will report the advantages of nanoparticulate molecule-based organizations for drug delivery. It has been reported that polymeric nanoparticles and nanovesicles are efficient drug carriers that can significantly help to develop new drug delivery routes, and more selective and efficient drugs with a higher permeability to biological membranes and with controlled released profiles, as well as to enhance their targeting towards particular tissues or cells [1-2].

The potential of nanotechnology «bottom-up» strategies, based on molecular self-assembling, is much larger than that of «top-down» approaches for the preparation of such nanosized supramolecular organizations. For instance, by precipitation procedures it should be possible to control particle size and size distribution, morphology and particle supramolecular structure. However, conventional methods 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 USA and European medicine agencies. On the contrary, using compressed solvent media it is possible to obtain supramolecular materials with unique physicochemical characteristics (size, porosity, polymorphic nature morphology, molecular self-assembling, etc.) unachievable with classical liquid media. The most widely used CF is CO_2, which has gained considerable attention, during the past few years as a «green substitute» to organic solvents. Due to such properties, during the past few years CFs based technologies are attracting increasing interest for the preparation of nanoparticles and nanovesicles with application in nanomedicine.

In this lecture a simple one-step and scale-up methodology for preparing multifunctional nanovesicle-drug conjugates will be presented. This method is readily amenable to the integration/encapsulation of multiple bioactive 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. A couple of examples of novel nanomedicines for solving serious diseases, prepared by this methodology, will be presented and their advantages discussed [3-4].

References

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