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PATENT

Actively targeted polymeric micelles for drug and gene delivery

Market sector: nanomedicine, gene therapy, oncology

Type of opportunity: licensing and/ or co-development

Scope of the problem

In recent years, nanomedicine has substantially evolved aiming to achieve great advances in diseases treatment and diagnosis. Among the wide range of nanometric vehicles used for drug delivery polymeric micelles have been proved as efficient nanosized (approximately 20 to 200 nm) polymeric self-assembly systems for encapsulating drugs and gene (gene therapy).

In this context, gene therapy has appeared as a promising alternative for an effective and more specific treatment of cancer and other complex diseases with an important genetic background. However, the in vivo delivery of oligonucleotides (OGN) has precluded the clinical use of gene-based therapies mainly due to its vulnerability to enzymatic blood degradation, poor cellular uptake and rapid renal clearance. Therefore, the greatest challenge for a successful clinical application of gene therapy relies on the development of vectors able to condensate negatively charged OGN and to effectively deliver them into the cytoplasm and/or nucleus of target cells.

Nowadays, viral vectors are still considered the most efficient, being the most commonly used for gene transfer in both pre-clinical and clinical research, however, the well-known drawbacks related with viral-based vectors such as their immunogenicity, mutagenesis, carcinogenesis, limited cargo loading, and time consuming/high cost procedures, boosted the development of safer vehicles using a wide range of lipids and polymers (non-viral vectors).

Patient need addressed: cancer

Our innovation:

- Innovative micelles as non-viral vectors for drug delivery (in particular for siRNA delivery) into cancer cells
- These new micelles allow the delivery of OGN in an effective and safety mode into the cells
- The micelles composition comprises biodegradable, biocompatible and low immunogenicity block copolymers and a component able to condense siRNA and improve its transfection efficiency and biological activity without toxic cell effects. This composition also allows the micelles to adopt a special self-assembly system in a non-polar solvent
- A pharmaceutical composition can be obtained in aqueous media with a therapeutically effective amount of a drug-loaded polymeric micelle together with pharmaceutically acceptable excipients and/or carriers (use as medicament).
- Multifunctional delivery systems can also be developed. Those systems allow the simultaneous treatment with two or more therapeutic agents, as well as the traceability of the delivered compounds and cells when the delivered compound is a cell marker (e.g. dye)

Competitive advantages: these new nanoparticles are able to deliver into cells compounds of different nature (drug, gene, other compounds). Use for therapeutic and non-therapeutic purposes.

Market size/ opportunity: Global nanomedicine market expected to reach $261,063 Million by 2023 (Allied Market Research, Nov. 2, 2017).

The global gene therapy market was valued at $584 million in 2016, and is estimated to reach $4,402 million by 2023. Non-viral vector is anticipated as one of the most lucrative segments (Chandra and Kunselallied, Allied Market Research, February 2018). Cancer and rare diseases will be the drivers for gene therapy drug market growth during the period 2018-2028 (Visiongain Report, Jun 12, 2018).

Intellectual property

Priority European patent application filed (December 28, 2017)
International extension PCT filed (December 20, 2018)

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