

Safe and efficient modular nanovectors for gene/drug delivery in precision medicine

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A combinatorial approach based on cells engineered to express/silence specific genes and innovative delivery of pharmacological active molecules could pave the way for remarkable therapeutic solutions in cancer, rare and neurodegenerative diseases.

In this frame, thanks to their ability to improve drug efficiency within single administrations, properly engineered nanovectors show a controlled drug release at the action site by reducing side effects, additionally, nanovectors can be used to genetically modify cells thus avoid safety issues of viral vectors. In this context, we have developed several modulable nanosystems such as enzyme-responsive polyelectrolyte capsules [1], polyelectrolyte complexes [2] and core/shell polymeric nanoparticles for drug/gene delivery in cancer cells [3-9].

These nanosystems are based on the proper employment of both FDA approved synthetic and natural polymers, and loaded with drugs/natural compounds and/or nucleic acids for application in oncology and neurodegenerative diseases.

High drug loading efficiency and sustained release over time is obtained, such as good transfection efficacy of different primary/immortalized human cells. In addition, these nanoparticles showed the ability to penetrate into 3D spheroids, thus allowing to target inner cells and to achieve transfection and/or drug release. Additionally, thanks to their biomimetic properties [10], the developed nanovectors are able to target specific cells.

References

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