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Therapeutic protein-only nanoparticles as targeted antitumoral drugs

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Nowadays, conventional cancer treatments present high systemic toxicity, leading to side effects on healthy tissues. For that reason, it is of great relevance to develop targeted drugs that can increase the local drug concentration, minimize toxic effects on off-target tissues and reduce the dose administered. Moreover, loading capacity and drug leakage from vehicles during circulation in blood is a major concern when developing nanoparticle-based cell-targeted cytotoxics. To circumvent this potential issue, it would be convenient the engineering of drugs as self-delivered nanoscale entities, devoid of any heterologous carriers. In this context, we have engineered potent protein toxins, using the active fragments of the diphtheria toxin and the *Pseudomonas aeruginosa* exotoxin, as self-assembling, self-delivered therapeutic materials targeted to CXCR4⁺ cancer stem cells. CXCR4 receptor is overexpressed in a variety of human cancers and plays a critical role in metastatic process. For this reason, we have fused T22 to the toxic domains (T22-TOXIN-H6), as it is a CXCR4 ligand able to bind specifically and internalize into the target cells. The systemic administration of both nanostructured drugs in a colorectal cancer xenograft mouse model promotes efficient and specific local destruction of target tumor tissues and a significant reduction of the tumor volume. This observation strongly supports the concept of intrinsically functional protein nanoparticles, which having a dual role as drug and carrier, are designed to be administered without the assistance of heterologous vehicles. The promising results obtained have allowed the development of a new patent (EP17169722) that has been licensed to Nanoligent SL.

Biography

Laura Sánchez García is a PhD student at the Universitat Autònoma de Barcelona, Spain. She is doing her research in the Nanobiotechnology Group, which is working in the development of targeted protein-only nanoparticles against cancer stem cells. She has studied her degree in Microbiology and Master's in Applied Microbiology. She has published 13 papers in reputed journals and has received an EMBO Fellowship to perform a three-month internship in Slovenia.

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