TITLE Theragnostic System for the Directed Diffusion of Therapeutic and Image Agents to Cancerous Cells

DESCRIPTION OF THE TECHNOLOGY

Intravenous administration is the most frequently used route for parenteral cancer drug delivery. However, it is certain that for some types of highly focalized cancers, this way of chemotherapy administration can lead to serious toxicity-related side effects, which drastically limits the dosage and therefore hinders the efficacy of the treatment. In this context, the incorporation of a biologically active molecule over a pharmaceutical vehicle can facilitate selective diffusion to cancer cells, minimizing side effects. This is particularly noticeable when two specific targets are matched:

- intratumor administration instead of parenteral administration.
- incorporation of a targeting molecule to the pharmaceutical vehicle to ensure specific interactions with tumor cell membrane receptors.

At this point, nanoparticles of some porous materials (e.g., silica and covalent organic frameworks) show huge potential for drug delivery, as their surface and pores can be highly functionalized with therapeutic molecules, imaging agents, antibodies and protecting substances to improve their stability in biological medium. Unfortunately, the biomedical use of nanoparticles is usually hindered by their low stability under physiological conditions, high immunogenicity, low specificity for cancer cells and low biodegradability.

To overcome all these issues, this invention presents a novel theragnostic platform based on porous nanoparticles for diagnostic and treatment of prostate cancer by intratumor administration. These nanoparticles are reasonably stable in physiological fluids, show low immunogenicity, are able to target specific prostate cancer cells and are fully biodegradable.

Specifically, the invention has been developed and tested for prostate cancer, where the therapeutic agent was Docetaxel, the imaging molecules tested were 18F and 68Ga, and the carrier nanoparticles were based on covalent organic frameworks.

This invention aims to solve the toxicity problems generated by intravenous administration of cytotoxic drugs in prostate cancer treatment (chemotherapy). The main benefits of this system vs the current methods are: i) selective killing of cancer cells at the prostate gland and local lymph nodes; ii) lower dosage and toxicity, while having bigger therapeutic effect; iii) accurate cancer cell tracking in prostate gland and local lymph nodes by PET imaging. This nanoplatform is stable in physiological medium and also biodegradable.

MARKET APPLICATION SECTORS

Nanodelivery Systems and Devices, Chemotherapy for Prostate Cancer, Delivery Systems based on Nanotechnologies

TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

- Selective destruction of cancer cells located at the prostate gland and local lymph nodes.
- To track the evolution of the cancer and the specificity of the treatment simultaneously.
- High cytotoxic activity towards the specific cell line with FOLH1 receptors translating into less dosage needed and less side effects.
- Great stability in physiologic medium vs other nanoparticles in the drug delivery market, such as micelles, polymers (cyclodextrins, dendrimers, chitosan) or liposomes.
- Possibility to impose control over drug discharge through the ordered structure of the covalent organic framework, opening the door to monitoring therapeutic agent release for hours or days.

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- Higher biodegradability than other nanoparticles due to its 100% organic nature, which facilitates regulatory clearance.

CURRENT STATE OF DEVELOPMENT

The invention is currently in preclinical phase with good prognosis to advance into clinical phase I in 2021. This technology is protected with a patent filed in November 2019.

INTELLECTUAL PROPERTY RIGHTS

Patent Pending
Priority Number (SPTO): P201931015
Priority Date: 20/11/2019

COLABORATION SOUGHT

Se busca una colaboración que lleve a una explotación comercial de la invención presentada

RELATED IMAGES

Image 1:

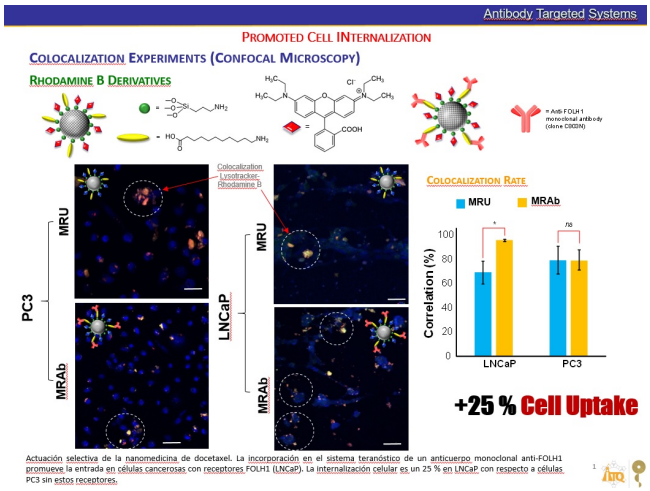

Image 2:

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