

TARGETED ANTI-CANCER DRUG DELIVERY SYSTEM

Fields of use

In vitro testing, Trials, Diagnostic services, Molecular diagnosis, Therapeutic services, Oncology, Pharmaceuticals, Special chemicals and intermediates, Clinical research, Trials, Cytology, Cancerology, Pharmaceutical Products/Drugs

Current state of technology

Concept stage

Type of cooperation

Research and development agreement for financing and finalization of pre-clinical studies, clinical trials and upscaling manufacturing process

Intellectual property

Patents granted

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More information about the invention



Summary

A Slovenian research institution has developed a specific bio-molecular drug delivery system using a selective cathepsin inhibitor as a guiding molecule towards cancer sites. The invention solves the problem of safety and accuracy of drug delivery to the cancer target site. The researchers seek research cooperation for pre-clinical studies, clinical trials followed by upscaling the production according to the good manufacturing practices.

Description of the invention

Despite the progress of modern medicine, cancer still represents a major problem of the developed world. A number of drugs exhibit major harmful side effects or are inefficient because of low bioavailability. Current delivery systems are often based on nanoparticles or conjugation with antibodies; however, nanoparticle systems are often nonspecific and require high doses of drugs to be effective, and antibody-based systems are costly.

One of the characteristics of tumour cells and tumour stroma cells is their secretion of the proteolytic enzymes such as cathepsins, which actively promote tumour growth and are therefore amenable as targets for targeted delivery of anti-cancer drugs.

The invention developed by Slovenian research institution and presented here is bio-molecular drug delivery system with a specific cathepsin-B inhibitor linked to a highly bio-compatible liposomal nanocarrier via lipid tail and which enables specific targeting of cathepsins in the tumour microenvironment, and therefore bringing the liposomal nanocarrier containing the drug payload (eg. doxorubicin), to the target site.

The technology is applicable for targeted delivery of both anti-tumour and anti-inflammatory drugs to pathological sites. It enables to deliver both water soluble and insoluble compounds to the target site due to the liposome structure with lipid layer and hydrophilic core.

Apart from treatment, the technology is also applicable for detection purposes (for example, by specific delivery of a fluorescent marker or magnetic resonance imaging (MRI) contrast agent to a tumour site), and was confirmed using encapsulated Gadolinium (Gd) with linked cathepsin-B inhibitor on tumour bearing mice, which resulted in signal enhancement, prolonged retention and elimination.

The researchers from Slovenian research institution are among the world's leading experts in the field of proteases (primarily cysteine cathepsins) and their regulation of physiological processes in normal and pathological conditions, including cancer, and inflammatory associated diseases, and have extensive knowledge and expertise in cell biology, proteomics, animal cancer models and in-vivo imaging techniques. The researchers filed number of patent on drug delivery systems on international level, have



many international collaborations and have participated in several International and EU projects among which, EU project FP7 that was focused on developing drug delivery system for oral and ocular application. They published over a hundred articles in high-impact scientific journals.

The partners sought should already be involved in biotechnology and pharmaceutical industry or are investors. Partners with own manufacturing capacities are desired.

The most preferred type of cooperation is research and development agreement for financing and finalization of pre-clinical studies, clinical trials and upscaling the manufacturing process in accordance with good manufacturing practice (GMP) to implement the technology for medicinal use. The most desirable result would be a drug delivery system ready to be licensed-in by the same or other potentially interested partners.

Main Advantages

This liposome based drug delivery system enables reduction in dosages and systemic toxicity with increased efficiency of anti-cancer drugs which leads to more efficient and less costly treatments.

Successful functioning of the system has been demonstrated both in vitro on various cell cultures and in vivo on mouse cancer model. In-vitro experiments on cells showed that encapsulated doxorubicin in liposomes with linked cathepsin-B inhibitor was 22 times more potent in killing cells compared to only liposome encapsulated doxorubicin. In vivo data confirmed increased accumulation of liposomes with linked cathepsin-B inhibitor in tumours while there was no accumulation in healthy tissue.

Partner Sought

Industry partners or investors active in the fields of biotechnology and pharmaceutical industry, preferably with their own manufacturing capacities are sought.

The role of partners sought is financing and collaborating with the finalization of pre-clinical studies, clinical trials and scaling up the manufacturing process in order to make the technology implementable for medicinal use and further licensed-out for manufacturing and sales.