Extracellular Nano-vesicles For Applications In Therapeutic Delivery

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OTHER INFORMATION

CATEGORIZED AS

- **Medical**
  - Therapeutics
- **Nanotechnology**
  - NanoBio

RELATED CASES

2016-464-0

BRIEF DESCRIPTION

Drug delivery relies on nano-sized carriers whose objectives are to protect cargo from the body and to release the cargo at the appropriate site without inducing immunogenic response. The inventors at UCI have developed a method of mass producing extracellular nano-vesicles that have shown promise for drug delivery, but have been slow to progress to clinical trials due to low production yields.

FULL DESCRIPTION

The fields of drug delivery and gene therapy rely on nano-sized carriers for effective delivery of therapeutic cargo to the designated target site. Therapeutic delivery agents have two key objectives: Protect the cargo from the harsh environment of the body and release the cargo at the appropriate site without inducing immunogenic response. A variety of viral and non-viral based nanocarriers have been designed, but have had issues with non-specific cytotoxicity, poor biocompatibility, and low efficacy of delivery.

Extracellular vesicles (EVs) are membrane-surrounded structures that are naturally produced and released by cells. EVs have recently become an exciting option for nano-scale delivery. Cells are harvested from a patient and used to produce personalized vesicles that are loaded with therapeutic cargo. The personalized nature reduces the chances of inducing immunogenic response, and the vesicles can undergo surface modification to improve targeting. Unfortunately, there is low yield associated with ex vivo production of vesicles, resulting in a bottleneck in testing and slow progress to clinical trials.

The inventors at UCI have developed a method for mass production of nano-sized extracellular vesicles using chemical reagents. Natural vesicle production occurs via a process called blebbing, in which the hydrostatic pressure in the cell tries to create vesicles, but is opposed by the retraction of actin filaments, such that the blebbing is reversible. But when the bleb is treated with a chemical reagent, the actin filaments are unable to retract, and the cell forms nano-vesicles at a rate 12.5 times higher than normal.

ADVANTAGES

§ Allows for faster and cheaper production of extracellular nano-vesicles

§ Production rate is 12.5 times higher than passive incubation

§ In vitro effectiveness was shown to be as effective as the free drug

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,717,480	08/08/2023	2016-464
Patent Cooperation Treaty	Published Application	2018/102608	06/07/2018	2016-464

STATE OF DEVELOPMENT

Drug loaded nano-vesicles have been produced and tested in vitro and in vivo to confirm potential as therapeutic delivery agents.

RELATED MATERIALS

» Ingato, D; et. al. Good things come in small packages: Overcoming challenges to harness extracellular vesicles for therapeutic delivery. Journal of Controlled Release. 2016, 241, 174. - 11/10/2016

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