Technology Offer

UNIVERSIDADE DE COIMBRA

CENTER FOR NEUROSCIENCE AND CELL BIOLOGY

A LIGHT-TRIGGERABLE NANOPARTICLE LIBRARY FOR THE CONTROLLED RELEASE OF RNAS

Keywords:
Drug delivery; Nanoparticle library; RNA-based therapies; Light-triggerable formulations.

BACKGROUND:

Importance: RNA-based therapies offer a wide range of therapeutic interventions including for the treatment of skin diseases.

Issues: Lack of efficient strategies to deliver RNA-based therapies. **1º obstacle**: cellular targeting (ability to select specific cells in a tissue); **2º obstacle**: cytoplasmic delivery (escape from the endolysosomal compartment).

State-of-the-art: RNA-based therapies can be delivered by nanoparticles (NPs), scaffolds, nanoneedles, among others. NPs can **stabilize** the RNA molecules, **target** specific cell populations, and **deliver** intracellularly the cargo. Unfortunately, NPs still offer limited success in terms of endolysosomal escape and temporal delivery of the cargo. In the most efficient formulations, the escape of RNA molecules from the endolysosomal compartment is below 2%. Moreover, with the exception of few cases, most of the formulations do not allow temporal delivery of the cargo and yet this issue seems very important because for effective knockdown, RNA molecules should be released from the endosomal compartment shortly (≈15 min) after endocytosis.

TECHNOLOGY DESCRIPTION:

A light-triggerable polymeric nanoparticle (NP) library composed of 160 formulations with physico-chemical diversity and differential responsiveness to light for delivery of RNA-based therapies.

Physico-chemical diversity: allows the selection of the best NPs considering the cell type being transfected, diminishing the time required for the transfection to occur. Some NPs presented cell transfection of 10 min or less.

Differential responsiveness to light: allows the selection of the more efficient NPs in endolysosomal escape after light-triggering the release.

Proof-of-concept:

- Six formulations were more efficient (up to 500%) than commercial Lipofectamine in gene knockdown activity in HeLa cells (*in vitro*) using an anti-GFP siRNA;
- Acute skin wounds treated with the top hit NP complexed with miRNA-150-5p* healed faster than wounds treated with scramble miRNA (*in vivo*).

The NPs described were effective in the release of siRNA and miRNA but can also be extended to the release of mRNA and other types of RNA.

Technology Offer

*miRNA-150-5p: miRNA recently identified to be involved in keratinocyte proliferation and migration as well as skin fibroblast survival in ischemic conditions

ADVANTAGES:

Solving the main issue (delivery) related to the usage of RNA-based therapies through a rapid and efficient intracellular release of RNAs: rapid delivery to reduce clearance from the place they are administered *in vivo* and efficient endolysosomal escape through temporal control of release triggered by light.

APPLICATIONS:

Drug delivery system (library of nanoparticles) of RNA-based therapies for treatment of skin lesions and disorders such as skin cancers.

INTELLECTUAL PROPERTY RIGHTS:

Owner:

University of Coimbra (UC)

Center for Neuroscience and Cell Biology (CNC)

IPR Legal Status:

PCT Application

CONTACTS:

University of Coimbra / UC Business -Technology Transfer Office
Laura Alho - TTO
Phone: +351 239 247 815
E-mail: lauraalho@uc.pt

Center for Neuroscience and Cell Biology - Technology Transfer Office
Catarina Cunha Santos, PhD - TTO
Phone: +351 239 820 190
E-mail: anacunhasantos@cnc.uc.pt