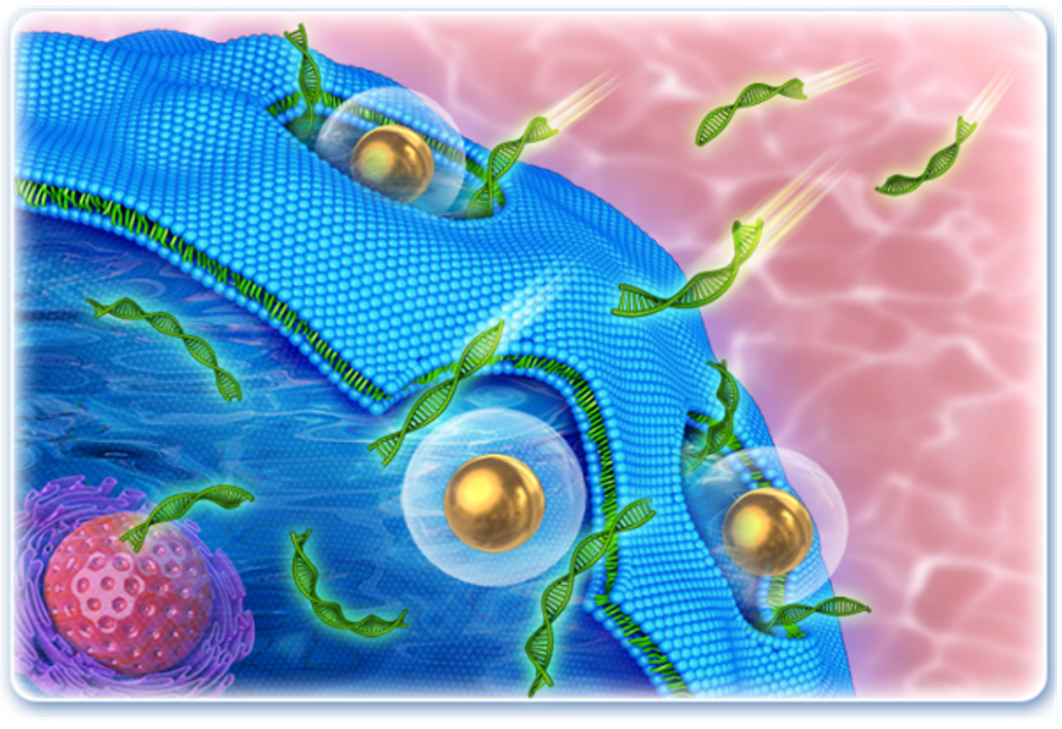
LumiPore™, a gentle non-viral transfection platform
Achieving high yields of mRNA delivery into various cell types

Introduction

- **Efficiently delivering exogenous payloads** ranging from mRNA, plasmid DNA, or proteins into cells is **a crucial bottleneck in designing clinical cell therapies** as it directly determines the number of modified cells, and thus the treatment efficacy.
- Although **electroporation** is a frequently used method, it is accompanied with several drawbacks such as **high cell toxicity**, **functional & genomic alterations**.
- An **alternative** is **laser-assisted nanoparticle-sensitized photoporation** for the cytosolic delivery of macromolecules.
- Photoporation can deliver payloads at a **high throughput rate of 1,000,000 cells per second.**
- Cells maintain **high viability**, **proliferative capacity,** and **functionality after photoporation**.
- Photoporation as an intracellular delivery method can be used in the engineering of therapeutic cells (NK, T-cells, SCs, Dendritic cells…).

Photoporation method



1. Nanosensitizers are added to cells.
2. Pulsed laser irradiation induces heating and vapor nanobubbles (VNBs).
3. Formation of transient membrane pores allows delivery of macromolecules into the cytosol.

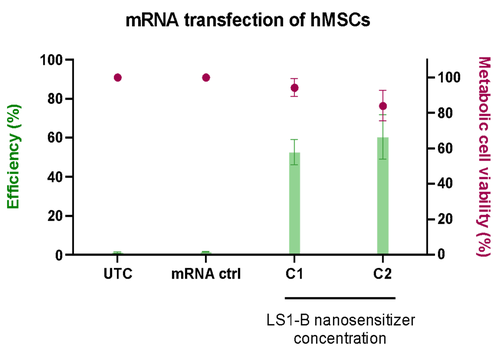
Photoporation of mRNA into MSCs — LS1-B nanosensitizers

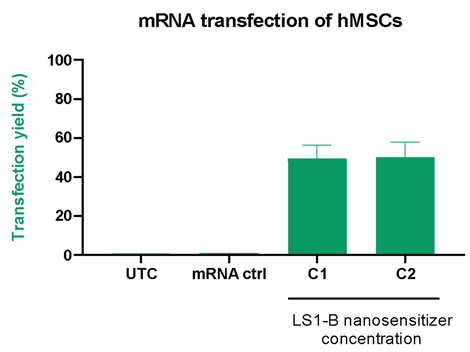
- Adherent MSCs (Revatis).
- LumiSense™ 1-B nanosensitizers.
- 96-well plate.
- 5 µg/per well mRNA eGFP (TriLink Technologies, clean cap, 996 bp).

Photoporation of mRNA into jurkat cells — LS2-C nanosensitizers

- Suspension jurkat cells E6.1.
- LumiSense™ 2-C nanosensitizers.
- 96-well plate with 1 million jurkat cells per well.
- 1.25 µg/per well mRNA eGFP (Cellerna mRNA, ±1100 bp).

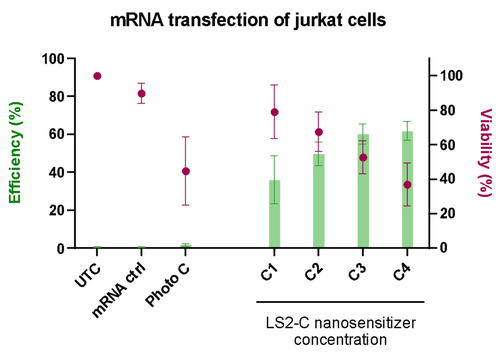
Photoporation of mRNA into hMSCs

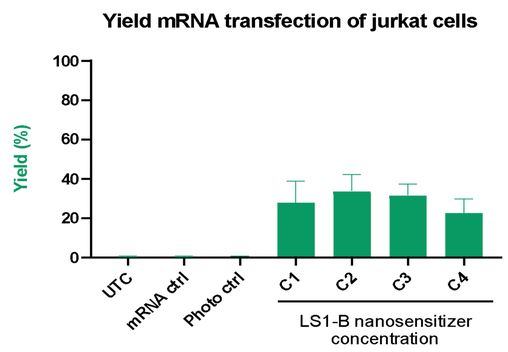




- **Efficiency: 60%**
- **Metabolic cell viability: 84%**

Photoporation of mRNA into jurkat cells





- **Efficiency: 50%**
- **Metabolic cell viability: 70%**

LumiPore™ photoporation device



- Benchtop transfection system.
- Delivery of a variety of payloads.
- Compatible with well-plates (6-96), flasks, slides.
- Scale: < 10min for a 96 well-plate.
- Spatial selective photoporation.

Conclusion

1. Photoporation is **harmless to cells**:
    1. cells have no delay in proliferation after photoporation.
    2. cells maintain high viability, retain their normal functionality.
2. Photoporation can **efficiently deliver payloads** into cells (gene knockout, gene silencing..).
3. Photoporation works for **suspension** and **adherent cells**.
4. Photoporation **does not require any cell detachment, medium change**.

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References:
Xiong R et al, Nature Nanotechnology, 2021, 16, 1281–1291