The **LumiPore™**, nonviral transfection platform

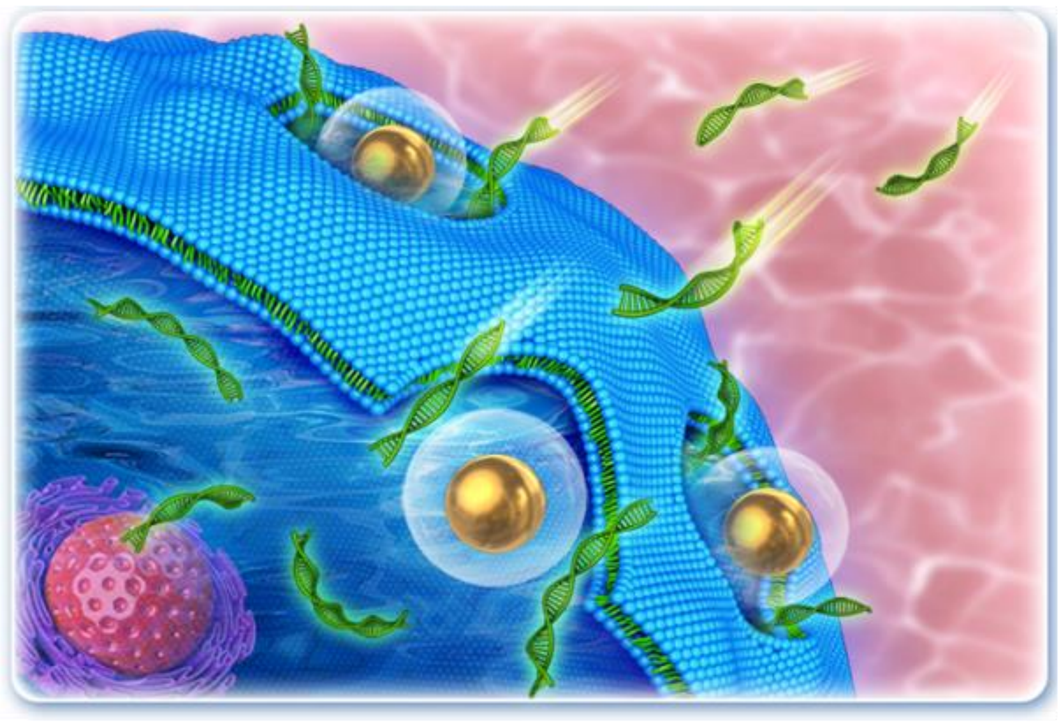
Photoporation: high viability, high throughput rate of cargo delivery

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Introduction

- **Efficiently delivering exogenous cargo material** 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**.
- Alternative: use **of laser-assisted nanoparticle-sensitized photoporation** for the cytosolic delivery of macromolecules.
- The photoporation technique is able to deliver cargo at a **high throughput rate of 100,000 cells per second.**
- The cells maintain **high viability**, **proliferative capacity** and **functionality after photoporation**.
- Photoporation as an intracellular delivery method could be used in the engineering of therapeutic cells (NK, T-cells, SCs, Dendritic cells…).

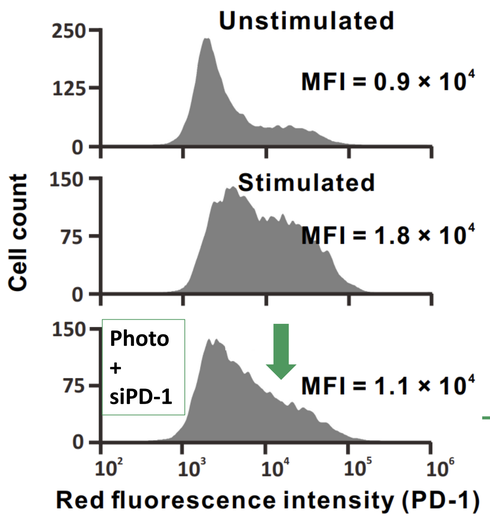
Photoporation method

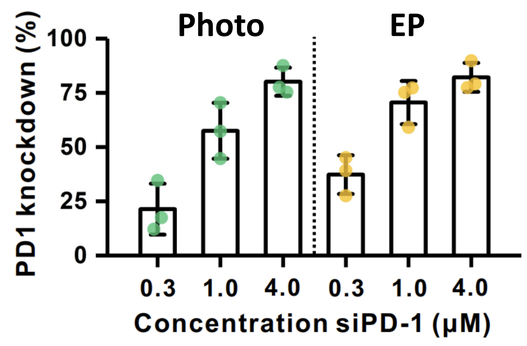


1. Nanosensitizers are added to cells.
2. Pulsed laser irradiation induces heating or vapor nanobubbles (VNBs).
3. Formation of transient membrane pores which allows passage of macromolecules such as DNA, RNA, RNPs etc. into the cytosol.

Engineering of Therapeutic cells

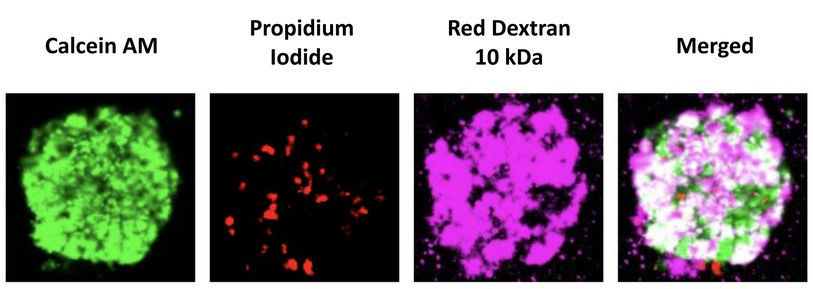
siRNA delivery in stimulated human (Hu) T cells

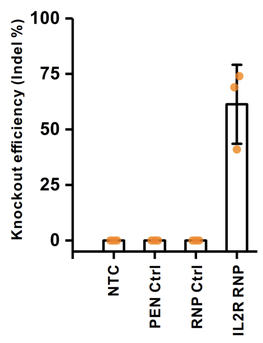




➢ **Photoporation can efficiently induce gene silencing in primary Hu T cells**

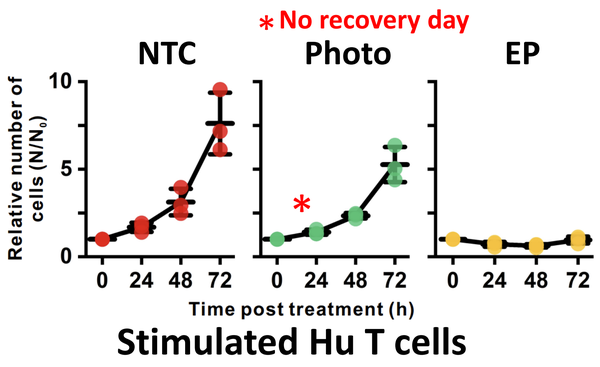
Cas9 RNP delivery in hESCs

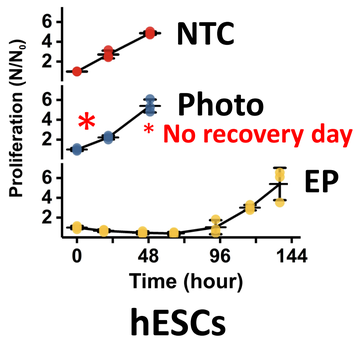




➢ **Photoporation can efficiently induce gene knockout in hESCs**

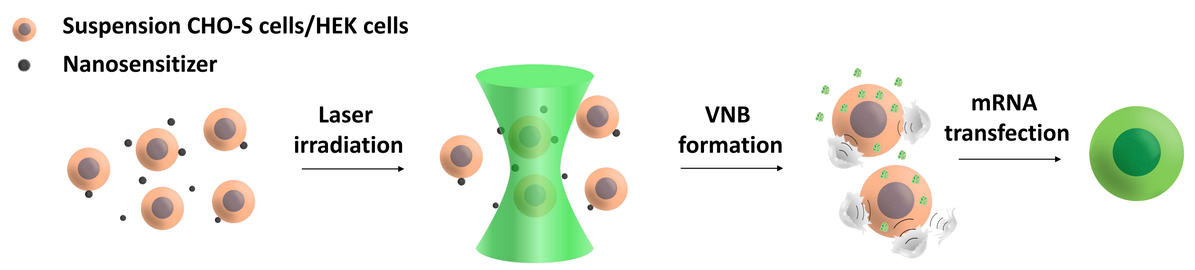
Proliferation curves: photoporation vs electroporation



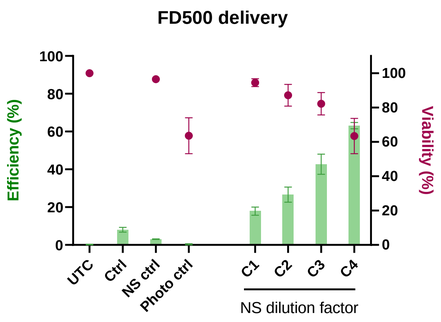


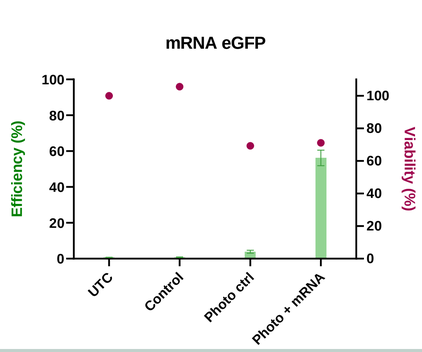
➢ **Photoporation does not cause a delay in cell proliferation**

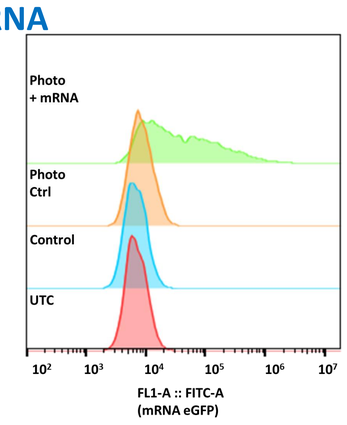
Cell line engineering for Biologics



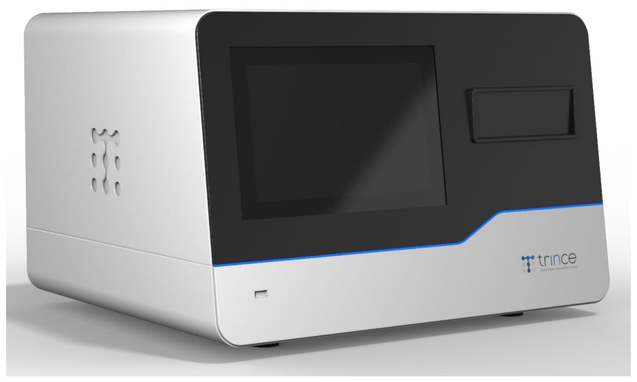
➢ **Photoporation can efficiently modify CHO cells with mRNA**







LumiPore™ photoporation device



trince PRECISION TRANSFECTIONS

* Benchtop transfection system.
* Delivery of a variety of cargos.
* Compatible with well-plates (6-96), flasks, slides.
* **Scale: > 1 Billion cells/day**.
* Special selectivity photoporation.

Conclusion

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

References

1. Xiong R et al, Nature Nanotechnology, 2021, 16, 1281–1291
2. CHO data – *in-house* experiment

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