

A Promising Strategy for Ocular Inflammation: Nanoscale Lipid-Methylprednisolone Conjugates for Targeted Retinal Pigmented Epithelium Therapy

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❖ Introduction

Ocular Diseases

Inflammation leads to;

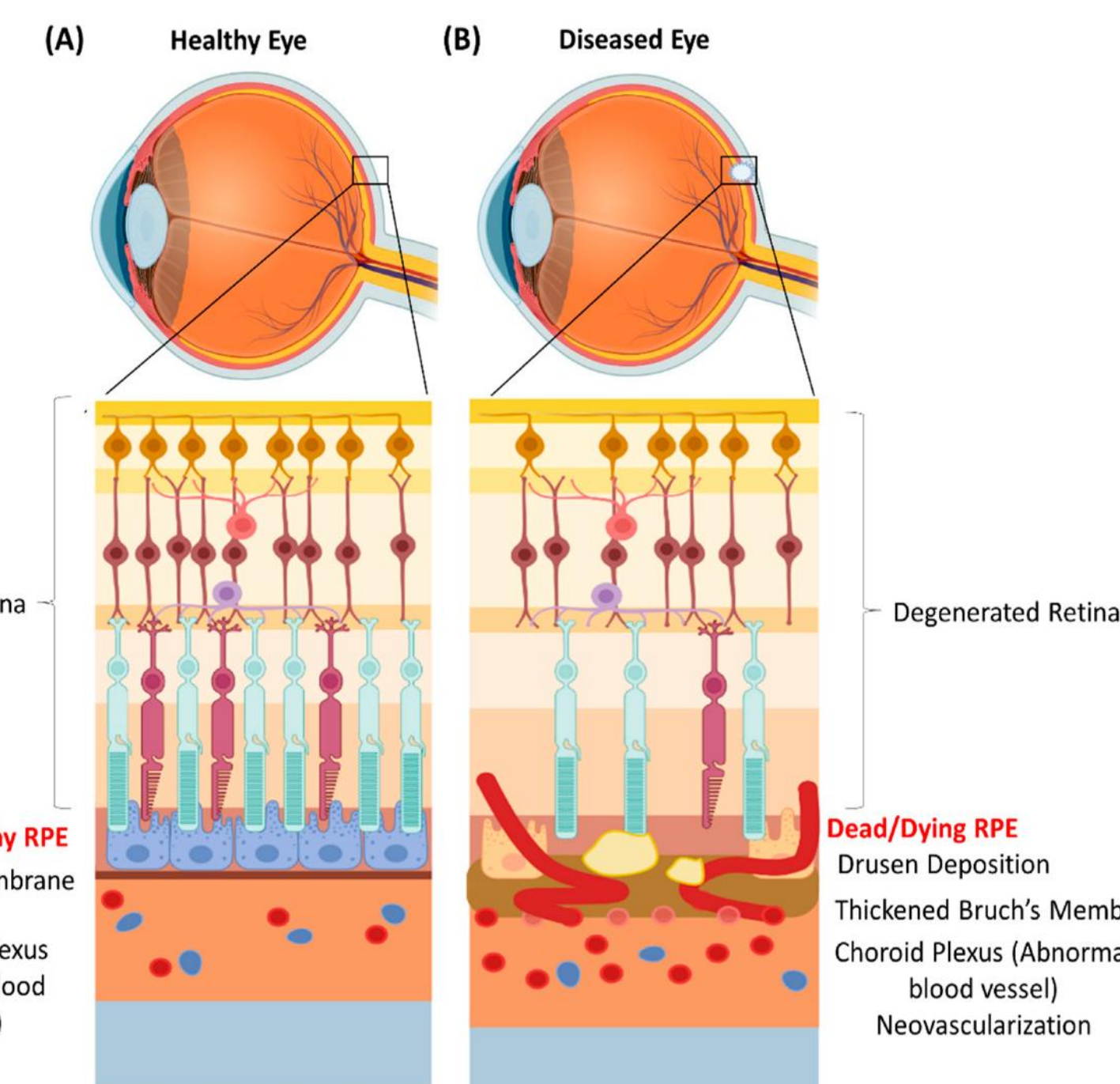
- Proliferative diabetic retinopathy
 - Age-related macular degeneration
- RPE is a cell layer in the eye that is affected by these inflammatory processes.

Treatment

- Glucocorticoids (Methylprednisolone)
- NSAIDs
- DMARDs

Challenges in available treatment

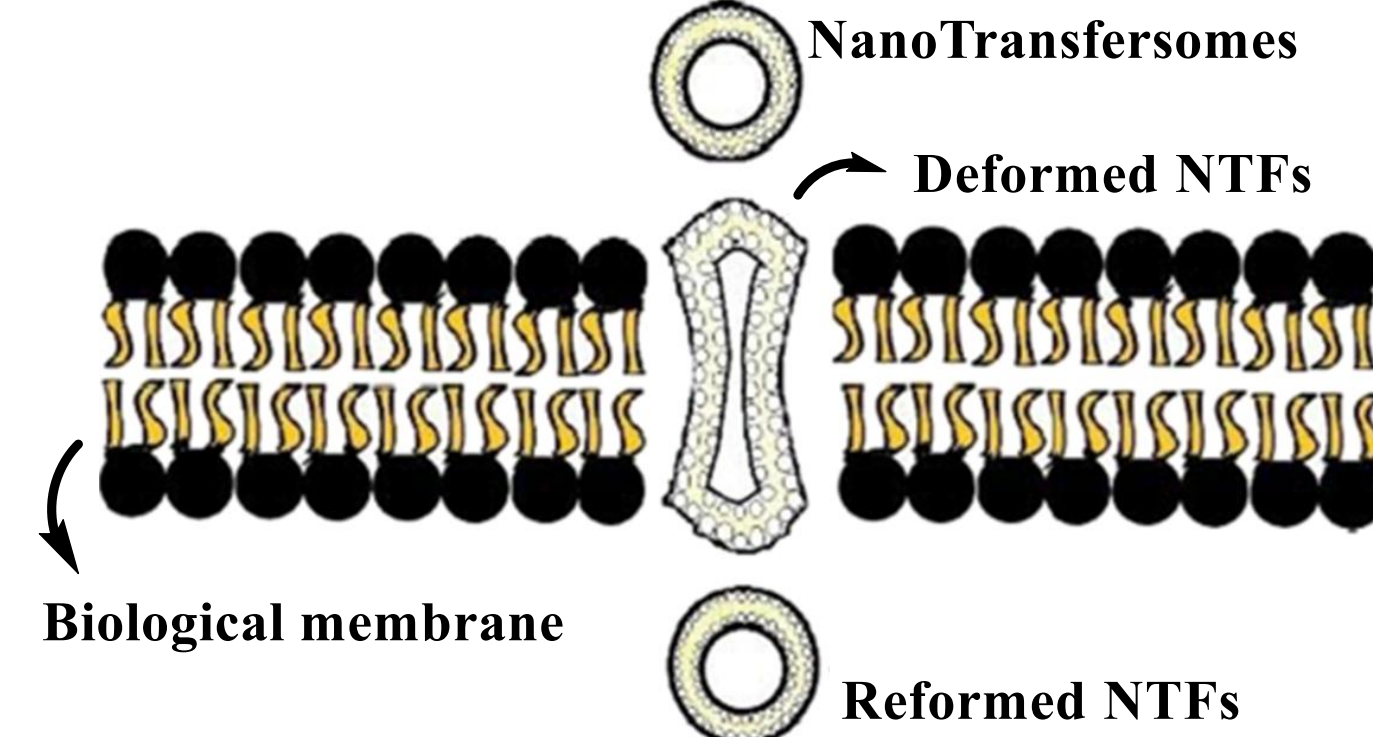
- Lack targeted delivery
- Painful
- Systemic side effects



Nanotransfersomes approach

A vesicular drug delivery system

- Ultradeformable NPs
- High penetration
- Sustained release and targetability
- Improve bioavailability
- Enhance therapeutic efficacy
- Reduced dosing frequency

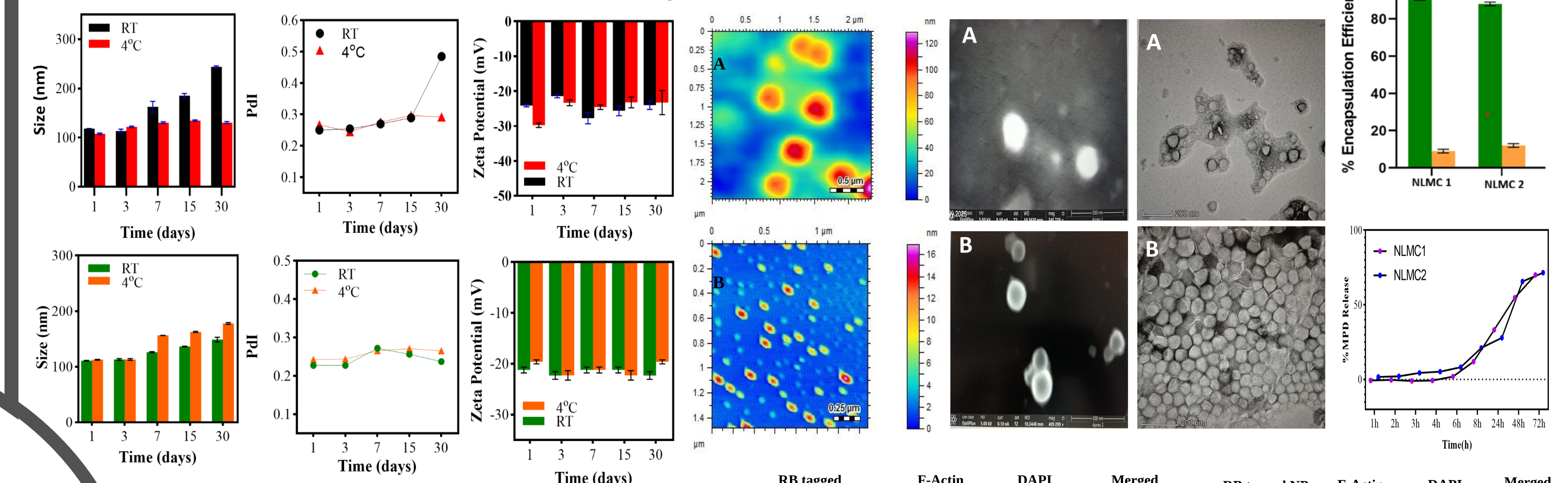


❖ Objectives

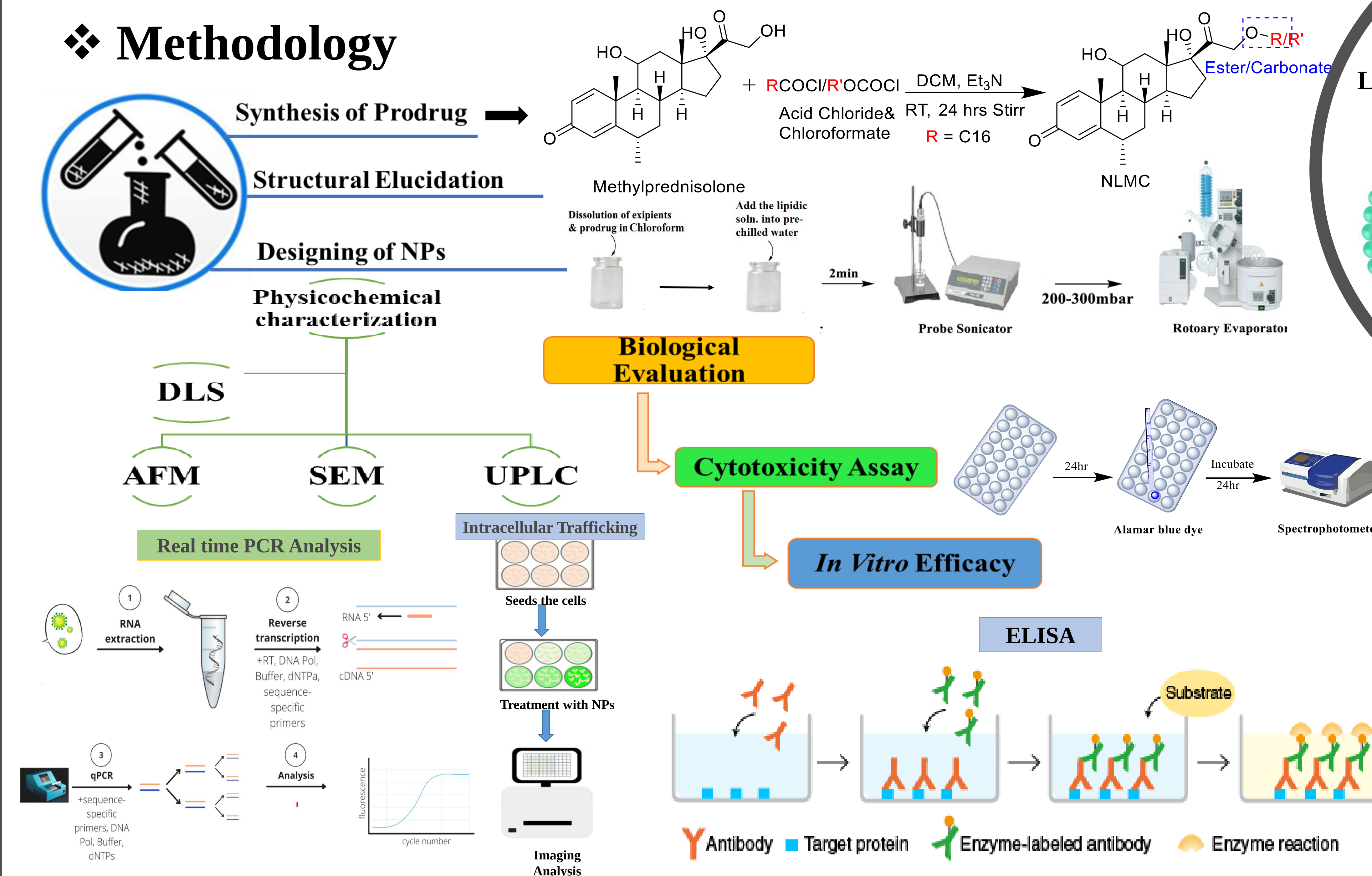
- To Enhance the Drug Stability
- High Encapsulation Efficiency
- Sustained Controlled Drug Release
- Specific tissue targeting
- Improve pharmacokinetics
- High penetration

❖ Result and Discussion

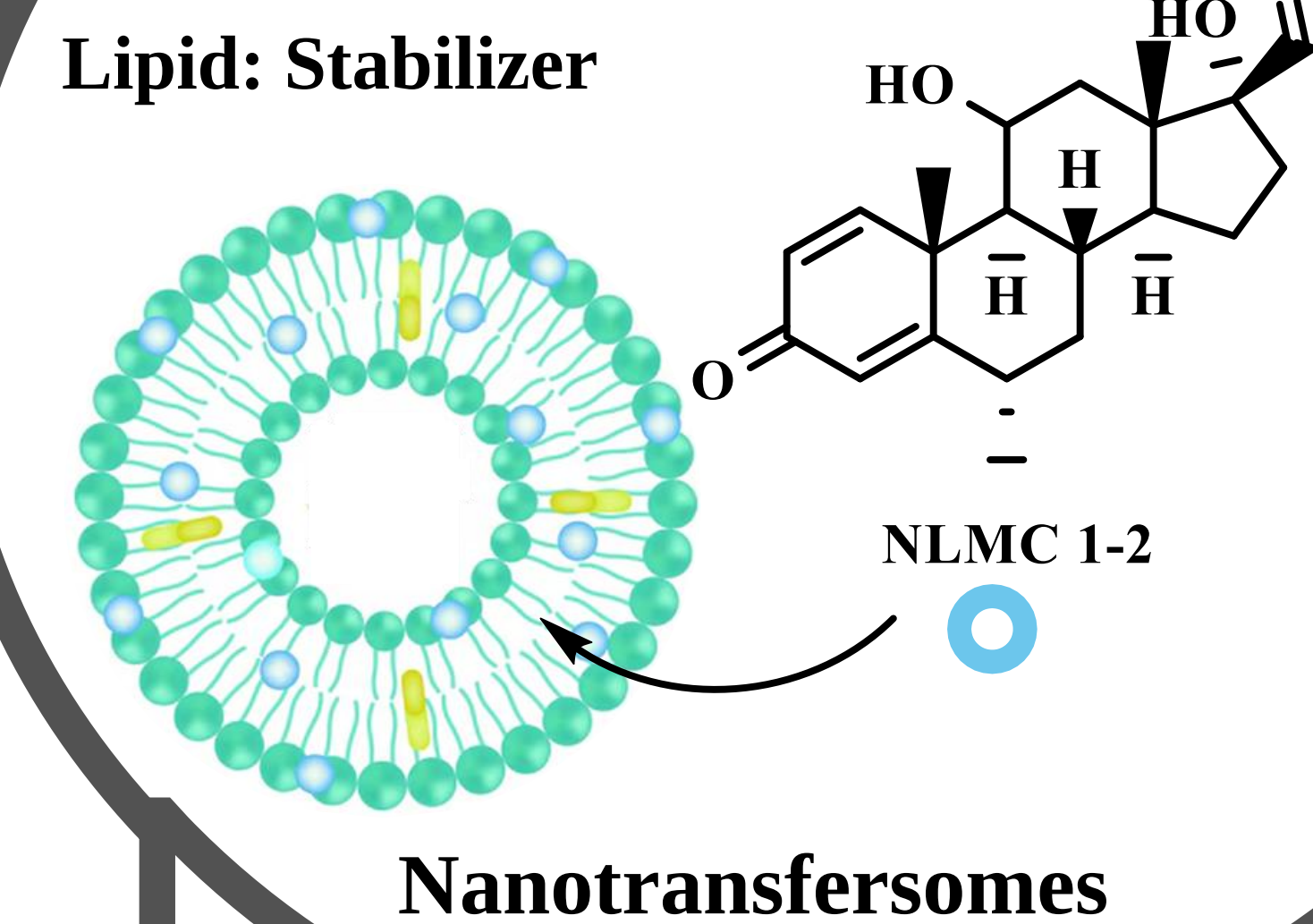
Physicochemical Characterization



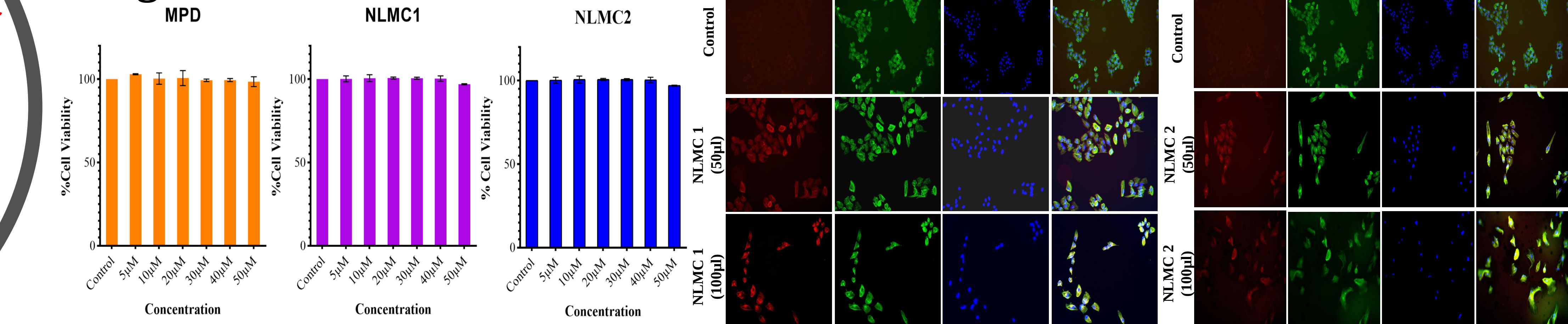
❖ Methodology



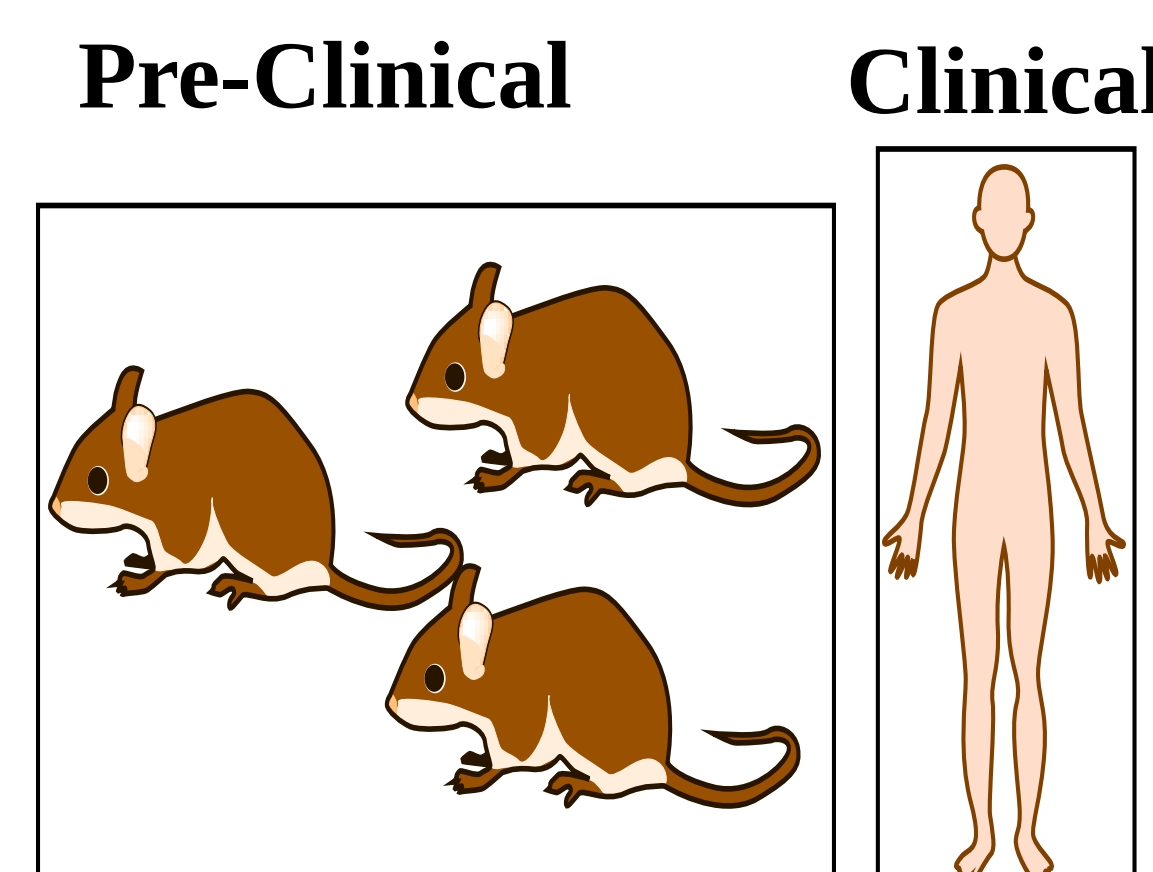
Graphical Abstract



Biological Evaluation



❖ Future Perspectives



❖ Conclusion

This study successfully developed two novel nanoscale lipid-methylprednisolone conjugates, designed for the targeted treatment of RPE cell inflammation. These stable, well-characterized nanoparticles demonstrated efficient drug encapsulation and sustained release, ensuring a prolonged therapeutic effect. In vitro experiments confirmed their safety and successful cellular uptake by RPE cells. Most importantly, NLMCs 1-2 effectively modulated the inflammatory response in RPE cells by significantly suppressing pro-inflammatory genes while simultaneously upregulating anti-inflammatory markers. These results highlight the potential of NLMCs as a promising and targeted therapeutic strategy for inflammatory and pain-related conditions affecting the retina, offering a way to improve treatment efficacy while minimizing systemic side effects.