

Dexamethasone Lipoidal Prodrug Nanoparticles: A Potent Anti-inflammatory Strategy

^aPerveen Bano^a, Aqsa Arif^a, Saadat Hussain^a, Rudaba Saleem^a, Irfan khan^b, Mujeeb ur Rehman^a

^aL. E. J. Nanotechnology Center, H. E. J. Research Institute of Chemistry, International Center for Chemical and Biological Sciences, University of Karachi, Karachi-75270, Pakistan.

^bThe Aga Khan University, Centre for Regenerative Medicine and Stem Cell Research, Jumah Building, Karachi, Pakistan.

Introduction

Inflammatory conditions are disorders marked by acute or chronic inflammation.

Causes:

- Tissue damage
- Environmental factors
- Hormonal Imbalance

Disorders

- Rheumatoid arthritis
- Inflammatory bowel disease

Available Treatment

- NSAIDs
- Glucocorticoids (Dexamethasone)

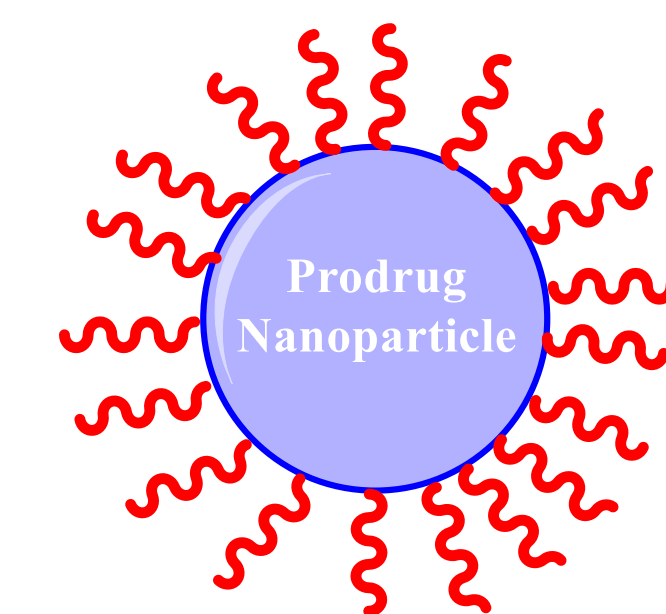
Side Effects

- Weight gain
- Digestive Issues
- Undesirable pharmacokinetics

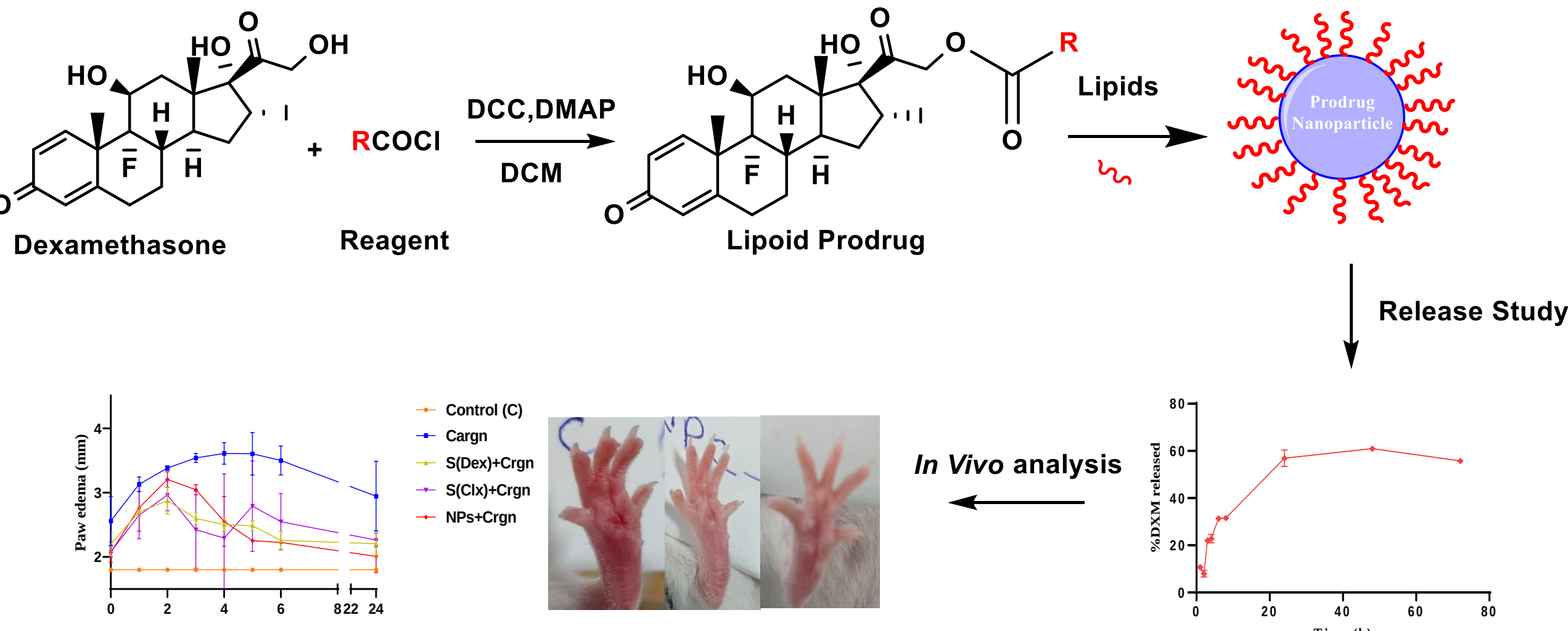
Solution

1. Lipid-Drug Conjugates Approach
2. Lipid Nanoparticles

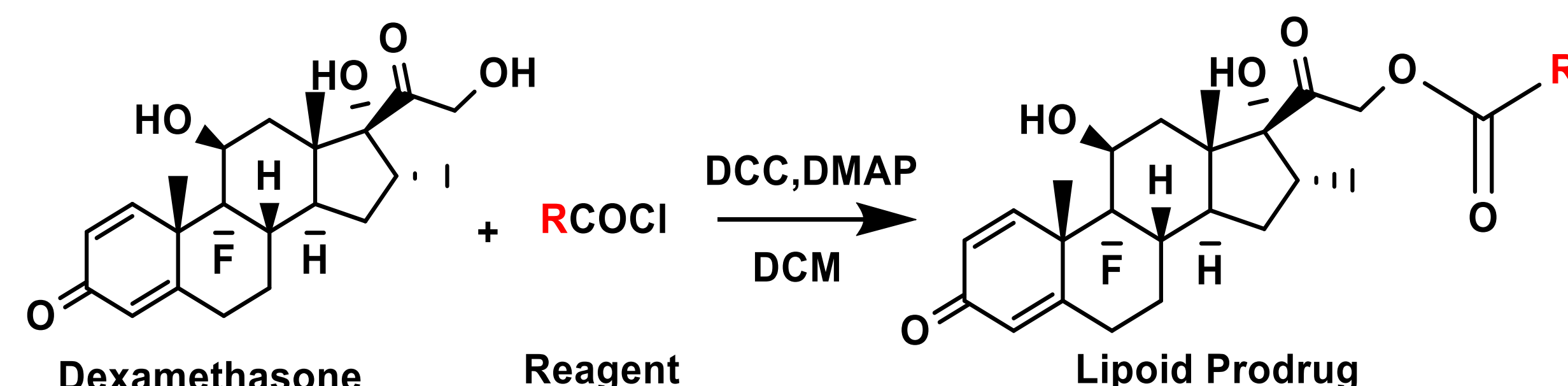
- Enhance Bioavailability
- Improve pharmacokinetics



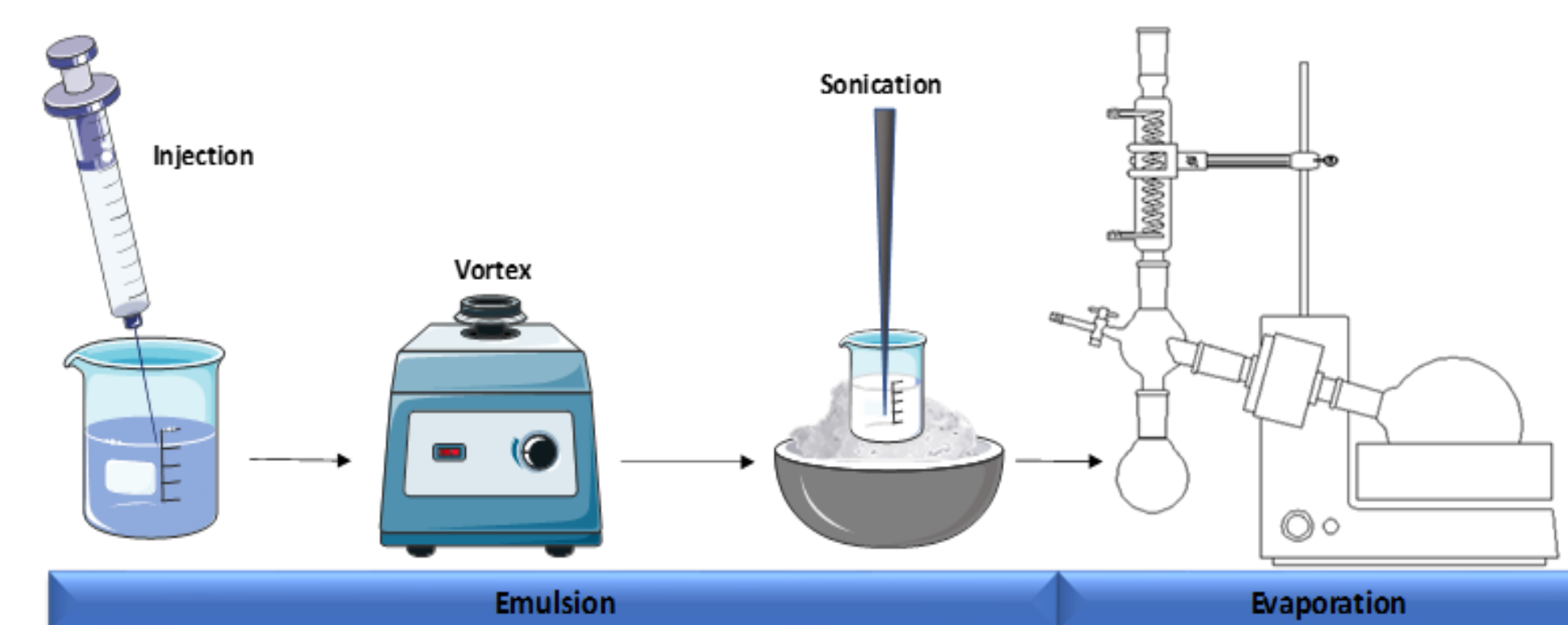
Objectives



Chemical Synthesis

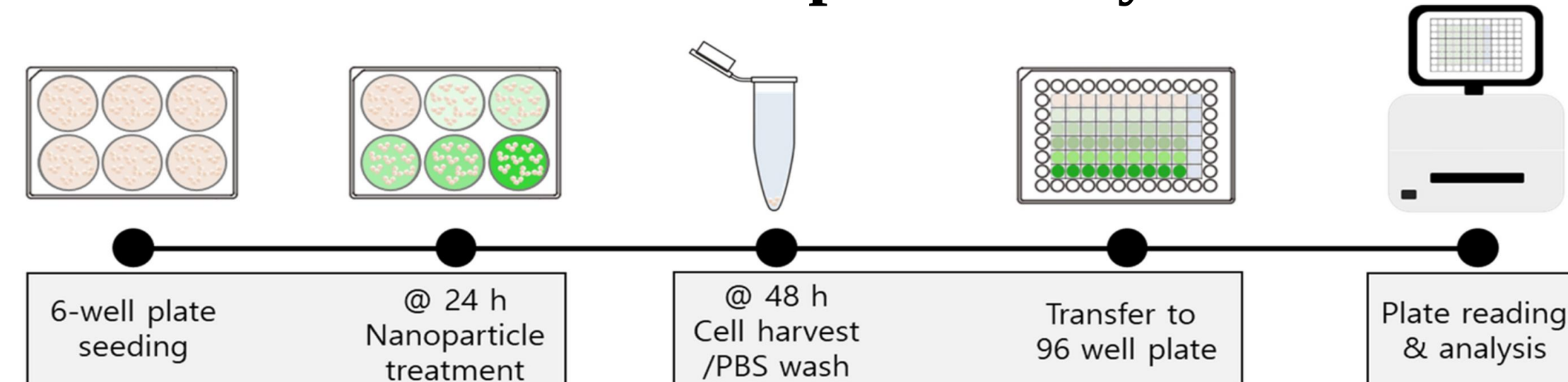


Designing of Nanoformulation

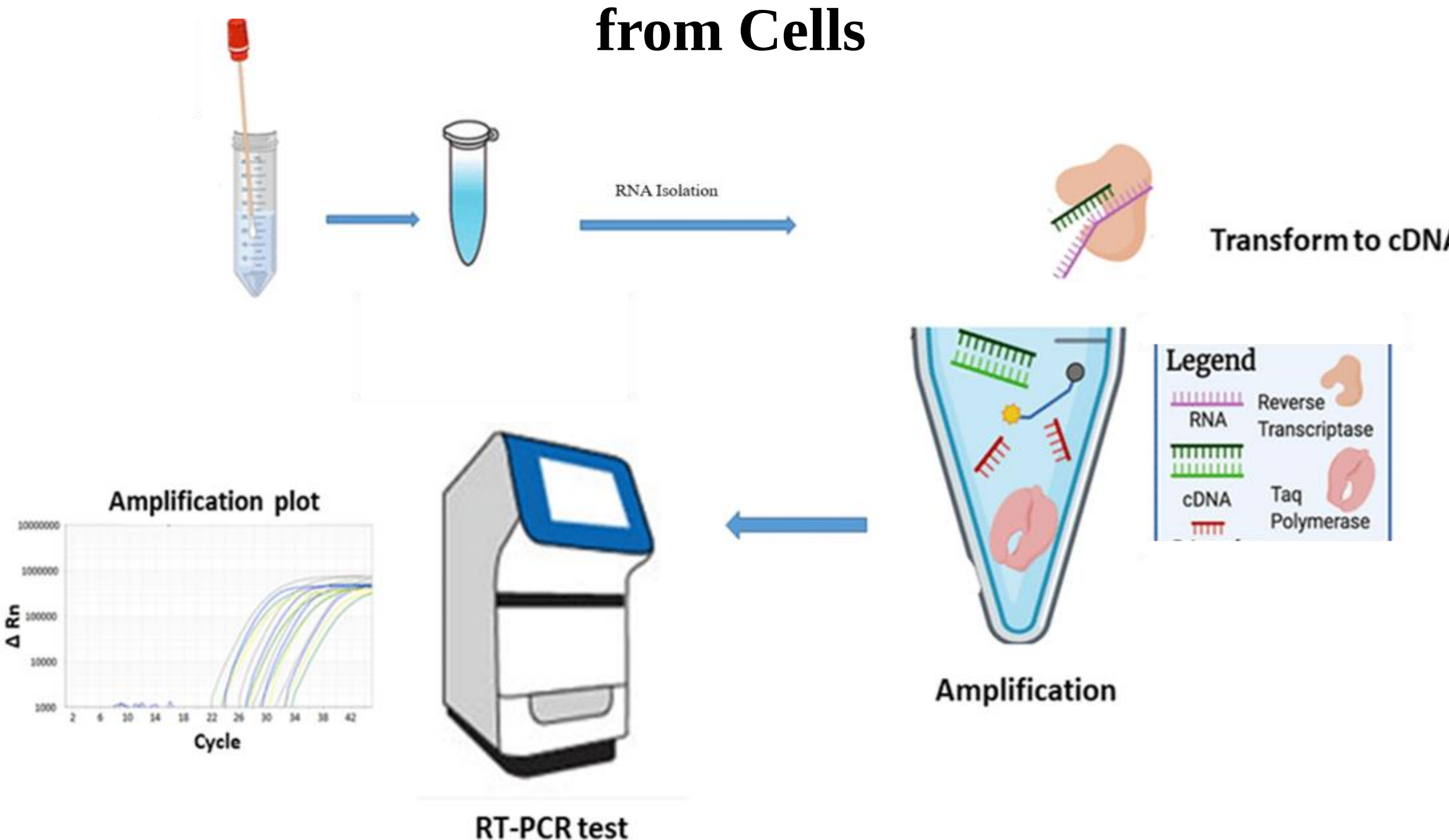


Biological Evaluation

Protocols for Cellular uptake study of NPs

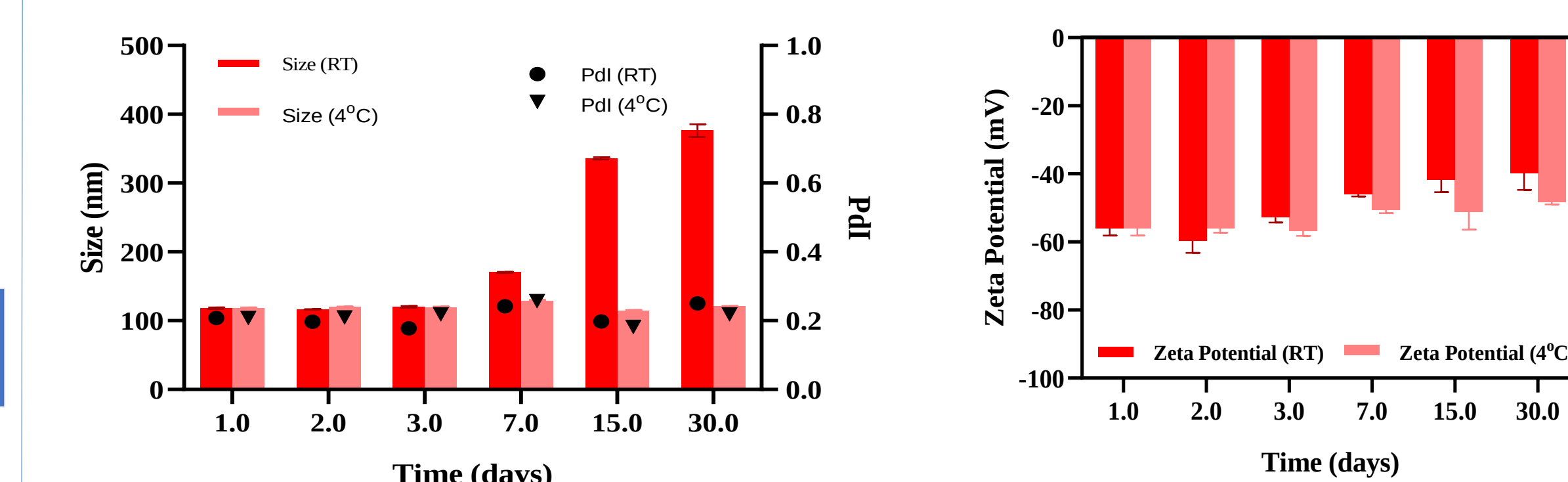


qPCR Analysis following cDNA synthesis & RNA extraction from Cells

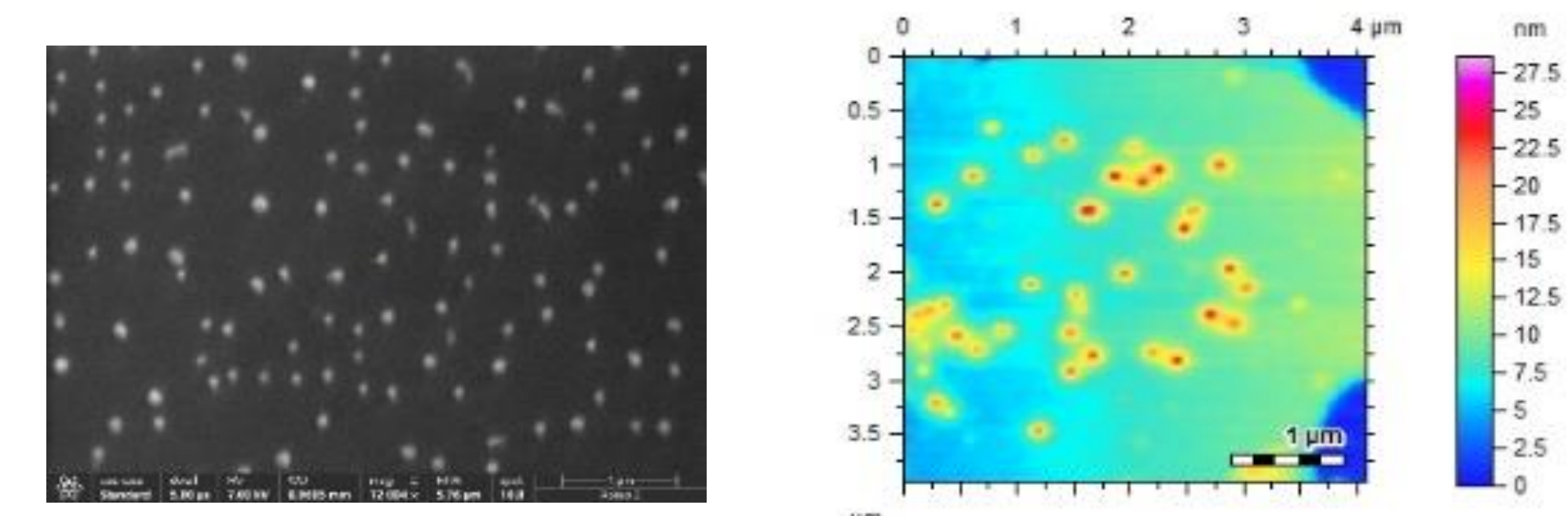


Physicochemical Characterization

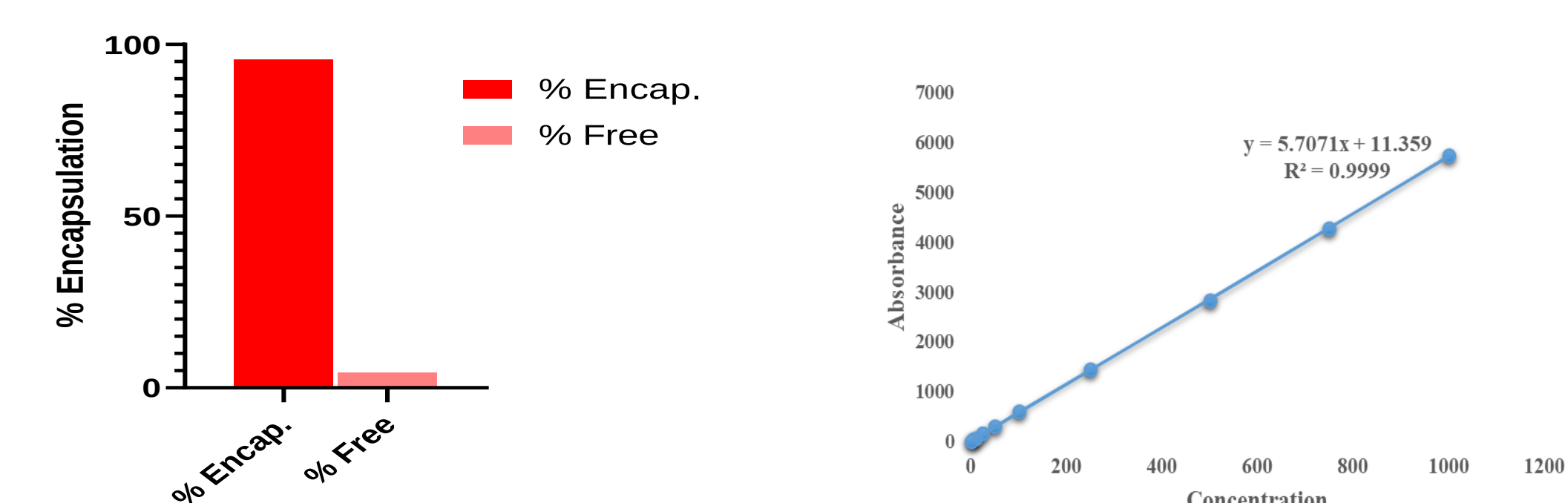
Stability of Nanoparticle (Size, Pdl and Zeta potential) determined by Malvern Nanozetaser over time.



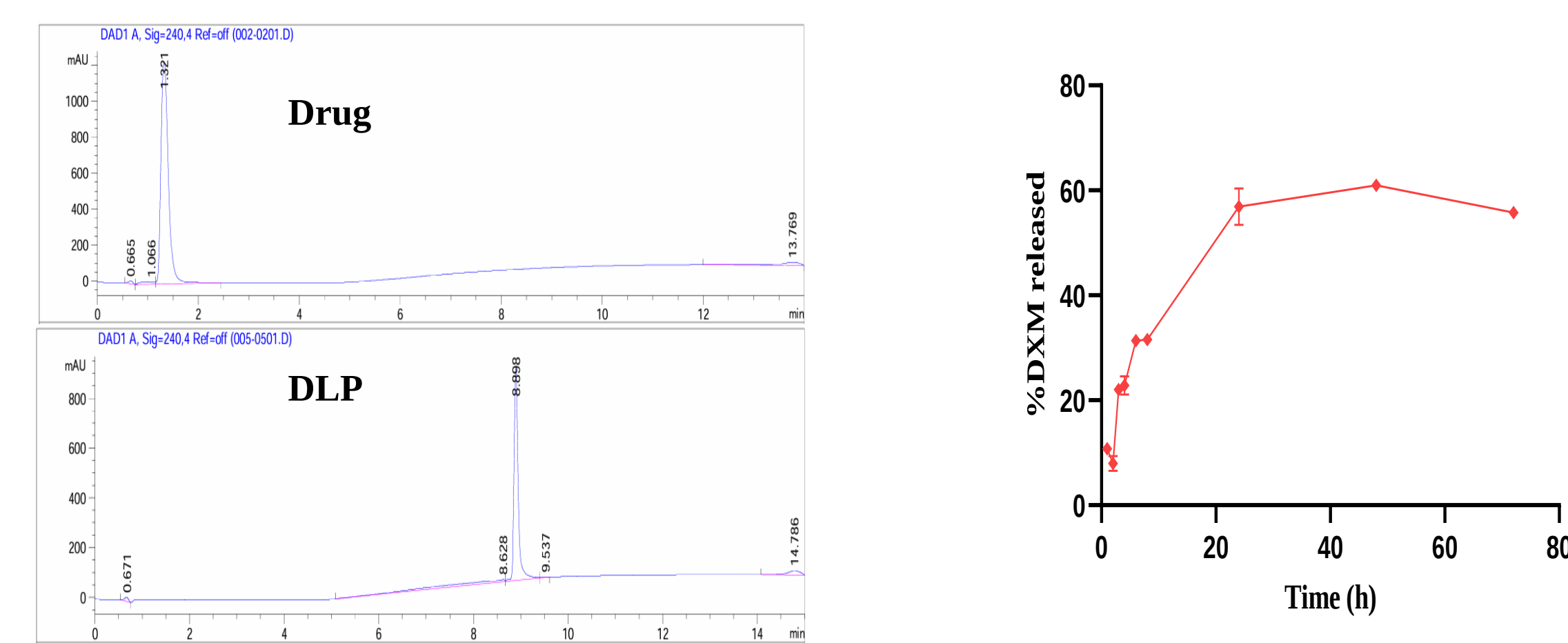
Morphological Analysis



Encapsulation Efficiency

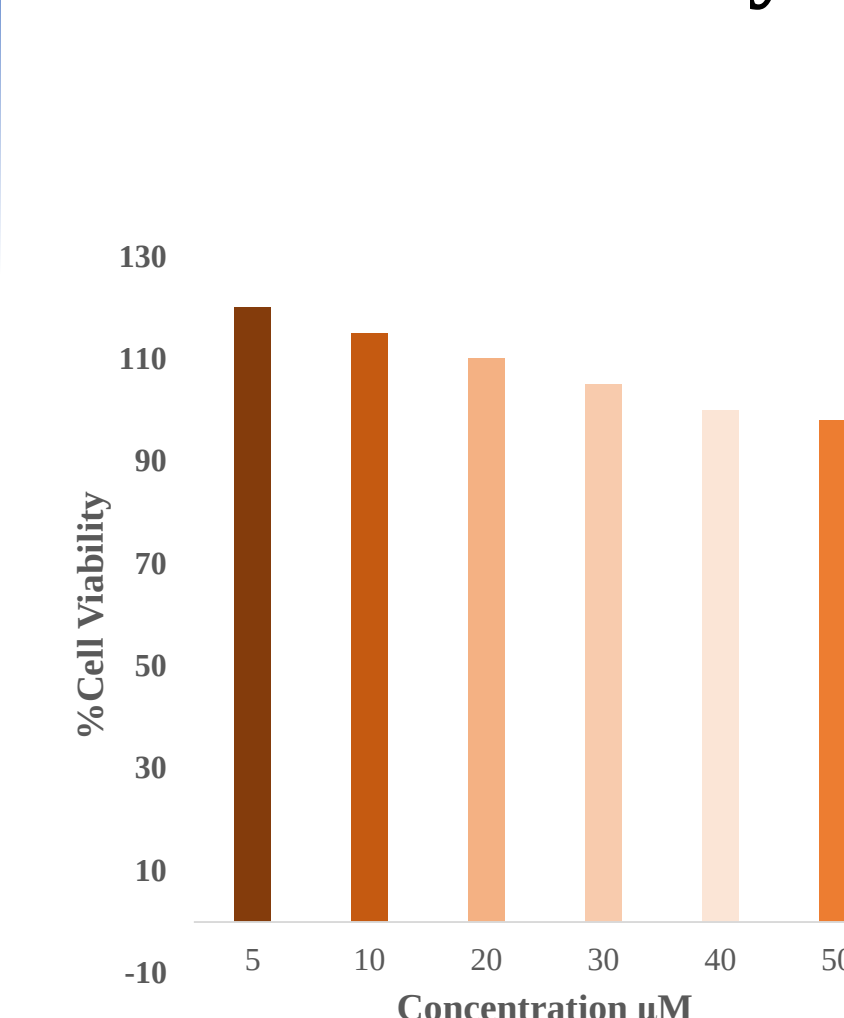


Release Study

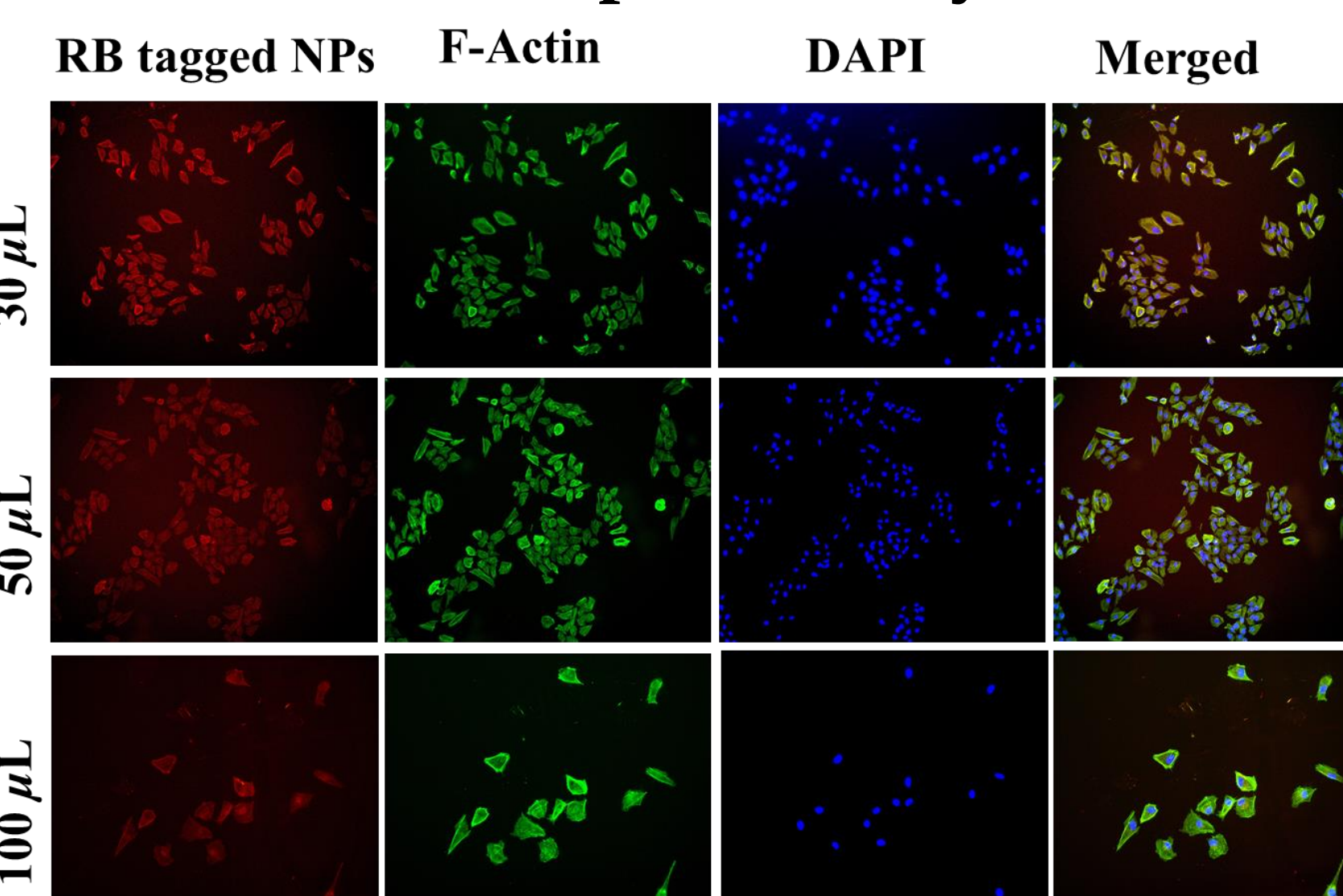


In Vitro Efficacy

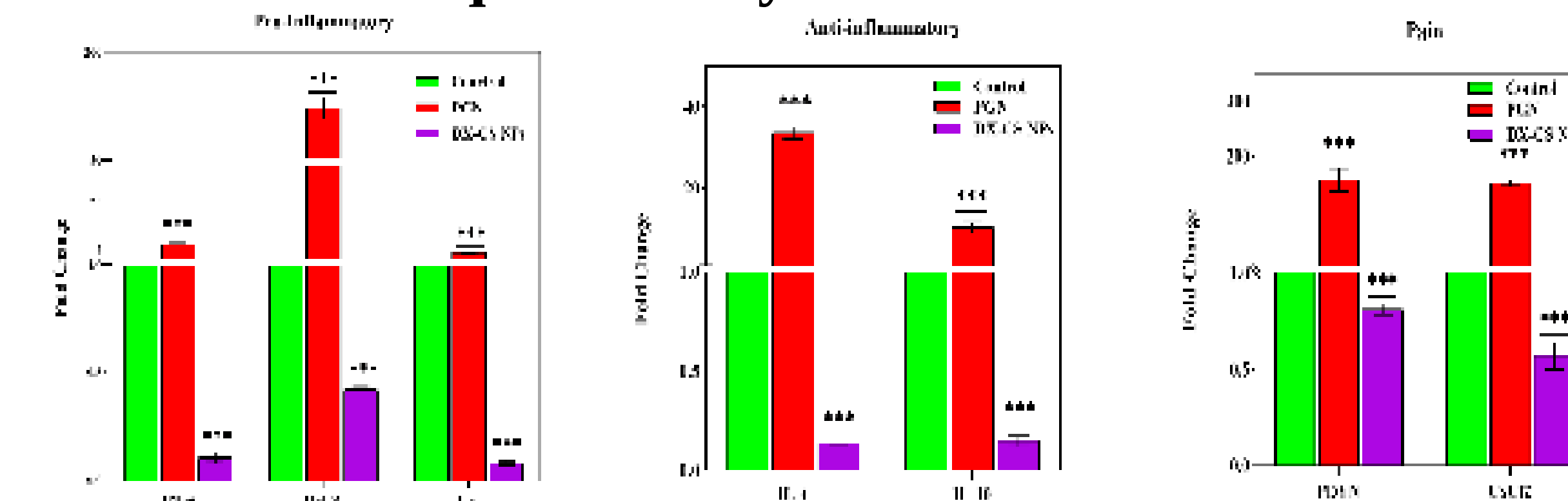
%Cell Viability



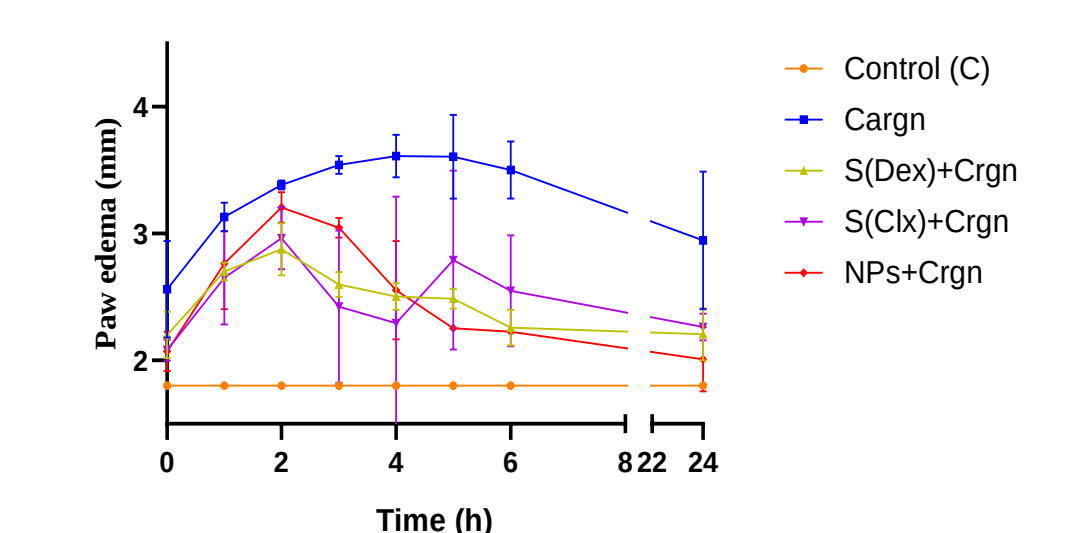
Cellular uptake study of NPs



qPCR Analysis of NPs



In Vivo Efficacy



Conclusion

A new lipoidal conjugate of dexamethasone was formulated into stable nanoparticles (NPs), with high encapsulation efficiency. *In vitro* and *In vivo* model of inflammation, these DLP NPs significantly reducing inflammatory markers and paw edema.

References

- Arif, A., Hussain, S., Rajput, S. N., Malik, H. N., Naqvi, F., Jabeen, A., & Khan, I. (2024). Nanoscale lipid-methylprednisolone conjugates: Effective anti-inflammatory, antioxidant, and analgesic agents. *Journal of Drug Delivery Science and Technology*, 101, 106251.
- Hussain, S., Ur-Rehman, M., Arif, A., Cailleau, C., Gillet, C., Saleem, R., & Tsapis, N. (2023). Diclofenac prodrugs nanoparticles: An alternative and efficient treatment for rheumatoid arthritis?. *International Journal of Pharmaceutics*, 643, 123227.