

Advancing Therapeutic Proteins Through Nanosized Delivery Systems

Rrona Mehmeti, Stina Morina

Toskë Kryeziu, Mimoza Basholli-Salihu, Aida Loshaj-Shala*

University of Prishtina, Faculty of Medicine, Bulevardi i Dëshmorëve, Prishtina, Kosovo

rrona.mehmeti@student.uni-pr.edu

stina.morina@student.uni-pr.edu

aida.shala@uni-pr.edu

Therapeutic proteins present a powerful class of biopharmaceuticals with the potential to treat various diseases. However, limitations like short half-lives, diminished stability, and inadequate target specificity have restricted their clinical efficacy. The development of nanosized delivery systems has offered transformative solutions, elevating the potential of these proteins. This review sheds light on the current breakthroughs in leveraging nanotechnology for enhanced delivery of therapeutic proteins. It outlines the numerous nanosized delivery mechanisms, which offer advantages including enhanced stability, prolonged circulation durations, and the capability time and the ability to encapsulate a variety of therapeutic proteins. Notably, these delivery systems possess the unique potential for precise site-specific targeting, thereby reducing undesired interactions. Additionally, the review emphasizes the challenges in scaling, adherence to regulatory requirements and potential toxicities. It accentuates the necessity for an all-encompassing strategy to facilitate a smooth transition to clinical applications. As a summary, this review critically assesses the advancements, challenges, and future horizons of nanoscale delivery systems for therapeutic proteins, emphasizing their pivotal role in transforming patient care.

Keywords: therapeutic proteins, nanosized delivery systems, targeted delivery, drug delivery, scalability, regulatory compliance, toxicity, clinical translation.

- Rrona Mehmeti and Stina Morina contributed equally to the presented Review.

Mimoza Basholli-Salihu, Aida Loshaj-Shala, Toskë Kryeziu, Rrona Mehmeti, Stina Morina are members of NANOALB research group.

References

- [1] Moncalvo, F., Martinez Espinoza, M. I., & Cellesi, F. (2020, February 14). Nanosized Delivery Systems for Therapeutic Proteins: Clinically Validated Technologies and Advanced Development Strategies. *Frontiers in Bioengineering and Biotechnology*, 8. <https://doi.org/10.3389/fbioe.2020.00089>
- [2] Allen T. M., Cullis P. R. (2013). Liposomal drug delivery systems: from concept to clinical applications. *Adv. Drug Deliv. Rev.* 65 36–48. 10.1016/j.addr.2012.09.037
- [3] Sarmiento, B. (2010, August). Research Spotlight: Nanomedicines for delivery of therapeutic proteins and biopharmaceuticals. *Therapeutic Delivery*, 1(2), 231–235. <https://doi.org/10.4155/tde.10.39>
- [4] Choi, H., Choi, Y., Yim, H. Y., Mirzaaghasi, A., Yoo, J. K., & Choi, C. (2021, July 14). Biodistribution of Exosomes and Engineering Strategies for Targeted Delivery of Therapeutic Exosomes. *Tissue Engineering and Regenerative Medicine*, 18(4), 499–511. <https://doi.org/10.1007/s13770-021-00361-0>