

# Nano-Pharmacokinetics: Present and Future Paths in Drug Delivery

---

**Amir Makolli**<sup>1,2</sup>

Mimoza Basholli – Salihu<sup>3\*</sup>

1. Centre for Translational Medicine, Semmelweis University, Budapest, Hungary.

2. Center for Pharmacology and Drug Research & Development, Department of Pharmacology and Pharmacotherapy, Semmelweis University, Budapest, Hungary

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

[amir.makolli@phd.semmelweis.hu](mailto:amir.makolli@phd.semmelweis.hu)

[mimosa.basholli@uni-pr.edu](mailto:mimosa.basholli@uni-pr.edu)\*

---

Integrating nanotechnology into pharmaceuticals has significantly advanced drug delivery systems, particularly by developing nanoparticles (NPs) that enhance the pharmacokinetic properties of therapeutic agents. This review explores the current landscape of nano-pharmacokinetics, highlighting the benefits of nanoparticle formulations in improving drug solubility, stability, and targeted delivery, especially in complex disease treatments such as cancer. A systematic literature review was conducted using PubMed, EMBASE, and Cochrane databases, focusing on studies published up to September 2024. Keywords regarding the nanodrugs and pharmacokinetic parameters were used. The findings reveal that nanoparticle-loaded drugs exhibit superior pharmacokinetic profiles compared to traditional formulations, characterized by increased area under the curve (AUC), enhanced bioavailability, and prolonged circulation times. Notably, engineered nanoparticles demonstrate the ability to bypass biological barriers and address multidrug resistance through innovative combination therapies. Looking ahead, the future of nano-pharmacokinetics lies in precision medicine, where intelligent nanoparticles are designed to respond dynamically to patient-specific factors and tumor microenvironments. This evolution promises to optimize therapeutic efficacy while minimizing adverse effects and improving patient outcomes. Continued research and clinical trials are essential for translating these advancements into practical applications in healthcare.

Amir Makolli and Mimoza Basholli-Salihu are members of NANOALB research group.