Editorial

What lower the development of nanodrug?

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Only a few nanomedicines have entered clinical application after over a decade and billions of dollars of investments in nanoscience and nanotechnology around the world. So, what lower the development of nanodrug? Recently, at our recent Editorial and Editorial Advisory Board meeting, we asked ourselves to address these questions and accelerate the development of nano pharmaceuticals. We will work with leaders in the area of drug supply to share our experiences and compare efforts around the world.

The unique physicochemical, biological, optical, electrical, and catalytic activities of nanodrugs allow them to overcome the pharmacokinetic limitations associated with conventional pharmaceutical agents[1,2]. An intravenously delivered nanodrug typically has to pass through five consecutive processes[3]: circulation in the blood compartments, accumulation into the target area, subsequent penetration deeply into the tissue, cellular uptake by cells, and intracellular release of drug from endosome or lysosome. A good nanodrug need to overcome multiple challenges[4].

Targeting: Numerous studies have shown that most nanodrugs can accumulate up to 0.7% at the target site, which is the biggest obstacle to later inefficiency.

Endosomal/Lysosomal Barrier[5]: Compared with the physiological pH of 7.4, the pH gradually decreases during maturation of the endosome[6]. Lysosomes contain various degradative enzymes (such as nucleases and phosphatases), and failure to escape rapidly from lysosomes usually results in entrapment and potential degradation, leading to the unsuccessful delivery of therapeutic drugs[7,8].

Safety and biocompatibility: As new materials and strategies are developed; it is essential to ensure that they are safe and biocompatible for use in humans. Discuss the importance of evaluating the toxicity and biocompatibility of various nanomaterials and delivery systems.

Scalability and manufacturing: The translation of these strategies to clinical settings will require scalable and cost-effective manufacturing processes. It is important to discuss the challenges related to scaling up the production of nanodrug delivery systems, as well as the need for standardized protocols to ensure reproducibility and quality control[9].

Regulatory considerations: Address the importance of considering regulatory requirements in the development of nanodrug delivery systems and strategies, particularly as they pertain to safety, efficacy, and quality.

Interdisciplinary collaboration: An in-depth understanding of nanocarrier trafficking and metabolization may facilitate the rational design of smarter nanodrug delivery systems[10]. This includes collaborations between researchers from the fields of chemistry, materials science, biology, and medicine, as well as partnerships with industry and regulatory agencies.

Of course, other factors will also affect the process of nanodrug development. We look forward to more people joining the discussion, and we believe that the more arguments there are, the clearer the argument.

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Disclosure

Views expressed in this editorial only are derived from author and not necessarily the views of the Micromaterials and Interfaces.

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Conflict of interest

The authors declare no conflict of interest.

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