EDITORIAL

Nanotechnology-based Drug Delivery as Therapeutic Modalitiesfor Neurological Diseases

Neurological diseases are heterogeneous neurodegenerative disorders/neuroinfectious diseases, specifically characterized not only by the progressive degeneration of the structure and function of the central nervous system (CNS) but also of the peripheral nervous system. The occurrence of various neurological disorders/diseases like Alzheimer's, epilepsy, Parkinson, depression, brain tumors is on the rise affecting millions of people worldwide due to an increase in lifespan, stressful living conditions, bad eating habits, injury, trauma, neurochemical imbalance, infection being some of the contributing factors [1]. The disabilities related to the most common neurodegenerative disorders such as Alzheimer's, epilepsy and Parkinson's that affects millions of people worldwide is on the rise and new infections are also leading to cognitive dysfunctions.

In order to treat the various symptoms of neurological diseases/disorders, new drugs are warranted but off late the launch of new molecules has slowed up as drug discovery is a time-consuming and costly process. The other reasons responsible for new CNS medications failing to be developed include the complexity of neurological disorders and the difficulty of neuropharmacology research [2]. The new trend that is becoming popular is repurposing of the existing drug molecules and the use of combination of drugs to treat disease as it has been recognized that manifestation of a disease is a multifactorial process and simultaneously targeting leads to beneficial results.

The conventional delivery of drugs available for treating neurological diseases/disorders suffers from the problems of poor oral bioavailability, non-targetability, high dose, dose-related side effects, thereby leading to poor patient compliance [3]. In order to overcome the above-mentioned challenges associated with conventional delivery of neurological drugs, the therapeutic importance of nano-based delivery systems is been researched extensively. Nano-based delivery of therapeutic molecules to the brain assists in crossing the cellular tight junctions, encapsulating higher drug content, enhancing solubility of the lipophilic drugs, increasing surface area and rate of dissolution, reducing the therapeutic dose and providing rapid onset of action leading to the enhanced therapeutic efficacy of the therapeutic molecules [4]. These nano-based delivery systems also demonstrate a controlled/sustained drug release pattern, and show targetability when conjugated with a ligand on the surface of nanotechnology-based delivery system, thereby enhancing the bioavailability of therapeutic molecules in brain tissues.

For successfully designing novel targeted-drug delivery systems for effective treatment of neurological disorders, it is necessary to have a thorough understanding of how brain cells function in neurological disease pathology. In addition, more investigation is required to ascertain the clearance of these carriers, as well as their systemic toxicity, biocompatibility, and other properties. In preclinical and clinical studies, several nanocarrier systems have demonstrated excellent efficacy, but their clinical translation has not always been successful due to issues such as aggregation and rapid clearance because of their nano-size and lack of knowledge about their ultimate toxicity fate [5]. Therefore, it is vital to conduct comprehensive toxicological research on brain-targeting nanocarrier systems so that mechanisms of action and pharmacokinetics can be well-defined [6, 7]. Also, it is imperative to develop standardized assays for the evaluation of nanoformulation toxicity in *in vitro* and *in vivo* models in order to fully address the toxicity issues in humans [8, 9]. Research focusing on improving the regulatory frameworks for nanocarrier systems is also the need of the hour for them to have commercial viability [10].

The current special issue is aimed to assemble translational work related to nanotechnology-based delivery system against neurological disorders, including parkinsonism, Alzheimer's, psychosis, epilepsy, seizures, depression, *etc.*, and neuroinfectious diseases. It is hoped that the special issue will improve the understanding related to the mechanism of action and targeting of neurological disorders via a nanotechnology-based delivery system. This issue will also focus on toxicity induced by novel drug delivery system, and regulatory issues and will provide insights into patented technologies.

The articles in this issue focus on molecular targets for the enhancement of therapeutic intervention in neurological diseases based on the delivery system for the management of neurological diseases. Moreover, the focus is given on current advancements related to nano delivery for neurological disorders, targeting approach of ligand conjugated nano-based approach for management of neurological disorders, recent advances in the nano-based approaches for the treatment of microbial induced neurological infections, and aspects of regulatory and Intellectual property insights on nano drug delivery formulations for neurological disorders.

The articles reinforce the potential of Nanotechnology-based drug delivery for therapeutic interventions for neurological diseases from the global perspective and highlight various advancements which have been made in the past few years to improve efficacy and efficiency. I hope the peers will find them useful.

Happy reading!!!

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