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PDDS: Innovative Technological Approach in Drug Delivery

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Editorial Article

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Commentary

The non-invasive and rational delivery systems abstract to overcome the onerous barriers which piling up the clinical benefit of therapeutic outputs [1] seeing the accurate demands of regulatory accountability [2]. The novel drug delivery system (Pulsatile drug delivery system) conceivably optimizes dosage, intensify therapeutic agent accomplishment and lessen the systemic side effects are enforced in conventional drugs, based on their financial benefits along with recent classes of biopharmaceutical [3] and pharmaceutical products [4]. The recent technologies transformed by different levels to attain more productive pharmacological assessment [5]. Since decades, the scenario of drug delivery has been enterprising endeavor of the Pharma companies that incorporate technologically a rapid development and peculiar approaches in assessing medical needs [6].

Employment of computer in drug discovery has noted a revolutionary change in practice of drug designing. At the beginning, drug designing process was time-taking, arduous and expensive, and has high possibility of failure [7]. But, today the drug discovery process has become decisive, authentic and economical due to scope of large amount of genomic and proteomic data, application of tools for modeling, ligand designing, pharmacophore mapping, protein-ligand simulation, molecular descriptors and toxicity prediction [8,9].

Nanotechnology is the current area of research which draws the attention of numerous investigators and researchers around the scientific world which offers confident podiums for gaining therapeutic advancements in clinical fields [10]. The nano-technological studies on drug delivery systems are increasing periodically [11] in the aspects like route of administrations of the drugs and different pathological circumstances [12]. Considering available reports and results on the nanotechnology, it is already proved to minimize several barriers in topics of drug delivery by overcoming specific drug targeting, bioavailability [13], adverse/unwanted effects and stability of the active ingredients [14]. The other concerning subjects include drug efficacy [15], quality and toxicity of the active ingredients within the lipophilic drugs [16].

Pulsatile drug delivery system (PDDS) has attracted lot of interest of the researchers due to their betterment over the conventional drugs [17]. The PDDS delivers the drug at the appropriate time in applicable time and amount which is advantageous over the conventional drugs and commercial yielding. PDDS are designed conceding to the circadian rhythm of the body, and the drug is released rapidly and completely as a pulse after a lag time by following sigmoid release profile characterized by a time period [18]. Drugs showing first-pass effect and drugs which require nocturnal dosing with chronopharmacological behavior this delivery system are beneficial [19].

Classification of PDDS is done into three categories [20] as timed controlled release system Stimuli induced release system and externally regulated release system. In time controlled delivery system pulsatile release is retrieved after precise time in order to minimize the cardiac rhythms. It consist of two peripherals, one is immediate release type and second is pulsed release type. The stimuli induced release system follows the drug release after stimulation by any other biological factor (temperature, etc.). Depending upon the stimuli this release system further classified into temperature

induced and other chemical stimuli induced release system. In temperature induced system thermo responsive hydrogel systems [21] are developed for pulsatile release and for Chemical stimuli induced system it is again sub categorized into glucose responsive insulin release device, drug release from intelligent gels of antibody concentration, and inflammation induced release system.

Oral route of drug administration is the most preferred route of administration [22]. The oral controlled-release systems show a conventional template of drug release [23] in which the drug concentration is maintained in the therapeutic aperture for an extended duration of time, thereby providing sustained therapeutic action [24]. Certain conditions for which such a release pattern is not suitable that demand release of a drug after a lag time, they require PDDS.

PDDS is time and site-specific drug delivery [25], thus equipping spatial and temporal delivery and booming patient compliance, defined as the rapid and transient release of certain amount of molecules within a short time period immediately after a predetermined off-released period. Human beings display endogenous circadian rhythms which are regulated by the master circadian clock of the body, the suprachiasmatic nucleus. Chronopharmacotherapy of diseases show circadian rhythms in their pathophysiology and treatment of such diseases require PDDS by which drug is released rapidly and completely as a pulse after a lag time. There are various circumstances that appeal PDDS, like legion body functions that pursue circadian rhythms, such as acid secretion in the stomach, secretion of hormones, gastric emptying [26] and gastrointestinal blood transfusion.

Drugs that yield biological tolerance demand a system that will avoid their extended presence at the biophase, as this gravitate to roll back their therapeutic effect. In current research approaches the PDDS attaining priority in treating different disease situations like diabetes [27] in which dosage should be given at different time intervals. Sustained release drugs are not productive while treating chronological pathophysiology which can be replaced by PDDS. Different approaches are developed in PDDS to conquer the obstacles in assessing the medical and clinical needs [28]. PDDS will be a promising drug delivery system in future with available benefits [29].

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