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OPINION

Connected polymeric drug delivery systems: A promise for the future!

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ABSTRACT

Subcutaneous (SC) drug delivery is one of the best routes of drug administration to patients over intravenous (IV) administration due to the ease of application and patient acceptance. The main limitation of using the SC route is administering larger volumes of drug, greater than 3–5 mL for therapeutic dosages. Wearable injectors on body devices are an attractive option for larger-volume drug delivery to patients. Thus, the need for a self-administration strategy at home is growing faster and is required for the next level of time-dependent and high-volume drug delivery. The advances in low-cost, connected on-body delivery systems hold great opportunity for novel ways of delivering home-based drug therapy in the future.

Keywords: SC drug delivery; wearable injectors; remote patient monitoring; connected drug delivery device; home healthcare

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Remarkable advances in polymeric biomaterials[1], nano/microtechnology, biotechnology, and artificial intelligence (AI) have led to the development of various medical devices for real-time monitoring of human activities as well as transdermal delivery of drug molecules[2,3]. Transdermal or SC delivery systems are able to continuously transport therapeutic agents across the skin and have been found to have several advantages over intravenous administration, including improved patient experience, safety, and reduced treatment burden, resulting in lower healthcare costs. Several patients suffer from chronic illnesses and manage their health conditions via daily medications. This may underscore the need for novel treatment regimes for better patient care and home-based therapy systems.

The advent of novel polymers and their use in drug delivery systems have achieved great development in the last two decades. Polymeric drug delivery can be a drug in micro- or nanocapsules as a formulation or a device that enables the introduction of a therapeutic substance into the body[4,5]. The major advantages of using controlled delivery systems can include the maintenance of drug levels within a desired range, the need for fewer administrations, optimal use of the desired drug, and increased patient compliance[2,3]. The emergence of connected drug delivery devices, which allow the tracking of active drug principles and communication between doctors' offices, is of immense use in minimizing the costs of unmet health conditions.

SC drug delivery is the preferred option for therapeutic drug delivery to patients due to its ease of use, comfort, safety, acceptance,

and drug availability. However, SC delivery has major limitations in the amount of drug substance that can be delivered to the body in a single injection. Normally, the amount of SC injection has been limited to 1-2 mL to prevent leakage of the active ingredient from the injection site. The advent of wearable body devices has the ability to deliver over 50 mL of prefilled and preconfigured drug to patients as a fully integrated, ready-to-inject system[2]. The use of wearable injectors, configured with Bluetooth, provides the customer with significant opportunities to improve connections with patients and the doctor's clinic for better therapeutic applications. The use of connected drug delivery devices has changed the patient's life by enabling them to confidently use therapeutic agents, get injection reminders and prompts, and access historic data regarding their therapy regime with accurate technical information. It is apt to think about the use of on-body delivery systems, which can be the move of treatment options from the hospital to the home, reducing costs, and patients getting more favorable treatment options for adhering to chronic maintenance therapies[6,7].

The major disadvantage of using connected technology for drug delivery monitoring is the cost factor of getting configurations with integrated Bluetooth, which provides connections with patients and prescribers. However, the cost of such connectivity can be reduced with the development of novel manufacturing technology and finding new materials and design concepts for devices in the future. In addition, in-depth studies on novel polymeric materials for packaging and manufacturing technologies are needed to enable the development of low-cost, miniaturized, lightweight combination medical devices for long-term monitoring and feedback-controlled therapy.

Conflict of interest

The author declares no conflict of interest.

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