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Biomaterials In Drug Delivery

Urszula Stachewicz*

Department of Electron Microscopy for Materials Science, AGH University of Science and Technology, Krakow, Poland

***Corresponding author:** Urszula Stachewicz, Department of Electron Microscopy for Materials Science, AGH University of Science and Technology, Krakow, Poland E-mail: ustachew@agh.edu.pl

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Introduction

The limited efficiency of conventional drugs has been instigated the development of new and more effective drug delivery systems (DDS). Transdermal DDS, are associated with numerous advantages such its painless application and less frequent replacement and greater flexibility of dosing, features that triggered the research and development of such devices. Such systems have been produced using either biopolymer; or *synthetic polymers*. Although the first ones are safer, biocompatible and present a controlled degradation by human enzymes or water, the second ones are the most currently available in the market due to their greater mechanical resistance and flexibility, and non-degradation over time. This review highlights the most recent advances (mainly in the last five years) of patches aimed for transdermal drug delivery, focusing on the different materials (natural, synthetic and blends) and latest designs for the development of such devices, emphasizing also their combination with drug carriers that enable enhanced drug solubility and a more controlled release of the drug over the time. The benefits and limitations of different patches formulations are considered with reference to their appliance to transdermal drug delivery. Furthermore, a record of the currently available patches on the market is given, featuring their most relevant characteristics. Finally, a list of most recent/on-going clinical trials regarding the use of patches for skin disorders is detailed and critical insights on the current state of patches for transdermal drug delivery are also provided. Drug delivery systems have unusual materials requirements which derive mainly from their therapeutic role: to administer drugs over prolonged periods of time at rates that are independent of patient-to-patient variables. The chemical nature of the surfaces of such devices may stimulate bio rejection processes which can be enhanced or suppressed by the simultaneous presence of the drug that is being administered. Selection of materials for such systems is further complicated by the need for compatibility with the drug contained within the system. A review of selected drug delivery systems is presented. This leads to a definition of the technologies required to develop successfully such systems as well as to categorize the classes of drug delivery systems available to the therapist. A summary of the applications of drug delivery systems will also be presented. There are five major challenges to the biomaterials scientist: (1) how to minimize the influence on delivery rate of the transient biological response that accompanies implantation of any object; (2) how to select a composition, size, shape, and flexibility that optimizes biocompatibility; (3) how to make an intravascular delivery system that will retain long-term functionality; (4) how to make a percutaneous lead for those delivery systems that cannot be implanted but which must retain functionality for extended periods; and (5) how to make biosensors of adequate compatibility and stability to use with the ultimate drug delivery system-a system that operates with feedback control. Drug delivery systems have unusual materials requirements which derive mainly from their therapeutic role; to administer drugs over prolonged periods of time at rates that are independent of patient-to-patient variables. The chemical nature of the surfaces of such devices may stimulate bio rejection processes which can be enhanced or suppressed by the simultaneous presence of the drug that is being administered. Selection of materials for such systems is further complicated by the need for compatibility with the drug contained within the system. A review of selected drug delivery systems is presented. This leads to a definition of the technologies required to successfully develop such systems as well as to categorize the classes of drug delivery systems available to the therapist. A summary of the applications of drug delivery systems will also be presented. There are 5 major challenges to the biomaterials scientist: 1) how to minimize the influence on delivery rate of the transient biological response that accompanies implantation of any object; 2) how to select a composition, size, shape, and flexibility which optimizes biocompatibility; 3) how to make an intravascular delivery system that will retain long term functioning; 4) how to make a percutaneous lead for those delivery systems that cannot be implanted but which must retain functionality for extended periods; and 5) how to make biosensors of adequate compatibility and stability for use with the ultimate drug delivery system--one operating with feedback control.

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