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Mucoadhesive polymers in the design of nano-drug delivery systems for administration by non-parenteral routes: A review

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Abstract

The presence of a mucus layer that covers the surface of a variety of organs has been capitalized to develop mucoadhesive dosage forms that remain in the administration site for more prolonged times, increasing the local and/or systemic bioavailability of the administered drug. The emergence of micro and nanotechnologies together with the implementation of non-invasive and painless administration routes has revolutionized the pharmaceutical market and the treatment of disease. Aiming to overcome the main drawbacks of the oral route and to maintain patient compliance high, the engineering of innovative drug delivery systems administrable by mucosal routes has come to light and gained the interest of the scientific community due to the possibility to dramatically change the drug pharmacokinetics. In addition, to achieve the goal of mucosal drug administration, the development of biomaterials has been refined to fit the specific applications. The present review initially describes the potential of nano-DDS conceived for mucosal administration by diverse non-parenteral routes (e.g., oral, inhalatory, etc.). Then, the benefit of the incorporation of mucoadhesive polymers into the structure of these innovative pharmaceutical products to prolong their residence time in the administration site and the release of the drug cargo will be discussed with focus in the developments of the last decade. In addition, the regulatory status of the most extensively used mucoadhesive polymers will be emphasized. Finally, a thorough overview of the different pharmaceutical applications of mucoadhesive polymers will be addressed.

Keywords: Mucoadhesive natural, synthetic and semi-synthetic polymers; pharmaceutical materials science; pharmaceutical research & development; mucoadhesive drug delivery systems.

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