Polypyrrole, Its Application in the Delivery of Dopamine.

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Polypyrrole, its application in the delivery of dopamine.

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In recent years there has been considerable interest in the development of new and efficient drug delivery systems, particularly with the growth of sophisticated drugs that are based on DNA and proteins.[1, 2] Currently, there are several materials under consideration in drug delivery, for example dendrimers[3], nanoparticles[4] and hydrogels[5]. Conducting polymers are also receiving much attention in biomedical research due to their light weight, good biocompatibility and ability to function at body temperature. In particular, conducting polymers exhibit a reversible electrochemical response.

In this paper, a conducting polymer, polypyrrole is considered as a drug delivery system. Polypyrrole can be reversibly switched between an electronically conducting and insulating state. This change in the net charge of the polymer requires ions to flow into or out of the film allowing the polymer to bind and expel ions in response to an applied potential. Here, we show that polypyrrole can be used to control the delivery of a well known catecholamine, dopamine. Dopamine was selected as a model cationic drug as it has a protonated amine and can be used to represent a large class of pharmaceutically important compounds. This concept of controlled delivery is based on the well-known redox chemistry of polypyrrole; a change in the net charge on the polypyrrole film during its reduction or oxidation requires ions to flow into or out of the film. This, in turn, allows the polypyrrole film to bind and expel ions in response to electrical signals.

Polypyrrole was first synthesized electrochemically and then the dopamine was incorporated on reduction of the polypyrrole film in an appropriate solution of the cations. The cationic dopants were then released on oxidation of the polymer and the release profiles were monitored using UV-visible spectrophotometery.

References

1. T. M. Allen and P. R. Cullis, *Science*, **303**, (2004), 1818-1822.
2. K. E. Uhrich, S. M. Cannizzaro, R. S. Langer, and K. M. Shakesheff, *Chem Rev*, **99**, (1999), 3181-3198.
3. H. Yang and W. Y. J. Kao, *J Biomat Sci-Polym E*, **17**, (2006), 3-19.
4. H. Wartlick, B. Spankuch-Schmitt, K. Strebhardt, J. Kreuter, and K. Langer, *J Control Release*, **96**, (2004), 483-495.
5. T. Serizawa, D. Matsukuma, and M. Akashi, *Langmuir*, **21**, (2005), 7739-7742.

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