POLYPHOSPHAZENES: BIODEGRADABLE ALTERNATIVES FOR POLYMER THERAPEUTICS

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ABSTRACT

In this contribution we describe the potential of polyphosphazenes as biodegradable analogues to the biopersistent water soluble polymers commonly used for drug delivery applications such as PEG, HPMA and PVP.

Polymers are now widely used for drug delivery applications and one particularly important field is that of polymer therapeutics,[1] whereby polymer-drug conjugates have been shown to significantly improve the pharmacokinetics of their small drug counterparts. However, in recent years a number of safety issues have arisen for the use of high-molecular weight, non-degradable polymers in such applications.[2] This is especially of concern if, as for example anti-cancer drug delivery, high amounts of polymer and repeated doses are required. There is, therefore, a pressing need to develop polymers with controlled biodegradability in order to enable the safe use of higher molecular weight polymers.

Although there are clearly a number of potential biodegradable polymers available, polyphosphazenes offer a number of distinct advantages with their inherent high functionality and the ease in which the rate of degradation can be tailored.[3] Furthermore, polyphosphazenes can be prepared with controlled molecular weights and narrow polydispersities using living cationic polymerization.[4] In this contribution we will demonstrate in particular how a triggered degradation can be incorporated into such polymers, enabling stability in storage and administration but with a triggered degradation of the polymer after drug delivery action is completed. Also, utilizing the high versatility of these polymers, we demonstrate how polymer-drug conjugates can be prepared with PEG and PVP-like polyphosphazenes in which anti-cancer drugs can be covalently or non-covalently bound to the polymer backbone.

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References:

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