FUNCTIONAL AMPHIPHILIC AND DEGRADABLE COPOLYMERS FOR DRUG DELIVERY SYSTEMS

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Over the last decade, polymer micelles and nanoparticles (NPs) attracted an increasing interest in pharmaceutical research because they can be used as efficient drug delivery systems[1,2]. In this field, amphiphilic copolymers combining poly(ethylene oxide) and aliphatic polyester (such as poly(ε-caprolactone) (PCL) or polylactide (PLA)) are particularly of interest[3] because (i) PEO has unique protein- repellent properties and thus provides a stealth behaviour to the drug carriers and (ii) aliphatic polyesters are biocompatible and biodegradable hydrophobic matrices well-suited for the incorporation of an hydrophobic drug. Up-to-now, these polymers were mainly combined as linear diblock or triblock copolymers because of the ease of synthesis.

We recently developed synthetic strategies allowing tuning the architectures of such copolymers, leading to graft-copolymers. The versatility of the developed method allows the synthesis of well-controlled amphiphilic copolymers with various hydrophilic/lipophilic balances. In addition, the derivatization of such copolymers allows the immobilization of targeting units on the hydrophilic segments which makes them quite attractive candidates for the building of drug nanocarriers. The biodistribution of such polymeric micelles can be modulated and specific cellular uptake can be induced by receptor-mediated endocytosis.

The efficiency of click-chemistry in the preparation of functional PCL-g-PEO copolymers will be described and compared to their linear homologues. Their derivatization in water i.e. as colloids will then be reported. The functionalization by a sugar (mannose) will be particularly emphasized. Finally, their use as surfactant for the stabilisation of PLGA nanoparticles will be exemplified with the goal to target M cells for oral vaccination[4].

References

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