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| **pH-responsive polymersomes: targeted release for solid tumors** |
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| **Background:** Polymersomes are emerging nanosystems currently undergoing research for their translation to the clinic as drug/gene delivery systems. Inspired by liposomes, they are polymeric, colloidal-sized, spherical nanoparticles comprised of a lipophilic bilayer surrounding an aqueous core. They can carry either lipophilic or hydrophilic molecules, and they can load more than one agent at a time. Moreover, the polymer composition can be tuned to introduce stimuli-responsive moieties to achieve a targeted, controlled release. Different intrinsic and extrinsic stimuli can be used to trigger drug release such as temperature, redox or pH. The intracellular pH of solid tumors is maintained below the extracellular pH. Thus, pH-sensitive nanoparticles are highly efficient in delivering cargo to tumors compared to conventional nanoparticles. In this study, novel pH-responsive polymersomes were developed and their pH-triggered release, biocompatibility, and therapeutic efficacy against glioblastoma multiforme were successfully established in vitro. |
| **Methods:** The polymersomes were synthesized from self-assembling amphiphilic block copolymer poly(ethylene oxide)-block-poly(diisopropylaminoethyl methacrylate-co-furfuryl methacrylate) PEO-b-P(DPA-co-FMA) and loaded with camptothecin, a potent, natural chemotherapeutic agent. Their stability and pH-responsive release profiles were characterized in a range of tumoral pHs. Finally, the biocompatibility and therapeutic efficacy of the polymersomes were analyzed in vitro against the U-87 MG glioma cell line. |
| **Results:** The polymersomes were consistently stable at physiological pH with no significant cargo release observed. At lower pH, however, the stability of the polymersomes was conveniently lost and the drug was released in a pH-responsive manner. Moreover, the polymersomes showed biocompatibility against the U-87 MG glioma cell line and the camptothecin-loaded polymersomes successfully reduced the cell viability up to 80%. |
| **Conclusions:** pH-responsive polymersomes synthesized from PEO-b-P(DPA-co-FMA) via solvent exchange hold great promise as smart drug delivery systems in the treatment of glioblastoma multiforme and other solid tumors. Their unique capabilities establish them as very promising candidates for the development of controlled delivery nanosystems in cancer treatment and diagnosis. |