Targeting Tumors with Solidified Polymer Micelles

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Nanomedicine is an emerging field in cancer therapy that has the potential of revolutionizing the way drugs are introduced to patients today. Many drugs have critical limitations such as low solubility, stability, and specificity – leading to inefficient treatment and to adverse side effects. Among the different types of drug-delivery systems, polymer micelles represent an appealing technology for delivering drugs to tumors because of their relatively simple formulation and their small size, enabling efficient tumor extravasation from leaky tumor blood vessels.
We found that self-assembled di-block polymers can be used successfully to deliver small molecule drugs by encapsulation or by chemical conjugation of the drug, and that these nano-micelles can be further stabilized by a secondary solidification step. The formation of stable solidified nano-micelles enables efficient cellular internalization, and improve drugs' bioavailability half-time, enhances blood circulation time, increases tumor uptake, and reduces side effects as demonstrated in-vivo. Moreover, our studies also revealed that the endocytosis of stabilized particles occur via clathrin pathway, unlike the reported mechanism for non-solidified polymer micelles. Because of the high stability of this particles our data suggest that the nanoparticles can be transported by transcytosis and thereby they can also be efficient in tumors that are not vascularize.