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Nanofibers with unique adaptive and invasive properties for enhanced tumoral retention and anticancer drug delivery

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A drug delivery system that can cross multiple biological barriers, penetrate solid tumors, and prevent nonspecific body accumulation is in demand for precision treatment. We introduce a smart self-assembling peptide nanofiber that can overcome these challenges by using an approach that combined shape-controlled tumoral uptake, chargeassisted tissue penetration, and enzyme-induced retention approach to improve the delivery efficacy of anticancer agents. The nanofiber displays a high aspect ratio to promote tumoral delivery. Multimodal imaging studies reveal the tumor infiltration, invasion, and saturation properties of the nanofibers. In situ activation by tumorassociated proteases structurally transforms the fibers into networks that are more than ten times larger, leading to a weeks-long local retention. Specific examples are given on delivering aldoxorubicin, proceeding as a novel treatment for triple negative breast cancer. The drug-loaded nanofibers release the active metabolites under the acidic tumor microenvironment and display an enhanced antitumor efficacy with minimal host toxicity in immunodeficiency mice bearing tumor explants compared to the free drug and the liposomal formulation.

Biography

Vanessa Bellat received her PhD in Chemistry from the University of Burgundy in France in 2012. After completing her degree, she joined Welience, the private valorization subsidiary of the University of Burgundy and oversaw the development of a new technological platform called "NanoCare", which was devoted to the toxicological analysis of nanoparticles. In 2014, she moved to New York and became a member of the Molecular Imaging Innovations Institute (MI3) in Weill Cornell Medicine where she is currently working as a Post-doctoral fellow. Her work focuses on the development of nanomedicine for cancer drug delivery.

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