Intelligent Nanomedicines for Tumor Microenvironment Sensing, Targeting and Regulation

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Emerging nanotechnology on precision design and fabrication of intelligent next generation nanomedicine-medical nanorobots hold the great potential to revolutionize the current landscape of drug development. It is also clear that tumor microenvironment plays critical roles on either promotion or restriction on primary tumor rapid growth and metastasis. Those achievements have made targeting and regulation of tumor microenvironment via nanobiomaterials a feasible and fruitful strategy, to improve the therapeutic outcomes for cancer treatment. This presentation will feature our recent development on using DNA and protein based nanorobots as intelligent nanomedicines to regulate tumor microenvironment to block tumor microvessels or re-store the homeostasis of tumor stroma. Robotic molecular systems have great potential as intelligent vehicles to enable the delivery of various potent molecules, which otherwise never could be used as therapeutics due to numerous limitations. Yet, achieving in vivo, precise molecular-level, and on-demand targeting and delivery has proven extremely challenging. We developed an autonomous nanorobotic system for targeted cancer therapy, programmed to transport molecular payloads and cause on-site tumor infarction. Given the robust self-assembly behavior, exceptional designability, potent antitumor activity and minimal in vivo adversity, the nanorobot represents a promising strategy for precise drug design for cancer therapeutics.

References

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