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Thermally targeted delivery of anticancer therapeutic peptides using elastin-like biopolymers

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Current cancer therapy is limited by severe toxicity from systemic administration of antineoplastic agents. Motivated by limitations to current therapeutic approaches for cancer, we developed an externally triggered drug delivery system with the potential to selectively deliver anticancer drugs to tumors, increase therapeutic specificity and efficacy, and reduce cytotoxicity to normal tissues. This drug delivery system consists of a thermally responsive polypeptide whose amino acid sequence is based on elastin-like polypeptide (ELP) biopolymers. The polypeptides are genetically engineered, allowing incorporation of a therapeutic peptide sequence in the ELP carrier by simple molecular biology. ELP is further modified by adding cell penetrating peptides (CPPs), which allow targeting of therapeutic peptides to different tissues or intracellular compartments and also enables crossing of the blood-brain barrier. The conjugation of the ELP delivery system with therapeutic peptides targeting cell cycle, oncogenic, and apoptotic pathways has resulted in enhanced cellular uptake rates, increased apoptosis, and cancer cell killing. The clinical potential of the ELP delivery system was confirmed in animal tumor models that demonstrated hyperthermia-induced aggregation of ELPs due to phase transition of these polypeptides, providing a new way to thermally target ELP therapeutic peptides conjugates to solid tumors. This drug delivery system has the potential to provide a method for targeted delivery of chemotherapeutic agents to tumor cells. The system exploits clinically available applications of external hyperthermia to induce site-specific drug carrier accumulation of anticancer drugs through a technology that is both easy to implement and feasible for a broad range of cancer types.

Biography

Drazen Raucher completed his PhD (1995) in Molecular Biophysics from the Institute of Molecular Biophysics at Florida State University. He then pursued Post-doctoral studies in Cell Biology and Biomedical Engineering at Duke University, USA. He is currently a Professor of Biochemistry at the University of Mississippi Medical Center. He pioneered the use of cell penetrating elastin-like peptides for the delivery of therapeutic peptides that modulate the activity of aberrant molecular pathways in cancer. His research interests include thermally targeted biopolymer drug carriers and drug-delivery systems in oncology. He has published more than 50 articles and is co-author of 2 patents.

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