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Immune cell-mediated cell and drug delivery platform

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Efficient drug delivery strategies into solid tumors that target primarily malignant cells and avoid damaging healthy tissue are limited by the pharmacokinetics, solubility and specificity of the chemotherapeutic drugs. Drug delivery into brain tumors is significantly more challenging due to the presence of the blood brain barrier. Glioblastoma, with a 5-year survival rate of only 5% is the most aggressive type of brain tumor. Despite modern treatment techniques (e.g. chemotherapy, radiation, and surgical removal), the prognosis remains dismal. To address this clinical challenge, we designed a targeted drug delivery system using genetically modified chimeric antigen receptor (CAR)-T cells to target glioblastoma tumors and polymeric nanoparticles to encapsulate the therapeutic drug. Nanoparticles provide a great opportunity to develop a targeted delivery system that in conjunction with immune cells can specifically deliver drugs to brain tumors.

Keywords

Blood-brain Barriers, CAR-T cells, Drug Delivery, Nanoparticles,

Biography

Cheng Dong received his Ph.D in Engineering Science and Bioengineering in 1988 from Columbia University, New York USA. He is now a Department Head of the Penn State Biomedical Engineering Department, and a Distinguished Professor of Biomedical Engineering. His research is to elucidate biomechanical, biophysical and biochemical aspects of cellular function in the circulatory systems, with particular interest in cell signalling. Current research at Penn State University includes studies of micro-hemodynamics, coagulation, leukocyte rheology, intercellular and intracellular signalling, cancer immunology and metastases. In particular, he is investigating how fluid dynamics, adhesion kinetics and tumor microenvironment change leukocyte and/or endothelial immune functions which subsequently affect tumor cell extravasation in the microcirculation and subsequent metastasis. He is also collaborating with material scientist and neural science biologist on most-recent designs of immune cell-mediated nanoparticle and drug delivery targeting brain tumors.

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