Advanced Materials for the Delivery of Anti-Cancer Compounds and Imaging Contrast Agents

Cancer is a public health problem and a major cause of death. The need for cancer treatment with high efficacy and safety is increasing. The work described in this thesis aims to design advanced materials to deliver anti-cancer compounds and imaging contrast agents to improve the current treatment modalities, including surgery, radiation therapy and chemotherapy.

Currently, the development of novel markers that provide the accurate tumor localization during surgery and reduce the discomfort of patients is the crucial challenge in the improvement of surgery. An injectable multimodal fiducial marker has been developed for image guided surgery. The marker combined the advantages of different technologies by providing preoperative information by CT, ultrasound and PET images as well as accurate intraoperative location of the tumor by NIR images and gamma detection. The marker was found to be clearly visible by PET, CT and NIR images with long-term stability in vivo.

For brachytherapy, the current limitations are the invasive procedure due to the implantation of the hard materials and the heterogeneous dose distribution in the tumor. To overcome these issues, we have designed and synthesized two novel surfactant-like conjugates for controlled delivery of radionuclides to tumors. The compounds were designed to diffuse in the tumor region and partition to the cell membrane. The presented data demonstrated a faster distribution of these compounds with decent retention in the tumor. Moreover, the liposome formulation of these compounds had a slower distribution with longer tumor retention than the free compounds. Therefore, the liposome formulation is promising to deliver Alpha, Auger or Beta emitters for brachytherapy.

For chemotherapy, in order to increase the local accumulation in tumor with low systemic dose of the drug, we have developed an in situ forming depot formulation deliver a new generation Ti-complex chemotherapeutic drug. The release profile of the drug could be turned by different excipients. Our in vivo data showed a significant tumor suppression in a murine model.

In conclusion, we have managed to develop advanced materials such as micelles, liposomes and in situ-forming depot formulations to improve the clinical cancer treatment modalities.

General information
Publication status: Published
Organisations: Colloids & Biological Interfaces, Biotherapeutic Engineering and Drug Targeting, Department of Health Technology
Corresponding author: Wang, W.
Contributors: Wang, W.
Number of pages: 135
Publication date: 2019

Publication information
Publisher: DTU Health Technology
Original language: English
Source: PublicationPreSubmission
Source ID: 182956943