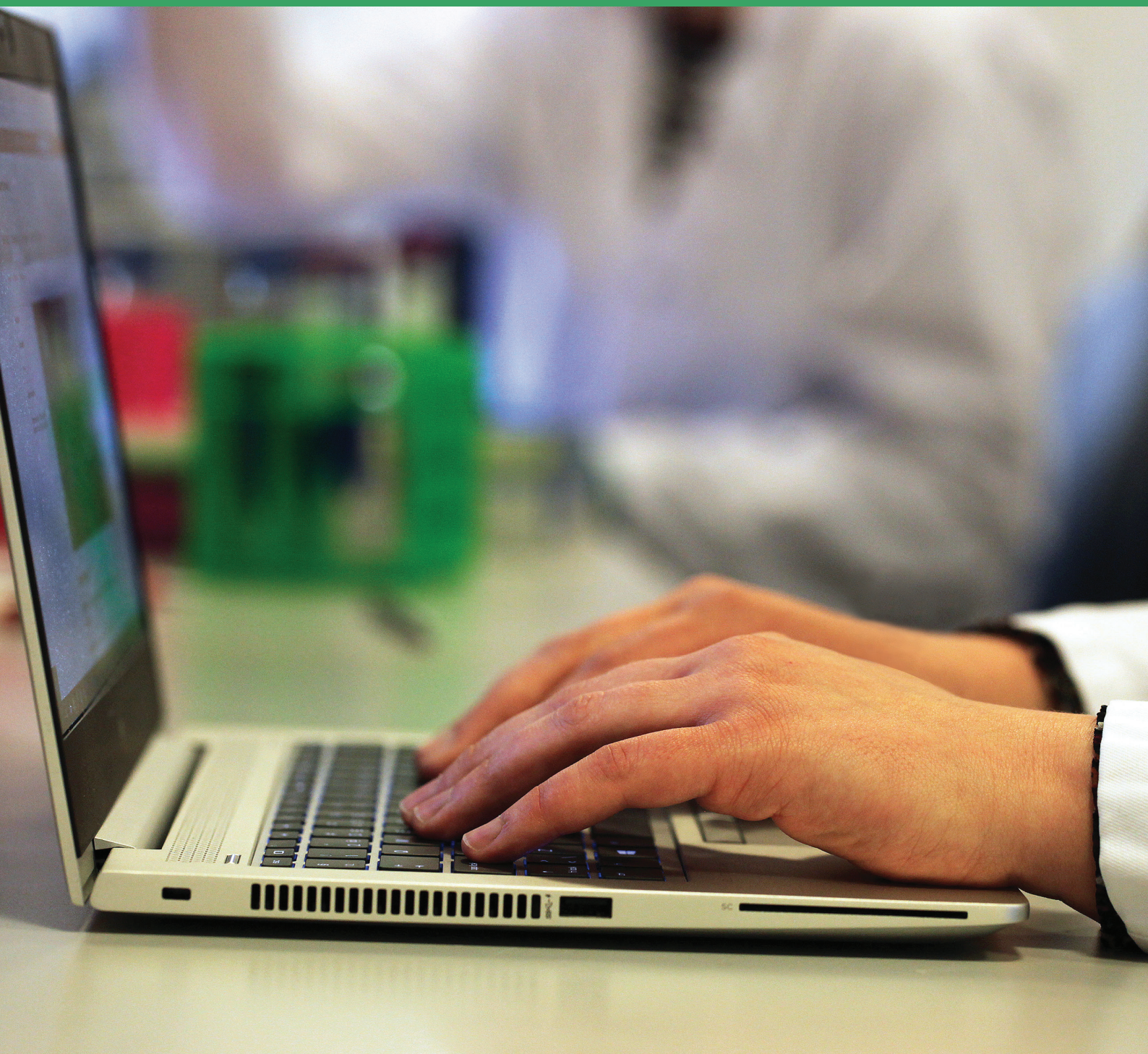
DTU Health Tech
Department of Health Technology

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

Wenbo Wang, PhD Thesis February 2019



Technical University of Denmark

Popular science summary of the PhD thesis

PhD student	Wenbo Wang
Title of the PhD thesis	Advanced Materials for the Delivery of Anti-Cancer Compounds and Imaging Contrast Agents
PhD school/Department	DTU Health Tech

Science summary

* Please give a short popular summary in Danish or English (approximately half a page) suited for the publication of the title, main content, results and innovations of the PhD thesis also including prospective utilizations hereof. The summary should be written for the general public interested in science and technology:

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. These compounds are promising to deliver Alpha or Auger emitters to 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.

Please email the summary to the PhD secretary at the department

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