Title: *In vivo* cancer research using aggregation-induced emission organic nanoparticles

Authors: Xiaoyong Yi, Jun Li, Zhipeng Zhu, Qian Liu, Qiang Xue, Dan Ding

PII: S1359-6446(17)30175-7
DOI: http://dx.doi.org/doi:10.1016/j.drudis.2017.04.004
Reference: DRUDIS 2000

To appear in:

Please cite this article as: Yi, Xiaoyong, Li, Jun, Zhu, Zhipeng, Liu, Qian, Xue, Qiang, Ding, Dan, In vivo cancer research using aggregation-induced emission organic nanoparticles.Drug Discovery Today http://dx.doi.org/10.1016/j.drudis.2017.04.004

In vivo cancer research using aggregation-induced emission organic nanoparticles

Xiaoyong Yi[1], Jun Li[2], Zhipeng Zhu[2], Qian Liu[1], Qiang Xue[3], and Dan Ding[2]

[1]Tianjin University of Chinese Medicine, Tianjin 300193, China
[2]State Key Laboratory of Medicinal Chemical Biology, Key Laboratory of Bioactive Materials, Ministry of Education, and College of Life Sciences, Nankai University, Tianjin 300071, China
[3]Tianjin Medical University Cancer Institute and Hospital, National Clinical Research Center for Cancer, Tianjin's Clinical Research Center for Cancer, and Key Laboratory of Cancer Prevention and Therapy, Tianjin, China
Corresponding author: Xue, Q. (xuehero126@126.com); Ding, D. (dingd@nankai.edu.cn)

Highlights

- AIEgens show unique advantages over conventional fluorescent materials.
- AIE nanoparticles (NPs) allow for sensitive cancer diagnosis *in vivo*.
- AIE NPs serve as an advanced theranostic system for cancer diagnosis and treatment.

Keywords: aggregation-induced emission; cancer diagnostics and theranostics; nanoparticles; molecular imaging; drug delivery; photodynamic therapy.

Teaser: The combination of aggregation-induced emission luminogens (AIEgens) and nanotechnology provides an excellent nanoplatform on which to develop *in vivo* cancer diagnostic and theranostic agents.

Exploration of a nanoplatform that benefits precise cancer diagnosis and treatment *in vivo* is particularly valuable. In recent years, aggregation-induced emission luminogens (AIEgens) have emerged as advanced fluorescent materials for the design and preparation of organic nanoparticles (NPs); they also have unique advantages in biomedical applications, especially in cancer diagnosis and theranostics. In this review, we summarize the current status of the development of AIEgen-based NPs for *in vivo* cancer research, including *in vivo* tumor diagnosis, drug delivery, and photodynamic therapy. We hope that our review will inspire more exciting research in cross-disciplinary fields, contributing to precise cancer diagnostics and therapeutics.

Introduction

Cancer diagnostics and therapeutics research has received increased interest over the past few decades, resulting in both valuable insights and diagnostic and therapeutic materials [1–3]. The term 'theranostics' was first coined by Funkhouser in 2002 and now is generally accepted as a methodology that combines the modalities of both diagnosis and therapy [4]. The development of efficient theranostic agents will open new avenues for the tailoring of personalized treatment for individual patients [5]. Before cancer treatment can be decided, precise diagnostic imaging is required that can visualize the location, size, boundary, heterogeneity, malignancy, and even classification of the tumor [6]. Among the versatile imaging techniques available, fluorescence imaging is particularly useful in cancer diagnosis and theranostics because of its excellent sensitivity, superb temporal resolution, low cost, few adverse effects, and maneuverability [7]. In 2008 and 2014, the Nobel Prize in Chemistry was awarded to scientists engaged in the development of GFPs and super-resolved fluorescence microscopy, respectively, implying that fluorescence techniques are one of the most important tools for contemporary bioscience.