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Photo-activated drug delivery systems

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Citation

Kong, L. (2018, June 7). *Photo-activated drug delivery systems*. Retrieved from <https://hdl.handle.net/1887/63080>

Version: Not Applicable (or Unknown)

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Title: Photo-activated drug delivery systems

Issue Date: 2018-06-07

Preface:

The work in this thesis focuses on the development of new stimuli-responsive drug delivery systems. All four described systems rely on light as the exclusive trigger of activation and the spatiotemporal precision afforded by this approach is demonstrated, both *in vitro* and *in vivo*, throughout this thesis. Light activation, for three of the four described systems (**chapters 2-4**), leads to dePEGylation of a nanoparticle surface. In this way, the benefits of PEGylation (*e.g.* limited non-specific cellular interactions) are maintained, while the obstacles of PEGylation (*e.g.* limited uptake by targeted cells) can be overcome on demand. In **chapter 5**, light is used to switch the surface charge of a nanoparticle *in situ* and *in vivo*. The effectiveness of this approach is demonstrated within zebrafish embryos. Despite countless reports of stimuli-responsive drug delivery systems in the literature, none have yet made it to the clinic. The work in this thesis is therefore aimed at providing potential solutions to some of the roadblocks slowing the progression of stimulus-responsive drug delivery systems.