HIFU-triggered release of nile red encapsulated in nanoemulsions

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To be potent, anticancer drugs should penetrate tissue efficiently to reach tumor cells in a sufficient concentration to exert a therapeutic effect. A high dose of drugs is usually given to a patient to locally reach the critical potent concentration at the tumor site, while in other healthy tissues this drug concentration induces severe side effects. To reduce these effects, drugs need to be encapsulated inside carriers that should specifically bring the drug to the tumor. Indeed, these formulations improved drug efficacy and reduced toxicity on peripheral healthy tissues compared to conventional therapeutics. In addition the drug delivery should only be triggered after that the drug carrier is accumulated on the tumor site. A way to achieve this is to control the drug release through an external stimulus like ultrasound. For this reason, we have investigated the HIFU- triggered release of nile red, used as model drug, encapsulated inside nanomemulsions. These emulsions are made of droplets of perfluoro-octyl bromide (to be used as 19F-MRI contrast agent) and oil (solubilizing nile red) stabilized with fluorinated surfactants. The percentage of delivered nile red was assessed using a spectrofluorometer and was monitored as a function of the ultrasonic parameters (maximum peak negative pressure, insonification time and duty cycle) at 37°C using a HIFU transducer operating at 1 MHz.