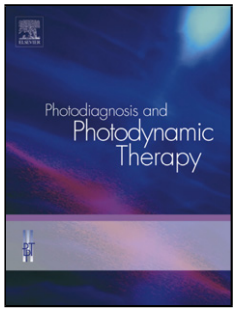

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New optical sources for interstitial and metronomic photodynamic therapy

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Highlights

- In contrast to conventional optical fibers, which must be removed from the body soon after use, the biodegradable and biocompatible light sources may be used for long-term light delivery and need not be removed as they are gradually resorbed by the tissue. This letter aims to present two light sources which fulfill most of the requirements for iPDT and possibly for mPDT.

Introduction

Multiple clinical studies have shown that interstitial photodynamic therapy (iPDT) is a promising modality in the treatment of cancerous tumors in prostate, pancreas, head and neck cancer and brain. The laser fibers are into the target tissue inserted via needles, or placed in catheters [1]. However, the transport distance of light in biological tissues is limited by scattering and absorption. Practical therapeutic penetration depth is 0.1-1 mm for visible light in 400-600 nm and 2-3 mm for near infrared light in 700-1300 nm for most biological tissues. The fluence rate of therapeutic light must limited to prevent undesirable photothermal damage of tissues. The rate of oxygen consumption by the PDT process and the re-oxygenation rate of tissues may be also be an important consideration in deciding on fluence rate. Depending on photosensitiser and treatment site, lower fluence rates can also reduce pain problems. Consequently, when treating a large tumor, numerous lasers fibers must be inserted in the tumor. Moreover, except maybe for the brain, interstitial fibers cannot be left in tissue for a long period time. However, several studies have demonstrated that metronomic PDT (mPDT) based on continuous low rate delivery of photosensitizer and light, induces an enhanced induction of cell apoptosis as compared with a conventional PDT regimen [2,3]. Thus, mPDT could benefit for light sources placed inside the tumor tissue and emitting for several hours or days.

Recently, several teams have elaborated innovative implantable and biodegradable light sources that can be used for iPDT and mPDT in particular. In contrast to conventional optical fibers, which must be removed from the body soon after use, the biodegradable and biocompatible light sources may be used for long-term light delivery and need not be