Bioresorbable multifunctional fiber-optic devices for theranostic and monitoring of tumor

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Calcium phosphate glass based bioresorbable optical fibers have attracted attention as a candidate for various interstitial biomedical applications. Indeed, these fibers dissolve in the human body at a tailorable rate with its constituents being metabolized by patient's organism. This avoids the subsequent extraction surgeries in case of the implanted fiber optic device unlike the conventional non-bioresorbable implants. Current methods in different stages of diagnosis and therapy of tumors mainly uses conventional fiber optic technology and the post operative monitoring mainly rely on external imaging techniques and/or implanted sensors which does not provide continuous information over a timescale which is clinically relevant and/or possess the requirements of surgical procedures with associated costs and risks. In this study, we investigate the compatibility of our custom-manufactured bioresorbable optical fibers for time gated diffuse optics spectroscopy (DOS), photodynamic therapy (PDT) and diffuse correlation spectroscopy (DCS) applications which can be respectively used for the diagnosis, treatment, and monitoring of malignant tissues. Ex-vivo studies were conducted on Intralipid and tissue mimicking phantoms for DOS and PDT and an in-vivo study was performed for DCS. The results demonstrate the potential of calcium phosphate glass-based fiber optic devices towards the realization of an implantable multi-functional class of devices with functionalities ranging from cancer detection to cure monitoring integrated into a single bioresorbable platform.

Key words: optical fibers, bio-resorbable, multifunctional, cancer diagnosis, therapy, multifunctional.

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