

Injectable silver nanosensors: in vivo dosimetry for external beam radiotherapy using positron emission tomography - DTU Orbit (08/11/2017)

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Development of safe and efficient radiotherapy routines requires quantification of the delivered absorbed dose to the cancer tissue in individual patients. In vivo dosimetry can provide accurate information about the absorbed dose delivered during treatment. In the current study, a novel silver-nanosensor formulation based on poly(vinylpyrrolidone)-coated silver nanoparticles formulated in a gelation matrix composed of sucrose acetate isobutyrate has been developed for use as an in vivo dosimeter for external beam radiotherapy. In situ photonuclear reactions trigger the formation of radioactive (^{106}Ag), which enables post treatment verification of the delivered dose using positron emission tomography imaging. The silver-nanosensor was investigated in a tissue equivalent thorax phantom using clinical settings and workflow for both standard fractionated radiotherapy (2 Gy) and stereotactic radiotherapy (10- and 22 Gy) in a high-energy beam setting (18 MV). The developed silver-nanosensor provided high radiopacity on the planning CT-scans sufficient for patient positioning in image-guided radiotherapy and provided dosimetric information about the absorbed dose with a 10% and 8% standard deviation for the stereotactic regimens, 10 and 22 Gy, respectively.

General information

State: Published

Organisations: Department of Applied Mathematics and Computer Science , Image Analysis & Computer Graphics, Department of Micro- and Nanotechnology, Colloids and Biological Interfaces, University of Copenhagen, Copenhagen University Hospital, Technical University of Denmark

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Pages: 11002-11011

Publication date: 2016

Main Research Area: Technical/natural sciences

Publication information

Journal: Nanoscale

Volume: 8

Issue number: 21

ISSN (Print): 2040-3364

Ratings:

BFI (2017): BFI-level 2

Web of Science (2017): Indexed Yes

BFI (2016): BFI-level 2

Scopus rating (2016): CiteScore 7.46 SJR 2.769 SNIP 1.459

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 2

Scopus rating (2015): SJR 2.842 SNIP 1.588 CiteScore 7.97

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 2

Scopus rating (2014): SJR 2.651 SNIP 1.676 CiteScore 7.64

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 2

Scopus rating (2013): SJR 2.55 SNIP 1.469 CiteScore 6.89

ISI indexed (2013): ISI indexed yes

Web of Science (2013): Indexed yes

BFI (2012): BFI-level 2

Scopus rating (2012): SJR 2.761 SNIP 1.346 CiteScore 6.08

ISI indexed (2012): ISI indexed yes

Web of Science (2012): Indexed yes

Scopus rating (2011): SJR 2.494 SNIP 1.448 CiteScore 5.69

ISI indexed (2011): ISI indexed no

Web of Science (2011): Indexed yes

Scopus rating (2010): SJR 1.827 SNIP 0.62

Web of Science (2009): Indexed yes

Original language: English

DOIs:

10.1039/c6nr00201c

Source: FindIt

Source-ID: 2303886910

Publication: Research - peer-review › Journal article – Annual report year: 2016