In vivo Evaluation of PEGylated 64Cu-liposomes with Theranostic and Radiotherapeutic Potential using Micro PET/CT - DTU Orbit (22/12/2018)

The objective of this study was to evaluate the potential of PEGylated 64Cu-liposomes in clinical diagnostic positron emission tomography (PET) imaging and PEGylated 177Lu-liposomes in internal tumor radiotherapy through in vivo characterization and dosimetric analysis in a human xenograft mouse model. Liposomes with 5 and 10 mol% PEG were characterized with respect to size, charge, and 64Cu- and 177Lu-loading efficiency. The tumor imaging potential of 64Cu-loaded liposomes was evaluated in terms of in vivo biodistribution, tumor accumulation and tumor-to-muscle (T/M) ratios, using PET imaging. The potential of PEGylated liposomes for diagnostic and therapeutic applications was further evaluated through dosimetry analysis using OLINDA/EXM software. The 64Cu-liposomes were used as biological surrogates to estimate the organ and tumor kinetics of 177Lu-liposomes. High remote loading efficiency (>95%) was obtained for both 64Cu and 177Lu radionuclides with PEGylated liposomes, and essentially no leakage of the encapsulated radionuclides was observed upon storage and after serum incubation for 24 h at 37 °C. The 10 mol% PEG liposomes showed higher tumor accumulation (6.2±0.2 %ID/g) than the 5 mol% PEG liposomes, as evaluated by PET imaging. Thedosimetry analysis of the 64Cu-liposomes estimated an acceptable total effective dose of 3.3·10−2 mSv/MBq for diagnostic imaging in patients. A high absorbed tumor dose (114 mGy/MBq) was estimated for the potential radiotherapeutic 177Lu-liposomes. The overall preclinical profile of PEGylated 64Cu-liposomes showed high potential as a new PET theranostic tracer for imaging in humans. Dosimetry results predicted that initial administered activity of 200 MBq of 64Cu-liposomes should be acceptable in patients. Work is in progress to validate the utility of PEGylated 64Cu-liposomes in a clinical research programme. The high absorbed tumor dose (114 mGy/MBq) estimated for 177Lu-liposomes and the preliminary dosimetric studies justify further therapeutic and dosimetry investigation of 177Lu-liposomes in animals before potential testing in man.

General information
State: Published
Organisations: Department of Micro- and Nanotechnology, Colloids and Biological Interfaces, Center for Nanomedicine and Theranostics, Department of Chemistry, Center for Nuclear Technologies, The Hevesy Laboratory, University of Copenhagen
Number of pages: 12
Pages: 941-952
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: European Journal of Nuclear Medicine and Molecular Imaging
Volume: 43
Issue number: 5
ISSN (Print): 1619-7070
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 5.05 SJR 2.458 SNIP 1.844
Web of Science (2017): Impact factor 7.704
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.84 SJR 2.364 SNIP 1.951
Web of Science (2016): Impact factor 7.277
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 3.94 SJR 2.053 SNIP 1.635
Web of Science (2015): Impact factor 5.537
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.19 SJR 2.02 SNIP 1.764
Web of Science (2014): Impact factor 5.383
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 4.17 SJR 2.039 SNIP 1.759
Web of Science (2013): Impact factor 5.217
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.98 SJR 2.086 SNIP 1.833
Web of Science (2012): Impact factor 5.114
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 3.86 SJR 1.812 SNIP 1.632
Web of Science (2011): Impact factor 4.991
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.774 SNIP 1.461
Web of Science (2010): Impact factor 5.036
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.28 SNIP 1.324
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.401 SNIP 1.253
Scopus rating (2007): SJR 1.645 SNIP 1.429
Scopus rating (2006): SJR 1.505 SNIP 1.462
Scopus rating (2005): SJR 1.308 SNIP 1.52
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.335 SNIP 1.607
Scopus rating (2003): SJR 1.288 SNIP 1.746
Scopus rating (2002): SJR 1.328 SNIP 1.537
Scopus rating (2001): SJR 1.504 SNIP 1.509
Scopus rating (2000): SJR 1.483 SNIP 1.376
Scopus rating (1999): SJR 1.439 SNIP 1.487
Original language: English
Keywords: Nanoparticle, Theranostic, Cancer imaging, Diagnostic, PET, Radiotherapy
Electronic versions:
In_vivo_Evaluation_of_PEGylated.pdf
DOIs:
10.1007/s00259-015-3272-6
Source: PublicationPreSubmission
Source-ID: 119503147
Research output: Research - peer-review › Journal article – Annual report year: 2015