^{161}Tb-Pertuzumab as a Theranostic Antibody for HER2-Positive Breast Cancer

Faculty of Medicine and Dentistry
Palacký University Olomouc

Katarína Hajduová[1] , Martin Vlk[4] , Ján Kozempel[4] , Zbyněk Nový[1,2] , Miloš Petřík[1,2,3] , Marián Hajdúch[1,2,3]

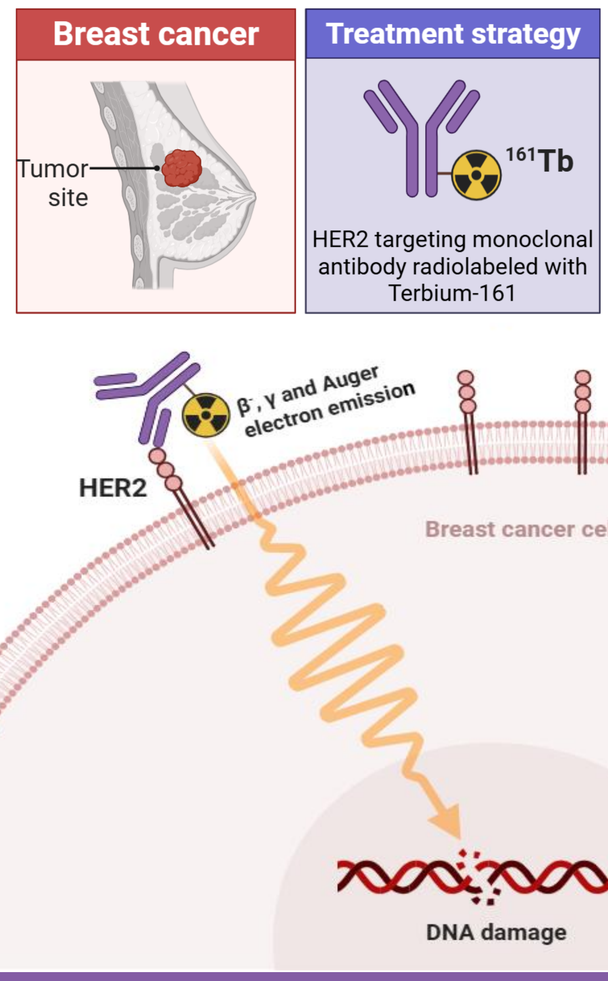
1 Institute of Molecular and Translational Medicine, Faculty of Medicine and Dentistry, Palacky University, Olomouc, Czech Republic
2 Czech Advanced Technology and Research Institute, Palacky University, Olomouc, Czech Republic
3 Institute of Molecular and Translational Medicine, University Hospital, Olomouc, Czech Republic
4 Faculty of Nuclear Sciences and Physical Engineering, Prague, Czech Republic

Introduction

HER2-positive breast cancer represents 15–20% of cases and is associated with aggressive disease, making HER2 a critical therapeutic target

Terbium-161 [^{161}Tb] offers theranostic advantages with β⁻ and γ emissions and abundant Auger electrons, providing potentially superior therapeutic effects compared to Lutetium-177 [^{177}Lu], especially for small lesions

Pertuzumab, an FDA-approved HER2-targeting antibody



Methods

[^{161}Tb] Tb-Pertuzumab was successfully radiolabeled with >95% radiochemical purity

Experiments were performed in HER2-positive (SKOV-3) and HER2-negative (MDA-MB-231) tumour-bearing SCID mice to assess specificity

SPECT/CT imaging and biodistribution were conducted across multiple time points (1 h to 7 days) to quantify organ and tumour uptake (%ID/g)

Results

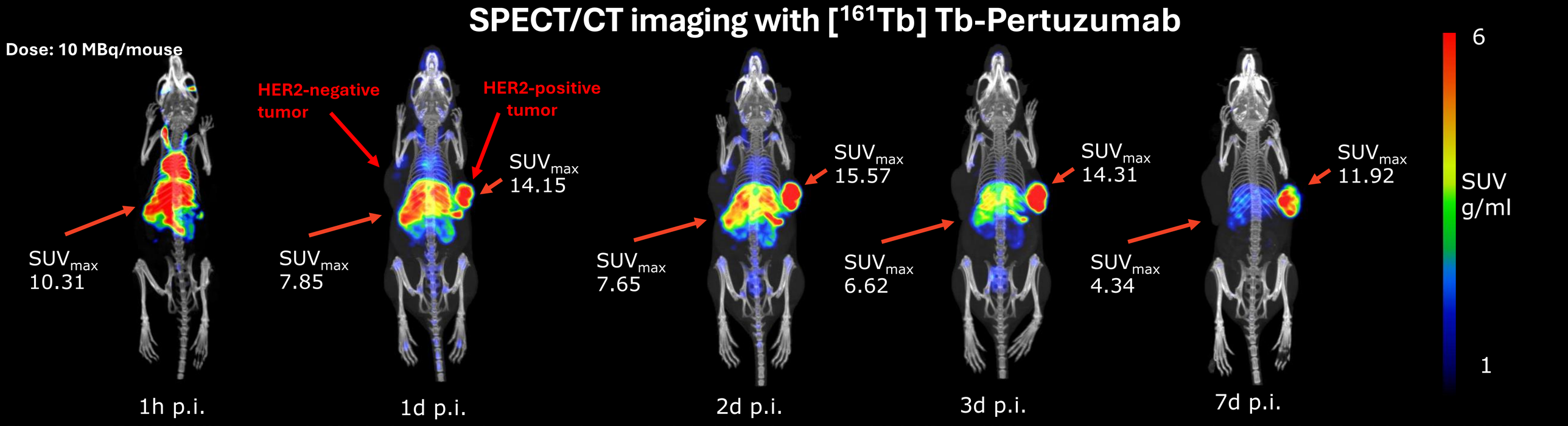


Fig. 1 Static SPECT/CT MIP images of SCID dual tumour mice xenografts – on the left side of the animal – MDA-MB-231 (HER2 negative tumour) and on the right side of the animal SKOV3 (HER2 positive) tumour injected with [^{161}Tb] Tb-Pertuzumab

Biodistribution

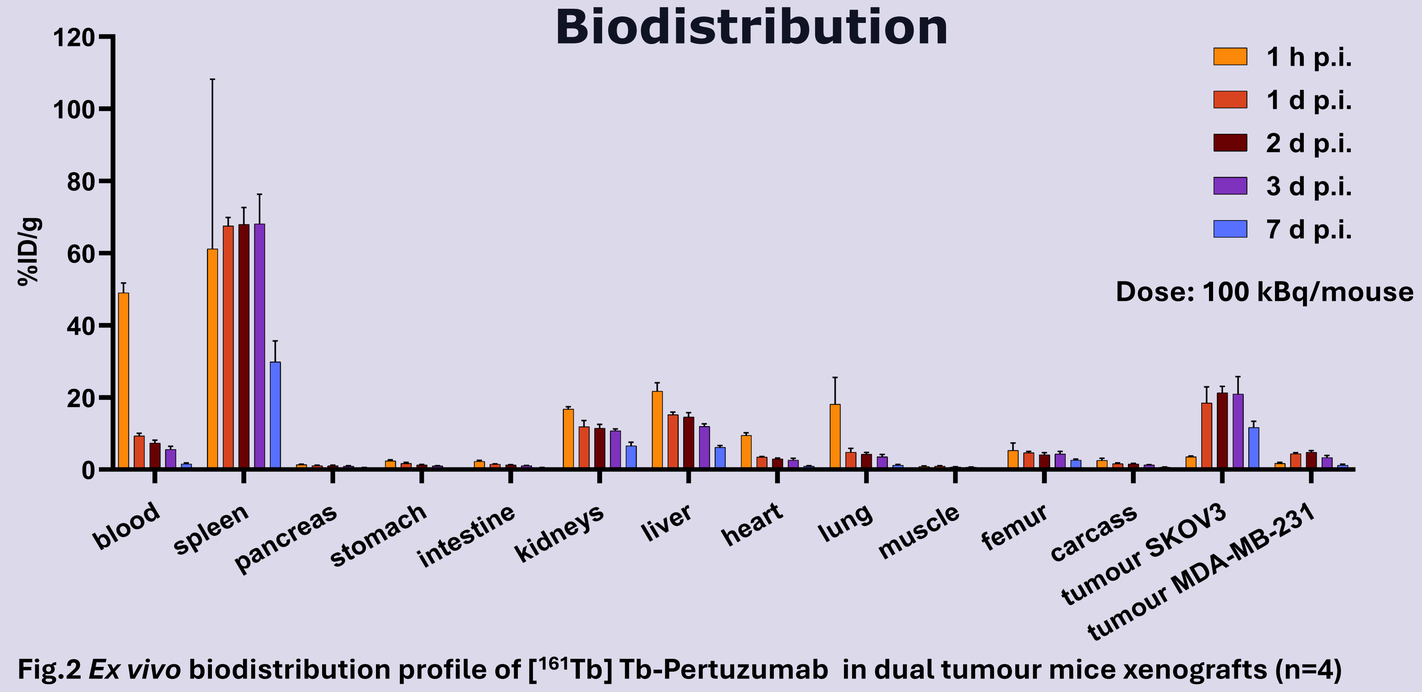


Fig.2 *Ex vivo* biodistribution profile of [^{161}Tb] Tb-Pertuzumab in dual tumour mice xenografts (n=4) presented as mean values ± standard deviation

Conclusions

[^{161}Tb] Tb-pertuzumab shows high, sustained uptake in HER2-positive tumours (peak 21.33 ± 1.73 %ID/g on day 2; 11.67± 1.69 %ID/g at day 7) and minimal uptake in HER2-negative tumours, confirming specificity.

SPECT/CT imaging clearly visualized HER2-positive tumours from day 1 onward, with very low signal in HER2-negative lesions.

Findings support further development of ^{161}Tb agents, including dosimetry and therapy studies, toward eventual clinical translation.

Contact: katarina.hajduova01@upol.cz

Acknowledgements: This work was supported by the Internal Grant Agency of Palacky University (IGA LF UP 2025_006), the project National Institute for Cancer Research (Programme EXCELES, ID Project No. LX22NPO5102) - Funded by the European Union – Next Generation EU, EATRIS-CZ (LM2023053), the project SALVAGE (Project No. CZ.02.01.01/00/22_008/0004644) funded by Czech Ministry of Education, Youth and Sports and PERMED,T2B (TN02000109) funded by Technology Agency of the Czech Republic.

References: Ondrák Fialová K, Ondrák L, Vlk M, et al. In vitro and in vivo evaluation of anti-HER2 antibody conjugates labelled with ^{225}Ac. *EJNMMI Radiopharm Chem*. 2025;10(1):16. Published 2025 Apr 4. doi:10.1186/s41181-025-00337-8

Funded by the European Union NextGenerationEU