Contribution ID: **25** Type: **poster**

Positronium biomarker in 3D melanoma spheroid model, a novel probe for cancer diagnosis

Sunday, 10 October 2021 16:10 (20 minutes)

Spheroids are three-dimensional cancer cell models able to mimic important properties of real tumors such as physical structure, physiological characteristics, and gene expression patterns. In this research, the lifetime of Positronium has been evaluated in spheroids formed from human melanoma cell lines, WM266-4 and WM115. In the first step, spheroids were formed from WM266-4 and WM115 melanoma cell lines, using the hanging drop method and the size, rate of proliferation and viability of spheroids were evaluated precisely by optical, fluorescent Microscopy and micro-CT [1].
After precise determination of spheroid characteristics, we created spheroids in 5D microplates for measuring positronium lifetime by PALS spectroscopy. The lifetime of positronium is environmentally dependent and it provides information about the size of intra-molecular spaces in cells, thus it is related to the tissue morphology. To determine the positronium lifetime, the spheroids were inserted into an Aluminium chamber and irradi-ated with positrons emitted from 22Na radionuclide. The photons resulting from the annihilation of positrons inside the spheroids were measured by the dedicated detector build from BaF2 scintillators and digitizing acqui-sition system. We observe differences in the lifetime of positronium depending on the degree of malignancy of the melanoma cells. WM266-4 showed a higher velocity in division than WM115 which got 1.5 and 2.74-fold more cells after the 4th and 8th day while WM115 demonstrated 1.4 and 1.7-fold more cells after 4th and 8th days, respectively. The Lifetime of o-Ps in WM266-4 spheroids was 1.87 ns and 1.86 ns in 4th and 8th day after cul-turing while in WM115 spheroids, the o-Ps lifetime was 1.90 ns and 1.87 ns in 4th and 8th day, respectively. In conclusion, both cell lines showed a reduction in an o-Ps lifetime during the time. This decrease in lifetime indicates the reduction in molecular mobility because of the high concentration of cells in spheroids which are growing during the time. We can also consider this difference in an o-Ps lifetime for malignancy diversity. The results will be reported in the context of its application of positronium as a biomarker for the in-vivo assess-ment of the degree of cancer malignancy with the total-body PET scanners [2].
Keywords: Spheroids, melanoma, Hypoxia, Positron imaging
Acknowledgments
This work was supported by the Foundation for Polish Science (FNP) through grant TEAM/2017-4/39 program, and DSC grant, nom. N17/MNS/000023.
References
1. Karimi, Hanieh, et al. "X-ray microtomography as a new approach for imaging and analysis of tumor spheroids." Micron 137 (2020): 102917.
2. Moskal, Paweł, and Ł. Stępień, Ewa. "Prospects and clinical perspectives of total-body PET imaging using plastic scintillators." PET clinics 15.4 (2020): 439-452.

Primary author: KARIMI, Hanieh (Department of Medical Physics, M. Smoluchowski Institute of Physics, Faculty of Physics, Astronomy and Applied Computer Science, Jagiellonian University, Kraków, Poland, Total-Body Jagiellonian-PET Laboratory, Jagiellonian University, Poland)

Co-authors: Prof. MOSKAL, Paweł (Department of Experimental Particle Physics and Applications, M. Smoluchowski Institute of Physics, Faculty of Physics, Astronomy and Applied Computer Science, Jagiellonian University, Kraków, Poland c Total-Body Jagiellonian-PET Laboratory, Jagiellonian University, Poland); Prof. STĘPIEŃ, Ewa (Department of Medical Physics, M. Smoluchowski Institute of Physics, Faculty of Physics, Astronomy and Applied Computer Science, Jagiellonian University, Kraków, Poland)

Presenter: KARIMI, Hanieh (Department of Medical Physics, M. Smoluchowski Institute of Physics, Faculty of Physics, Astronomy and Applied Computer Science, Jagiellonian University, Kraków, Poland, Total-Body Jagiellonian-PET Laboratory, Jagiellonian University, Poland)

Session Classification: Poster Session