Contribution ID: **49** Type: **poster**

# Free radicals influence on the positronium lifetime in melanocytes and melanomas cell cultures

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

Positronium, a bound state of positron and electron has been proposed as a novel biomarker for examining cancer cells [1]. This atom is copiously created in cells during Positron Emission Tomography (PET) imaging [2-3].Our pre-clinical studies have shown significant differences in the lifetime of positronium between normal and neoplastic cells and tissues [4-5]. Due to the conversion process concentrations of free radicals, especially reactive oxygen species (ROS) have a significant influence on the properties of positronium, such as its lifetime and production intensity in the tissue [6-7]. We investigated the role of antioxidants, such as vitamin C and epigallocatechin gallate (EGCG), on the values of the newly proposed biomarker.
Studies were conducted on in vitro cell culture of normal human cell: melanocyte HEMa-LP cell line and two cell lines of melanoma: WM115 (primary melanoma) and WM266-4 (metastatic melanoma) as an example of cancer cells with different degree of malignancy. Cells were exposed to vitamin C in various concentrations (100, 1000 μM) and EGCG (10, 100 μM). Positronium lifetime was determined by means of Positron Annihilation Lifetime Spectroscopy and Na-22 isotope was used as a source of positrons.
Obtained results showed differences in positronium lifetime, between normal and cancer cell in relation to their malignancy. Resulting o-Ps lifetime in HEMa-LP, WM115, and WM266-4 cells was equal to 1.91(02)ns, 1.95(03)ns, 1.99(01)ns, respectively in control; 1.93(02)ns, 1.96(01)ns, 1.98(01)ns in 1000 μM concentration of vitamin C and 1.91(02)ns, 1.93(01)ns, 1.89(02)ns in 100μM concentration of EGCG. No significant differences were observed in measured solutions without the cells, resulting in o-Ps lifetime of 1.91(02)ns, 1.88(01)ns in vit. C and EGCG solution, respectively.
Outcome of our experiment confirmed the validity of employing positronium as an indicator, which may have a direct impact on better and more accurate diagnostics. The Jagiellonian Positron Emission Tomography scanner can be applied for simultaneous PET and positronium imaging [8-12].

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**Session Classification:** Poster Session