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Breast Cancer estrogen and progesterone receptors evaluation using FTIR spectroscopy imaging: A Pilot Study

Del-Valle, M[1]; Santos, M. O.[1,2]; dos Santos, S. N.[3]; Bernardes, E. S.[3], Zezell, D. M.[1]

[1]Center for Lasers and Applications, Nuclear and Energy Research Institute, Brazil, [2]Technology College, Amazonas State University, Brazil, [3]Radiopharmacy Center, Nuclear and Energy Research Institute, Brazil

INTRODUCTION. Breast cancer is the second leading cause of cancer death in woman worldwide with an incidence of 2.09 million and 627 thousand deaths in 2018. Histopathology is the gold standard method for cancer diagnosis and identification of therapeutic targets, however it still presents interpretation difficulties, especially when comparing different cancer subtypes. **OBJETICVE:** The aim of this study was to evaluate Fourier transform infrared (FTIR) spectroscopy in the diagnose and differentiation of molecular differences between two different breast cancer subtypes: positive and negative for estrogen (ER) and progesterone (PR) receptors **METHODS:** Two human breast cell lines, BT474 (ER and PR positive) and SKBR3 (ER and PR negative), were inoculated in Balb/c nude mice. Tumors were collected when reached 0.5 cm^3, processed by formalin fixation and paraffin embedding. 5µm thick tissue cuts were fixed in low-e slides (MirrIR, Kevley Technologies). Spectral images were performed in a micro-FTIR (Cary 660, Agilent Technologies) with 32 x 32 FPA of 5.5 µm pixel size. Scattering correction (RMieS-EMSC) was performed using MATLAB and remaining processing using Python. Groups differentiation were evaluated by PCA from 1350 to 1000 cm^{-1} second derivatives. **RESULTS AND DISCUSSION**: Groups were split in two clusters, separated by PC-1 with a 99 % accuracy in both groups and 45 % of explained variance. The absorptions in the selected region for the PCA were mainly related to DNA, RNA and protein content. The main contribution was presented by the 1238 cm^{-1} peak, which was correlated with nucleic acids symmetrical stretching. Hyperspectral image built from this peak presented a spatial correlation with the microscope white light imaging, indicating that possible region for histopathological correlation might be present. **CONCLUSAO:** Our pilot study shows that FTIR spectroscopy imaging can distinguish ER/PR positive from negative breast cancer subtypes.

Key-words: Breast Cancer, FTIR imaging, spectral processing
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