

Assessment of melanoma extent and melanoma metastases invasion using Electron Paramagnetic Resonance and bioluminescence imaging

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Introduction

Malignant melanoma is a skin tumor characterized by the uncontrolled proliferation of melanocytes, which can lead to metastasis mainly in lungs. The incidence of melanoma is rising each year. Nowadays, the cumulative lifetime risk for an invasive melanoma is estimated at 1/59 in U.S. For this reason, it is essential to develop new effective methods able to detect melanoma. We demonstrated previously that melanin pigments from melanoma tumors can be imaged using an EPR-based method (1).

The purpose of the present study was to assess the ability of EPR to detect and measure the colonization of lungs by melanoma metastases. In order to validate our method, the EPR results were compared with those obtained with bioluminescence imaging (BLI) (2) in a melanoma B16 model with cells transfected with luciferase.

Materials and methods

18 C57/BL6 mice were injected intravenously with 750.000 B16 melanoma cells. After 6, 15 and 18 days, mice were measured *in-vivo* with bioluminescence (Xenogen), the lungs were then excised, freeze-dried and measured by X-band EPR spectroscopy and imaging with a Bruker Elexsys spectrometer.

Results

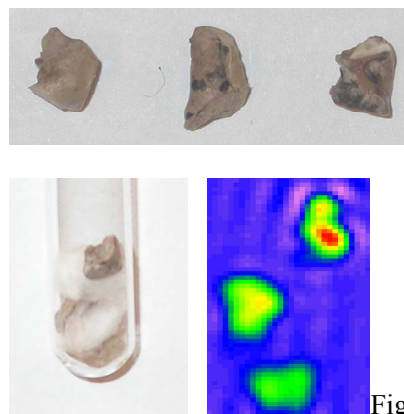
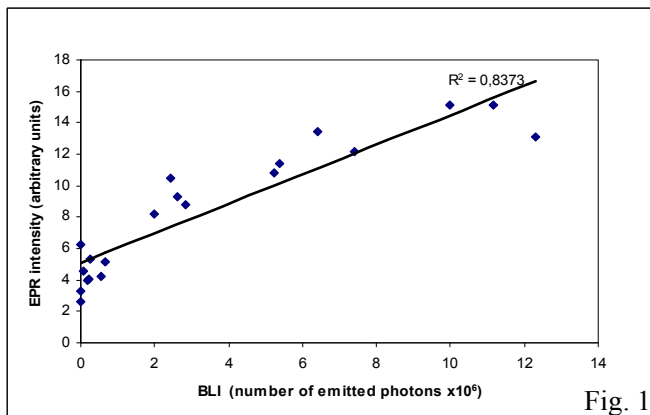


Fig. 2

We observed a linear progression of the EPR and BLI intensities, corresponding to the progression of tumor invasion. As shown in the figure 1, a strong correlation ($R^2 = 0.8373$) between the results obtained with EPR and the results obtained with BLI is observed. EPR spectroscopy was found to be more sensitive than BLI, and able to detect tiny quantities of melanin (2 μg). As shown in figure 2, EPR imaging, used as a tool to confirm the EPR results, also demonstrated the convenience of EPR to quantify the melanoma invasion inside the lungs.

Discussion and conclusion

In this work, we used for the first time EPR as a tool to quantify the melanin content of melanoma lung metastasis. To confirm our results, we compared them to results obtained by bioluminescence and showed an excellent correlation. Furthermore, this new method is far more sensitive than BLI and suits for every pigmented melanoma.

References

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