Autofluorescence corrected multispectral red-shifted fluorescent protein tomography

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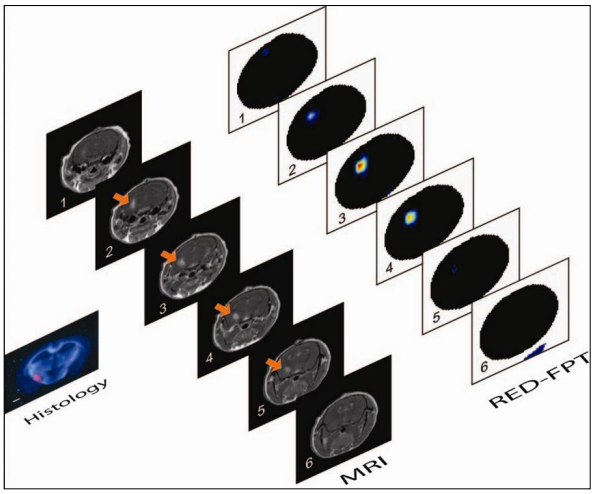
Introduction: The development of fluorescent proteins (FPs) that operate in the far-red and near-infrared part of the spectrum, enable the macroscopic visualization of FP activity deep in tissues. We demonstrate herein a multispectral fluorescence tomography method that allowed the visualization of labeled glioma tumors in animal brains operating with two-orders of magnitude better sensitivity compared to imaging GFP. We discuss how the detection sensitivity can be improved by at least an order of magnitude using further shifted FP's and the potential of the method for accelerating discovery associated with functional genomics, stem cell research and systems biology.



Methods: The method makes use of a novel spectral inversion scheme that integrates three-dimensional image reconstruction and auto-fluorescence correction that works seamlessly in the steep absorption transition from visible to near-infrared. The method is based on non-contact full angular projection Fluorescence Molecular Tomography.

Results: We have successfully imaged mCherry labeled glioma tumors located deep in tissue in animal brains. The results show almost perfect anatomical localization of the tumors that is verified by MRI and histology.

Conclusions: The approach offers therefore the ability for tomographically visualizing the emerging new class of red-shifted fluorescent proteins though entire animals. We discuss how the detection sensitivity can be improved by at least an order of magnitude using further shifted FP's and the potential of the method for accelerating discovery associated with functional genomics, stem cell research and systems biology.

Acknowledgement: This research is supported by a Marie Curie Intra-European Fellowship within the 7th European Community Framework Programme.

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