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P2.25: On the possibility of Spectral Imaging for Cell Location and Cell Tracking

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With an incidence of 1 - 4 per 100,000 habitants in the western world, glioblastoma is the most common primary malignant brain tumour [1]. Significant advances have been made in our understanding of the pathophysiology of glioblastoma over the past decade, however, glioblastoma remains an incurable disease with a median survival time after diagnosis of approximately 15 months [2]. Moreover, therapies that have had better results in other types of cancer were ineffective in glioblastoma. In order to combat this disease new therapeutic modalities are needed to develop truly effective treatments. One approach is based on the use of genetically modified cells, in particular human mesenchymal stem cells (hMSC). It could be shown that hMSCs have the ability to selectively migrate to glioblastoma tumours in animal models, suggesting their potential for engineered cell glioblastoma therapy [3,4]. hMSCs can be isolated from different tissues, including bone marrow and adipose tissue, the latter being a very accessible and abundant source. Therefor each potential patient can be their own donator of hMSCs. It was demonstrated [3] that GNP loaded hMSCs injected into the carotid artery of nude mice migrated towards and integrated into U87 glioma tumours present in mice. Moreover, hMSCs can be permanently labelled with gold nano particles (GNP) as described in [5] constituting thus a selective marker, which subsequently can be detected utilizing X-rays imaging modalities. Here we report on the explorative implementation of spectral X-ray computer tomography (CT) in combination with GNPs as a permanent cell marker for hMSCs for investigating micrometric tumour cell distribution in rodents. Preliminary experiments have been carried out at the PEPI lab [6] utilizing a CdTe hybrid pixel detector [7] with a pixel size of 62 µm x 62 µm. We were able to obtain post mortem high-resolution 3D spectral images (figure1) of mice bearing U87 glioma tumours, which prior scarification had been injected with GNP loaded hMSCs. In this contribution we will present first encouraging results of this promising imaging technique, which could significantly improve the understanding of complex processes of disease progression and the effects of therapies in preclinical trials.

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