OC10

RELAXOMERY OF CANCER: EFFECT OF WATER MOBILITY AND MAGNETIC FIELD STRENGHT ON TISSUE AND CELL WATER PROTON T_1

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Conventional diagnostic magnetic resonance imaging (MRI) has focused on the improvement of the spatial resolution by using high magnetic fields (l-7T). High field allows the visualization of small tumour mass but lacks to give a precise evaluation of tumour grading, oxygenation, pH and metastasization. The presence of hypoxic or necrotic regions as well as the interstitial pressure are important hallmarks of the disease as they may affect the type of therapy to be chosen. This work aims at developing an innovative diagnostic strategy, based on the measurements of low fields l/T_1 NMRD profiles (0.0l-16MHz) with Fast Field Cycling FFC-NMR to obtain quantitative information on tumour characteristics, due to different water content and mobility that is invisible to standard high field MRI. To this purposes different types of mammary tumours cells have been injected in the leg muscle to generate a tumour xenograft suitable for "in vivo" studies. The Stelar relaxometer used in this study is equipped, for the first time anywhere in the world, with a 40mm 0.5T magnet with a dedicated 11 mm detection coil allowing to acquire FFC-NMR profiles "in vivo"(Figure I). Preliminary results show significant differences in FFC-NMR profiles reporting on different tumour characteristics. Cell swelling, caused by hypoxia or necrosis, increases both the amount of cytoplasmatic water and its mobility causing the increase of T_I of tumour tissues. We can conclude that FFC relaxometry may be a paradigm-shifting technology which will generate new, quantitative disease biomarkers, directly informing and improving clinical diagnosis, treatment decisions and monitoring in oncology. Despite this prototype FFC-NMR instrumentation is not endowed with spatial resolution, fundamental knowledge that will be obtained, will open the route for the development of new diagnostic horizons in oncology until now uncharted and easily transferable to the increasing number of FFC-MRI scanners already present around in the world.

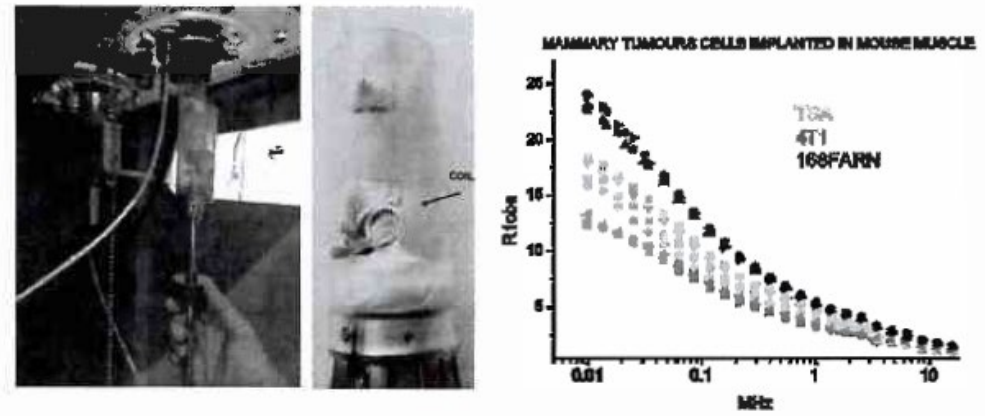

Figure 1: A) Photographs of the "in vivo" 11mm solenoid detection coil of FFC-NMR; B) "In vivo" l/T1 NMRD profiles of tumours obtained from transplantation of three mammary adenocarcinoma cell lines.