MR Cellular Tracking and Specific Target Imaging

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In vivo molecular imaging can hardly show single cell events directly but it can provide information on the temporal (sequential) change of net molecular events in live animal. Two aspects of molecular MR imaging will be introduced: One is cell tracking study. The other one is in vivo targeting study with water soluble iron oxide-Ab conjugate.

1. MR cellular tracking study

Cell tracking is a crucial step for cell therapy procedure. Intra-cellular labeling of detection probe is the first step for the in-vivo tracking study. Selection of the probe and membrane permeable agents can be determining factors. Transfection agents facilitate molecules to pass into the cells by means of internalizing mechanism. It is believed to be independent of receptor and transporter systems. Currently, the SPIO-Poly-L-lysine (PLL) complex is commonly used one for intracellular delivery of iron-oxide particles. Transfection efficiency varies depending on the cell types, cellular density, their incubation time and concentration ratio. We present here in vitro and in vivo cellular imaging after intracellular labeling of iron oxide magnetic nanocrystals. Labeling was done in a conventional method with aid of the transfection agents and a new cell membrane permeable cationic charged magnetic nanocrystal. I hope that cellular tracking technology may disclose the treatment efficacy and homing and migration effects of injected cells in the near-future.

2. Specific MR targeting study

Recent advances have been noticed in the specific MR target imaging. The complex of the MR contrast agents and biofunctional molecules were proposed as actively targeting and detection probes. For the better sensitivity, the development of highly efficient bio-compatible magnetic nanocrystalsis required than the currently used magnetic crystals. It will be presented how the magnetic crystals have an impact on the signal generation(change) and about potential applications for in vivo MR imaging particularly when using magnetic nanocrystals conjugated with monoclonal antibodies. The magnetic nanocrystal conjugates can be utilized as MRI probes not only for *in vitro* diagnosis of cancer cell lines but also for the monitoring of *in vivo* dynamic targeting events of human cancer cells implanted in nude mice.

In summary, for successful molecular MR imaging researches, interdisciplinary approaches are required, focusing on the development of imaging device, imaging probes, and biological models.