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Technical challenges to track in vivo therapeutic cells with imaging

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In vivo detection of specific cells implies the labeling of the cells with a physical agent locatable via imaging techniques. For the following of cell therapies, a direct labelling method is more appropriate, performed by direct incubation of the cells with the labeling agent in vitro. Because the signal given off by the labeling agent will be weak,the type of imaging technique used must, therefore, have elevated intrinsic detection sensitivity.

The stability of the labeling over time impacts the duration for studying cellular processes and depends on two parameters: the physical stability of the labeling agent and the absence of label dilution. Only the incorporation of a gene coding for the labeling agent within the genome prohibits the dilution of the label due to cellular divisions.The labeling process must not alter the viability or the functionality of cells and the labeling agent must not exhibit overall toxic effects.

SPECT, first choice method for the clinical imaging in general and daily used for the detection of infection after intra-venous injection of radiolabeled autologus leukocytes is not appropriate for the following of cell therapies.

The use of MRI, which is less sensitive, requires the optimization of a certain characteristics and labeling probes.

At this time, no optimal method could be proposed to follow therapeutic cells. The challenge is to develop nanoprobes allowing an efficient and stable cell labeling, preserving the functional and therapeutic properties toxicity, and the detection and quantification of few cells combined with anatomical informations.

Biography

Claire Billotey is physician in nuclear medicine and medical biology, professor in Biophysics and nuclear imaging. She is medical manager of a clinical imaging research center at Lyon. Due to her clinical position in a medical imaging department and her academic research, she acquired a specific expertise in the field of the development of new probes for molecular imaging and theranostic, especially based on nanotechnology development. One of her major field of research concerns the in vivo cell tracking with imaging. She has published 36 papers in peer-reviewed journal; 3 chapters in international books; 3 international patents.

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