

Imaging Physiology & Metabolism by MRI



Magnetic resonance imaging (MRI), the most widely used imaging modality for soft tissues, in general is thought to lack sufficient sensitivity for molecular imaging of biological processes. Although Gd³⁺-based contrast agents are widely used in clinical MRI as non-specific extracellular agents, new approaches need to be developed to bring MRI into closer competition with optical and nuclear methods for molecular imaging of physiology and metabolism. A key parameter in the design of more sensitive Gd³⁺-based MRI contrast agents is the rate of water exchange. This will be illustrated in the design of Zn²⁺-sensors for in vivo imaging of free Zn²⁺ ions from pancreas and prostate. The ability to fine-tune water exchange rates is also key in maximizing the sensitivity of paramagnetic chemical exchange saturation transfer (paraCEST) agents. The chemistry of these novel reporters and their limitations for use in vivo to image tissue pH, redox and metabolite levels will be discussed. Other MR techniques, including CEST imaging and hyperpolarized nuclei also offer considerable potential for providing new insights into the tumor microenvironment and tumor metabolism. These newer technologies make MRI more competitive as an effective molecular imaging tool.

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Invité par Eva JAKAB TOTH

Vendredi 4 décembre 2015 à 11h

Salle de conférence du CBM