

What Life Scientists Should Know About Molecular Imaging

MR Fundamentals for Life Scientists

MRI reporters

Eric T. Ahrens

Radiology, University of California, San Diego, La Jolla, California, USA

Learning Objectives:

In this talk we will give a brief overview of:

- Approaches for generating exogenous contrast in tissues in vivo using MRI reporters.
- The difference between MRI reporters requiring an MRI-detectable substrate (or probe) and those that are 'probe-less.'
- The technical and sensitivity limitations of MRI reporters.
- Key biomedical applications of MRI reporters.

The field MRI is experiencing an explosive expansion in its ability to visualize specific cell populations and molecular events in vivo. Cellular and molecular MRI involves the exploration of sophisticated biological processes in vivo at the whole organism or systems level and enables monitoring of new generations of therapeutics. In this talk we will discuss methods to alter a cell's proteome to facilitate MRI detection. These new MRI tools harvest the power of modern molecular biological tools to impart exogenous image contrast to living tissue in a cell-specific or event-related manner. This is accomplished using transgenic and vector technologies to express reporter genes coding for paramagnetic metalloproteins and magnetic resonance spectroscopic markers. In this talk we will describe exemplary biological applications of MRI reporters, such as use in labeling stem cells for long-term tracking, or for imaging transgene expression in genetically-manipulated animals. The prospects and barriers to clinical translation of these technologies will also be discussed.