

What Life Scientists Should Know About Molecular Imaging

MR Fundamentals for Life Scientists

Hyperpolarized MRI sensors and contrast mechanisms

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Learning Objectives:

- Limits of thermal polarization
- Definition of hyperpolarization
- Polarization techniques
- Available tracers
- Special encoding aspects

Increasing sensitivity is a continuing endeavour in the field of NMR. Solving the sensitivity issue will eventually realize the exquisite molecular specificity of this technique. Hyperpolarization is a powerful approach that has enabled a large number of NMR applications for molecular and cellular imaging and can be used with various nuclei. Substantial progress has been achieved over recent years, in terms of both tracer preparation and detection schemes. This tutorial will summarize aspects of polarization methods, probe design and optimized signal encoding, as illustrated by promising results extending to sensitive disease detection and efficient therapeutic monitoring. The different methods presented here have great potential to provide molecular specificity that goes beyond that of other diagnostic modalities.

Relevant Publications:

1. Kurhanewicz J. et al.: Analysis of cancer metabolism by imaging hyperpolarized nuclei: prospects for translation to clinical research. *Neoplasia* 13(2):81-97 (2011)
2. Witte C., Schröder L.: NMR of hyperpolarised probes. *NMR Biomed.* 26: 788-802 (2013)

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