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Special Issue on
Technological developments in hyperpolarized ^{13}C imaging – toward a deeper understanding of tumor metabolism in vivo

MAGMA Special Issue, planned publication 1/2021

The publication in 2003 of the landmark paper by Golman, Ardenkjaer-Larsen and colleagues (1), demonstrating that the nuclear spin polarization that had long been observed in the solid state could also be obtained in solution, sparked enormous interest in the biological and clinical imaging communities. In the oncology field this interest was enhanced by a growing appreciation for the importance of cell metabolism in oncogenesis, cell proliferation and response to treatment. This was cemented with the inclusion of tumor metabolism as one of the recognised hallmarks of cancer (2). Following the first clinical study in 2013 (3) metabolic imaging with hyperpolarized ^{13}C labelled substrates now stands on the threshold of wider clinical application. The success of this venture builds on nearly 20 years of intense research into investigating potential applications, methods for chemical shift imaging that make best use of the transient hyperpolarization and improved methods for hyperpolarization, with the latter standing on a foundation that goes back more than half a century. With the establishment of hyperpolarization techniques in the laboratory and in the clinic, it is perhaps timely now to consider where this technology may go in the future. In this special issue we will feature reviews on parahydrogen-induced polarization (PHIP), a relatively low cost hyperpolarization technique that previously had been limited by the range of relevant substrates that could be polarized; new methods for dynamic nuclear polarization that could facilitate relatively long term storage of the hyperpolarized state prior to injection into a biological system of interest; new approaches for accessing long-lived singlet states that could radically extend the polarization lifetime *in vivo*; and new sequences, hardware and image reconstruction methods that allow fast and robust chemical shift imaging of hyperpolarized substrates. The issue will include a commentary by a leading radiologist, who will highlight potential future applications of hyperpolarized imaging in the clinic and its potential role in oncology. We invite submissions of original research in the areas covered by these reviews i.e.

- Methods for parahydrogen-induced polarization
- New methods for dynamic nuclear polarization that could facilitate long term storage of the hyperpolarized spin state
- New methods for accessing long-lived singlet states
- New sequences, hardware and image reconstruction methods for fast and robust chemical shift imaging of hyperpolarized substrates

In order to meet the timeline, papers should be submitted as soon as possible, and not later than 1st June 2020. Papers should be submitted through the normal submission procedures on the web (http://www.editorialmanager.com/mrmp). Authors should indicate when prompted during their submission that the manuscript is submitted "For inclusion in the Special Issue on Technological developments in hyperpolarized ^{13}C imaging", and specify it within their cover letter.

The special issues of MAGMA reach a wide audience, and are highly cited. This special issue on technological developments in hyperpolarized ^{13}C imaging is an excellent opportunity to showcase your work in a high-profile format. We look forward to receiving your manuscripts.

Editor-in-Chief David G. Norris

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References

1. Ardenkjaer-Larsen JH, Fridlund B, Gram A, Hansson G, Hansson L, Lerche MH, Servin R, Thaning M, Golman K. Increase in signal-to-noise ratio of > 10,000 times in liquid-state NMR. Proceedings of the National Academy of Sciences of the United States of America 2003;100(18):10158-10163.
2. Hanahan D, Weinberg Robert A. Hallmarks of Cancer: The Next Generation. Cell 2011;144(5):646-674.
3. Nelson SJ, Kurhanewicz J, Vigneron DB, Larson PEZ, Harzstark AL, Ferrone M, van Criekinge M, Chang JW, Bok R, Park I, Reed G, Carvajal L, Small EJ, Munster P, Weinberg VK, Ardenkjaer-Larsen JH, Chen AP, Hurd RE, Odegardstuen L-I, Robb FJ, Tropp J, Murray JA. Metabolic imaging of patients with prostate cancer using hyperpolarized [1-^{13}C]pyruvate. Science Translational Medicine 2013;5(198):198ra108.