

Translational Pathways & Validation

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Highlights

- Immunohistochemistry is a powerful tool in detecting the molecular basis of local MRI signal changes (due to contrast agent accumulation, restructuring of tissue, etc).
- Electron Microscopy can illuminate ultrastructural changes to tissue that might influence MRI signal changes on the nano- and micro-scale.
- Other analytical techniques such as the western blot and inductively coupled plasma spectroscopy are useful quantifying parameters that may influence MRI signal.

Target audience

Those looking for practical insights into validation of MRI-based results.

Purpose

This lecture is a supplement to the lecture on basic molecular biology principles given by Dr. van der Weerd and will be given as a survey of practical techniques which the audience may find useful in their own imaging research. The MRI signal of a single voxel is very complex in nature, and one must be careful to account for major physiological and exogenous effects when interpreting the signal. This lecture will discuss some of the common techniques that might illuminate MRI-signal changes due to disease and/or exogenous contrast agent accumulation. This lecture hopes to inspire the audience to use the discussed validation techniques not only to confirm hypotheses but also to explore deeper into the nature of the MRI signal.

Methods

This lecture will begin with a discussion of applications of optical microscopy to MRI research. The lecture will then move to electron microscopy and its use in measuring contrast agent size and in exploring tissue ultrastructure. Finally, other analytical techniques for quantifying parameters that might contribute to the MRI signal will be discussed.

Results and Conclusion

Upon completion of this lecture the audience will have a basic understanding of how to apply basic histology, electron microscopy, and analytical techniques to validate MRI results. While this lecture will merely survey a few validation techniques, the hope is that the audience will leave motivated to expand their toolbox for validation of MRI data.