

Assessment of mesoscopic properties of brain iron through a model-based analysis of magnetic susceptibility and $R2^*$ MRI in multiple sclerosis

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Inductively coupled plasma mass spectrometry (ICP-MS) of brain tissue has confirmed that both $R2$ and magnetic susceptibility increase linearly with the tissue iron concentration in humans without neurological diseases. However, being related to mesoscopic magnetic field inhomogeneities, $R2$ depends not only on the voxel-average concentration but also on the distribution of iron in the tissue. Quantitative Magnetic Susceptibility Mapping (QSM), on the other hand, is a recent MRI technique that may be regarded as a more direct measure of the iron concentration in the tissue. The goal of the present study was to exploit the dependence of both measures on physical interactions at different length-scales to retrieve information about the tissue micro-environment in vivo.

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