Multinuclear magnetic resonance spectroscopy for in vivo assessment of mitochondrial dysfunction in Parkinson’s disease.

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Parkinson’s disease (PD) is a common and often devastating neurodegenerative disease affecting up to one million individuals in the United States alone. Multiple lines of evidence support mitochondrial dysfunction as a primary or secondary event in PD pathogenesis; a better understanding, therefore, of how mitochondrial function is altered in vivo in brain tissue in PD is a critical step toward developing potential PD biomarkers. In vivo study of mitochondrial metabolism in human subjects has previously been technically challenging. However, proton and phosphorus magnetic resonance spectroscopy ((1)H and (31)P MRS) are powerful noninvasive techniques that allow evaluation in vivo of lactate, a marker of anaerobic glycolysis, and high energy phosphates, such as adenosine triphosphate and phosphocreatine, directly reflecting mitochondrial function. This article reviews previous (1)H and (31)P MRS studies in PD, which demonstrate metabolic abnormalities consistent with mitochondrial dysfunction, and then presents recent (1)H MRS data revealing abnormally elevated lactate levels in PD subjects.

PMID: 19076443