Analysis of *in vivo* redox status with magnetic resonance technique

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In vivo redox status is involved in processes of oxidative diseases. The redox imaging technique is important to diagnose redox-induced diseases and to access cure effects of pharmaceutical drugs. A group of nitroxyl radicals is sensitive to redox reactions and we have investigated mechanisms of oxidative diseases, including diabetes, ischemia reperfusion injuries and gastric ulcer. ESR technique has been utilized in analysis of free radicals, which is generated through imbalance of *in vivo* redox status. Overhauser enhanced MRI (OMRI) is a new technique for imaging *in vivo* redox status in animals via Overhauser effect. We have developed nanometer-scale imaging and simultaneous assessment of redox processes by using OMRI with ^{14}N- and ^{15}N- labeled nitroxyl probes with different distribution properties. OMRI imagers are, however, under development in labratory level and are only available as R&D system. We therefore developed a home-built OMRI imager based on an electromagnet for L-band ESRI. A mouse-sized phantom, which contained nitroxyl radical, was successfully imaged and resolved. This OMRI technique with dual probes may become a powerful tool to clarify mechanisms of disease and to monitor pharmaceutical therapy. We have been developing magnetic resonance approaches for imaging free radicals / redox status in living animals and its application to disease models will be also discussed.