Imaging analysis for multiple paramagnetic agents using OMRI and electrophoresis

Abstract

Nitroxides have been widely used as a molecular probe for analysis of various diseases models. This article describes an analytical method for separation and semi-quantification of multiple paramagnetic contrast agents with simple procedure combining electrophoresis and Overhauser enhancement magnetic resonance imaging (OMRI) imaging. We used three nitroxides, 3-carbamoyl PROXYL, 3-carboxy PROXYL, and CAT-1, which have different ionic charges in the molecule. In addition, we showed that this method could apply for in vitro measurement using biological sample. The results showed the nitroxides were successfully separated with electrophoresis depending on their charge, and their separation was visualized with OMRI after electrophoresis. Vehicle media such as whole blood did not affect the electrophoresis results and OMRI enhancement factor. Thus, the method can be used to analyze the redox status of biological samples without preprocessing. This analytical method enables in vitro measurement of biological samples to determine the redox status of specific tissue layers using paramagnetic agents, which is helpful for detailed analysis of redox-related diseases.