Quantitative ^{23}Na MRI of muscle foods

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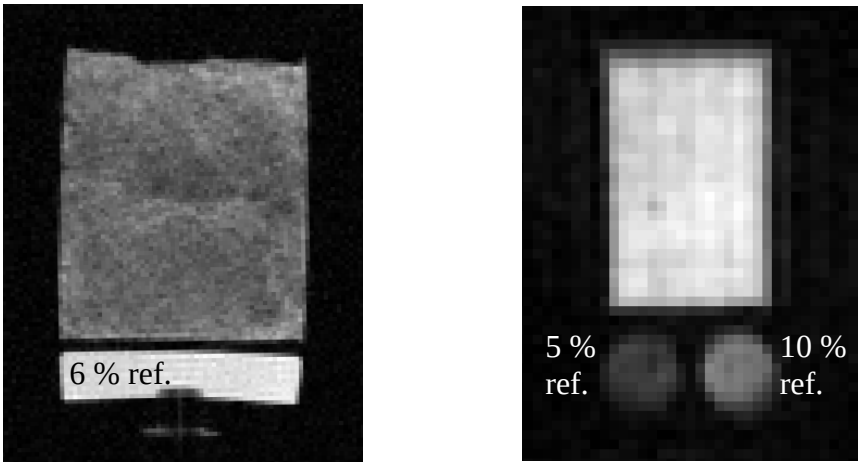
Abstract:
Quantitative sodium analysis in muscle foods by ^{23}Na MRI is traditionally considered problematic because of the well-known partial MRI sodium "invisibility" phenomenon reported earlier [1,2]. Partial ^{23}Na "invisibility" is often referred to as an inherent drawback of the MRI technique, impairing the quantitative sodium analysis.
Several model samples were designed to simulate muscle foods with a broad variation in the protein, fat, moisture and salt content. Spin-echo MRI technique and a recently developed SPRITE MRI approach [3,4] were applied for quantitative sodium imaging. Typical sodium images generated by these two methods from the same sample are shown in Fig. 1. Substantial underestimation of the salt content by the spin-echo technique and good correspondence between the SPRITE MRI sodium content and that determined by the reference chemical method were found. Thus the applicability of SPRITE MRI approach for accurate sodium quantification was demonstrated. ^{23}Na free induction decay and CPMG relaxation experiments were performed on the same sample set as well, additionally confirming that the sodium "invisibility" is rather a methodological problem that can easily be circumvented by using SPRITE MRI technique.



(a) (b)

Fig.1: (a) Spin-echo MRI and (b) SPRITE MRI image of the same sample.
Salt content determined chemically was 15.8 %.

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