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Can CEST contrast image gluten network?

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Non-coeliac gluten sensitivity (NCGS) is a major issue in our occidental countries. Unfortunately, the medical causes of this NCGS are unknown. One hypothesis to explain the development of the gluten sensibility deals with a longer and more complex gluten network leading to a lower digestibility. However, while the gluten is suspected to be responsible for the NCGS, it does not exist yet a non-invasive analytical method able to image the gluten network in food products.

The gluten network is made from the formation of disulfide bonds from thiols moieties. From a chemical point of view, it is dealing with an oxidation process and the loss of exchangeable protons. Chemical exchange saturation transfer (CEST) is an indirect metabolic contrast imaging the exchangeable protons [1]. While this method has been successfully applied to hydroxyl and nitrogen based moieties, the proof of concept on thiols functional groups has not yet been realized. In this presentation, we first demonstrate that thiol moieties are sensitive to CEST contrast. Then, we study the CEST effect obtained from dough products. Due to the presence of significant magnetization transfer effect of the immobile macromolecules, the CEST effect is not visible anymore in the experimental data. To extract the CEST effect from thiol moieties, our data were fitted with a 3-pool model [2].

We show that CEST might be an interesting contrast to detect gluten network. However, to obtain a reliable imaging method of the baking products, it will be important to limit the macromolecule magnetization transfer compared to the CEST effect.

[1] van Zijl P. C. M., Nirbhay N. Y. *Magn. Reson. Med.*, **2011**, 17: 927-948

[2] Zaiss, M. *NMR Biomed.*, **2014**, 31: 217-230