The distribution of sodium within cooked food and sodium interactions with the matrix depends on both food matrices and salting practices.

Cécile Leroy[1,2,3], Jean-Marie Bonny[1,2], Thierry Thomas-Danguin[3], Sylvie Clerjon[1,2]

France

[1]INRAE, QuaPA, F-63122 Saint-Genes-Champanelle, France

[2]INRAE, PROBE research infrastructure, AgroResonance facility, F-63122 Saint-Genes-Champanelle, France

[3]Centre des Sciences du Goût et de l'Alimentation, INRAE, CNRS, AgroSup Dijon, Université Bourgogne Franche-Comté, F-21000, Dijon, France

cecile.leroy@inrae.fr

Daily salt intake of most French people exceeds the recommendations of the World Health Organisation (5g/j). The Sal&Mieux research project tackles the question of salt in food while focusing on discretionary salt with the aim to contribute to prevent diseases linked to excessive sodium intake. Complementary to the work carried out by agri-food companies to reduce salt content in processed foods, it is critical to consider the salt added at home and to identify solutions for consumers to reduce their consumption of discretionary salt while preserving the food organoleptic qualities. In this work we investigated the interaction between discretionary salt and food matrices, using magnetic resonance imaging (MRI), in order to understand how sodium is localized and linked to the food matrix following home salting practices.

The quantification of nucleus density by MRI gives us access to salt distribution in cooked food. The influence of the moment of adding salt, namely during cooking or when seasoning directly in the plate, was examined by measuring the final distribution of salt in a carrot as food matrix either boiled in salted water or salted after cooking. In addition to quantitative MRI of sodium, 23Na and 1H NMR spectra were recorded to investigate sodium-matrix and water-matrix bonds in the food matrix. MRI and NMR acquisitions were carried out on a 9.4 T WB imager (Bruker, Ettlingen, Germany) equipped with micro-imaging gradients and a 1H / 23Na RF volume antenna (diameter 32 mm). We also developped and optimized an original sodium mapping protocol applied to real food matrices.

The first results showed that not all the salt entered into the carrot when cooked in boiling salted water. We observed a concentration gradient with less salt in the center compared to the edge of the carrot. In comparison, the images of a carrot boiled in salt-free water, but with salt added after cooking, showed a high concentration of salt on the edges of the carrot but none at the center. Considering these differences, it would be interesting to establish relationships with sensory evaluation data (esp. salty taste) and to follow the dynamics of salt release in the mouth for the two matrices. It is worth noting that salt diffusion is dynamic and the equilibrium is not reached when the product is consumed. We therefore need to perform quick acquisitions to be as close as possible to the salt distribution state reflecting the moment of food consumption in order to have a reliable comparison with the sensory data and sodium release data.

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