Abstract

The effect of salt substitutes on protein and water structures in muscle foods – a near infrared study

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Introduction
High sodium intake has been linked to detrimental health effects, and food manufacturers are faced with the dilemma of how to reduce sodium chloride content of foods without losing their palatability, taste, texture, processing yield and long shelf-life. Understanding the physical and chemical changes related to sodium chloride reduction and substitution in muscle food systems is thus of great importance, and near infrared (NIR) spectroscopy holds promise as a potential technique to investigate changes in protein and water structures in intact muscle food systems. In this study, NIR spectroscopy is used to study the effect of salt reduction and salt substitution (KCl and $MgSO_4$) in samples of beef muscle.

Materials and Methods
Samples of beef muscle (*longissimus dorsi)* were taken from four different animals after 48 h post rigor. Muscle blocks were placed in pure salt brines of NaCl, KCl and $MgSO_4$ (including salt mixtures) in 1.5%, 6% and 9% total salt concentration (21 different brines in total). Reflectance NIR measurements (400–2500 nm, digital resolution 0.5 nm) were obtained employing a NIRSystems Model XDS Rapid Content Analyzer (Foss NIRSystems, Silver Springs, MD, USA). For each sample 6 replicate measurements were obtained. NIR interpretations were facilitated employing FT-IR microspectroscopic data of corresponding samples.

Results and Discussion
The NIR data could be used to separate the muscle samples both according to salt concentrations and salt types. Feasible explanations on the changes in water and protein structures based on the variation in the NIR spectra were obtained, and data based on FT-IR microspectroscopy of the corresponding samples constituted a helpful guide in the interpretation.

Conclusion
NIR spectroscopy is a potential technique for probing effects of salt reduction and salt substitution in beef muscle. The technique provides useful interpretation and subsequent explanations both related to changes in water and protein structures.

Reference paper as:
N. Perisic, N.K Afseth, B. Narum, R. Ofstad and A. Kohler (2012)The effect of salt substitutes on protein and water structures in muscle foods – an near infrared study (abstract), in: Proceedings of the 15th International Conference on Near Infrared Spectroscopy, Edited by M. Manley, C.M. McGoverin, D.B. Thomas and G. Downey, Cape Town, South Africa, p. 427.