

# 3<sup>RD</sup> GLOBAL FOOD SECURITY, FOOD SAFETY & SUSTAINABILITY CONFERENCE

May 21-22, 2018 | New York, USA

## Combination of multivariate analysis and image processing for detection of protein in cooked pork sausages by using visible near-infrared hyperspectral imaging

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**Statement of the Problem:** Protein is an important parameter to evaluate for sausage products. If there is a precise, rapid and non-invasive method to evaluate the protein, it will facilitate the evaluation system and benefit for the online industrial applications. As an emerging technique, hyperspectral imaging (HSI) offers numerous advantages over conventional analytical methods, such as accurate prediction ability, visualization of the parameter via distribution map. However, protein prediction in ready-to-eat sausage has not been investigated.

**Objective:** The objective was to establish a quantitative partial least square regression (PLSR) model between the spectral data and protein contents of ready-to-eat cooked pork sausage with 57 d storage.

**Methodology & Theoretical Orientation:** 117 big cooked Japanese pork sausage slices (diameter:  $8.86 \pm 0.37$  cm; thickness:  $0.12 \pm 0.02$  cm; mass:  $6.85 \pm 0.12$  g) were purchased and randomly divided into 7 groups for up to 57 d storage. The HSI system (380-1000 nm) was used for image acquisition whilst multivariate analysis was carried out by using the Unscrambler software (X 10.3, CAMO Software Inc., Trondheim, Norway). The coefficients of determination ( $R_c2$  for calibration and  $R_p2$  for prediction) and root mean square error (RMSEC for calibration and RMSEP for prediction) were used for evaluate the predictive capabilities.

**Findings:** The model using full wavelengths obtained the high  $R_c2$  (0.90) and  $R_p2$  (0.91) with low RMSEC (0.05) and RMSEP (0.05). Seven important wavelengths (395, 405, 555, 615, 665, 975, 995) were selected. Simplified model derived from important spectra ( $R_c2=0.85$ ; RMSEC=0.06;  $R_p2=0.88$ ; RMSEP=0.06) showed comparably performance compared to that developed from full wavelengths. Protein distribution map was established based on the simplified models.

**Conclusion & Significance:** Hyperspectral imaging coupled with PLSR are competent to evaluate sausage protein up to 57 d storage.

1. Liu Y T and Yang Y (2017) Physical properties and volatile composition changes of cooked sausages stuffed in a new casing formulation based in surfactants and lactic acid during long-term storage. *Journal of Food Science*. 82 (3): 594-604.
2. Feng CH, Drummond L, Sun DW and Zhang ZH (2014) Evaluation of natural hog casings modified by surfactant solutions combined with lactic acid by response surface methodology. *LWT - Food Science and Technology*. 58 (2): 427-438.

### Biography

Chao Hui Feng has her expertise in modifying natural hog casing by using surfactant solution and lactic acid, applying innovative cooling method (immersion vacuum cooling) to packaged pork ham and Irish cooked sausages, to improve the cooling rate and reduce the cooling loss without compromising the quality of the meat products and estimating the meat quality by using hyperspectral imaging. With regard to her Postdoctoral work which is financially supported under the Japan Society for the Promotion of Science (No. P16104) and a Grant-in-Aid for Scientific Research (JSPS No. 16F16104), she evaluated the quality and safety concerns of processed meat based on hyperspectral analysis. Presently, she has 14 SCI papers as a first author accepted to be published in the peer-reviewed international journals.

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