

## Effects of ultrasound on the taste compound profile of unsmoked bacon

Wangang Zhang, Jian Zhang

College of Food Science and Technology, Nanjing Agricultural University, Nanjing, China

**Introduction:** As the increasing attention paid on food safety, unsmoked bacon could be a safer and healthier choice. However, the deficiency of insufficient taste existing in unsmoked bacon greatly impairs its market competitiveness. Ultrasound is a burgeoning technology and well used in food industry (Turantaş, Kılıç, & Kılıç, 2015). However, few studies have explored the influence of ultrasound on the taste profile of dry-cured meat products. Part of non-volatile metabolites are recognized as taste compounds (Sforza et al., 2006) and NMR technology is an effective method to identify these compounds. However, no published study has investigated the metabolites variation of unsmoked dry-cured bacon with <sup>1</sup>H NMR after ultrasound treatment. Therefore, the aim of this work was to explore the effects of ultrasound on the taste compound profile of unsmoked bacon.

### Materials and methods:

- 1 Production process referred as Jin et al. (2010). The process included the selection of raw bacon, salting (3% salt and 0.01% nitrite for 2 days) and dry-ripening (with temperature from 15 to 30 °C (increasing with 1.5 °C/d) and relative humidity from 80% to 75% (decreasing with 0.5%/d) for 10 days).
- 2 Ultrasound treatment: after salting, raw bacons were subjected to 0, 250, 500 and 750 W for 1 h in ultrasonic bath (24.5 kHz) respectively.
- 3 Sample extraction and NMR determination referred as Xiao et al. (2019).
- 4 Pathway analysis used MetaboAnalyst 5.0.

### Results:

#### 1 Identified metabolites

Sixty metabolites were recognized and quantified. The concentration of total metabolites, total organic acids and total free amino acids were higher in each ultrasonic group than 0 W, and the highest values were presented in 500 W treatment.

#### 2 Multivariate statistical analyses of metabolites

From PCA plot, the metabolite profiling of unsmoked bacon was significantly changed after ultrasonic treatment, and the 0 W and 500 W groups had the most significant difference. Basing on the OPLS-DA of 0 W and 500 W, 21 metabolites (VIP > 1) were discriminated as significantly different metabolites.

#### 3 Significantly different metabolites related to taste development (SDMRTD)

Combining the results of VIP > 1, p < 0.05 and TAV > 1, nine metabolites (alanine, arginine, glutamate, isoleucine, lysine, tyrosine, valine, creatine and lactate) were screened as SDMRTD after ultrasound treatment.

#### 4 Metabolic pathway

Basing on KEGG date library, six metabolic pathways (tyrosine metabolism, alanine, aspartate and glutamate metabolism, pyruvate metabolism, arginine and proline metabolism, valine, leucine and isoleucine biosynthesis and lysine degradation) were screened and regarded as major pathways closely related to taste development after ultrasound treatment.

**Conclusion:** Ultrasound could effectively improve the taste profile of unsmoked bacon. Nine metabolites were selected as SDMRTD and six screened metabolic pathways were closely related to the taste development of unsmoked bacon after ultrasound treatment.

**Acknowledgements and Financial support statement:** This work was financially supported by the National Key R&D Program of China (2016YFD0400700, 2016YFD0400703).

### Literature:

- Jin, G., Zhang, J., Yu, X., Zhang, Y., Lei, Y., & Wang, J. (2010). Lipolysis and lipid oxidation in bacon during curing and drying-ripening. *Food Chemistry*, 123(2), 465-471.
- Sforza, S., Galaverna, G., Schivazappa, C., Marchelli, R., Dossena, A., & Virgili, R. (2006). Effect of extended aging of Parma dry-cured ham on the content of oligopeptides and free amino acids. *Journal of Agricultural and Food Chemistry*, 54(25), 9422-9429.
- Turantaş, F., Kılıç, G. B., & Kılıç, B. (2015). Ultrasound in the meat industry: General applications and decontamination efficiency. *International Journal of Food Microbiology*, 198, 59-69.
- Xiao, Z., Ge, C., Zhou, G., Zhang, W., & Liao, G. (2019). <sup>1</sup>H NMR-based metabolic characterization of Chinese Wuding chicken meat. *Food Chemistry*, 274, 574-582.