SIFF 2026
Singapore International Food Forum 2026

Sensomics-Based Decoding of Meat Flavor: From Key Odorants and Tastants to Alternative Protein Systems

C. A. Stübner[a,b], A. Spaccasassi[a,b], S. Pillai[a,b], H. Q. Yeo[a,b], N. Willanda[a,b], J. Heidenkampf[a,d], M. Reiter[a,d], V. Mittermeier-Kleßinger[a,d], N. Basri[c], A. Thong[c], C. Dawid[a,b,d,e]

[a] *TUM Create, 1 Create Way, #10-02 CREATE Tower, Singapore 138602*
[b] *Chair of Food Chemistry and Molecular and Sensory Science, TUM of Life Sciences, Technical University of Munich, Lise-Meitner-Str. 34, Freising 85354, Germany*
[c] *Singapore Institute of Food and Biotechnology Innovation, Agency for Science, Technology and Research (A*STAR), Singapore City, Sinapore*
[d] *Professorship for Chemosensory Food Systems, TUM School of Life Sciences, Technical University of Munich, Lise-Meitner-Str. 34, Freising 85354, Germany*
[e] *Leibniz Institute for Food Systems Biology at the Technical University of Munich, Lise-Meitner-Str. 34, Freising 85354, Germany*

Abstract
Meat has been a valued protein source in the global human diet for decades due to its protein content of around 30% and biological value of around 80%. [1] However, in recent years, there has been increasing interest in developing alternative protein products due to increasing environmental, ethical, and sustainability concerns related to meat production. [2] This transition is particularly relevant in regions such as Singapore, where local agricultural production is limited and alternative protein strategies are of growing interest. [3] Although consumers increasingly demand protein-rich and sustainable products, flavor, including both aroma and taste, is a major driver of consumer acceptance and purchase decision. [4] Consequently, the development of alternative protein products must address equivalence not only in terms of nutritional value but also flavor properties compared to animal meat.

The characteristic flavor properties of meat are generated through several enzymatic and thermally induced non-enzymatic reactions involving amino acids, peptides, reducing sugars, lipids, sulfur-containing compounds, and other precursors. [5] These reactions lead to the formation of numerous odor-active and taste-active compounds, of which only a limited subset significantly contributes to the characteristic sensory perception as key odorants and key tastants. [6] To obtain meat-like flavor systems, a detailed molecular understanding of the responsible compounds, their precursors, and their formation pathways is essential.

This presentation will highlight analytical and sensory workflows based on the SENSOMICS approach, including LC-MS/MS analysis, for decoding meat flavor. In addition, the key odorants and tastants responsible for the characteristic flavor of chicken and beef meat will be emphasized. Furthermore, perspectives on the transfer of this molecular knowledge to alternative protein systems based on soy and microalgal proteins for the targeted generation of chicken- and beef-like flavor profiles will be outlined.

References

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