



HAL
open science

Understanding the in-mouth release of aroma sulfur compounds from food precursors and the role of microbial C-S lyases

Mathieu Schwartz, Nicolas Poirier, Jade Moreno, Francis Canon, F. Neiers

► To cite this version:

Mathieu Schwartz, Nicolas Poirier, Jade Moreno, Francis Canon, F. Neiers. Understanding the in-mouth release of aroma sulfur compounds from food precursors and the role of microbial C-S lyases. 2. international Meet on food science and technology, Aug 2023, Vancouver, Canada. hal-04464859

HAL Id: hal-04464859

<https://hal.inrae.fr/hal-04464859>

Submitted on 19 Feb 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Understanding the in-mouth release of aroma sulfur compounds from food precursors and the role of microbial C-S lyases

Mathieu Schwartz*, Jade Moreno, Nicolas Poirier, Francis Canon, Fabrice Neiers

Center for Taste and Feeding Behavior (CSGA), INRAE, University of Burgundy, CNRS, Institut Agro
17 rue Sully, 21000 Dijon, France

*Corresponding Author E-mail: mathieu.schwartz@inrae.fr

ABSTRACT

Flavor perception is the main factor in the acceptance of food. Cysteine conjugates are aroma precursors present in a number of plant-based foods (vegetables, fruits, as well as beverages such as wine and beer). They have low odorant properties, but become odorant when metabolized into aroma sulfur compounds in the oral cavity [1]. The metabolism involved in the production of these sulfur compounds has been associated with food aversion [2]. Therefore, it is desirable to improve our knowledge of the entailed enzymatic mechanisms. The involved enzymes are presumably carbon-sulfur lyases (C-S lyases) from the oral microbiota, but evidences are scarce [3]. Recently, we showed that saliva metabolizes allyl-cysteine into odorant sulfur metabolites, with evidence suggesting that pyridoxal phosphate-dependent C-S lyases are involved [4]. Protein sequence analysis of C-S lyases in the oral anaerobe *Fusobacterium nucleatum* was carried out and led to the identification of several putative targets. The C-S lyase FnaPatB1 from *F. nucleatum animalis*, showed high activity with a range of aroma precursors. FnaPatB1 metabolizes cysteine derivatives within a unique active site environment that enables the formation of flavor sulfur compounds. As sulfur compounds can be associated with food aversion especially at high concentration, we have designed an *in vitro* assay, based on the recombinant enzyme, to identify inhibitors of the C-S lyase activity. Among a food compounds library, we identified several compounds able to reduce the C-S lyase activity of FnaPatB1 *in vitro*. Future prospects will rely on the study of this oral microbiota metabolism and strategies to control it using both *in vitro* and *ex vivo* approaches.

Keywords: flavor, volatile sulfur compounds, oral microbiota, enzymes

Bibliography

- [1] Starckenmann, C.; Le Calve, B.; Niclass, Y.; Cayeux, I.; Beccucci, S.; Troccaz, M. Olfactory Perception of Cysteine-S-Conjugates from Fruits and Vegetables. *J Agric Food Chem* 2008, 56 (20), 9575–9580. <https://doi.org/10.1021/jf801873h>.
- [2] Frank, D.; Piyasiri, U.; Archer, N.; Heffernan, J.; Poelman, A. A. M. In-Mouth Volatile Production from Brassica Vegetables (Cauliflower) and Associations with Liking in an Adult/Child Cohort. *J Agric Food Chem* 2021, 69 (39), 11646–11655. <https://doi.org/10.1021/acs.jafc.1c03889>.
- [3] Schwartz, M.; Canon, F.; Feron, G.; Neiers, F.; Gamero, A. Impact of Oral Microbiota on Flavor Perception: From Food Processing to In-Mouth Metabolization. *Foods* 2021, 10 (9). <https://doi.org/10.3390/foods10092006>.
- [4] Neiers, F.; Gourrat, K.; Canon, F.; Schwartz, M. Metabolism of Cysteine Conjugates and Production of Flavor Sulfur Compounds by a Carbon–Sulfur Lyase from the Oral Anaerobe *Fusobacterium Nucleatum*. *J. Agric. Food Chem.* 2022, 70 (32), 9969–9979. <https://doi.org/10.1021/acs.jafc.2c01727>.