

Perceived Sensory Differences Among Enzyme-Modified Cheeses by Themselves and When Added to Processed Cheese

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INTRODUCTION:

WHAT ARE ENZYME-MODIFIED CHEESES?

Enzyme-modified cheeses are food ingredients made by adding enzymes to natural cheese to speed aging. This creates a cheese-like product with a **VERY** concentrated cheese flavor.

WHY USE ENZYME-MODIFIED CHEESES?

People love cheesy products—nacho cheese, mac & cheese, cheese spread, etc.—but using naturally-aged cheese to flavor these products is costly and inefficient. Enzyme-modified cheeses are produced more quickly and for more less money, making them a better source of cheese flavor.

THE GAP IN OUR KNOWLEDGE:

It is not well understood if and how the distinct aromas, flavors, and tastes of different enzyme-modified cheeses are perceived when they are added to processed cheese.

AIM:

- To examine if and how the distinct aromas, flavors, and tastes of nine enzyme-modified cheeses are perceived when they are added to processed cheese.

METHODS:

SUMMARY:

- Completed descriptive analysis training and testing of **nine** processed cheeses each flavored with a different, previously characterized, enzyme-modified cheese.
- Compared the results from the training and testing of the processed cheeses to the results previously collected for the enzyme-modified cheeses.

DETAILS:

PROCESSED CHEESE TRAINING:

- Who:** Eleven panelists, of which 7 had participated in the descriptive analysis of the enzyme-modified cheeses.
- What:** Panelists developed a processed cheese lexicon and practiced rating the intensity of the lexicon aromas, flavors, and tastes on calibrated scales.
 - To develop the lexicon, panelists worked as a group to select terms, definitions, and references for the tastes, flavors, and aromas of the processed cheeses.

PROCESSED CHEESE TESTING:

- Who:** The eleven panelists who developed the processed cheese lexicon.
- What:** Each panelist evaluated the nine processed cheeses one-at-a-time by rating the intensity of their tastes, flavors, and aromas.
 - The nine processed cheeses used in training were evaluated in duplicate.

ENZYME-MODIFIED CHEESE DATA:

- Enzyme-modified cheese data from a previous study were used¹.

DATA ANALYSES:

- Analyses of variance** ← identified attributes within which the processed cheeses differed ($p < 0.05$).

MOST SENSORY DIFFERENCES AMONG ENZYME-MODIFIED CHEESES ARE NOT PERCEIVED WHEN THEY'RE USED IN PROCESSED CHEESE.

RESULTS:

Table 1a-c. Comparison of the aromas, tastes, and flavors that were included in the lexicons for the enzyme-modified cheeses and processed cheeses. Aromas, tastes and flavors that differed in intensity among the nine enzyme-modified cheeses are highlighted in yellow, and those that differed in intensity among the nine processed cheeses are highlighted in teal.

Aromas	
Aromas perceived in the enzyme-modified cheeses*	Aromas perceived in the processed cheeses
Overall aroma	Overall aroma
Ammonia	---
Artificial cheese powder	Artificial cheese powder
Artificial cheese spread	Artificial cheese spread
Blue-veined cheese	---
Butter	Butter
Cultured dairy	Buttermilk
Butyric acid	---
---	Cauliflower
Aged Cheddar	Cheddar
Cheese stick	Cheese stick
Cooked milk	---
Dairy	Cream
Diacetyl	Diacetyl
Dill	---
Earthy	---
---	Fresh milk
Goat cheese	---
Hay	---
Horseradish	---
Lemon	---
Nutritional yeast	---
---	Old milk
Parmesan	Parmesan
---	Smoke
Cultured dairy	Sour cream
---	Starchy
Steamed corn	Steamed corn
Sulfurous	---
Swiss cheese	Swiss
Turmeric	---
Wheat germ	---

Tastes	
Tastes perceived in the enzyme-modified cheeses*	Tastes perceived in the processed cheeses
Bitter	Bitter
Salty	Salty
Sour	Sour
Sweet	Sweet
Umami	Umami

Flavors	
Flavors perceived in the enzyme-modified cheeses*	Flavors perceived in the Processed cheeses
Overall flavor	Overall flavor
---	Artificial cheese powder
Artificial cheese spread	Artificial cheese spread
Astringency	Astringent
Blue-veined cheese	---
Butter	Butter
Aged Cheddar	Cheddar
---	Cheese stick
Dairy	Cream
---	Fresh milk
Goat cheese	---
Horseradish	---
Lemon	---
Parmesan	Parmesan
Cultured dairy	Sour cream
Steamed corn	---
Swiss cheese	Swiss
Turmeric	---

* Data from Kleba, S., Vickers, Z. (2020, July). Lexicon development for Cheddar-type enzyme-modified cheeses (EMCs) and the relationship between sensory and compositional properties. Poster presented at SHIFT2020, virtual. Retrieved from <https://sensorycenter.cfans.umn.edu/recent-posters>

WHERE DO WE GO FROM HERE?

- Future research should focus on how to maintain the distinct characteristics of different enzyme-modified cheeses when they're added to other products.
- Current manufacturers should start conducting descriptive analysis of all their enzyme-modified cheese-containing products to ensure the unique characteristics of each enzyme-modified cheese are still perceivable.

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REFERENCES

- Kleba, S., Vickers, Z. (2020, July). Lexicon development for Cheddar-type enzyme-modified cheeses (EMCs) and the relationship between sensory and compositional properties. Poster presented at SHIFT2020, virtual. Retrieved <https://sensorycenter.cfans.umn.edu/recent-posters>