Sensory 101: Basics Tastes of Cheese

Pat Polowsky
Wisconsin Center for Dairy Research
Interactive Session

Text ACScheese to 22333
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Basics of Sensory Evaluation

Thresholds

- Detection
- Identification

Sensory Fatigue

- Spit, don’t swallow
- Palate cleansing between samples

Concentration
Basics of Sensory Evaluation

- Increased with experience
- Increased by hunger
- Decreased by satiety
- Sensory Ability
  - Sensory Sensitivity
  - Types of Tests
    - Descriptive (trained)
    - Hedonic (consumer)
Sensory Errors

Adaptation: change in sensitivity to a stimulus caused by continued exposure.

- Solution: rest time between samples.
Sensory Errors

**Logical error:** two or more characteristics are associated in the mind of the assessor.

- Solution: keep samples uniform, mask visual differences, break logical associations by doctoring samples during training.

**Halo effect:** evaluation of one attribute influences the response in another attribute.

- Solution: present separate sets of samples for evaluation of specific attribute.

**Order of presentation:** first sample influences assessment of next samples.

- Solution: use a balanced, randomized order of presentation.

**Mutual suggestion:** response of a panelist is influenced by another panelist. Even facial expressions can bias responses.

- Solution: separate panelists into booths, minimize interaction, training.
Let’s Taste

• Sucrose (sugar) in water
• Does it have aroma?
• Easily influenced by aroma
• Does lactose make cheese sweet?

Relative Sweetness

<table>
<thead>
<tr>
<th>Sugar</th>
<th>Relative Sweetness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fructose</td>
<td>173</td>
</tr>
<tr>
<td>Sucrose</td>
<td>100</td>
</tr>
<tr>
<td>HFCS-42</td>
<td>100</td>
</tr>
<tr>
<td>Honey</td>
<td>97</td>
</tr>
<tr>
<td>Glucose</td>
<td>74.3</td>
</tr>
<tr>
<td>Maltose</td>
<td>32.5</td>
</tr>
<tr>
<td>Galactose</td>
<td>32.1</td>
</tr>
<tr>
<td>Lactose</td>
<td>16</td>
</tr>
</tbody>
</table>
Basics of Perception

- We have built-in:
  - Chemical detectors
  - Light detectors
  - Pressure detectors
  - Temp detectors
Sight

• First impression

Which one has more flavor?
Basic Appearance of Cheese

Open Slits

Blind

Watering Off

Crystals
Touch

Touch

Mouthfeel
Basic Textures of Cheese

- Short
- Weak
- Pasty
- Curdy
- Crumbly
- Mealy
- Grainy
- Chalky
Sound

- Tympanic
- Bone conduction
  - Crunchy
  - Squeaky
  - ?
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Smell

- Respiration
- Mastication
- Temperature
- Fat soluble
Taste

Mastication

Temp/Pain

Water soluble

AHHH! Yum!
Tongue Map

D.P. Hanig. Zur Psychophysik des Geschmackssinnes → Edwin G. Boring
Let’s Taste

• Sodium chloride in water
• Does it have aroma?
• Flavor enhancer
**Bitter Blind**

Taster Types

- **Super taster**: 25%
- **Non taster**: 25%
- **Normal taster**: 50%

1-in-5 to 1-in-4 → bitter blind

“Blind” → higher threshold

**Causes:**
- Genetics
- Fungiform papillae
Let’s Taste

• Caffeine in water
• Does it have aroma?
• Many bitter receptors
• Common bitter foods:

- Bitter peptides
- Naringin
- Phenolics
- Humulone
- Caffeine
- Theobromine
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Flavor = Taste + Aroma

“The whole is greater than the sum of its parts”
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Cheese Flavors

- 150+ known attributes
- Many distinct flavors

cheesescience.org/wheel/
Let’s Taste

- Lactic acid in water
- Does it have aroma?
- In high amounts often causes *astringency*
- **Sources of acid in cheese:**
  - Starter culture metabolism (lactic acid)
  - Adjunct cultures (swiss cheese → propionic acid)
  - Direct acidification (lactic acid, citric acid, acetic acid)

Lactose $\rightarrow$ Lactic acid
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Trigeminal

• Tongue can sense things other than taste
• Sensations that trigger trigeminal nerve
  • Astrigency
  • Pungency (hotness)
  • Metallic
  • Temperature
  • Others
Lexicon

- A list of terms with definitions and references

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Definition</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet</td>
<td>Basic taste sensation elicited by sugars</td>
<td>5% sucrose in water</td>
</tr>
<tr>
<td>Salt</td>
<td>Basic taste sensation elicited by salt</td>
<td>0.5% NaCl in water</td>
</tr>
<tr>
<td>Acid</td>
<td>Basic taste sensation elicited by acids, sour</td>
<td>0.08% lactic acid in water</td>
</tr>
<tr>
<td>Bitter</td>
<td>Basic taste sensation elicited by bitter compounds</td>
<td>0.05% caffeine in water</td>
</tr>
</tbody>
</table>

cheesescience.org/cheddarlexicon.html
Sensory Training

1. Establish lexicon
2. Agree on definition
3. Find references
   - Non-food (e.g. struck match for sulfur)
   - Food, non-cheese (e.g. boiled egg for sulfur)
   - Cheese (e.g. sulfury NE cheddar)
4. Train using references
5. Identify in cheese
6. Quantify in cheese
Sensory Training

- Practice!
- Discuss!
- Always a group activity!

<table>
<thead>
<tr>
<th>CHEESE SENSORY LAB</th>
<th>TEXTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEAK</td>
<td>PASTY</td>
</tr>
<tr>
<td>CRUMBLY</td>
<td>CURDY</td>
</tr>
<tr>
<td>MEALY</td>
<td>GRAINY</td>
</tr>
</tbody>
</table>

<table>
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</tr>
<tr>
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</tr>
<tr>
<td>BUTTERY</td>
</tr>
<tr>
<td>MILKY</td>
</tr>
<tr>
<td>COOKED</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WHEY TAINT</th>
<th>GRASSY</th>
<th>MUSTY</th>
<th>AMMONIA</th>
<th>KETONE-MEDICINAL</th>
<th>UNCLEAN</th>
<th>LIGHT OXIDIZED</th>
</tr>
</thead>
<tbody>
<tr>
<td>OXIDIZED</td>
<td>CONTROL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

Photo by Claire Menck
Applying to Cheese

Preference Map for Cheese Products

MFA Cheddar Napping Bi-plot

Product 1
Product 2
Product 3
Product 4
Defect vs. Attribute

Defect
• An attribute that doesn’t belong (or is at wrong level)
• Product specific in many cases

Attribute
• A defined characteristic
• Found across products

Example: Calcium Lactate crystals
Attribute → Defect

Is this a defect? ↓
Let’s taste cheese!
Sweet

Used to mean:
- Lack of acid
- Fresh dairy
- “Sweet”

Examples:
- Colby
- Mascarpone
- Aged Gouda
- Swiss
- Brunost

Reference
Sucrose solution (5%)

Cheese
Sweet Cheddar
Sweet Reception

5-6 sets of locks…

...multiple keys for each lock

Proline

Reb A

SWEET
Salt

• Flavor enhancer
  • Enhances other flavors
  • “ Masks” unclean flavors

• Examples:
  • Almost all cheeses (at various amounts)
  • Low in Paneer, Swiss
  • High in Feta, Pecorino Romano, Mizithra

<table>
<thead>
<tr>
<th>Reference</th>
<th>Cheese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium chloride</td>
<td>Pecorino Romano</td>
</tr>
<tr>
<td>solution (0.5%)</td>
<td></td>
</tr>
</tbody>
</table>

@CHEESESOCIETY #CHEESE2016
Salt’s Mechanism

Main “salty” sensation

Na⁺

Cl⁻

“Modulates” salty taste

Oral Cavity

α, β, γ Protein Units

Lipid Bilayer

Interior of Taste Receptor Cell

Na⁺ → → Release of Neurotransmitters
Acid

• Prominent in many cheeses
  • Needs to be balanced with other tastes/flavors

• Often modulates salty taste
  • Acid and salt can boost each other

• Examples:
  • Cheddar, acid-set cheeses, low pH cheeses

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Lactic acid solution (0.08%)</td>
<td>Feta</td>
</tr>
</tbody>
</table>
Changing Acidity

• Taste cross-section of brie
Bitter

• Not always a defect
  • Balanced with other flavors

• Examples:
  • Aged Cheddar
  • Overripe Brie

<table>
<thead>
<tr>
<th>Reference</th>
<th>Cheese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caffeine solution (0.05%)</td>
<td>Aged Cheddar</td>
</tr>
</tbody>
</table>
Bitterness

Proteolytic Flavors

Large intact protein
Too bulky to interact with taste/olfactory receptors

Protease

Peptide fragments
Small enough to interact

BITTER

Protease

Free amino acids & more flavor…
Thank You!

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Funded by Dairy Farmers through

Wisconsin Milk Marketing Board
Wisconsin Dairy Producers

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