Sensory and satiety considerations for protein-rich products

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Werribee, 6 March 2019

Overview

• Texture

• Mouth coating / tooth-packing, astringency

• Taste, umami

• Different proteins

• Sensory specific satiety

• Satiety
**Texture**

- High protein products are firmer / more dense / less creamy
  - Firmer products need more oral processing

- Especially problematic for elderly people
  - Satiating effect
  - Denture issues

- Challenge to make high protein products for dysphagia suffers

**Example**

- Enriched with plant based protein
  - Chocolate brownies
  - Apfelstrudels
  - Cakes with fruit filling
    - Different proteins used for cake and for filling

- Softer texture
  - Veal

**Sensory and satiety considerations for protein-rich products**

- "Almost broke my dentures"
- "Hard as a brick"
- "Like wall paper glue"
- "Very cohesive filling"
- "Extremely bland"
Mouth coating granules, astringency

• “Astringency is a tactile sensation described as dryness, tightening, and puckering sensations perceived in the oral cavity” (Fermented Foods in Health and Disease Prevention, 2017)

• Result of binding with salivary proteins

• Astringency more pronounced in beverages with >3% whey protein and low pH (Beecher et al. 2008, doi:10.3168/jds.2008-1083)

Taste, umami

• Umami taste is linked to foods high in protein
  • L-glutamate stimuli
    – Fish, seafood, seaweeds, aged cheese, soy sauce, egg yolks, chicken, pork, beef, tuna, dried mushrooms

• Treatment of products can increase free AA, incl. L-glutamate
  – For example, during the process of ageing beef the concentration of free L-glutamate has been shown to increase by approximately 33% over eight days, umami taste potentiation can occur
Different proteins

- Meal replacement bars made with:
  - Whey protein: sweet aromatic and vanilla, adhesive and cohesive texture
  - Soy protein: nutty, tooth-packing and dense

- Meal replacement beverages made with:
  - Whey protein: sweet aromatic and vanilla flavour
  - Soy protein: cereal / grainy flavour
  - Consumer acceptance scores were higher for prototypes containing whey protein or a mixture of whey/soy protein than with soy protein alone

- Yogurt with soy protein: darker, more chalky texture, less sweet

Yogurt different casein:whey ratios

Control = 80:20, Y30 = 70:30, Y40 = 60:40, Y50 = 50:50

Sensory descriptive analysis by trained panel

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(Schouteten et al. 2016, doi: 10.1016/j.foodqual.2016.03.011)

**Table 4**
Frequency count of sensory terms across products under blind and informed conditions (n = 53).

<table>
<thead>
<tr>
<th>Sensory term</th>
<th>Blind based</th>
<th>Plant-based</th>
<th>Insect-based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aftertaste</td>
<td>21</td>
<td>25</td>
<td>16</td>
</tr>
<tr>
<td>Brown colour</td>
<td>32</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>Dry</td>
<td>2</td>
<td>16</td>
<td>47</td>
</tr>
<tr>
<td>Granular</td>
<td>3</td>
<td>19</td>
<td>33</td>
</tr>
<tr>
<td>Homogeneous</td>
<td>12</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Juicy</td>
<td>37</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Meat aroma</td>
<td>22</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Meat flavour</td>
<td>31</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Nutty flavour</td>
<td>1</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Off-flavour</td>
<td>9</td>
<td>32</td>
<td>29</td>
</tr>
<tr>
<td>Salty</td>
<td>12</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Soft</td>
<td>28</td>
<td>19</td>
<td>5</td>
</tr>
</tbody>
</table>

(Sensory specific satiety)

• High protein foods yield faster sensory specific satiety
  (Vandewater & Vickers, 1996)

12 week intervention:
- Juices, soups, snacks: declined
- Bread, desserts, veal: stable

Cater with Care
Increased Satiety

• High protein meals & foods accelerate satiety
  • Elderly market: reduce portion sizes?
    – Meal size reduction \( \text{(Ziylan et al. 2016)} \)

• Different sources?
  • Whey and fish proteins more satiating than others? \( \text{(Gilbert et al. 2010)} \)

  • Composition of the whole meal / product!!

Take home messages

• Firmer, more dense, harder textures

• Different sources of protein alter flavour and texture differently

• pH influences astringency perception

• Different target consumers, different needs

• Sensory specific satiety problematic with high protein foods?
Thank you