How does a sheep learn about a new food?

Produced for the CRC for Premium Quality Wool undergraduate program by;
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Identification of Food

- **Cues**
  - Visual (general location)
  - Olfactory or texture (mouth)
    - Innate responses?
  - Taste (swallow)
    - Innate responses?

- **Sensory Specific Satiety**
  - concept that animals will always include a small amount of a less preferred food.
Table 1.3. The effect of various concentrations of sweet (sucrose), sour (HCl), salt (NaCl), bitter (urea) and umani (monosodium glutamate, MSG) on intake of lucerne pellets.

<table>
<thead>
<tr>
<th></th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Sucrose</td>
<td></td>
</tr>
<tr>
<td>HCl</td>
<td></td>
</tr>
<tr>
<td>NaCl</td>
<td></td>
</tr>
<tr>
<td>Urea</td>
<td></td>
</tr>
<tr>
<td>MSG</td>
<td></td>
</tr>
</tbody>
</table>

a = Increased intake compared to control.
b = Decreased intake compared to control.
c = Similar intake compared to control.

### Table 1.2

The number (total of 16 per group) of sensory impaired sheep which accepted wheat over 5 days, and the mean wheat intake (grams per head) for five days.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Number of animals feeding by day 5</th>
<th>Mean wheat intake/head (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blind</td>
<td>14</td>
<td>460</td>
</tr>
<tr>
<td>Deaf and anosmic</td>
<td>13</td>
<td>362</td>
</tr>
<tr>
<td>Deaf</td>
<td>14</td>
<td>316</td>
</tr>
<tr>
<td>Deaf and blind</td>
<td>9</td>
<td>305</td>
</tr>
<tr>
<td>Control</td>
<td>15</td>
<td>198</td>
</tr>
<tr>
<td>Deaf, blind and anosmic</td>
<td>6</td>
<td>177</td>
</tr>
<tr>
<td>Anosmic</td>
<td>14</td>
<td>165</td>
</tr>
<tr>
<td>Anosmic and blind</td>
<td>9</td>
<td>141</td>
</tr>
</tbody>
</table>
Experience

• **Neophobia - “fear of new”**
  - Feeding sequence?
    - Do animals establish a pattern of “testing?”
  - Overcome by learning (social facilitation)
    - The rate of learning about new foods is influenced by maternal food choices
  - Cue associations and early experience
    - There is a possibility that animals are more sensitive to some sensory cues early in life
Learning about a new food - wheat

![Graph showing wheat intake over days for two conditions: no prior experience and prior experience.](graph.png)

Source: Chapple and Lynch (1986)
Social effects on learning about food

![Graph showing intake (g/head/day) over age (months) for different conditions.](Image)

- **Control**
- **Without Mothers**
- **With Mothers**

**Source:** Lynch, et al. (1992)
Sensitive Period for Cues?

• Cues : Flavour and Odour
  – learnt via olfactory learning vs innate?
  – sensitive period in early life?
  – hormonal modulation of olfactory sensitivity?

• Flavour Enhancers
  – Not an issue for grazing animals but of interest to feed manufacturing companies for supplementary feeds and or specialised feeds for monogasstrics.
Post-Ingestive Consequences

- The memory about a food is associated with the link between cues and post-ingestive outcome.

- Negative post-ingestive outcome creates an Aversion?
  - Toxins - alkaloids, phenolics (tannins), terpenoids

- Positive post-ingestive effects difficult to demonstrate. Maybe associated with the correction of a nutrient imbalance?
Loss of an Aversion to Lucerne

Disappearance of Li-induced Aversion to Lucerne

Intake (bites/2 min)

200
150
100
50
0


Li group
Control

Source: Waters (unpublished)