The Effect of Repeated Exposure to Herb and Spice Seasoning in Low Salt Tomato Soup on Consumer Liking

Ian Rowland
Department of Food & Nutritional Sciences
University of Reading
Conflict of interest regarding this presentation:

McCormick Science Institute

I wish to declare a potential conflict of interest, and that I have received direct industry support in relation to all or part of the results presented here.
Background

- In most countries the targets for reduction in salt intake are not met by the majority of the population.
- In western populations, approximately 75% of dietary salt is derived from processed food.
- Decreasing salt in processed food is challenging for the food industry ➔ adverse effect on product sensory profile and hence consumer acceptability.
- Herbs & spices with savoury aromas (‘salt congruent’) could enhance salty taste.
Hypothesis:

Herbs and spices will enhance liking of lower salt version of a standard soup.
Aims

1. To establish whether incorporation of H&S into low salt tomato soup would give an immediate improvement in the hedonic liking

2. To repeatedly expose subjects to the tomato soup over 3 d and assess changes in acceptability, familiarity and consumed volume over exposure time.

3. To assess the effect of adding H&S to low salt soup on perception of salty taste
Study Plan -1

• **Soup**
  – Tomato Soup (instant soup powder)
  – For taste tests - 30ml soup in cup
  – For repeat exposure tests - 400ml soup

• **Preliminary study:** Determine low salt level to use in main study
  – 100 subjects compared standard salt soup (0.5% w/w salt) with reduced salt variants (30, 40, 50% reduction)
  – Standard salt soup had highest overall liking
  – 50% reduced salt soup was significantly less liked ➔ used in main study
Subjects

160 consumer recruited (148 completed study)
- age 35-60
- balance of low & high socio-econ groups
- balance of male / female
- 24 h urine samples taken to assess salt intake: balance low/high salt intake across exposure groups
- Each completed FFQ (EPIC) as measure of salt intake

Exclusion criteria
- H&S rejecters
- vegetarians
- Medical conditions/drugs affecting taste/smell/appetite

Subjects were given no information on aim of study
Study plan: Liking of H&S Mods

150 subjects scored liking of low salt soup flavoured with 3 different blends of H&S ➔ soup to use in main study

<table>
<thead>
<tr>
<th>H &amp; S modification</th>
<th>Overall liking</th>
</tr>
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<tbody>
<tr>
<td>Oregano, Bay, Celery, Garlic and Black Pepper</td>
<td>57</td>
</tr>
<tr>
<td>Basil, Black pepper, Celery, Garlic</td>
<td>55</td>
</tr>
<tr>
<td>Cumin, Coriander, Celery seed, Garlic</td>
<td>54</td>
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</tbody>
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No significant difference in any variant, but Oregano variant chosen on basis of cluster analysis

For main study

- Std soup = 0.57% salt
- Low salt (LS) = 0.26% (53% reduction)
- LS + HS = 0.26%
Study design

All taste 3 soups (30ml) ‘Pre test’

Exposure period: each group eats 1 soup type (400ml)

N=148

N=50

N=49

N=49

Moñ Tuesday Wednesday Thursday Friday

Liking assessed with VAS scales (dislike extremely to like extremely)

The exposure groups were balanced for gender, age, H&S consumption, daily salt intake and their liking cluster
H&S did not give immediate increase in liking (pre-exposure)

<table>
<thead>
<tr>
<th></th>
<th>Std</th>
<th>LS</th>
<th>LS+HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall liking*</td>
<td>64.7a±1.9</td>
<td>52.5b ±1.9</td>
<td>55.4b±1.9</td>
</tr>
<tr>
<td>Liking flavour*</td>
<td>63.6a±2.0</td>
<td>50.6b±2.0</td>
<td>53.6b±2.2</td>
</tr>
<tr>
<td>Flavour intensity≠</td>
<td>2.7a±0.1</td>
<td>2.3b±0.1</td>
<td>2.9c±0.1</td>
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</table>

Balanced monadic presentation of 30ml samples of each soup. Results are mean ± SEM (n=145). Different letter shows sig diff

* VAS scale (0-100)
≠ Just about right (JAR) scale (value of 3 is ideal)
Overall liking of HS soup increased during exposure phase

Overall liking (0-100)

N=49-50/group
Effect of exposure to H & S soup on liking

Repeated exposure to the H&S soup led to significant linear increase in liking of

- Overall liking (+9.0  p=0.02)
- Flavour       (+9.8 p=0.02),
- Texture       (+10.1 p=0.01)
- Familiarity   (+11.9 p=0.002)
Pre & post exposure – liking of flavour
Effect of H&S on salt perception

1. ‘Post exposure’ – soup assessed by all subjects (n=145) for salty taste intensity by VAS
   - Std soup 38.5ab ±1.8
   - LS soup 33.7b ±1.5
   - LS+HS soup 40.3a ±1.7

2. Two-alternative forced choice directional comparisons in 92 subjects:
   - Low salt soup sig less salty than std soup (P<0.0001)
   - No sig diff in saltiness between std soup & H&S soup (P=0.23)

The H&S used in the study enhanced the perception of salty taste
Summary

- Reducing salt in tomato soup by ~50% reduced consumer acceptability.
- Inclusion of H&S did not cause an immediate increase in liking.
- Liking of low salt soup without H&S did not increase over repeated exposure.
- Repeated exposure to the H&S low salt soup enhanced significantly the overall liking and liking of flavour, texture and aftertaste.
Conclusions

• The H&S used in the study (oregano, bay, celery, garlic, black pepper) enhanced the perception of salty taste and compensated for a 53% reduction in added salt.

• Probably due to enhancement of salty taste perception by the savoury volatile aroma compounds.

• The findings suggest that the use of H&S is a useful approach to reduce salt content in foods.

• Herbs and spices should be chosen carefully to complement the food as large contrasts in flavour can polarise consumer liking.
Acknowledgements:

- Dr Sameer Ghawi
- Dr Lisa Methven
- Anne Hasted (QiStatistics)
- McCormick UK

- MSI for funding