Taste

SWEET
Sugar

SALT
NaCl
(Sodium Chloride)

SOUR
Lemon Vinegar

BITTER
Caffeine Quinine

UMAMI
MSG Savoury
Sodium Chloride Usage
Sensory

- Salty taste
- Sweet at low concentrations
- Suppresses bitterness
- Enhances / modifies flavour
- Fullness and thickness
- Visuals
- Stimulates salivation at higher concentrations
### Taste of Inorganic Salts

<table>
<thead>
<tr>
<th>Salt</th>
<th>Taste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Chloride</td>
<td>Sweet (low level) → Salt</td>
</tr>
<tr>
<td>Lithium Chloride</td>
<td>Sweet → Sour → Salt</td>
</tr>
<tr>
<td>Potassium Chloride</td>
<td>Sweet → Bitter → Salt</td>
</tr>
<tr>
<td>Calcium Chloride</td>
<td>Bitter/Sour/Sweet → Bitter/Salt/Sour (+other)</td>
</tr>
<tr>
<td>Lithium Sulphate</td>
<td>Sweet, (Bitter) → Sour</td>
</tr>
<tr>
<td>Potassium Sulphate</td>
<td>Sweet → Bitter/Salt/Sour</td>
</tr>
<tr>
<td>Magnesium Sulphate</td>
<td>Salt → Bitter / suppressing</td>
</tr>
</tbody>
</table>

Shallenberger, 1993  
Kilcast & den Ridder, 2007  
Beachamp & Breslin, 1995
Table Salt vs. Sea Salt

Table Salt

Maldon Sea Salt
<table>
<thead>
<tr>
<th>Sodium Alginate</th>
<th>Gelling Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Ascorbate</td>
<td>Antioxidant</td>
</tr>
<tr>
<td>Sodium Benzoate</td>
<td>Preservative (fruit juices, jams, beverages)</td>
</tr>
<tr>
<td>Sodium Bicarbonate</td>
<td>Leavening agent in some baking</td>
</tr>
<tr>
<td>Sodium Caprylate</td>
<td>Binder, emulsifier, anti-caking</td>
</tr>
<tr>
<td>Sodium Carboxymethyl cellulose*</td>
<td>Bulking agent, stabiliser</td>
</tr>
<tr>
<td>Sodium Caseinate</td>
<td>Emulsifier, thickener, binder, texturiser,</td>
</tr>
<tr>
<td>Sodium Citrate*</td>
<td>Control of acidity and stability, aid in emulsification, improve rehydration</td>
</tr>
<tr>
<td>Sodium Erythorbate</td>
<td>Antioxidant</td>
</tr>
<tr>
<td>(Mono)Sodium Glutamate (MSG)*</td>
<td>Flavour enhancer</td>
</tr>
<tr>
<td>Sodium Lactate and Diacetate</td>
<td>Prevention bacterial growth</td>
</tr>
<tr>
<td>Sodium Nitrite/ Nitrate*</td>
<td>Curing Agent</td>
</tr>
<tr>
<td>Sodium Phosphates*</td>
<td>Buffer/emulsifying salt, stabiliser</td>
</tr>
<tr>
<td>Sodium Propionate</td>
<td>Preservative, Mould inhibitor</td>
</tr>
<tr>
<td>Sodium Saccharin</td>
<td>Intense Sweetener</td>
</tr>
<tr>
<td>Sodium Sulfite</td>
<td>Prevention darkening, flavour &amp; vitamin loss (during drying)</td>
</tr>
</tbody>
</table>
Ways to reduce salt

- Salt substitutes
- Salt enhancers
- Stealth
- Sodium chloride availability
- Reformulation
Salt Substitute

Sodium chloride saltiness

Potassium chloride saltiness

Dzendolet & Meiselman, 1967
## Example – Canned Vegetable Soup

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt</td>
<td>Reduced 41%</td>
</tr>
<tr>
<td>Carrots</td>
<td>Increased 13%</td>
</tr>
<tr>
<td>Potatoes</td>
<td>Increased 13%</td>
</tr>
<tr>
<td>Dried Peas</td>
<td>Replaced by frozen peas</td>
</tr>
<tr>
<td>Green Beans</td>
<td>Removed</td>
</tr>
<tr>
<td>Swede</td>
<td>Added</td>
</tr>
<tr>
<td>MSG</td>
<td>Removed</td>
</tr>
<tr>
<td>Sugar</td>
<td>Reduced 9%</td>
</tr>
</tbody>
</table>

Robinson, 2007
Reduction by changing salt particle form
Influence of Saliva on Salt Perception

- Mixing of Food with saliva
- Dissolution Rate
- Transport to receptors in mouth
Salts Evaluated

Sainsbury’s Table Salt  Morton Dendritic Salt  Alberger Fine Prepared Flour Salt  Premier Fine Prepared Flour Salt

Microfine Salt  Microsized 95 Extra Fine Salt  LFI Freeze Dried Salt
Time-intensity responses

![Graph showing time-intensity responses for different salt types](image)
## Amorphous Salt vs. Table Salt

<table>
<thead>
<tr>
<th>Sample</th>
<th>Type</th>
<th>Supplier</th>
<th>Structure</th>
<th>Particle Size (µ) Range (Majority)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS</td>
<td>Table Salt</td>
<td>Sainsbury</td>
<td>Cubic crystalline</td>
<td>200-500 (400-500)</td>
</tr>
<tr>
<td>LFI</td>
<td>100% Salt</td>
<td>LFI</td>
<td>Cubic / glass-like</td>
<td>5-10 µ particles</td>
</tr>
</tbody>
</table>
Salt Intensity

LSD = 9.4

TS  LFI  LFI/TS:  90/10  80/20  70/30  60/40  50/50
Reducing Salt by Modifying the Perception of Saltiness in Emulsion
Oil in Water Emulsion

INTERNAL AQUEOUS PHASE
W/O/W Emulsion

Confocal Microscopy Image

Bar = 5µ
References

- Phelps, T. Et al. (2006). ‘Sensory issues in salt reduction’. Abstracts | Food Quality and Preference 17, 629-634
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