Functional Nutrition: Food As Medicine

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Taste: The Misunderstood Sense

- Taste receptors are **widespread**
- “Classic” paradigm of taste
  - Sweet
  - Salty
  - Sour
  - Bitter
  - Umami
- Carbonation is sensed through sour receptors
- “Fatty” taste receptors have been proposed

The Importance of Sweet

- Sweet receptors found throughout body
- Activated by both sugars **and** certain proteins/amino acids
- Activation in the intestines tends to **slow** stomach emptying and **increases** release of digestive enzymes and hormones such as insulin
- Activation **centrally increases** reward mechanisms and appetite
- Sweet sensitivity varies during the day (higher in the evening)
- Genetic differences in sweet perception → different rates of diabetes

Salty: The Goldilocks Taste

- Surprisingly poorly understood mechanism (definitive salt taste receptors just identified 2020)
- Likely two mechanisms → “low salt” sensors (which generate **positive** central responses) and “high salt” sensors (**aversive** → “oversalted”)
- Unclear digestive effects but **strong** central drive to eat salty food when activated
- Hyper-stimulated in modern diets → **can** restore sensitivity with reduced exposure

Sour: Complementary Taste

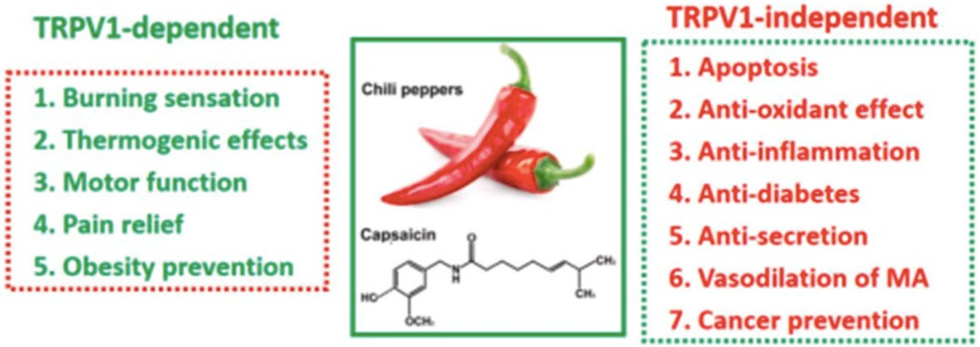
- In isolation, **strongly aversive** central responses invoked across most mammals
  - Humans/apes are an exception: to some extent, we **enjoy** sour tastes
    - Augment response to salt/sweet receptor activation
    - Unclear relationship → vitamin C? Fermentation?

Umami: Odd One Out

- Triggered primarily by L-glutamate (MSG is a purified example)
  - MSG sensitivity → MSG Is A-OK: Exploring the Xenophobic History of and Best Practices for Consuming Monosodium Glutamate
- Unclear purpose but activation seems to improve satiety and **reduces** amount of sweet/salt activation to achieve pleasurable sensation
- Umami receptors present in GI tract → activation seems to facilitate increased digestive enzyme release

Special Sense: Spicy

- Capsaicin → naturally occurring compound that activates TPRV receptor (found throughout GI tract)
- **Sporadic or massive** ingestion → increases GI distress and symptoms of heartburn, nausea, upset stomach
- **Chronic** ingestion → **decreases** upper GI symptoms and **protects** the stomach lining from external injury



Special Sense: Coolness

- Coolness perception (without actual temperature change) can be elicited
  - Menthol
- In the GI tract, activation of these receptors leads to relaxation of smooth muscle
- Cooling herbs → peppermint, lemon balm, lemongrass, chamomile

Bitter: Sweet?

- The dose makes the poison
- Paradoxic effects of activation in human studies
  - Equivocal data re: stomach emptying time per se **but….**
    - Increases feelings of pleasant fullness (satiety) and decreases food intake → attenuates post-eating blood sugar spikes
- **Strongly stimulates** GI hormone release (GLP-1 included)
- Centrally **aversive**
  - Tolerance to bitter flavors may be partially genetically determined (PTC for instance)
- Digestive bitters before meals → activate gastric/intestinal responses, attenuate intake, improve glycemic response?

Bitters: Ayurvedic Perspective

Six fundamental tastes (*rasa*) → Sweet, sour, salty, bitter, astringent, pungent

Bitter taste → balances *pitta* and *kapha,* exacerbates/augments *vata*

Considered to be a predominantly **cooling** and **drying** taste

Properties felt to include → antibacterial/antitoxin, choleretic (aids in bile secretion), stimulates appetite for other tastes


Most Common
Bitter Food
Consumed in
US......

Bitter Food Compendium

- Leafy green vegetables
  - Kale, spinach, collards, **radicchio, <u>dandelion greens</u>**, etc.
- Artichokes
- Cruciferous vegetables
- Coffee/tea
- Chocolate (cacao)
- Special mention → bitter melon

Bitter Melon: Superfood but YMMV

- Scientific name *Momordica charantia*
  - Member of broader *Cucurbitaceae* family
- Originally native to Africa, traditional component of many S/SE/E Asian diets
- **<u>Intensely</u>** bitter flavor due to multiple alkaloids, saponins
- Significant body of literature regarding possible anti-glycemic effects

Digestive Bitters: Homemade Recipe

- 2 tablespoons dried angelica root
- 2 tablespoons dried gentian root
- 1.5 tablespoons dried dandelion root
- 1 tablespoon dried ginger root
- ½ peel of whole lemon & orange
- 1-2 rosemary sprigs
- 8 oz of vodka or similar neutral spirit
- Mix/cover and agitate 1-2x/day for 2 weeks
- Dose is 1 dropper full (1/4 tsp) 15 minutes before meals
- Caution → History of alcohol abuse/sensitivity (non-alcoholic bitters are available); avoid if pregnant or breastfeeding (little safety data for gentian/angelica during pregnancy). Dandelion (leaves) can have mild diuretic properties; avoid if allergic to ragweed