Early Flavor Experiences and their Adaptive Role during Weaning and Beyond

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Conflict of Interest Disclosure

I have no conflict of interest to report in relation to this presentation.

Children are acquiring the same unhealthy eating habits that plague adults.

Feeding Infant and Toddler Study (FITS):
Fox et al., 2004, 2010; Mennella et al., 2006

Objectives

- Define the chemical senses;
- Sensory capabilities of the human infant;
- Impact of early flavor experiences on the development of food preferences.

Flavor Perception

Taste: Small number of primaries: sweet, sour, salty, bitter, umami

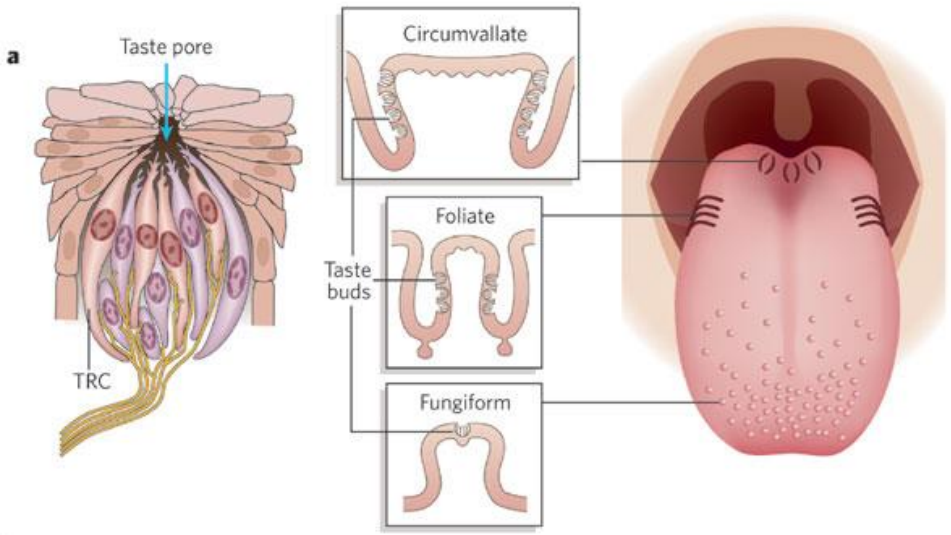
Smell: Many different odors (~1000's)

Chemosensation: cooling, tingle, sting, burn, temperature

Taste Perception

- Detected by specialized receptors in the tongue and other parts of the oral cavity and the gut.

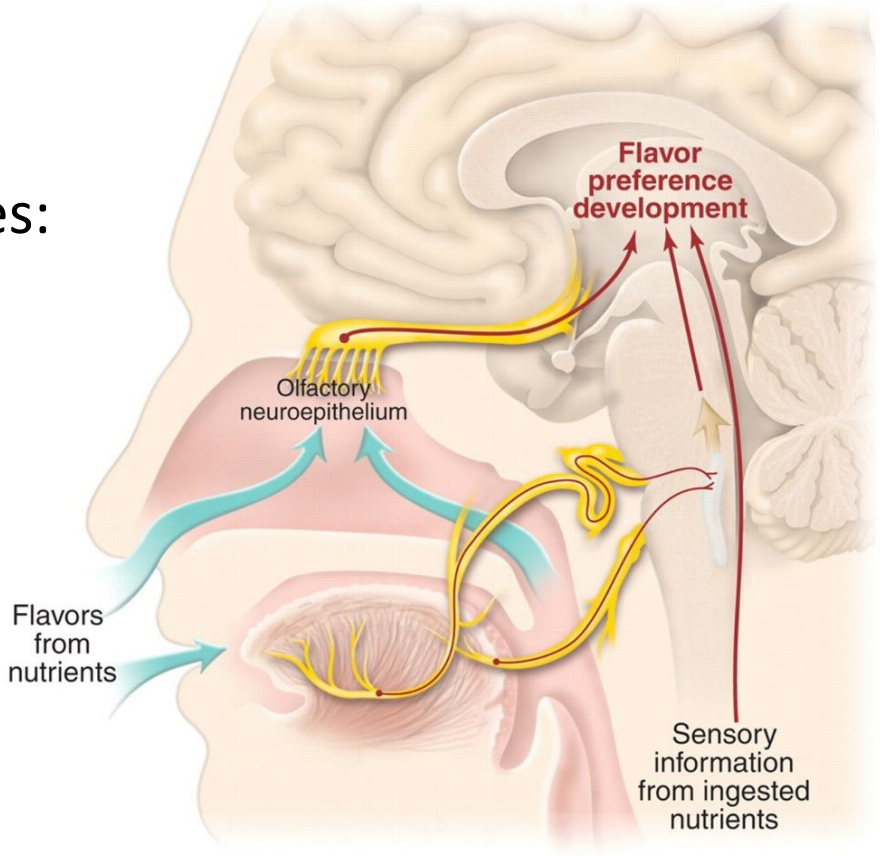
- Sweet, umami and bitter: G-protein coupled receptors.



Odor Perception

Odor molecules stimulate olfactory bulbs through 2 routes:

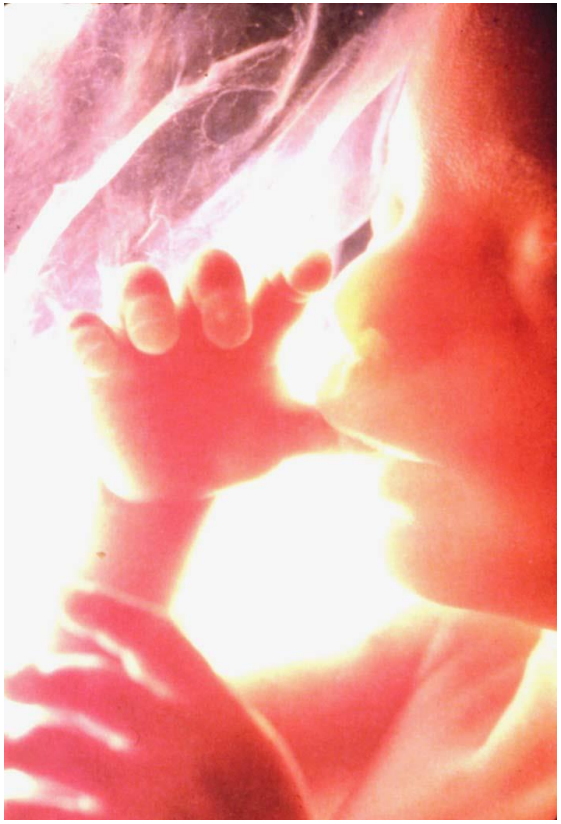
- Orthonasal: enter directly through the nose and travel along the nasal passages
- Retronasal: Travel up through the nasal passages as one is chewing.



The Child's Flavor World

Prenatal Flavor Experiences

- Taste and olfactory systems are well developed by the 2nd trimester.
- By the 6th month of gestation, open airway passages are continuously bathed in amniotic fluid.



Responses to Odors at Birth

Attraction to food:

- Neonates prefer the smell of their own amniotic fluid.
- Chemical profile of amniotic fluid overlaps with that of breastmilk.

Responses to Tastes at Birth

Sweet and Umami

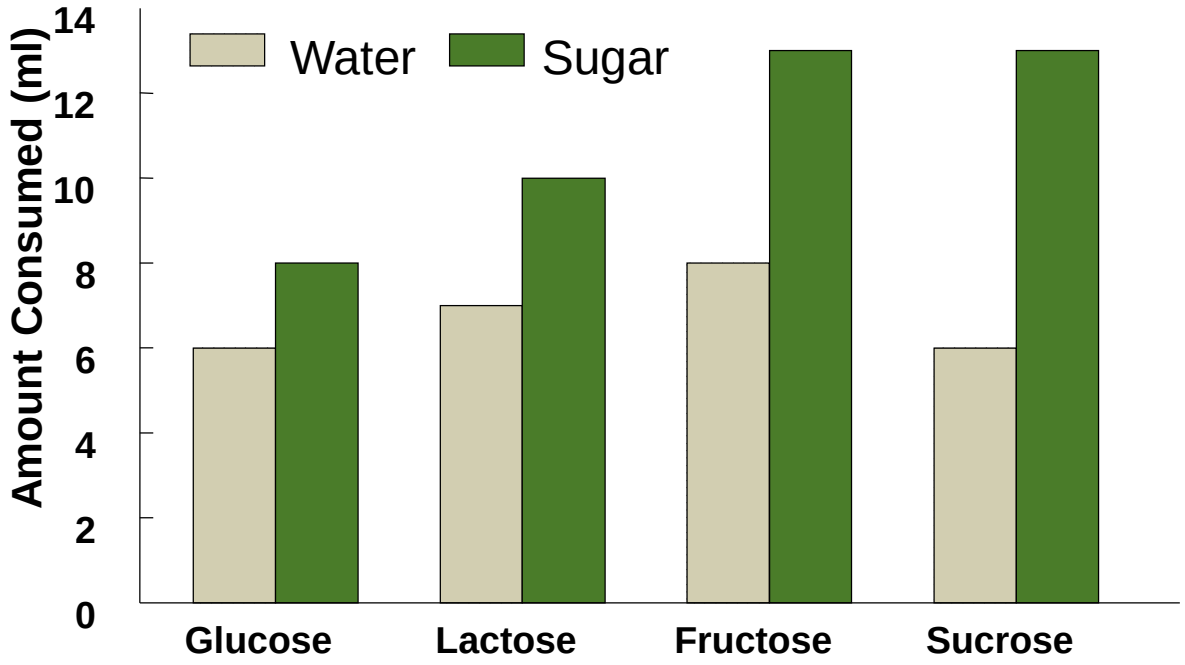
Sour

Bitter

Salty

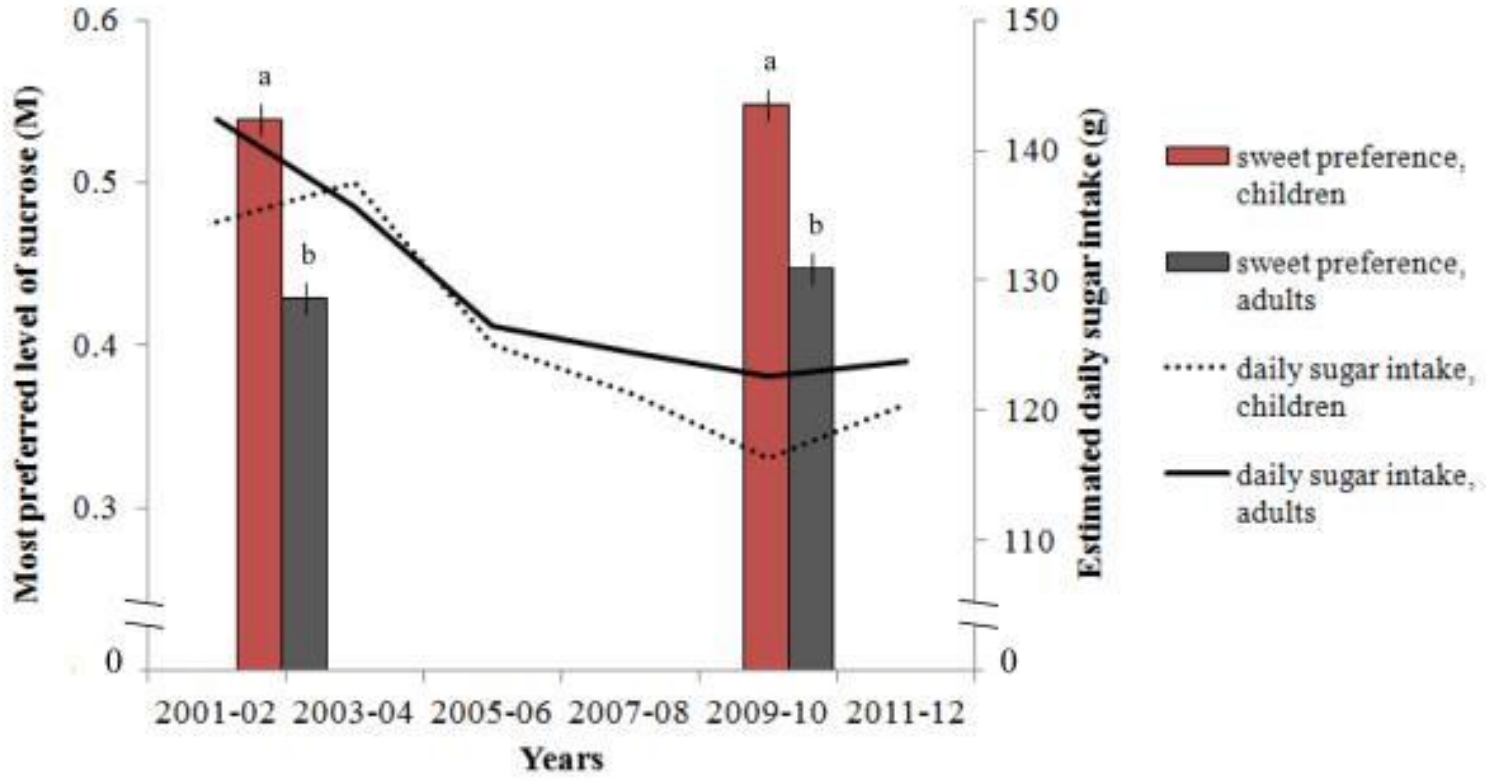
Rosenstein & Oster, 1988

Infants are “sweet connoisseurs”



Desor, Maller, Turner, 1973

Children's Heightened Preferences for Sweet Taste



Mennella, Lukasewycz, Griffith, Beauchamp, 2011

Food for Thought

Evolution has shaped the type of foods initially preferred or rejected by infants and children.

The child's basic biology, a consequence of long evolutionary history, predisposes them to favor low-sugar, low-sodium foods.

Our biology is not our destiny!

Two-year old Argentinian girl drinking brewed yerba mate, which is strongly vegetal, herbal, grassy and sometimes bitter.

Sandell and Breslin, 2006;Turnbull and Smith, 2002; Keller et al., 2002

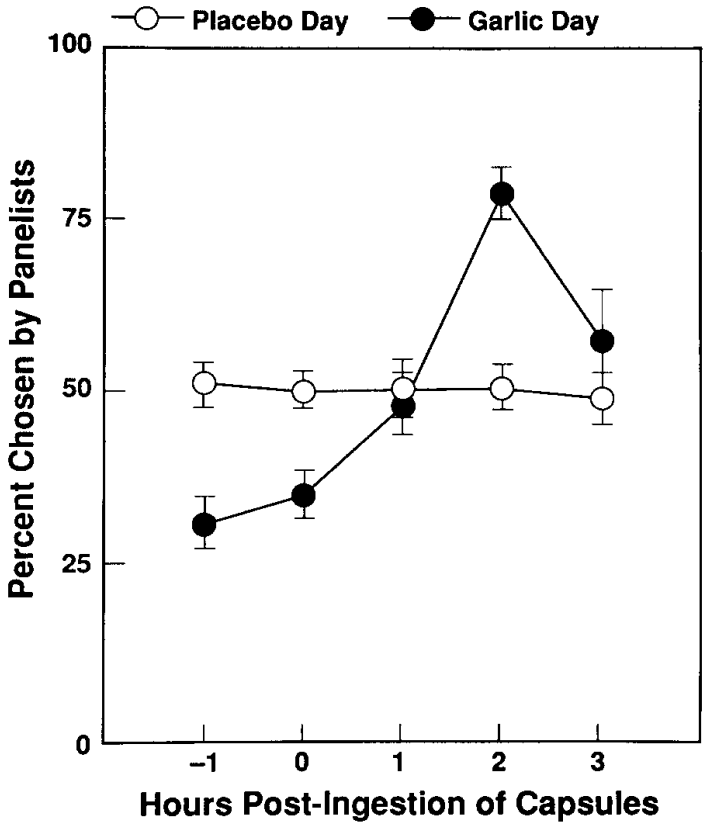
Flavor Learning throughout Development

Fundamental Feature of Mammals

- At weaning, young mammals are more accepting of foods that contain flavors previously experienced in amniotic fluid and mother's milk
- Plasticity and stability of flavor memories.

European Rabbit,
Oryctolagus cuniculus

Amniotic Fluid



Garlic
Alcohol
Anis
Carrot
Fruit Flavors
Mint
Vanilla
Bleu Cheese
Tobacco

Breastfeeding

- Provides continuity in flavor experiences.
- Breastfeeding confers an advantage for initial acceptance of fruits and vegetables.
- But mother has to eat these healthy foods.

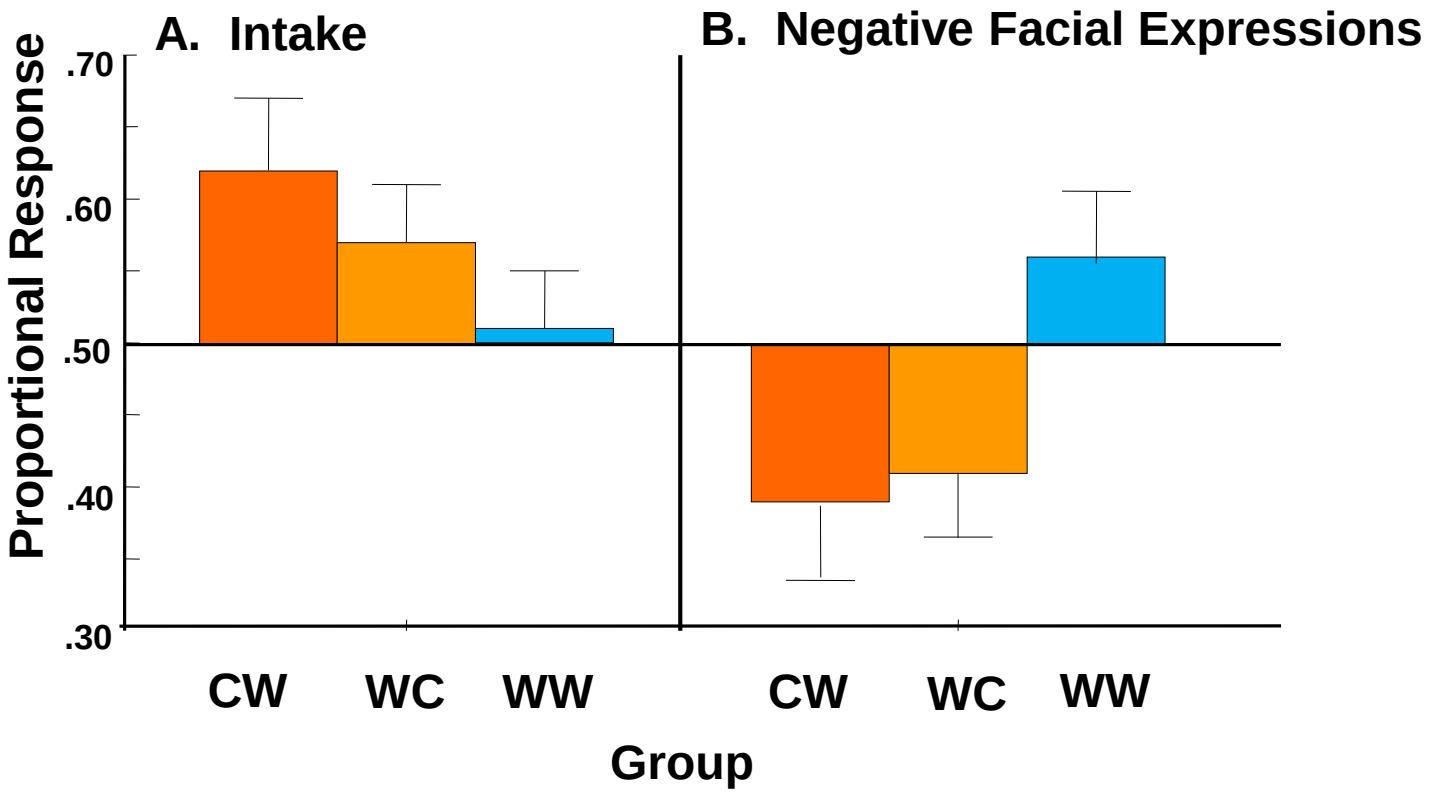
Formula

- Food of invariant flavor that does not reflect cultural cuisine;
- Not all formulas alike in flavor: type and brand;
- These differences are detected by infants and come to be preferred by the children who feed on them.

Learning about Flavors and Cuisine

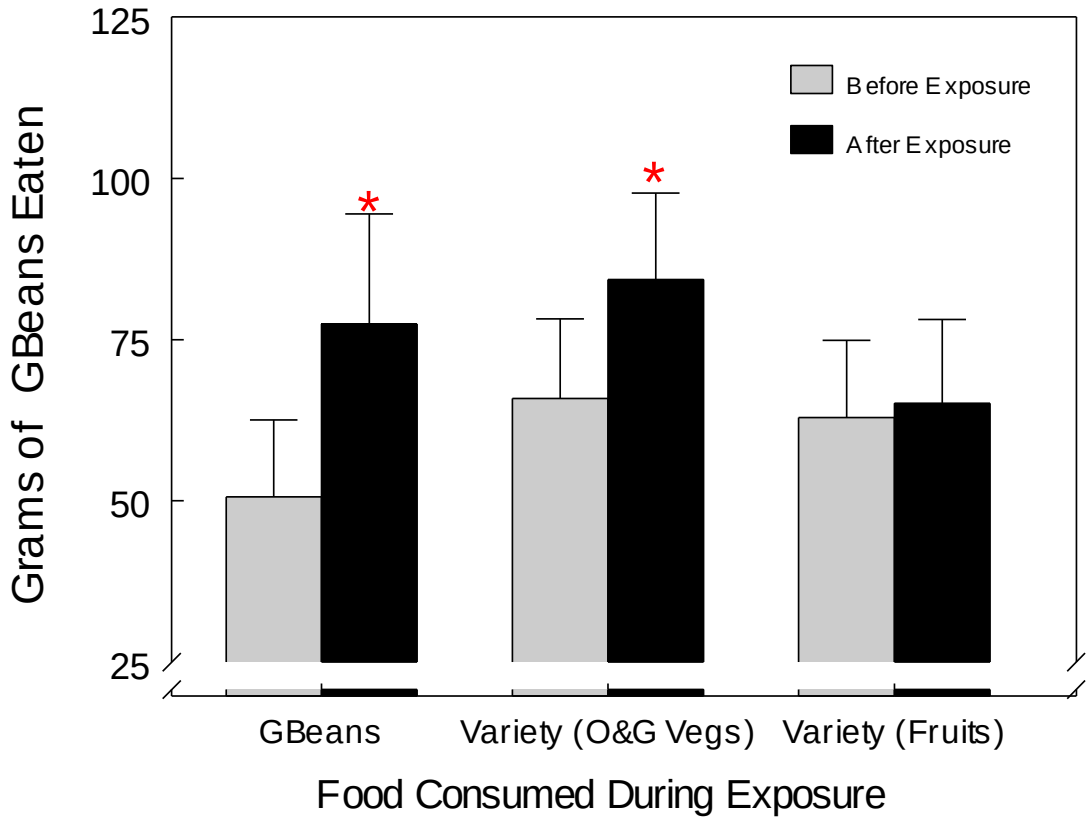
Does experience with a flavor pre- or post-natally affect infants' acceptance of that flavor at weaning?

Learning from Mom



Mennella, Beauchamp, & Jagnow, 2001

Repeated Exposure & Dietary Variety



Sullivan & Birch, 1994; Gerrish & Mennella, 2001, Forestell & Mennella, 2007

Facial Expressions

- Takes longer to see a change in the infant's facial expressions.
- Facial expressions signal that infant is eating something harmful
  - may be more salient cue for mothers.

Squint

Upper Lip Raise

Nose Wrinkle

Gape

Forestell and Mennella, 2007

Long-Term Effects

Fruit and vegetable variety intake in school-aged children was predicted by:

- Breastfeeding duration
- Early fruit and vegetable experiences
- Mothers' preferences

Food preferences at 2-4 years predict preferences at 8 years.

Skinner et al, 2002; Cooke et al., 2004; Nicklaus et al., 2004; 2005