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ECOG: “The place of fruit and vegetable in childhood obesity prevention” January 12<sup>th</sup> 2021

# ‘Promoting vegetable intake in preschool children: barriers and potential solutions’

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**YEARS OF EXCELLENCE**  
1994 - 2019

## Question:

How many portions of fruit and vegetables do you usually consume per day?

- a) 0-2
- b) 3
- c) 4
- d) 5 or more





# What's so special about vegetables?

- Low in energy density (Kcal/g)
- Nutrient dense: vegetables contain complex mixture of phytochemicals, fibre and vitamins.
- Significant health benefits:
  - Obesity, diabetes, coronary disease, stroke, certain cancers, dementia, and all cause mortality , effects of mental health, cognitive performance.
- Significant impact on human and planetary health IF WE CAN GET PEOPLE TO EAT THEM!

## The problem...



- Current UK guidelines: “5 a day” (400g) (DoH / WHO)  
Adults: 80g Children: 40g
- Health survey for England (2018)
  - Both **adults and children** are not consuming sufficient amounts of fruits and vegetables.
  - In the UK 82% of children 5-15 years do not consume recommended 5 a day.
  - Average child eats  $\leq 3$  portions of F&V a day.
  - 9% of children that consume no F&V a day (HSE 2016).
- Habitual diets contain too much meat and discretionary items.



## Barriers: Why don't children eat sufficient amounts of vegetables?

- Cost: NDNS (2008/9-2016/17) Intake of fruits and veg increase with income.
- Availability in the home and schools.
- Abundance of alternative foods.
- Report not liking them: texture, appearance, energy density, taste (bitter).

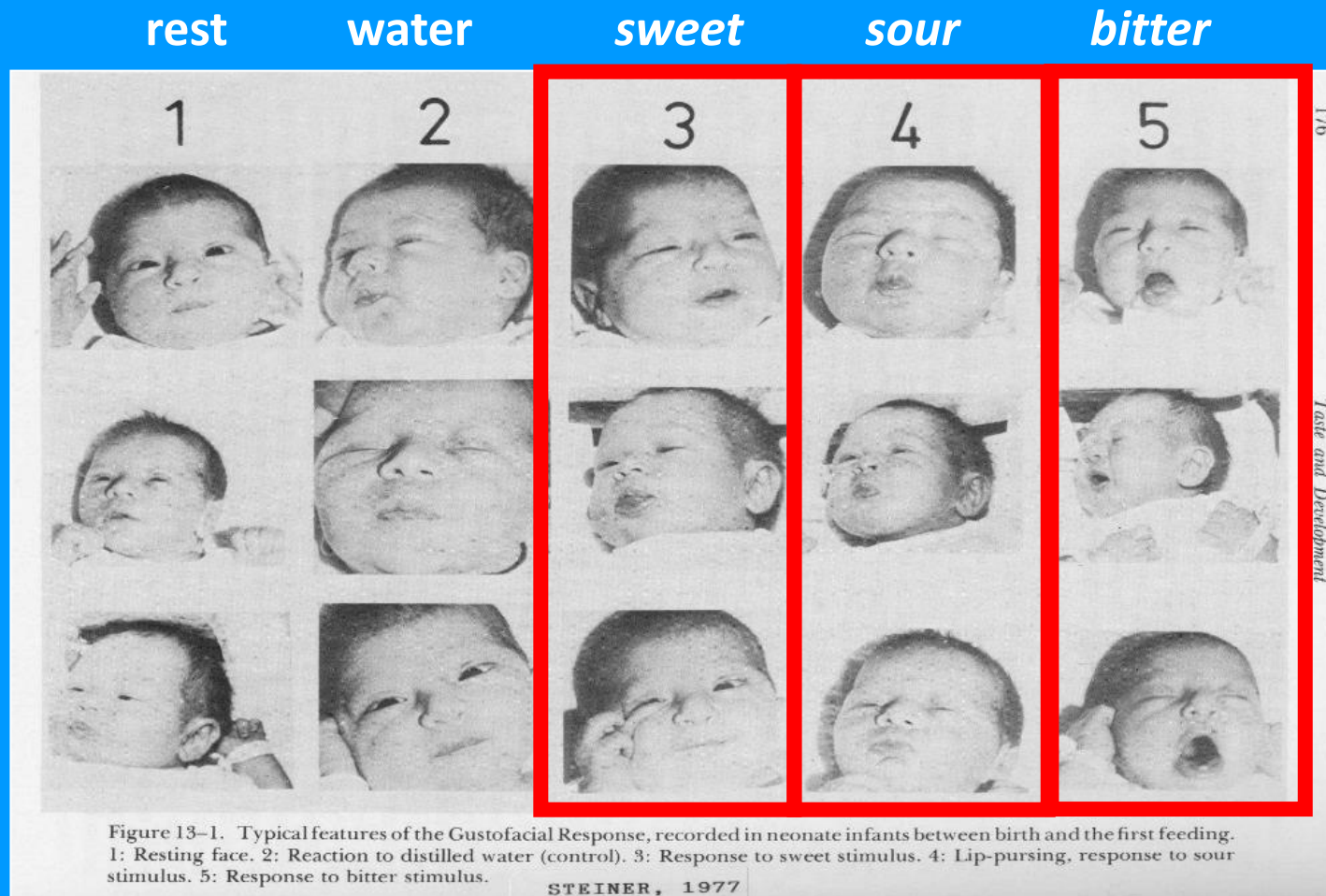


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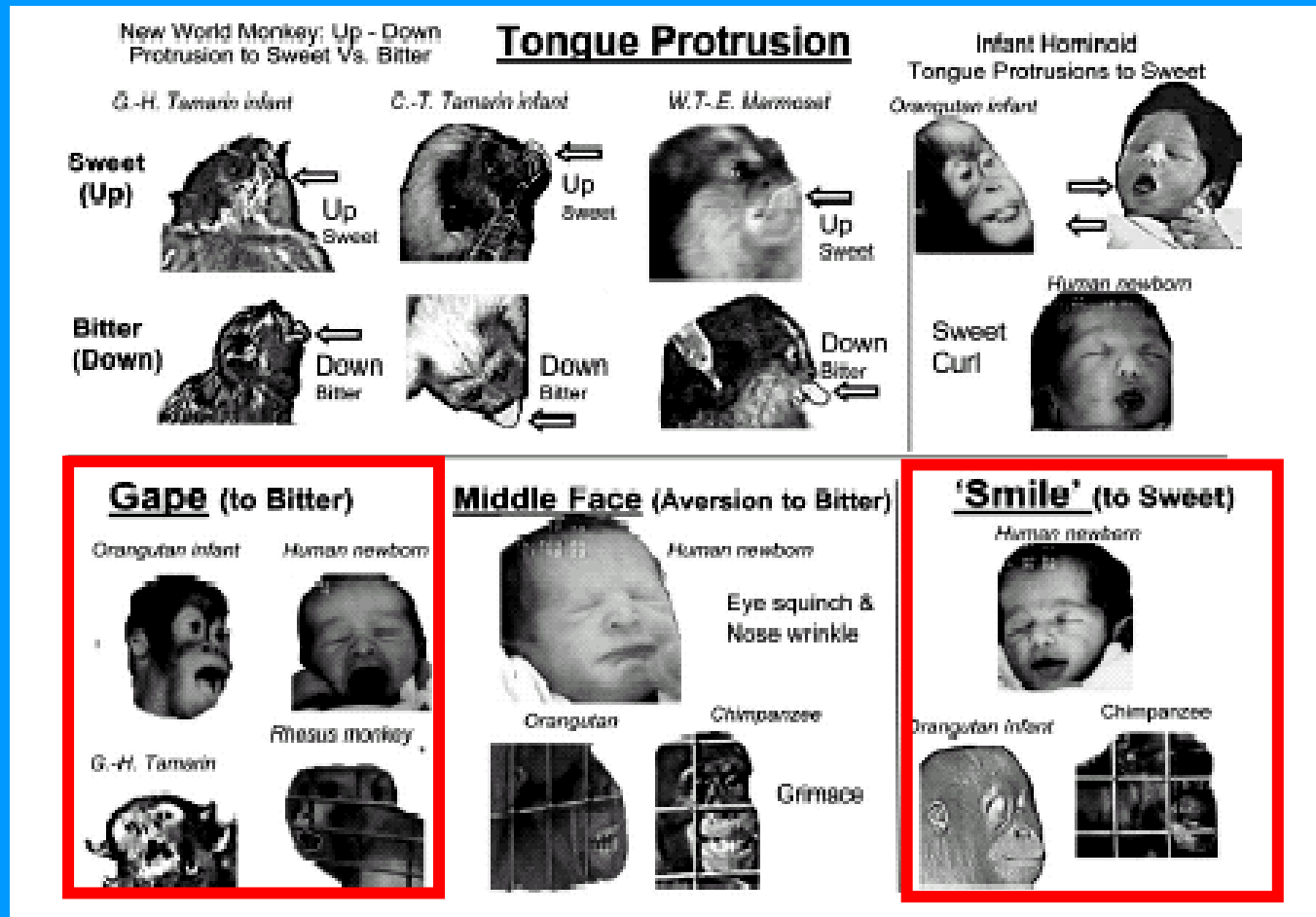
# Taste



# Neonatal response to taste



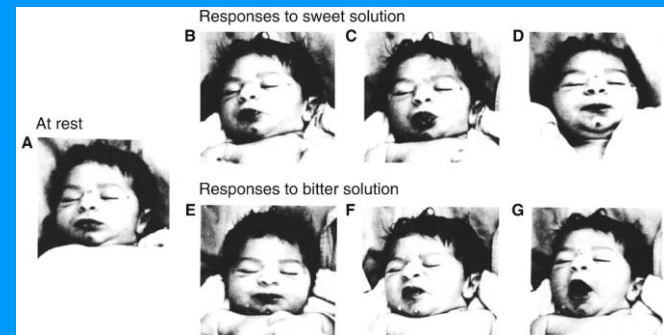
# Positive hedonic and aversive facial expressions to taste





## Innate preference for sweet tastes

- Infants demonstrate hedonic responses to sweet and aversive reactions to bitter, sour and salty.
- Therefore, infants must learn to like non-sweet tastes.
- How do we learn to like?



Ganchrow et al. Infant behaviour and development (1983)



# Old wives' tales and strange smelling newborns...

Reports that some newborns had very distinct smells

Early case studies from Israeli hospital: 4 newborns with distinct odours similar to the odour of the last meal that the mothers consumed (Hauser et al. 1985)

In utero exposure

Flavour transmission in breast milk

## *Short communications*

Eur J Pediatr (1985) 144:403

### **Peculiar odours in newborns and maternal prenatal ingestion of spicy food**

G.J. Hauser, D. Chitayat, L. Berns, D. Braver and B. Muhlbauer

Department of Neonatology, Serlin Maternity Hospital (Hakirya), Tel-Aviv Medical Center, Tel-Aviv, Israel

**Abstract.** A peculiar odour in an infant may raise the possibility of several important syndromes. Four cases of newborn infants with peculiar smells are described. In two, the sharp odour was identified as cumin, one smelled of fenugreek and one of curry. All these babies were born to mothers who ingested spicy food prior to delivery. In one case, the foul smelling amniotic fluid led to a spurious suspicion of amnionitis.

**Key words:** Odours – Newborn – Amnionitis

Jewish extraction. Upon examination immediately following delivery the physical findings were within normal limits except for the pungent odour of cumin (cumin cyminum), a spice commonly used in oriental cuisine. The hospital course was uneventful for both infants. The mothers reported having eaten "schug", a sharp tasting combination of spices containing cumin, garlic, salt, oil and pepper, in the days prior to delivery.

**Case 3.** This was a normal term newborn infant born to a mother of Yemenite-Jewish extraction. He had a sharp odour

#### **Discussion**

Peculiar odours in newborns in the immediate postnatal period may attract our attention and suggest the diagnosis of a disease. This, in turn, may lead to the use of unnecessary blood tests, cultures and, sometimes, antibiotic therapy, as in our case 4. Bartley et al. [1] also reported a 9-day-old boy whose urine and entire body smelled of maple syrup. Multiple urinary and blood tests ruled out the diagnosis of maple syrup disease. After further questioning, the mother stated that she had administered a supernatant of fenugreek seeds to the infant as a folk remedy. In this case, the spice was directly administered to the baby. In our cases, however, the spices were absorbed from the maternal gastrointestinal tract and transferred to the amniotic fluid, where they were swallowed by the fetus.

Our observations add another entity to the list of possible aetiologies of odd-smelling babies. Physicians caring for



## Potential solutions: Introduce vegetables early

- Use of vegetables in the weaning (complementary feeding) period
- Vegetables by Stealth (hide them!)
- “I just keep offering them”





## Potential solutions: What can we do about it?

### Repeated exposure

- Grounded in the “mere exposure effect” (Zajonc, 1968)
- “Learned safety hypothesis” in food preference development (Rozin and Kalat, 1971)
- 10-15 exposures (Birch & Marlin, 1982)

High  
variety



Low  
variety



Carrot





## Repeated exposure

- Repeated exposure is **consistently** effective at increasing intake
- Not all children respond the same
- Younger children <2y more accepting, less fussy
- Older children >2y less accepting, more fussy
- Repeated exposure is STILL effective for fussy children

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### **Repetition counts: repeated exposure increases intake of a novel vegetable in UK pre-school children compared to flavour–flavour and flavour–nutrient learning**

Samantha J. Caton, Sara M. Ahern, Eloise Remy, Sophie Nicklaus, Pam Blundell and Marion M. Hetherington

*British Journal of Nutrition* / FirstView Article / November 2012, pp 1–9

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<http://dx.doi.org/10.1017/S0007114512004126>

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### **Learning to Eat Vegetables in Early Life: The Role of Timing, Age and Individual Eating Traits**

Samantha J. Caton<sup>1,2</sup>, Pam Blundell<sup>1</sup>, Sara M. Ahern<sup>1</sup>, Chandani Nekitsing<sup>1</sup>, Annemarie Olsen<sup>3</sup>, Per Møller<sup>3</sup>, Helene Hausner<sup>3</sup>, Eloise Remy<sup>4,5,6</sup>, Sophie Nicklaus<sup>4,5,6</sup>, Claire Chabanet<sup>4,5,6</sup>, Sylvie Issanchou<sup>4,5,6</sup>, Marion M. Hetherington<sup>1\*</sup>

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**Appetite**

journal homepage: [www.elsevier.com/locate/appet](http://www.elsevier.com/locate/appet)

### Research report

**The root of the problem: increasing root vegetable intake in preschool children by repeated exposure and flavour flavour learning<sup>a</sup>**

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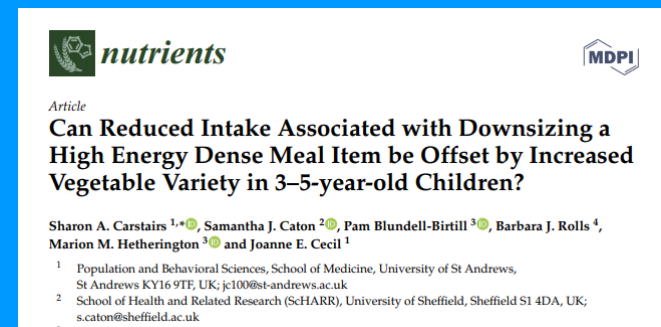
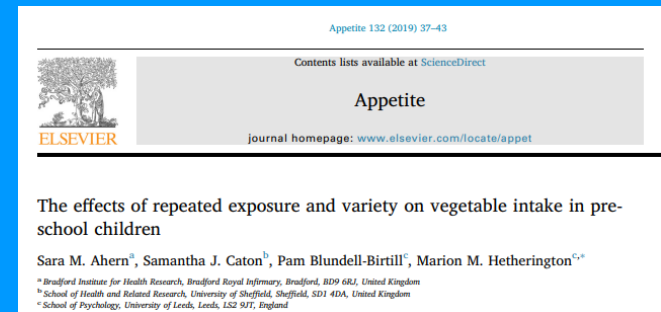
<sup>b</sup> School of Health and Related Research, University of Sheffield, Sheffield, S1 4DA, England, UK

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## Repeated exposure with variety

- Variety promotes food intake  
(Raynor & Vaadeloo 2018)
- Repeated exposure was effective
- Effect of variety was mixed





## Swap high energy dense snacks for fruits and vegetables

- Recruited parents of preschool children
- Replace all high energy dense snacks with fruit and vegetables OR half all high energy dense snacks
- Vegetable intake was increased in the replacement group (half a portion per day)



## Other evidence-based methods of getting children to eat (more) vegetables

Tangible rewards



Offer choice / varying preparation methods



Gardening/ education



Eating as a family (modelling)



Larger portion sizes



Wider food environment solutions: Advertising, price, policy, guidelines...





## Lots of ways to promote vegetable intake in children...

- Lessons learned:
  - Understand the learning process (Paroch *et al.* Front Psychol. 2017, Nekitsing *et al.* Appetite 2018)
  - Introduce vegetables early
  - Engage with the wider food system
- More research on promotion of vegetable intake in lower-income populations
  - Address issue of waste
- Address the problem on a global scale
- Seek to improve adults diets





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**Thank you for listening.  
Questions?**



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