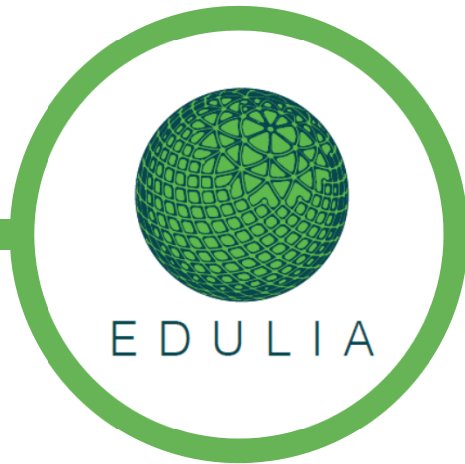


Early development of children's food preferences and eating habits



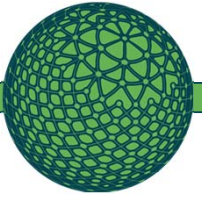
Sylvie Issanchou
Honorary Research Director INRAE



This project has received funding from the European Union's horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 764985.



Context: eating habits



Qualitative dimension



Quantitative dimension



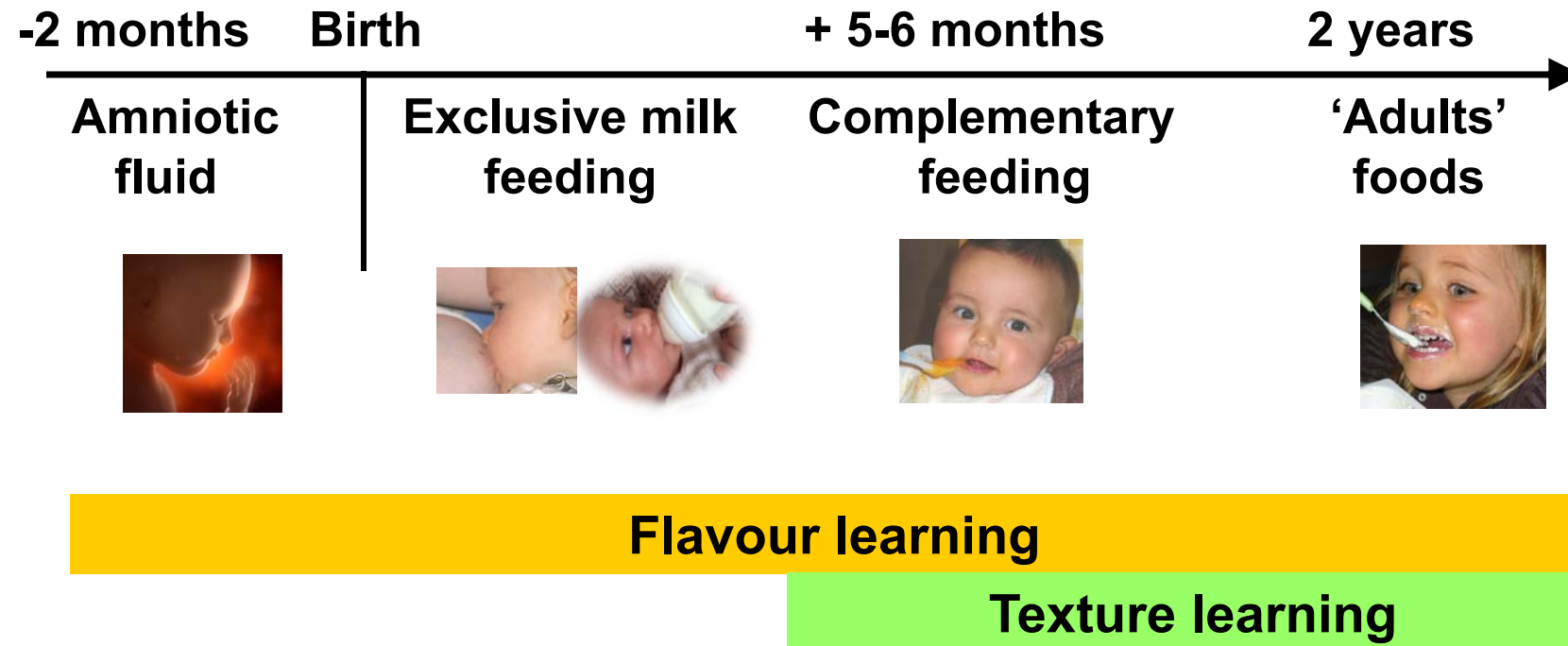
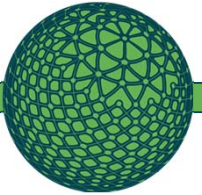
Eating habits

Temporal dimension

Contextual dimension

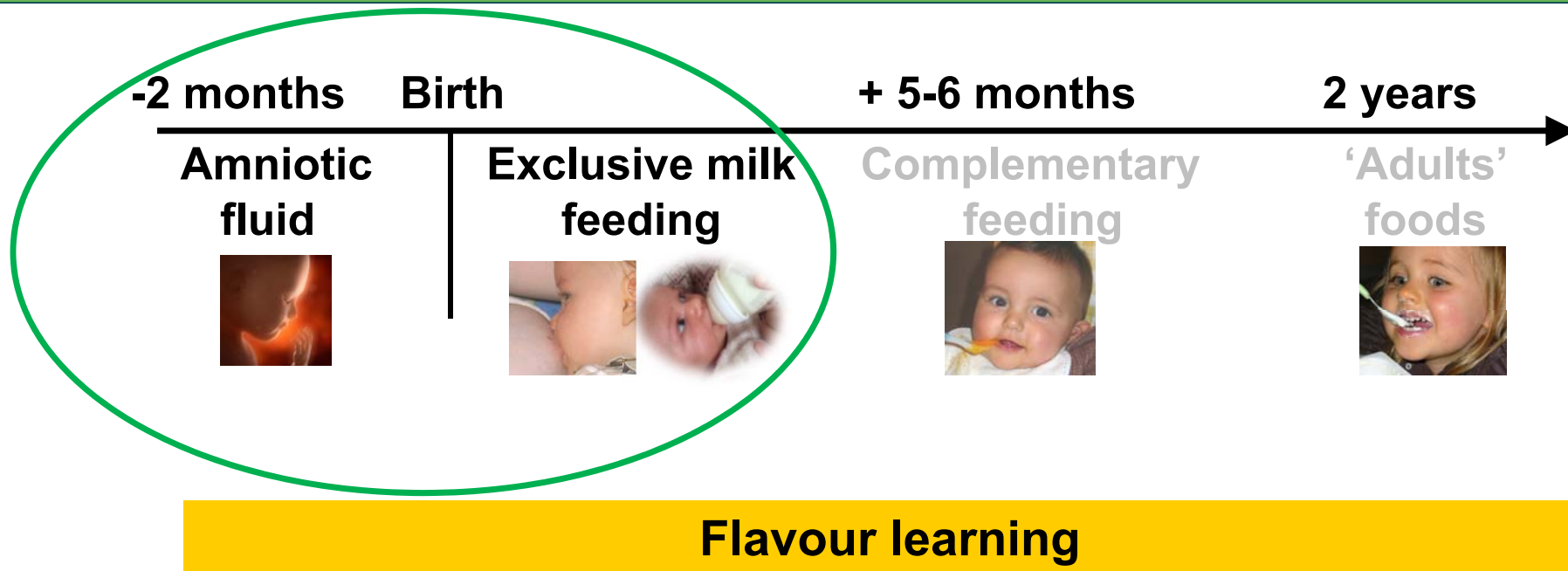
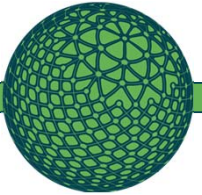
Bringing down barriers to children's healthy eating

Context: early development



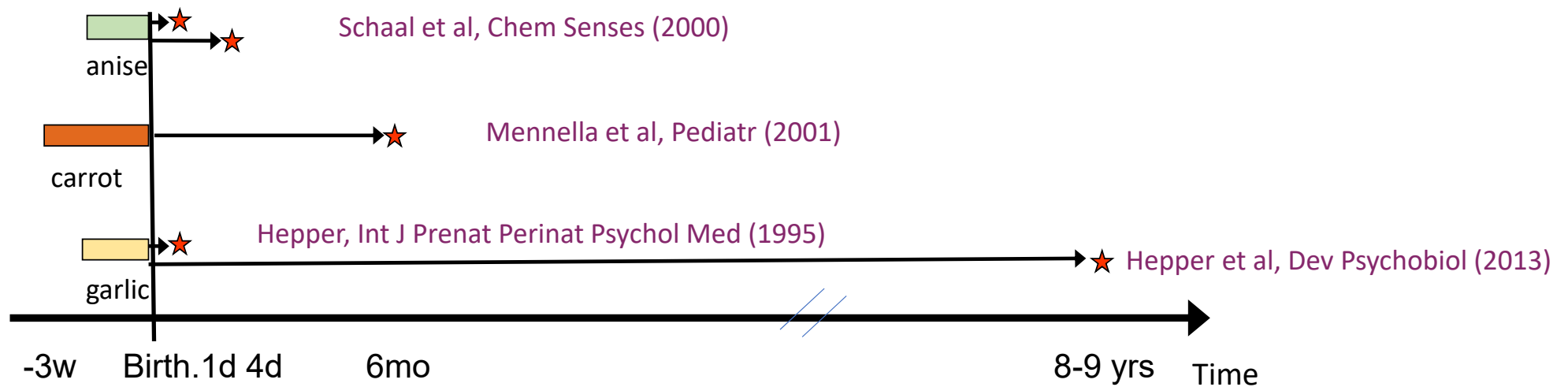
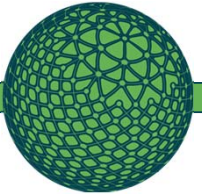
Bringing down barriers to children's healthy eating

Different stages of learning



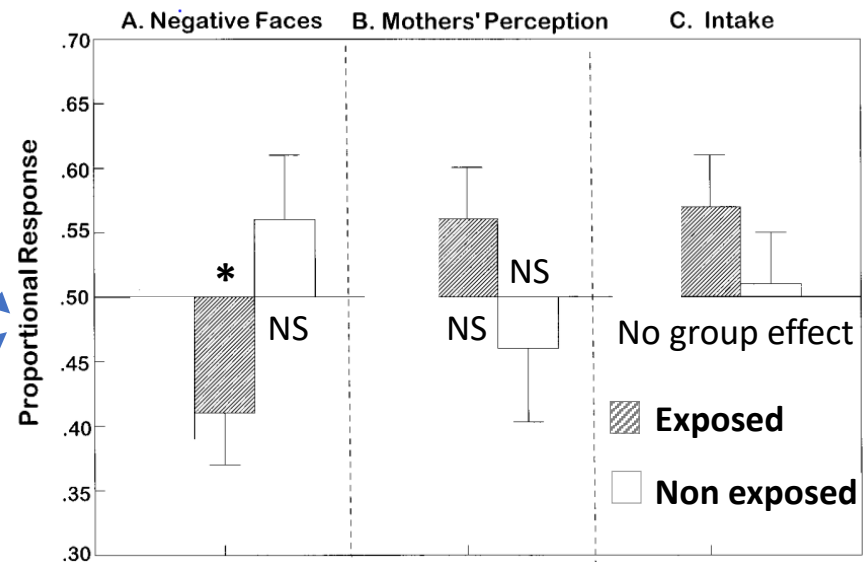
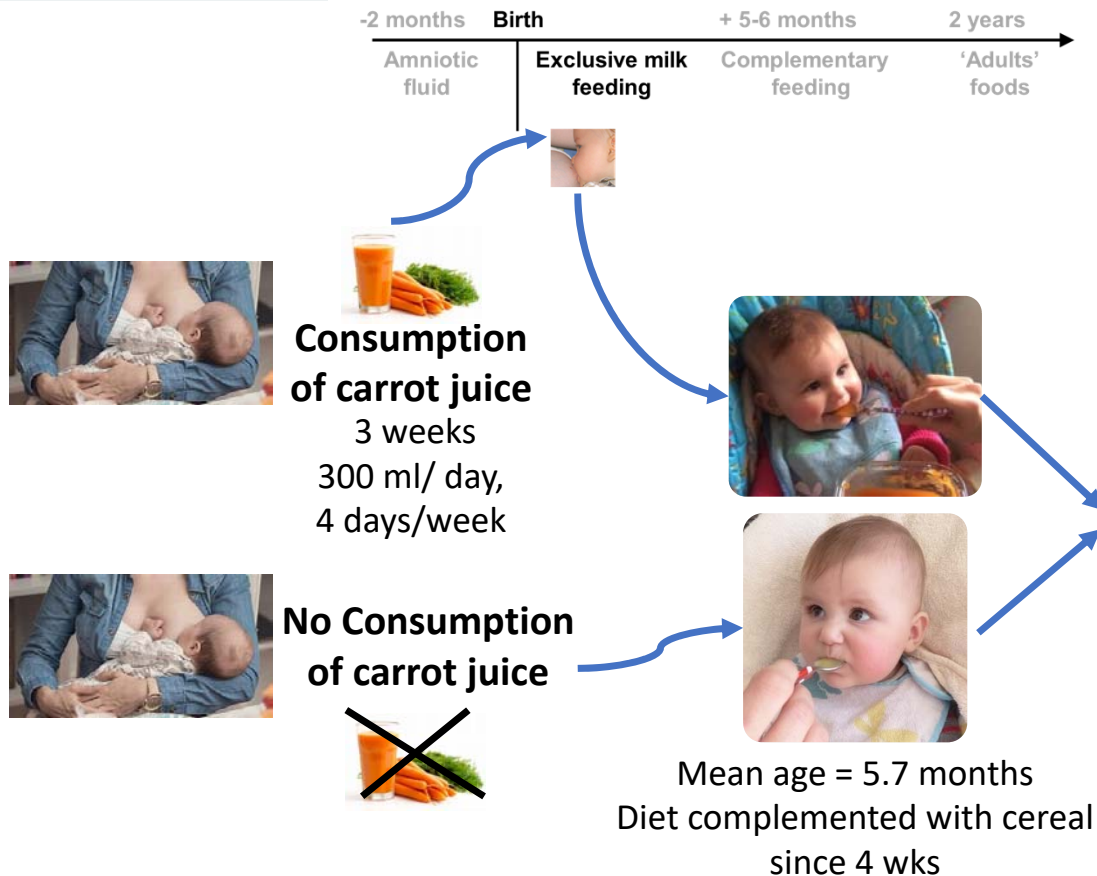
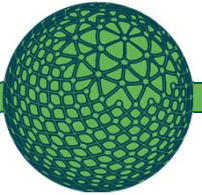
Bringing down barriers to children's healthy eating

Prenatal learning: olfaction



Bringing down barriers to children's healthy eating

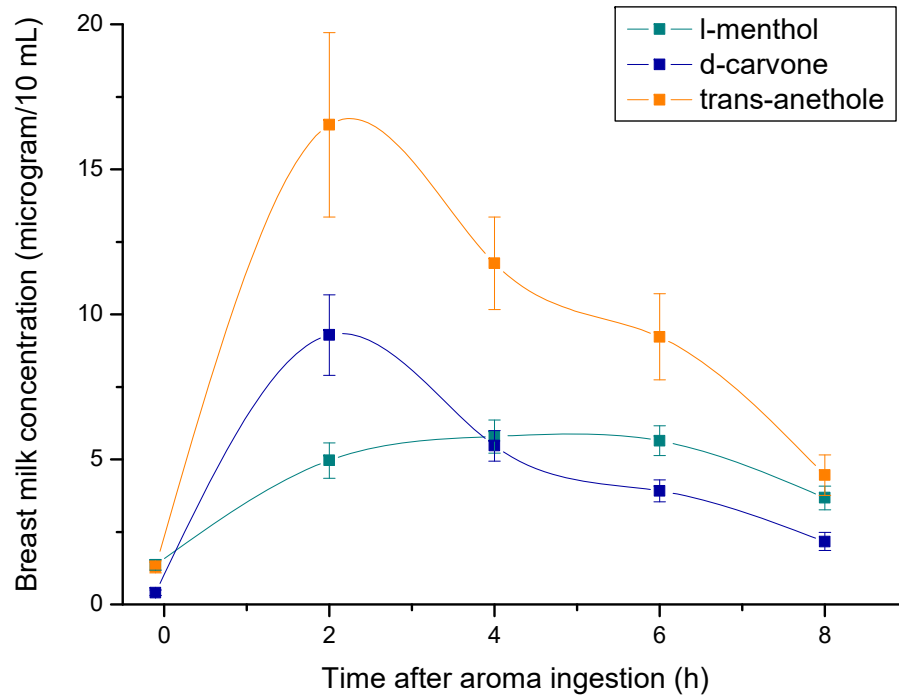
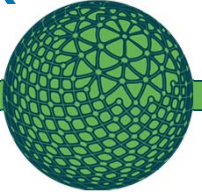
Postnatal learning: olfaction



Bringing down barriers to children's healthy eating

Mennella et al, Pediatr (2001)

Transfer of volatile compounds from food to breastmilk

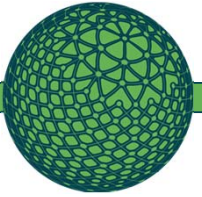


Factors affecting the concentration:

- Absorption in the gastrointestinal tract
- Metabolism
- Milk fat content
- Characteristics of the volatile:

Hydrophobic/hydrophilic character
3-methylbutyl acetate: not detected

Postnatal learning: taste



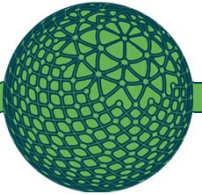
- The longer infants were breast-fed, the more they accepted umami solution at 6 months

Higher glutamate content of human milk compared with formula milk

- No more relationship at 12 months

Schwartz et al, Br J Nutr (2013)

Postnatal learning: taste



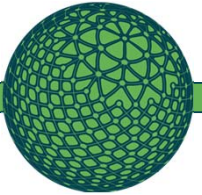
Exposure: 0.5 - 7.5 months		Hydrolyzed formula B Intake (ml) 7.5 months	
Standard formula	→	44	
Hydrolyzed formula A	→	119	Mennella et al, Pediatr (2004)

12 months exposure		4-5-year-old
Standard formula		
Hydrolyzed formula	→→→	Prefer: Hydrolyzed formulas Sour-flavored juices Broccoli

Mennella & Beauchamp,
Early Hum Dev (2002)

Bringing down barriers to children's healthy eating

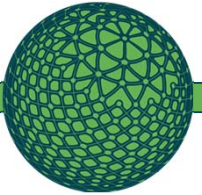
Different stages of learning



Flavour learning

Bringing down barriers to children's healthy eating

Effect of milk type



2 purees



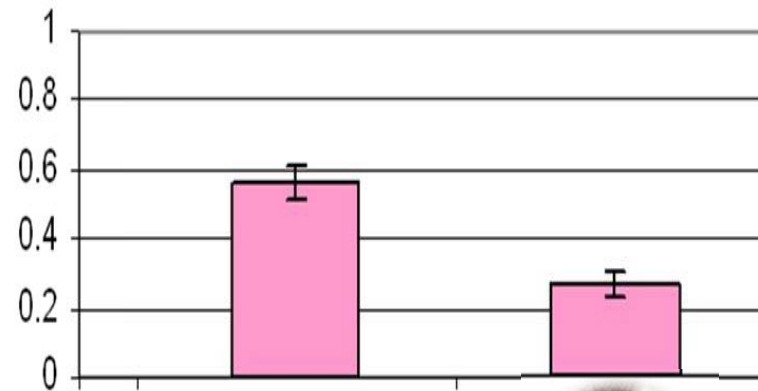
Plain potato



Potato +
caraway flavour



Intake Caraway / Caraway + plain



5–8 month-old infants



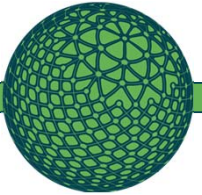
Breastfed



Formula-fed

Breastmilk : its flavour changes from day to day

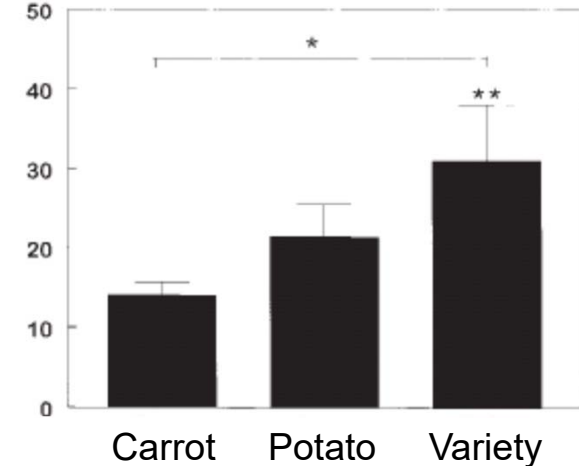
The effect of early variety: short term



	Lab	Home										Lab	Lab
Day	1	2	3	4	5	6	7	8	9	10	11	12	
Carrot group	Car	Car	Car	Car	Car	Car	Car	Car	Car	Car	Car	Chicken	
Potato group	Car	Pot	Pot	Pot	Pot	Pot	Pot	Pot	Pot	Pot	Car	Chicken	
Variety group	Car	Pea	Pot	Pum	Pea	Pot	Pum	Pea	Pot	Pum	Car	Chicken	

Formula-fed infants
 Infants' age : 4.6 months
 Cereals introduced at 4.0 months
 No consumption of vegetables and meat prior to the study

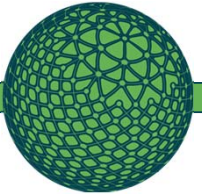
Consumed quantity (g)



Bringing down barriers to children's healthy eating

Gerrish & Mennella, Am J Clin Nutr (2001)

The effect of early variety: short term



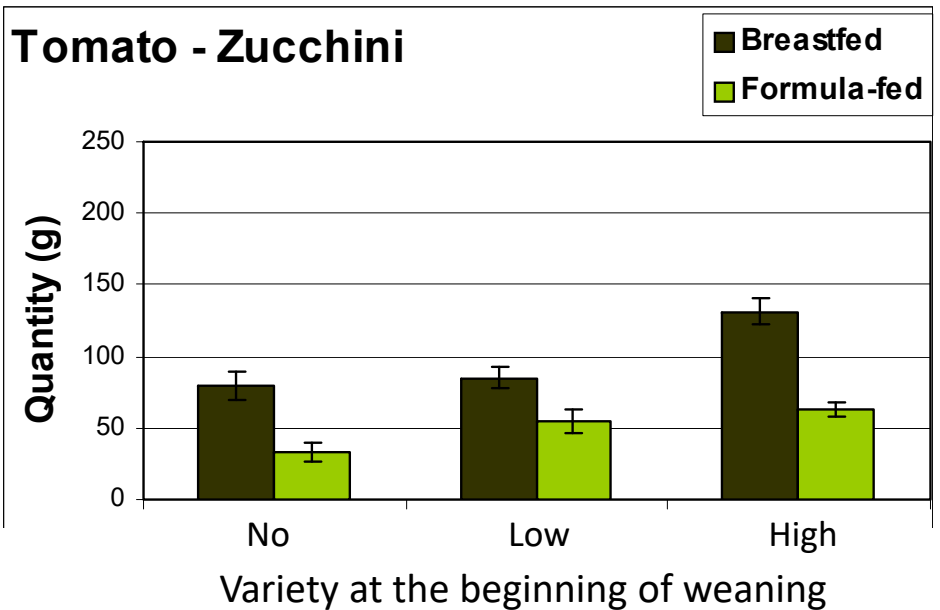
	Lab	Home										Lab
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	
No												
Low												
High												

In each experimental group:
Breastfed and non-breastfed infants

Key factor : number of changes

Day 12

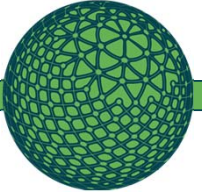
Tomato - Zucchini



Bringing down barriers to children's healthy eating

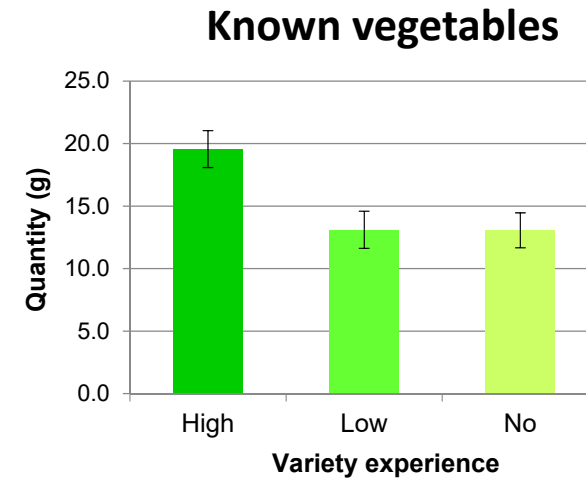
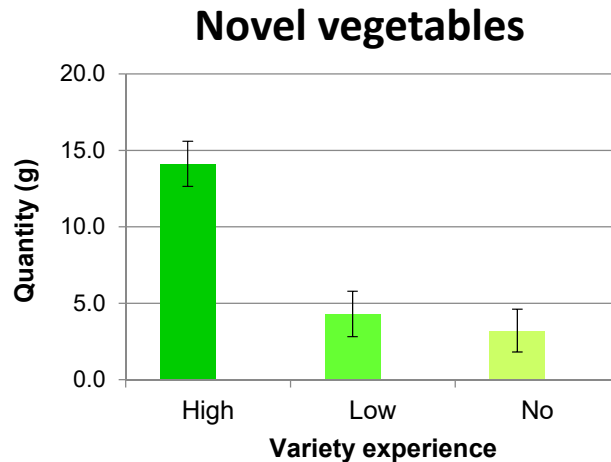
Maier et al, Clin Nutr (2008)

The effect of early variety: long term



	Lab	Home										Lab
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	
No												
Low												
High												

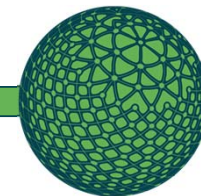
Intake at meal time in the lab, at 6 yrs



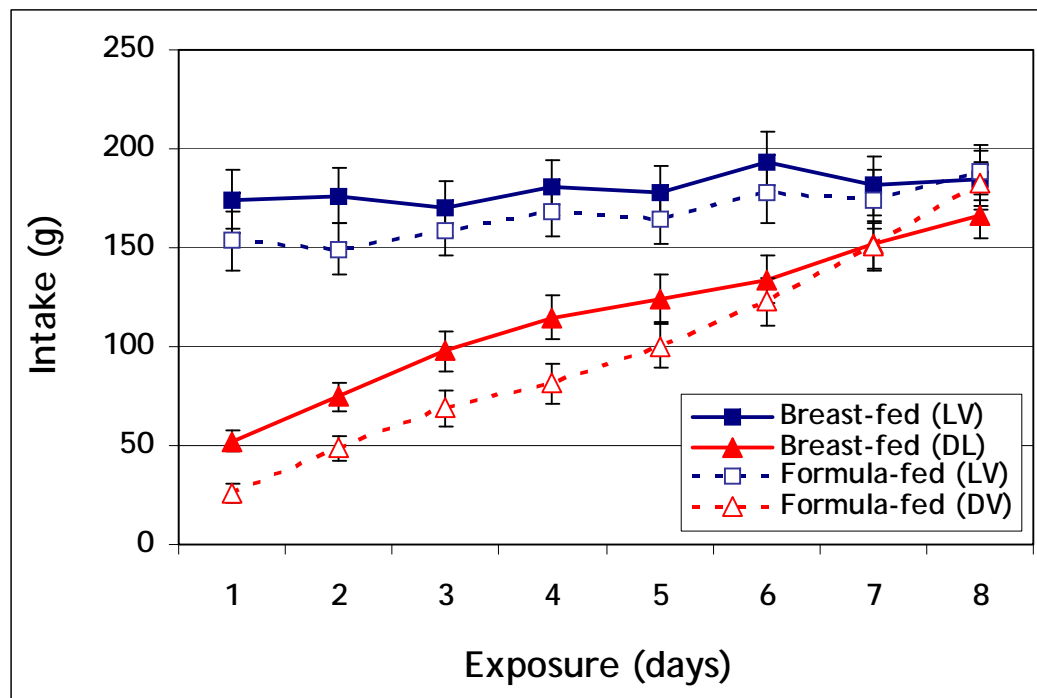
Bringing down barriers to children's healthy eating

Maier et al, Plos One (2016)

Flavour learning during complementary feeding



- Breastfeeding effect
- Repeated exposure



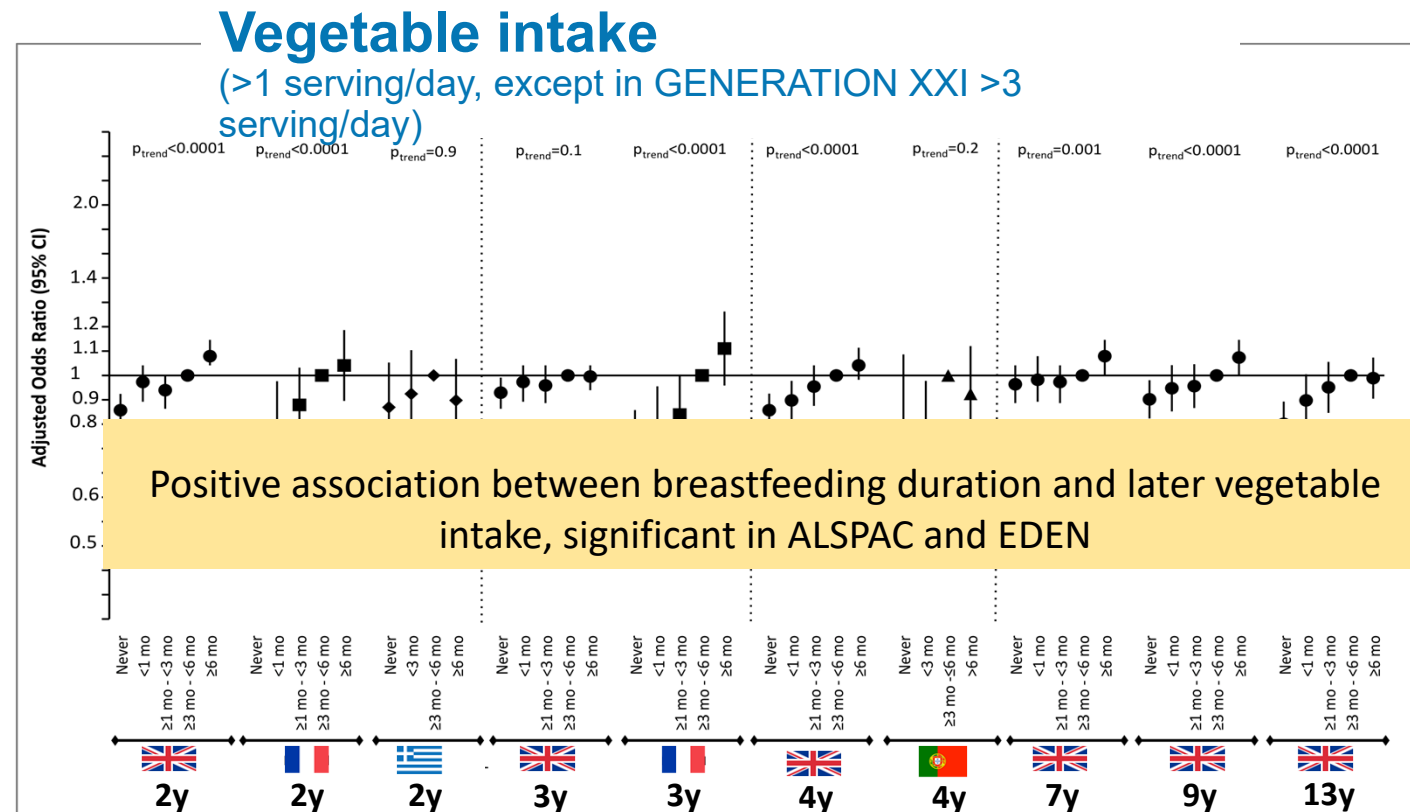
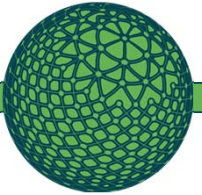
In blue: initially liked vegetable
In red: initially disliked vegetable

9 months later: 63% were still eating and liking the initially disliked vegetable

Bringing down barriers to children's healthy eating

Maier et al, Food Qual Pref (2007)

Effect of breastfeeding



Logistic regressions adjusted for age of introduction to vegetables, age of introduction to other foods, child's age and sex, maternal education &, except in EuroPrevall, maternal age and smoking during pregnancy

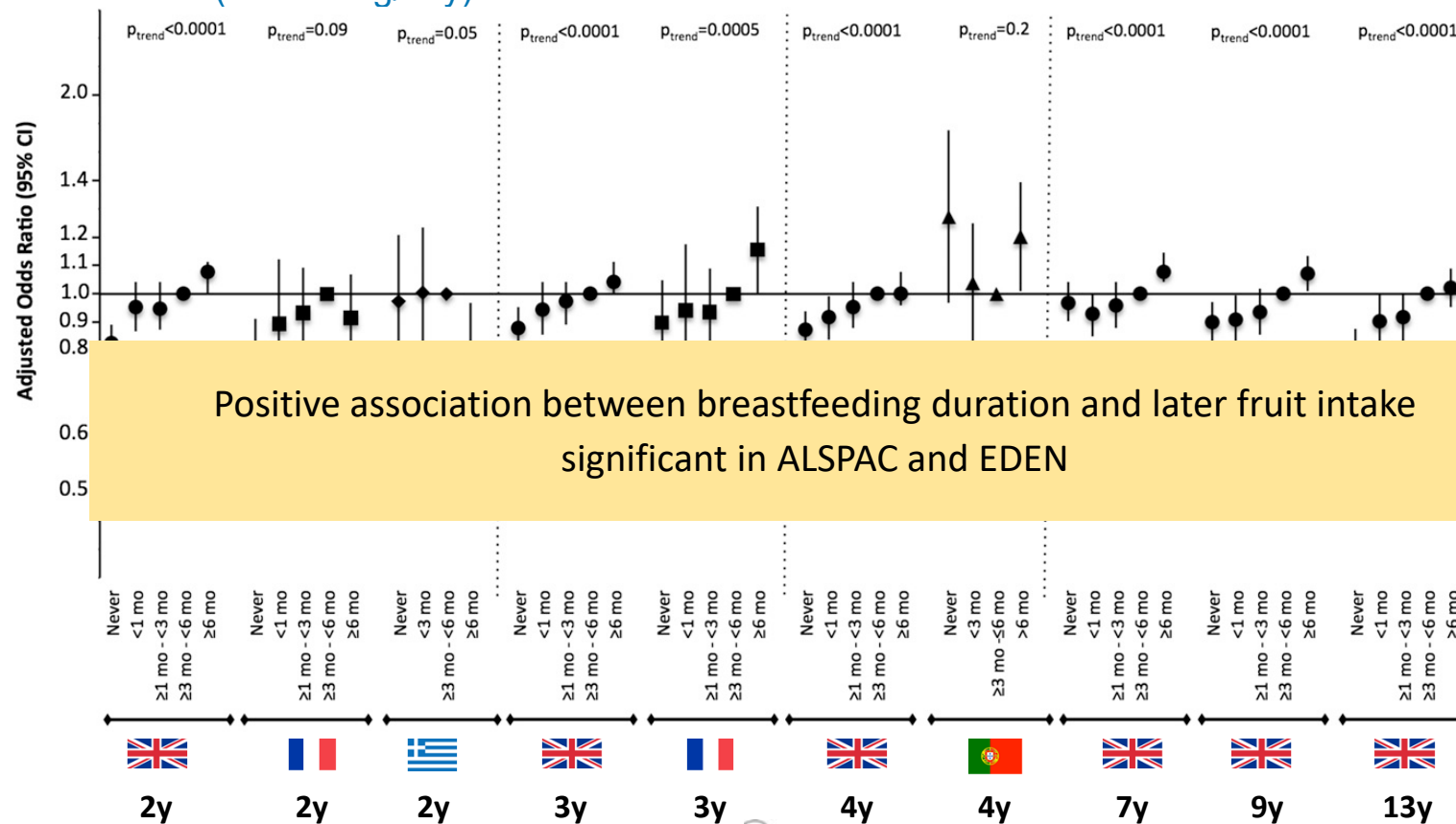
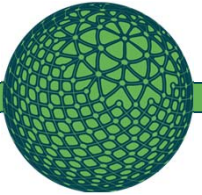
Bringing down barriers to children's healthy eating



de Lauzon-Guillain et al. AJCN (2013)

Effect of breastfeeding

Fruit intake (>1 serving/day)

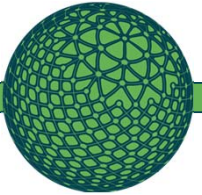


Bringing down barriers to children's healthy eating



de Lauzon-Guillain et al. AJCN (2013)

Which factors are the most influent?



Sensory variety

Prenatal Neonatal
exposure



Sensory reactions

Taste
6, 12, 22 mo



Odours
8, 12, 22 mo



New foods
3 first mo CF



Frequency, variety of foods

3 first mo CF
15, 18, 21, 24 mo



Food liking

15 mo
18 mo
21 mo
24 mo



Parental practices

Nicklaus et al, in preparation

Which factors are the most influent?

- Focus on bitter vegetables



+ 13 others



Acceptance of vegetable odours at 12 mo



Bitter taste acceptance at 12 mo

Frequency of bitter vegetable consumption from 15 to 18 mo

Frequency of bitter vegetable consumption from 18 to 21 mo



Permissive style at 22 mo



Variety of new veg 3 first mo CF



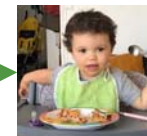
Reaction to new veg 3 first mo CF



Liking of bitter vegetables at 15 mo



Liking of bitter vegetables at 18 mo



Liking of bitter vegetables at 21 mo



Liking of bitter vegetables at 24 mo

Bringing down barriers to children's healthy eating

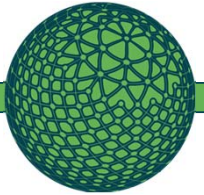
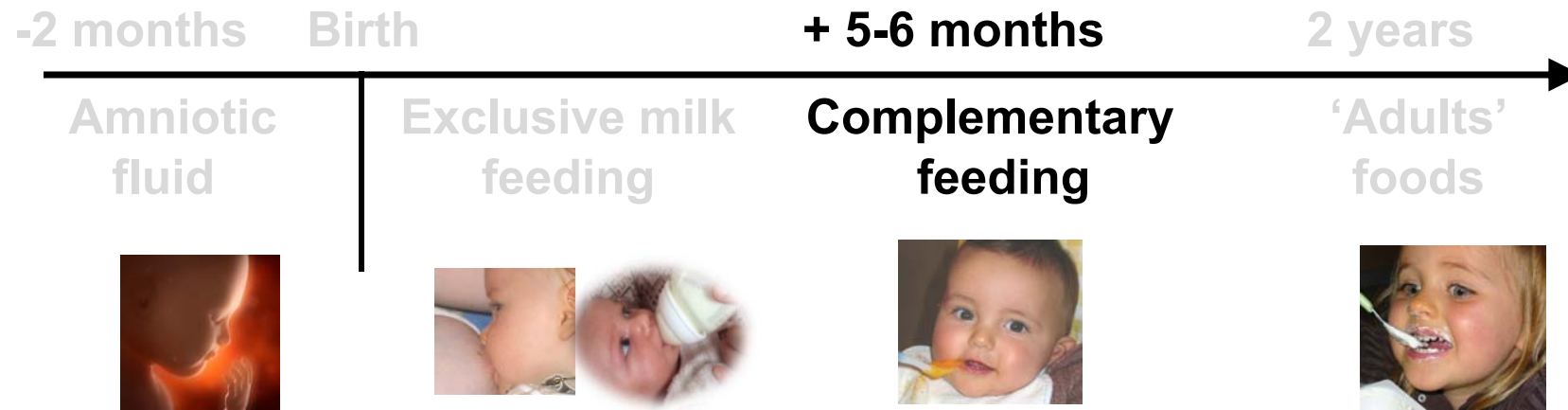


PALINE



Nicklaus et al, in preparation

Different stages of learning

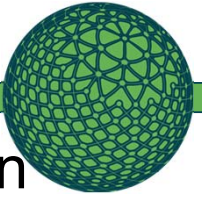


Flavour learning

Texture learning

Bringing down barriers to children's healthy eating

Effect of exposure to different textures



- At 12 months infants consumed significantly more pureed carrots than chopped carrots
- Familiarity with different textures, especially chopped foods, was the strongest predictor of intake and liking of chopped carrots

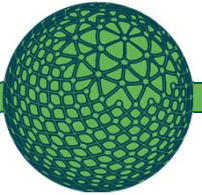
Blossfeld et al, Food Qual Pref (2007)

- Compared to children introduced to lumpy solids between 6-9 months, children introduced to lumpy foods after the age of 9 months:
 - ate less of many of the food groups at 7 years, including all 10 categories of fruit and vegetables
 - were reported as having significantly more feeding problems at 7 years

Coulthard et al, Matern Child Nutr (2009)
(ALSPAC cohort)

Bringing down barriers to children's healthy eating

Effect of exposure to different textures



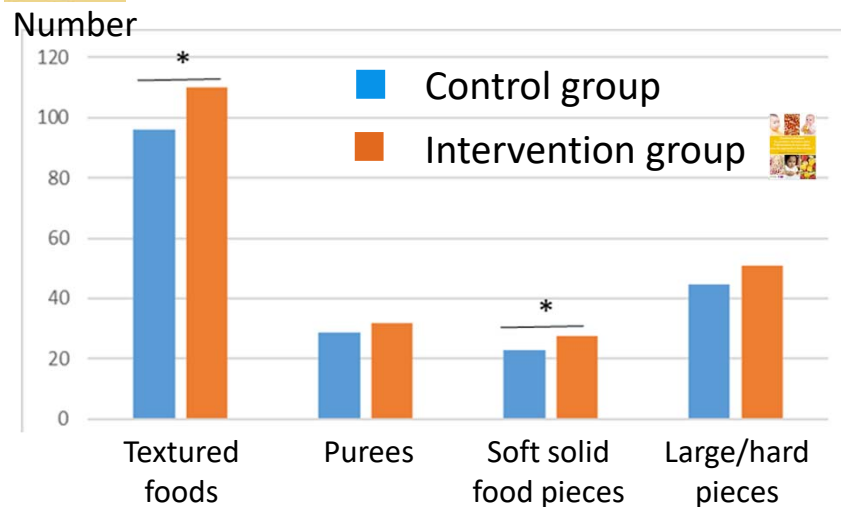
- New recommendations on texture introduction



Intervention from
8 to 15 months old



Effect on textured food introduction



Parents in the intervention group have introduced more soft/small food pieces

Bringing down barriers to children's healthy eating

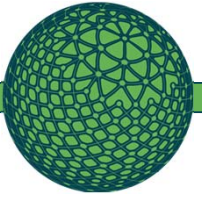


Effect on acceptance of diverse textures

Independently of their study group, the more children were exposed to textured (i.e., non-pureed) foods, the more they accepted a variety of food textures

Tournier et al, Appetite (2021)

Concepts: eating habits



Qualitative dimension



Quantitative dimension

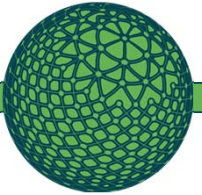
Eating habits

Temporal dimension

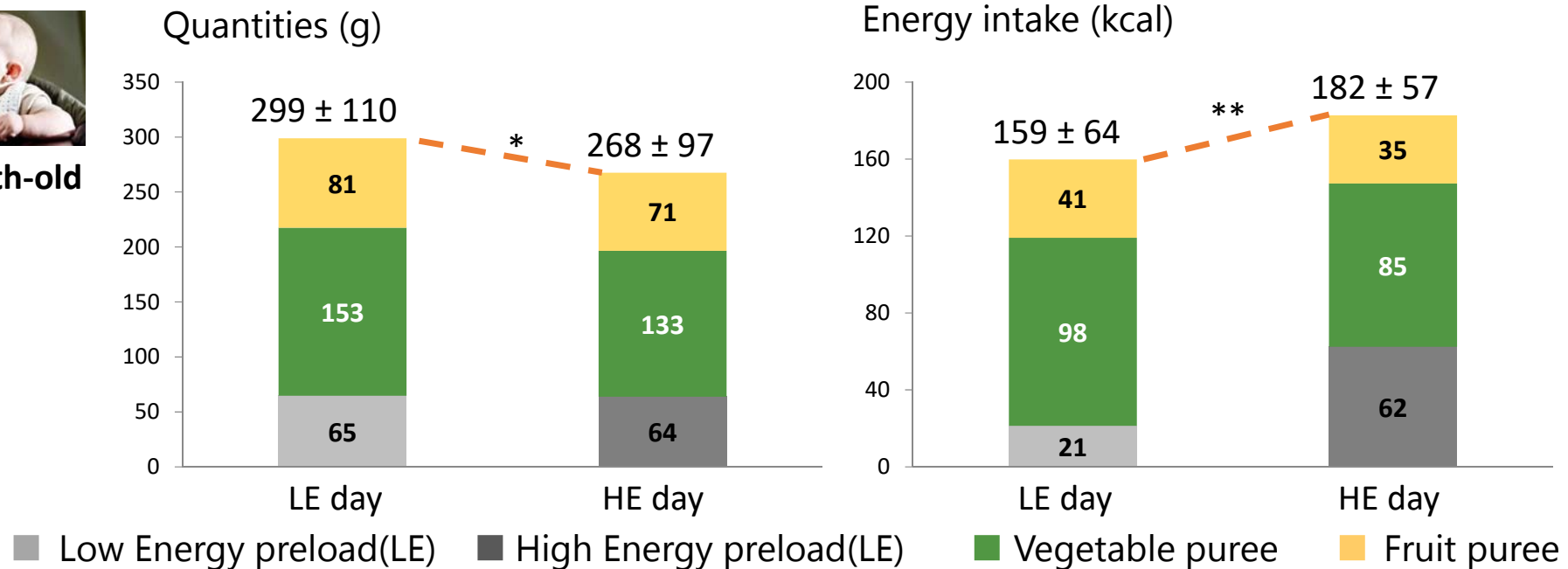
Contextual dimension

Bringing down barriers to children's healthy eating

Caloric adjustment ability



11 month-old



After the HE preload, infants decreased their intake
Nevertheless, they ingested more energy during the HE day

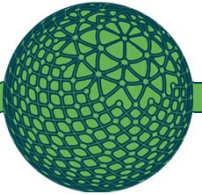
Bringing down barriers to children's healthy eating



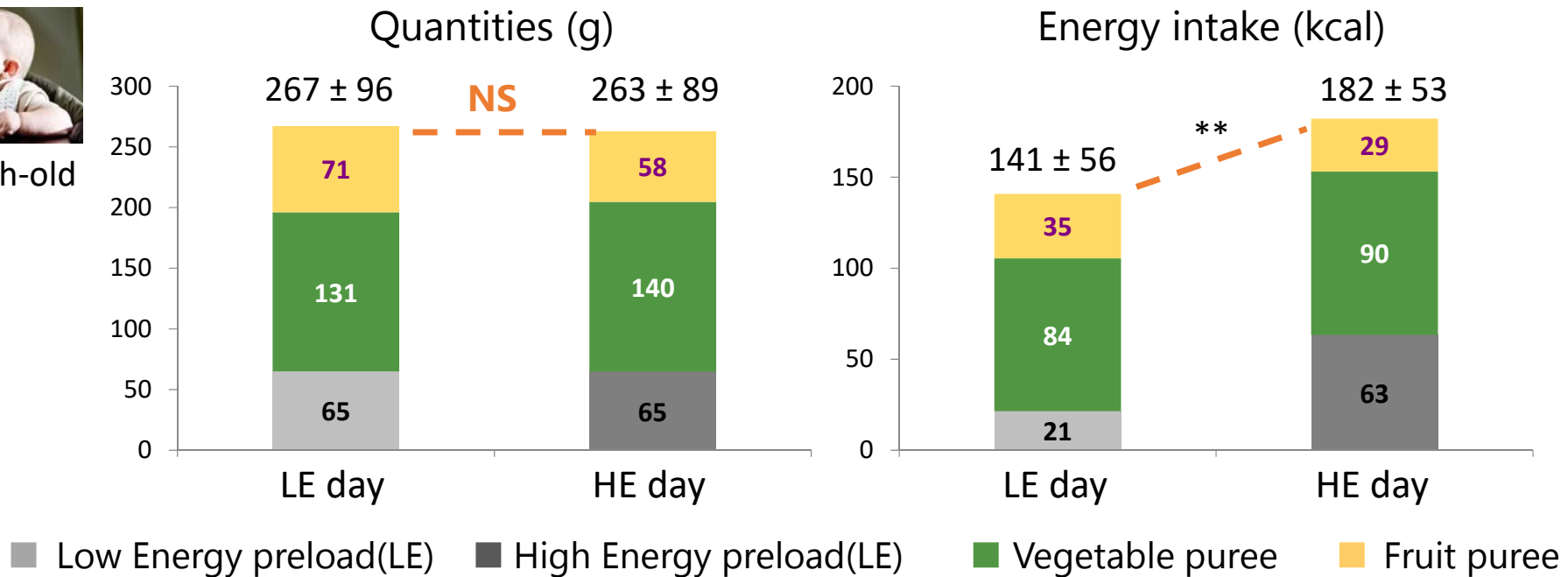
ANR-15-CE21-0014

Brugailières et al., Am J Clin Nutr (2019)

Caloric adjustment ability

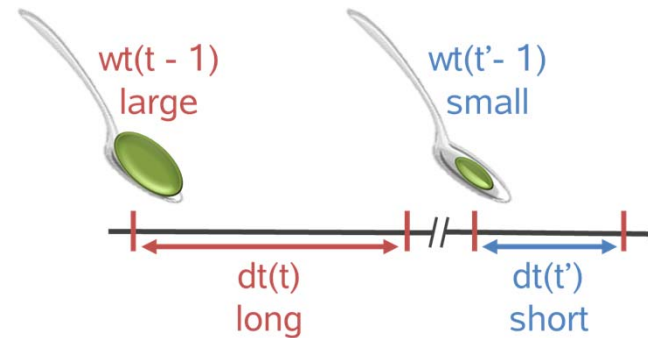
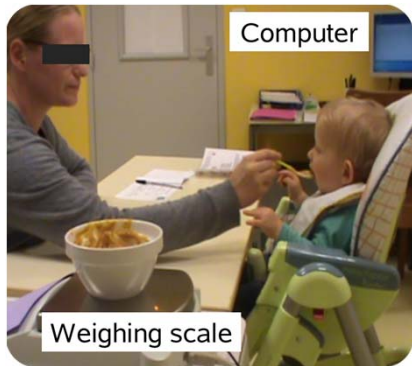
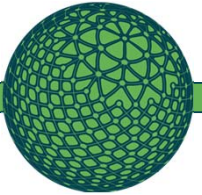


15 month-old



At 15 months, infants exhibited a volumetric adjustment
Consequently, they ingested more energy during the HE day

Caloric adjustment ability



Pace adaptation: the larger the spoonful, the longer the time interval until the next spoonful?

The more the spoonful pace was adapted to the spoonful weight, the more accurate the caloric adjustment was for 11 month-old infants

Caloric adjustment ability

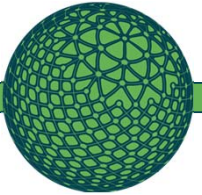


- The more the caloric compensation ability decreased between 11 and 15 months old, the more the infants were perceived as food responsive between these ages
- This decrease is associated with a larger increase in weight status from 11 to 15 mo and a higher weight status at 2 years

Brugaillères et al., Appetite (2019)

Brugaillères et al., Am J Clin Nutr (2019)

Conclusion



- The caloric adjustment ability deteriorates from 11 to 15 months until reaching a volumetric adjustment at 15 months
- However, this trait could be viewed as a highly adaptive strategy
Comment from M.L. Frelut
as sweetness liking and bitterness disliking
- But learning to like initially disliked foods is possible and the period of complementary feeding is a window of opportunity
- A responsive feeding style seems a favorable practice associated with better caloric adjustment ability

Thanks for your attention !



Thanks to all the students who have conducted the experiments

Thanks to my colleagues

Thanks to Paula Varela for the coordination of Edulia

Thanks to our Italian colleagues for organising this conference



This project has received funding from the European Union's horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 764985.

