Complimentary Feeding and Later Obesity

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Prevention during complementary feeding

**Outcomes of an Early Feeding Practices Intervention to Prevent Childhood Obesity**

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Nourish trial (n=698); Australia

The online version of this article, along with updated information and services, is located on the World Wide Web at:

http://pediatrics.aappublications.org/content/132/1/e109.full.html
Overview

- Why should complementary feeding impact obesity risk?
  - Transitional period with big nutritional changes
  - Period of high plasticity
  - High dependency on parental behaviours, beliefs, traditions and cousin
  - Period of "flavor shaping"
Potential pathways

Complimentary feeding

Parental believes, eating behaviours, food choices etc

Excessive Growth

"Normal"

Poor Growth

• Metabolic programming
• Flavor shaping
• Epigenetics, etc.

Health consequences
What aspects of complementary feeding could potentially impact growth and later obesity risk?

- Age at introduction of complementary foods
- Quality of complementary foods
  - Sensitivity of earlier growth period to environmental factors
  - Age inadequate addition of energy and changes in macro- and micronutrients
    - Changes in growth velocities
    - Metabolic programming
  - Shaping of food preferences
The first months of life - a sensitive growth period
Study population of the CHOP study

- 1090 healthy, term singelton infants with birth weights ≥ 2500 g
- Recruited in birth clinics from 8 urban areas in 5 countries
- Randomized until 8th week of life to a higher and lower protein formula
- Intake assessment by 3-day weighed food protocols
- 932 filled in at least one food protocol during the first 2 years of life

n=

<table>
<thead>
<tr>
<th>Country</th>
<th>Count</th>
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<tbody>
<tr>
<td>Germany</td>
<td>161</td>
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<tr>
<td>Belgium</td>
<td>110</td>
</tr>
<tr>
<td>Italy</td>
<td>220</td>
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<tr>
<td>Poland</td>
<td>169</td>
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<td>Spain</td>
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</table>
Number of food protocols

Month of food protocol

Number of food protocols (formula-fed)
Is energy intake impacted by complementary feeding in formula-fed children?

Energy intake and early weight gain

Percentages of infants who showed rapid (■) or slower (□) weight gain between 0 and 2 years, by quartiles of dietary energy intake at age 4 months, in formula- or mixed-fed infants (P < .0001 for trend).

More rapid weight with higher energy intake
Energy intake and early weight gain

Life course plot of the effect of energy intake (z-score) on weight-for-length at 24 months

Based on 402 formula-fed children; CHOP study
Shift of macronutrient intake during first 2 years of life (CHOP study; formula-fed children only)
Contribution of complementary foods to daily intake (CHOP study; formula-fed children only)
### Differences in consumption between countries at 6 mo.

**PROPORTION (%) OF FORMULA-FED INFANTS CONSUMING VARIOUS FOODS AT 6 MONTHS OF AGE BY COUNTRY**

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Germany (n=125)</th>
<th>Belgium (n=78)</th>
<th>Italy (n=175)</th>
<th>Poland (n=144)</th>
<th>Spain (n=208)</th>
<th>Total (n=730)</th>
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<td>Infant Formula</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<tr>
<td>All Vegetables</td>
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<td>81</td>
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<td>57</td>
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<td>Whole Vegetables</td>
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<td>36</td>
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<td>19</td>
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<td>All Fruit</td>
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<td>70</td>
<td>81</td>
<td>68</td>
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<tr>
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<td>63</td>
<td>24</td>
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<td>24</td>
<td>33</td>
<td>51</td>
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<td>0</td>
<td>54</td>
<td>0</td>
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<td>23</td>
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<td>85</td>
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<td>80</td>
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<td>6</td>
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<td>18</td>
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<td>74</td>
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<tr>
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<td>Sweets, Pastries, Cakes</td>
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<td>17</td>
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THE TIMING OF SOLID FOOD INTRODUCTION
IMPACTS GROWTH AND OBESITY RISK?
Timing of solid food introduction in Cincinnati, Mexico City, and Shanghai as well as in Europe (CHOP study)


Factors associated with early solid introduction (+quality)

- single parent households
- low education
- formula-feeding
- enrolment in day care
- young maternal age
- multi-parity
- higher maternal BMI
- maternal smoking
- depression

Timing of solid food introduction and obesity risk later in life


Timing of solid food introduction has no mayor impact on later obesity risk
Randomized trials on complementary feeding

- Randomization of 119 children at 4 months of age in exclusive breastfeeders and complementary feeders (CF). Setting Iceland.

- Results:
  - Higher ferritin levels at 6 months in CF children, but no impact on growth.
  - Caveat: Power on breastmilk intake, not growth, not iron status and anaemia.
PRIMARY NUTRITION INFLUENCES

COMPLEMENTARY FEEDING
Feeding type and healthy eating behaviours

- Breastfeeding duration was positively associated with adherence to dietary guidelines and early eating habits tracked into later childhood (S Nicklaus and E Remy. Current Obesity Reports 2013; 2 (2). p.179).

Timing of solid food introduction and obesity at 3 years according to breastfeeding status (n = 847)

Huh SY et al. Pediatrics 2011; 127:e544-e551
Energy Providing Liquids

• Energy providing liquids replace energy from other nutritive sources (like solid foods and milk)

• Great national and regional differences

• Varies according to primary feeding type
Intake of energy providing liquids during the first 10 months of life varies by the initial feeding type

breastfed

formula-fed


Fig. 1. Percentage (%) and standard error (SE) of breastfed (A) and formula fed infants (B) with intake of instant tea, fruit juice or vegetable juice during the first year of life.
Quality and type of feeding
Results of a review

10 studies identified up to June 2012 with complementary feeding data and BMI in later life (> 4 years)
- Protein intake at 6 months no impact, inconsistent for later time points
- No data with any association with fat and carbohydrate intakes
- No clear data on types of complementary foods with effects on obesity
Difficulties and gaps in the assessment of complementary feeding and its relationship to health outcomes

- Difficulty of randomized controlled trials on human infants, especially in diet
- Lack of clear hypotheses with proposed pathways for pathogenesis
- Complexity of dietary data with lack of precision
- Dynamic, short period
- Difficulty of analysing the effects of dynamic dietary exposures
- Lack of prospective and longitudinal data
- Long lag times between dietary exposure and presentation of disease
Conclusions

• Age of introduction and quality of complementary foods “depend” on primary nutrition

• Age at introduction of complementary foods has no major impact on the risk of obesity

• No evidence that consumption of specific foods or food groups during the complementary feeding increase the risk for childhood obesity

• Families of children that are formula fed should be targeted, as they share several features of nutritional behaviours that are considered unfavourable.
Thank you for your attention!