NUTRITIONAL CHALLENGES AND OPPORTUNITIES DURING THE WEANING AND TODDLER PERIOD

Martine Alles, PhD
14th March 2014

Note: for non-commercial purposes
TIME OF RAPID AND IMPRESSIVE GROWTH

Growth Velocity

Age (years)

0 – 3 years

WHO Growth Standards, 2006
SIGNIFICANT POSTNATAL ORGAN DEVELOPMENT DURING CHILDHOOD

# Development of Digestive Function

<table>
<thead>
<tr>
<th>Category</th>
<th>Enzyme/Function</th>
<th>Birth</th>
<th>1</th>
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Legend:
- **Absent / very Low levels**
- **Adult levels/sufficient**

*Note: ?* indicates data not available or uncertain.
TIMING OF NUTRITIONAL SIGNAL MATTERS
EXAMPLE: BRAIN SYNAPSE FORMATION

Adapted from Georgieff & Innis, 2005, Ped Res

Essential fatty acids
Iron

[Diagram showing the timing of nutrient signals during brain synapse formation, with key stages labeled for sensory pathways, language, and higher cognitive functions.]
Development starts in the first weeks of gestation and maturation continues until 4 y of age.

Differential nutritional programming (fetal vs postnatal).

Low protein is adverse during fetal life, beneficial during lactation for type 2 diabetes.

Hill & Duvillie, 2000
Holness et al, 2000
WHAT IS THE WINDOW OF OPPORTUNITY IN LATE INFANCY AND TODDLERHOOD?
KEY MESSAGES

- Significant growth and development
- The influence of nutritional factors depends on the timing
- Most studies looking at the relationship of early nutrition for later life health focus on pregnancy and young infants
YOUNG CHILDREN HAVE ADDITIONAL NUTRIENTS NEEDS:
E.G. TODDLERS NEED 5.5 TIMES AS MUCH IRON PER KG BODY WEIGHT AS ADULTS DO.
CHANGE IN FOOD SOURCES DURING THE FIRST 2 YEARS OF LIFE.

UNDERSTAND NUTRITIONAL REALITY IN OLDER INFANTS AND TODDLERS

WHY:
Childhood obesity is rising in many European countries, whereas nutritional deficiencies (e.g. of iron and vitamin D) are still prevalent. Recent data on dietary intake of young children is lacking in many European countries.

Scope nutritional reality in 3 steps
1. NUTRIPLANET: Literature search and expert interviews (@database)
2. Dietary surveys
3. Nutrient status studies
NUTRIPLANET GLOBE COVERAGE – Dec 2013

NUTRIPLANET, a referent, systematic & strategic process for a complete understanding of local food, nutrition & health situations.
VEGETABLE INTAKE

Reco. min. intake 1-3 y (75 g)

Reco. min. intake 4-8 y (125 g)

Vegetable intake (g/d)

Netherlands  Italy  Poland  Belgium  UK  Czech  Germany  Ireland

* Netherlands Nutrition Centre
FRUIT INTAKE

Mean fruit intake (g/d)

Reco. min. intake 1-3 y (150 g)
NUTRIENT INTAKE IN INFANTS/TODDLERS IN EUROPE

Literature search + expert interviews

Dietary survey
NUTRIENT INTAKE IN INFANTS/YOUNG CHILDREN ASIA

[Map showing nutrient deficiencies across Asia with indicators for low, mid, and high evidence.

Literature search + expert interviews]
SUGAR INTAKE

Information from National surveys

<table>
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<th>Age Group</th>
<th>Finland</th>
<th>Germany</th>
<th>Ireland</th>
<th>Netherlands</th>
<th>Poland</th>
<th>UK</th>
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<tr>
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<td>Sucrose</td>
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<td>Non-milk sugar</td>
<td>Sugar&amp;Sweets</td>
<td>Sugar&amp;Sweets</td>
<td>Non-milk sugar</td>
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</table>

Graph showing sugar and confectionery intake in grams per day (g/d) across different age groups and countries.
CONTRIBUTORS TO SUGAR INTAKE IN INFANTS AND TODDLERS

• Only a small number of surveys report the dietary sources of sugar.

• At weaning: fruit juices and beverages are important food sources of sugar intake.

• In older children: beverages and foods consumed in the morning are important contributors to sugar intake (fruit juices, baked goods, biscuits).
WHY REDUCE SUGAR AND SWEETNESS IN CHILDHOOD?

Caries
• Sucrose is a cariogenic sugar.
• Nursing bottle syndrome

Sweet taste preference
• Innate preference for sweetness
• Effects of exposure to sweet foods and beverages
• Long term effects on preference

Obesity
• Sugar intake associated with BMI in children
• Especially sugar sweetened beverages
A Trial of Sugar-free or Sugar-Sweetened Beverages and Body Weight in Children

Janne C. de Ruyter, M.Sc., Margreet R. Olthof, Ph.D., Jacob C. Seidell, Ph.D., and Martijn B. Katan, Ph.D.

ABSTRACT

BACKGROUND
The consumption of beverages that contain sugar is associated with overweight, possibly because liquid sugars do not lead to a sense of satiety, so the consumption of other foods is not reduced. However, data are lacking to show that the replacement of sugar-containing beverages with noncaloric beverages diminishes weight gain.

METHODS
We conducted an 18-month trial involving 641 primarily normal-weight children from 4 years 10 months to 11 years 11 months of age. Participants were randomly assigned to one of two groups: sugar-free beverages or sugar-containing beverages.
FAT INTAKE IN YOUNG EUROPEAN CHILDREN

Fat intake (en%)

Austria 12-36 mo, Belgium 2.5-4 y, Finland 2 y, France 3-18 mo, France 19-24 mo, France 25-30 mo, Germany 1.4 y, 2008, Ireland 1-1.9 y, Ireland 2 y, Ireland 3 y, Ireland 4 y, Italy 0-2.9 y, NL 18 mo, NL 2-3.9 y, Poland 12-24 mo, Poland 24-36 mo, Spain 2.5 y, UK 1-3 y
SATURATED FAT INTAKE IN YOUNG EUROPEAN CHILDREN


Recommended intake*: <10 en%

* Nordic Nutr. Recomm.
Impact of Repeated Dietary Counseling Between Infancy and 14 Years of Age on Dietary Intakes and Serum Lipids and Lipoproteins: The STRIP Study
Harri Niinikoski, Hanna Lagström, Eero Jokinen, Marja Siltala, Tapani Rönnemaa, Jorma Viikari, Olli T. Raitakari, Antti Jula, Jukka Marniemi, Kirsti Näntö-Salonen and Olli Simell

_Circulation_. 2007;116:1032-1040; originally published online August 13, 2007;
doi: 10.1161/CIRCULATIONAHA.107.699447

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Print ISSN: 0009-7322. Online ISSN: 1524-4539
PROTEIN INTAKE IN EUROPEAN INFANTS (<12 MO)


PROPOSED UPPER LIMIT: ≤15 en%

REQUIREMENT*:
5 en%

* EU / WHO requirement
PROTEIN INTAKE IN YOUNG EUROPEAN CHILDREN


Proposed upper limit: ≤15 en%

Requirement*: 5 en%

** EU / WHO requirement
PROTEIN INTAKE IN YOUNG ASIAN CHILDREN

Differences in protein quality between and within countries. ILSI SE-Asia advise: 16-23 g protein per day depending on protein quality

RDA 40 g/d 19 g/d 21 g/d 17 g/d 14-16 g/d

China National Nutrition and Health Synthesis Report 2002
Family Health Service, DoH report, Hong Kong 2012 (n=718)
Data extracted from NutriPlanet, Nipa Rojroongwasinkul, Institute of Nutrition, Mahidol University (n=1476)
Malaysian Dietary survey, NP follow up study 2012 unpublished data (n=181)

* EU / WHO requirement
CAN WE TRANSLATE THIS TO OLDER INFANTS AND TODDLERS?

Prospective observational research

High protein intake $^1,^3$

- At age of 12-24 months
- Is associated with a high BMI at 4 (Sweden) and 7 years (Germany)
- A high BF% at age of 7 years

High intake of animal protein, especially from dairy$^2$,

- At the age of 12 months
- Is associated with a higher BF at the age of 7 years
## NO STRONG INCREASE OF PROTEIN INTAKE IN DUTCH CHILDREN

<table>
<thead>
<tr>
<th>Year</th>
<th>Age 1-4 y</th>
<th>Age 4-7 y</th>
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</thead>
<tbody>
<tr>
<td>1987/1988</td>
<td>45¹</td>
<td>53²</td>
</tr>
<tr>
<td>1992</td>
<td>44 ♂, 45 ♀</td>
<td>57 ♂, 53 ♀</td>
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<tr>
<td>1998</td>
<td>50 ♂, 44 ♀</td>
<td>56 ♂, 53 ♀</td>
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<tr>
<td>2005/2006</td>
<td>44 ♂, 43 ♀³</td>
<td>51 ♂, 46 ♀⁴</td>
</tr>
</tbody>
</table>

¹ 1-3 year olds, ² 4-6 y olds, ³ 2-3 y olds, ⁴ 4-6 y olds
CONCLUSIONS

• Dietary intakes of vegetables, n-3 fatty acids, iron, vitamin D and iodine are low and the intakes of protein, saturated fatty acids and added sugar are high in young children living in Europe.

• Improving feeding habits and balancing nutritional intakes early in life may have significant public health benefits. Metabolic and taste imprinting are important mechanisms that affect long term health.

• However, more intervention studies are needed to evaluate the influence of nutrition in older infants and toddlers on later life health.