Dairy protein in the post weaning phase is positively associated with BMI and weight up to five years of age

Laura Pimpin, Susan Jebb, Jane Wardle, Laura Johnson, Gina Ambrosini
Testing the ‘Early Protein Hypothesis’

Breast milk

5-7% Energy from protein

Infant/follow-on formula milk

7-14% Energy from protein

Weber et al. AJCN 2014
Evidence for the ‘Early Protein Hypothesis’ after weaning

### Different protein source and body size

<table>
<thead>
<tr>
<th>Study</th>
<th>Protein intake</th>
<th>Duration</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hoppe et al.</td>
<td>9months</td>
<td>+ve Height at 10 years</td>
<td></td>
</tr>
<tr>
<td>Thorsdottir et al.</td>
<td>12 months</td>
<td>+ve BMI &amp; Weight at 6 years</td>
<td></td>
</tr>
<tr>
<td>Gunther et al.</td>
<td>12 months</td>
<td>+ve BF% at 7 years  +ve BF% at 7 years</td>
<td></td>
</tr>
<tr>
<td>Garden et al.</td>
<td>18 months</td>
<td>+ve BMI &amp; WC at 8 years -ve BMI at 8 years -ve BMI &amp; WC at 8 years</td>
<td></td>
</tr>
</tbody>
</table>
The Gemini study
a nationally-representative sample of 4804 twins

- BIRTH (2007)
  - Gender
  - Zygosity
  - Ethnicity
  - SES
  - Breastfeeding
  - Birth weight/height
  - Maternal BMI
  - T0 – 8 Months

Weight and Height every 3 months
3-day estimated diet diary
21 months
N= 2458

5 years (2012)
Dairy protein is associated with BMI and weight up 5 years

<table>
<thead>
<tr>
<th></th>
<th>BMI (kg/m²) β (95% CI)</th>
<th>Weight (kg) β (95% CI)</th>
<th>Height (cm) β (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing E from ANIMAL protein by 1%:</td>
<td>0.00 (-0.03; 0.04)</td>
<td>0.02 (-0.00; 0.04)</td>
<td>0.07 (-0.07; 0.20)</td>
</tr>
<tr>
<td>Increasing E from DAIRY protein by 1%:</td>
<td><strong>0.04 (0.00; 0.07)</strong></td>
<td><strong>0.05 (0.02; 0.07)</strong></td>
<td>0.08 (-0.04; 0.21)</td>
</tr>
<tr>
<td>Increasing E from PLANT protein by 1%:</td>
<td>0.02 (-0.04; 0.09)</td>
<td>0.01 (-0.03; 0.04)</td>
<td>-0.31 (-0.57; -0.05)</td>
</tr>
</tbody>
</table>

Adjusting for gender, age, total energy intake, birth weight and rate of prior growth.

$ All weight models are adjusted for height (cm); **Bold estimates p<0.05**
Dairy protein is associated with greater odds of overweight or obesity at 3 years.

Black diamonds p<0.05
Macronutrients are not consumed in isolation

- Findings so far relate to intake of one specific factor
- Studies of dietary patterns i.e. combinations of total food intake can offer ‘real world’ exposures to dairy protein

Dietary Indices and Scores

Reduced Rank Regression

PCA or Factor Analysis

Cluster Analysis

Dietary Pattern

? 

Disease or Health Outcome

MRC | Medical Research Council
A high dairy protein dietary pattern is associated with low intakes of most early weaning foods.
A high dairy protein dietary pattern is associated with BMI, weight up to 5 years

Increasing Dietary Pattern score but 1 unit:

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<th>β (95%CI)</th>
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</thead>
<tbody>
<tr>
<td>BMI (kg/m²)</td>
<td>0.09 (0.01; 0.16)</td>
</tr>
<tr>
<td>Weight (kg)$</td>
<td>0.06 (0.00; 0.12)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>0.00 (-0.27; 0.28)</td>
</tr>
</tbody>
</table>

Adjusting for gender, age, total energy intake, birth weight and rate of prior growth
$ All weight models are adjusted for height (cm);
**Bold estimates p<0.05**
A high dairy protein dietary pattern is associated with greater odds of overweight/obesity.
Summing up..

- Dairy protein intake (50% of total protein intake):
  - associated with increased BMI and weight up to 5 years
  - associated with greater odds of overweight and obesity up to 5 years
  - characterised by high intake of milk, low intake other foods (incomplete weaning?)

- Re-examine guidance for appropriate protein and milk intake (more about guidance on what to feed rather than how much protein is best)

- Promote healthy complementary feeding practices especially adequate but not excessive milk intake
Thank you

Dr Gina Ambrosini
Prof Susan Jebb

Dr Laura Johnson (University of Bristol)
Prof Jane Wardle (UCL)
Dr Clare Llewellyn (UCL)
Reduced Rank Regression

3-day diet diaries

All foods consumed

45 Food Groups

Intermediate variables selected *a priori*

\[ \text{Dietary pattern factors} = (\text{Score for each }) \]