BREAKFAST: The most important subject in school

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Good News:
Americans are eating less

The bad news:
Only when it comes to breakfast

- Adults reporting eating breakfast daily:
  - 1971 - 89%
  - 82% - 82%

Children are flunking breakfast

www.ars.usda.gov/SP2UserFiles/Place/12355000/pdf/Table_5_BIA.pdf

Breakfast: An ethnic problem

Research on the effects of breakfast & learning

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Positive results found</th>
<th>No effect found</th>
</tr>
</thead>
</table>
The effects of breakfast on education

- Cognitive function/attention/memory
- Academic performance
- Attendance
- Psychosocial issues & mood

Breakfast & affect on attention & memory

- 29 children (15F/14M)
- 12 years old
- 4 breakfasts:
  - "Shreddies" + milk
  - Cheerios + milk
  - Glucose drink
  - Nothing

Wesnes et al., Appetite, 2003

Breakfast & affect on attention & memory

<table>
<thead>
<tr>
<th>Type of breakfast</th>
<th>Change from 8 AM to midday</th>
</tr>
</thead>
<tbody>
<tr>
<td>No breakfast</td>
<td>12% decline</td>
</tr>
<tr>
<td>Glucose drink</td>
<td>27% decline</td>
</tr>
<tr>
<td>Shredded wheat</td>
<td>3% improvement</td>
</tr>
<tr>
<td>Cheerios</td>
<td>5% improvement</td>
</tr>
</tbody>
</table>

Wesnes et al., Appetite, 2003

Breakfast slows the decline in power of attention

More recent studies

- Breakfast eaters had:
  - Better performance (Gajre-2008)
  - Cognitive performance (Mahoney2005)
  - Cognitive perf: low-GI - (Ingwerson2007)
  - Better performance & Lower mental stress (2008-Norway)

Change in alertness & contentment

- No breakfast
  - Declined
  - Improved until 10 AM, then declined rapidly
- Glucose drink
  - Improved
- Shreddies
  - Improved
- Cheerios

Wesnes et al, Appetite, 2003

- 379 children
- 3 groups - single blinded
  - Never eat breakfast
  - Skip 2-3 times per week
  - Eat breakfast daily
- Assessed:
  - Memory
  - Attention/concentration
  - School grades

But what kind of breakfast?


- Daily breakfast eaters had significantly:
  - Better grades
  - Better memory recall
  - Better attention/concentration

Mahoney (2005): breakfast breakdown

<table>
<thead>
<tr>
<th></th>
<th>Oatmeal + 4 oz skim milk</th>
<th>RTE + 4 oz skim milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>CHO</td>
<td>38 g</td>
<td>36 g</td>
</tr>
<tr>
<td>Sugar</td>
<td>19 g</td>
<td>32 g</td>
</tr>
<tr>
<td>Protein</td>
<td>8 g</td>
<td>5 g</td>
</tr>
<tr>
<td>Fiber</td>
<td>3 g</td>
<td>1 g</td>
</tr>
</tbody>
</table>

Mahoney (2005)

- 30 students, 9-11 years old
- 3 groups:
  - No breakfast
  - RTE cereal + skim milk
  - Instant oatmeal + skim milk
- Similar calories, different macronutrients

Mahoney et al, Physiology & Behavior, 2005

Cognitive performance: Mahoney (2005)

- Spatial memory
- Short-term memory
- Visual perception

- Oatmeal beats RTE cereal
- RTE cereal beats no breakfast

Mahoney et al, Physiology & Behavior, 2005

<table>
<thead>
<tr>
<th></th>
<th>All-Bran</th>
<th>Coco Puffs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>98</td>
<td>133</td>
</tr>
<tr>
<td>Protein</td>
<td>4.9 g</td>
<td>1.6 g</td>
</tr>
<tr>
<td>CHO</td>
<td>16 g</td>
<td>30 g</td>
</tr>
<tr>
<td>Fiber</td>
<td>9.5 g</td>
<td>0.7 g</td>
</tr>
<tr>
<td>GI</td>
<td>42</td>
<td>77</td>
</tr>
</tbody>
</table>

Low-GI breakfast delayed the decline in performance throughout the morning:
- Accuracy of attention
- Secondary memory

Meal composition & Alertness

- **3 meal types:**
  - High protein: 52% CHO, 20% Pro, 27% fat
  - Super high CHO: 72% CHO/27% fat
  - Regular: 18% pro/ 55% CHO/27% fat

Regular diet was best with performance
- CHO:PRO ratio of 3.0 was suggested as optimal balance between mood & performance
- Cereal: 110 calories/26 gm CHO, 2 gm PRO
- 1% milk: 220 calories: 11 gm CHO, 8 gm PRO, 3 gm FAT
- 4 oz. juice/fruit: 60 calories: 15 gm CHO

Cereal: 110 calories/26 gm CHO, 2 gm PRO
- 1% milk: 220 calories: 11 gm CHO, 8 gm PRO, 3 gm FAT
- 4 oz. juice/fruit: 60 calories: 15 gm CHO

TOTAL:
- 208 cal CHO/40 cal PRO/27 cal fat

THE POWER OF PROTEIN

- Most children get enough
- May not get enough, early enough
- Most calories obtained after school through evening hours

Paz & Berry, Annals of Nutr & Metab; 1997
 Possible short-term mechanisms at work

• Increasing glucose ⇒ enhanced learning & memory

↑ Brain tryptophan  ➔ ↑ Serotonin  ➔ Positive Mood

1 – Korol et al, AJCN, 1998

Possible short-term mechanisms at work

• Influence of nutrients on brain transmitters
• Protein increases tyrosine level
• Increased dopamine & norepinephrine
• Trp and tyr may affect alertness

1 – Wurtman Sci Am, 1982
2 – Lieberman et al, Nutr Rev. 1986

Other influences

• Metabolic changes related to overnight fasting
  • Gradual decline in glucose and insulin concentrations
  • Long-term changes related to overall nutrition status
  • Presence/absence of anemia, etc.

Effect of breakfast on body weight

• Prior to 2005 - 16 studies
  • Positive effects on BMI: 12 studies
  • No difference: 3 studies
  • Negative effect: 1 study

Rampersaud, JADA 2005

NHLBI Growth & Health Study

• 2367 girls 9-10 years old
• 10 year longitudinal study
• 3-day food records

Barton et al, JADA, 2005

NHLBI Growth & Health Study

• Breakfast eating declined with age
• Cereal consumption declined with age
NHLBI Growth & Health Study

Cereal consumption predicted BMI

Body weight & breakfast

- Breakfast eaters were less likely to be overweight/obese

%Owt/OB

Maddah & Nikooyeh, Pub H Nutr, 2009

1° Reasons for skipping breakfast

- Not enough time to eat
- Parent doesn't have time to prepare
- Don't like the food

Protein & satiety

- Timing of protein may influence fullness/satiety
- Most important during energy restriction
- Higher protein intake produced initial and sustained fullness

Leidy et al Brit J of Nutrition, 2009

Protein needs of children

- Not an exact science – mostly derived
- Influenced by age & weight
- ~0.7-2.6 g/kg/day considered safe
- 0.77 g/kg/day estimated for 7-10 y.o.

Rodriguez, NR. JACN, 2005

HYPOTHESIS

- 25% of daily protein needs for breakfast
- 10-20 grams of protein for breakfast
WHERE KIDS’ DIETS ARE FAILING

Chief dietary gaps

- Low-fat dairy: Not getting enough calcium:
  - 6 in 10 children 5-11 years old
  - 7 in 10 teen boys
  - 9 in 10 teen girls
- Fruit/veg: 1 in 7 kids get enough
- Whole grains: average intake is ¼ of recommendation

School Breakfast Programs

- Created in 1966, made permanent in 1975
- 1975: 1.8 M children
- 2007: 10.1 M children
- Required: 25% of RDA for:
  - Calories, protein, calcium, iron, vitamins A & C
- Participants get more of these nutrients
- HIGHLY underutilized

Universal SBP

- Free to all students
- No income eligibility
- Reduces stigma

Universal SBP -- Pilot

- Increased breakfast consumption
- Reduced incidence of breakfast skipping
- Fewer fears about breakfast & obesity and SBP stigma

1 size does not fit all:
Other SBP service options

- 1 in 4 states and 1 in 5 school districts allow students to eat school breakfast outside the cafeteria
- Options:
  - Breakfast in the classroom
  - Grab ‘N Go
  - Breakfast after 1st period