

BREAKFAST: The most important subject in school

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Good News: Americans are eating less

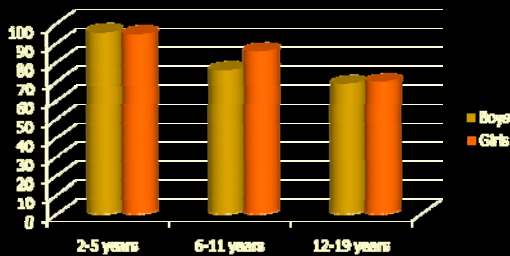
The bad news:

Only when it comes to breakfast

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

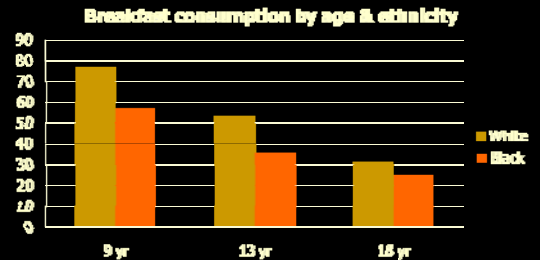
Kant & Graubard, AJCN, 2006

Children are flunking breakfast



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

Breakfast: An ethnic problem



Affenito et al, JADA, 2005

Problems with research on breakfast & children

- Poor methodology/lack of controls
- Lack of consistent definition of "Breakfast"
- Potential confounders:
 - Age, sex, nutritional status (past/present)
 - Timing of breakfast and testing
 - Size & composition of meal
 - Self reporting vs. objective measures

Research on the effects of breakfast & learning

Parameter	Positive results found	No effect found
Attention	3 studies (1983-2003)	7 studies (1981-96)
Memory	8 studies (1981-2003)	6 studies (1982-1996)
Academic test scores	4 studies (1983-2003)	0
Academic grades	3 studies (1998-2003)	0
Attendance	6 studies (1983-2002)	0

Rampersaud et al, JADA, 2005

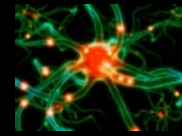
The effects of breakfast on education

- 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

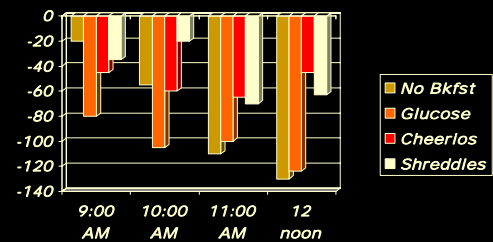
Breakfast & affect on attention & memory

Type of breakfast Change from 8 AM to midday

- | | |
|------------------|------------------|
| • No breakfast | • 12% decline |
| • Glucose drink | • 27% decline |
| • Shredded wheat | • 3% improvement |
| • Cheerios | • 5% improvement |

Wesnes et al, *Appetite*, 2003

Breakfast slows the decline in power of attention



Wesnes KA, *Appetite*, 2003

Change in alertness & contentment

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

Wesnes et al, *Appetite*, 2003

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)

Cognitive performance: Gajre (2008)

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

Cognitive performance: Gajre (2008)

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

But what kind of breakfast?

Cognitive performance: 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

Mahoney (2005): breakfast breakdown

	Oatmeal + 4 oz skim milk	RTE + 4 oz. skim milk
Calories	200	200
CHO	38 g	36 g
Sugar	19 g	32 g
Protein	8 g	5 g
Fiber	3 g	1 g

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

Cognitive performance: Ingwerson et al (2007)

	All-Bran	Coco Puffs
Calories	98	133
Protein	4.9 g	1.6 g
CHO	16 g	30 g
Fiber	9.5 g	0.7 g
GI	42	77

Cognitive performance: Ingwerson et al (2007)

- 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

Paz & Berry, *Annals of Nutr & Metab*; 1997

Meal composition & alertness

- 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

Paz & Berry, *Annals of Nutr & Metab*; 1997

Meal composition & alertness

- 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

Paz & Berry, *Annals of Nutr & Metab*; 1997

THE POWER OF PROTEIN

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

Possible short-term mechanisms at work

- Increasing glucose \Rightarrow enhanced learning & memory¹



1 – Korol et al, *AJCN*, 1998

Possible short-term mechanisms at work

- Influence of nutrients on brain transmitters¹
- Protein increases tyrosine level
 - Increased dopamine & norepinephrine
- Tryp and tyr may affect alertness²

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

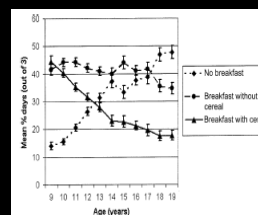
Rampersaud, *JADA* 2005

NHLBI Growth & Health Study

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

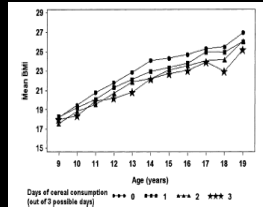
Barton et al, *JADA*, 2005

NHLBI Growth & Health Study



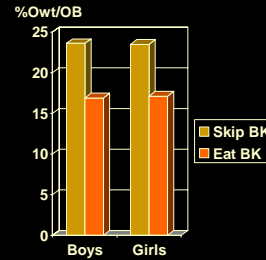
- Breakfast eating declined with age
- Cereal consumption declined with age

NHLBI Growth & Health Study



Cereal consumption predicted BMI

Body weight & breakfast



- Breakfast eaters were less likely to be overweight/obese

Maddah & Nikooyeh, Pub H Nutr, 2009

1^o 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 $\frac{1}{4}$ 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