

# Diet and Behavior

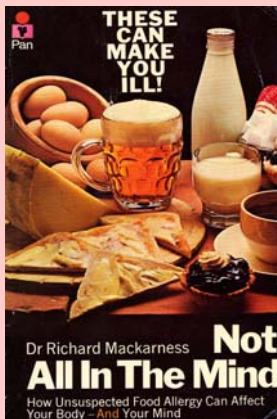
Associate Parliamentary  
Food and health forum  
18<sup>th</sup> April 2007

Professor David Benton D.Sc.  
University of Wales Swansea  
d.benton@swansea.ac.uk

## The impact of diet on anti-social, violent and criminal behaviour

- Food intolerance
- Hypoglycaemia
- Fatty acids
- Vitamins and minerals

David Benton - Neuroscience Biobehavioral Reviews (2007)



### FOOD INTOLERANCE

Food aversion	Biological intolerance
Psychological food intolerance	Enzyme defects
Food avoidance	Fermentation of food residues
	Allergy
	Irritants / toxins
	Pharmacological

- Depressed / irritable
- Knocked out 3 year old son
- Threw daughter out of window
- Serious self-harm



JOANNA

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- Knocked out 3 year old son
- Threw daughter out of window
- Serious self-harm



JOANNA

- In patient 13 times
- Diagnosed with schizophrenia, dementia, epilepsy, depression, hysteria
- Did not respond to treatment
- Brain surgery was proposed

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FOOD INTOLERANCE?

- Fasted for 5 days / drugs withdrawn
- First two days adverse reaction – day 3 felt better
- Foods reintroduced one at a time
- Double-blind testing of suspect foods

- Eggs produced self-mutilation and depression
- Responded to bacon, egg, porridge, veal, tongue, coffee and chocolate



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- Was given a menu

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"...has made a remarkable improvement. She is happy, gay, euphoric... she cares for the children without harming them, looks after her house and generally seems to be almost back to her old self...."

Joanna's General Practitioner



In this new and vitally important book, Dr Richard Mackarness, doctor and psychiatrist, shows how millions may be made ill, physically and mentally, by common foods such as milk, eggs, coffee and white flour.

HYPERACTIVE CHILDREN

- Overactive seven year olds with short attention span
- Oligoantigenic diet - lamb, chicken, potatoes, rice, banana, apple, brassica
- Foods reintroduced one by one
- Using double-blind procedures two recipes were compared

EGGER et al. Lancet (1985)

## FOOD TO WHICH CHILDREN REACTED

Colourant / preservative	79%	Pineapple	19%
Cows Milk	64%	Sugar	16%
Chocolate	59%	Beef	16%
Grapes	49%	Beans	15%
Wheat	49%	Peas	15%
Oranges	45%	Malt	15%
Cows cheese	40%	Apples	13%
Hens egg	39%	Pork	13%
Peanuts	32%	Pears	12%
Maize	29%	Chicken	11%
Fish	23%	Potatoes	11%
Oats	23%	Tea	10%

In total a response to 48 foods was noted

Egger et al. (1985)

• In five similar studies there was a large and consistent effect 0.80 (CI 0.41 to 1.19)

• Parents, prior to the study, believed that child responded to diet



• Findings may not generalize to other child

• Frequency of reaction unknown

• No two children's responses were the same



• No child only responded to additives

• There was no food to which all responded

• No child only responded to one food

• Exasperated rather than caused Attention deficit hyperactivity disorder

## BBC NEWS

Thursday, 21 November, 2002

### Additive ban improves class behaviour



A school in Worcestershire has banned all additives from its meals to stop children behaving badly.

After two weeks staff say they noticed a marked improvement in pupils' behaviour

## The impact of diet on anti-social, violent and criminal behaviour

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## BBC NEWS

Tuesday, 29<sup>TH</sup> March, 2005

### Call for ban on violent pupils



Teacher from Essex spoke about the "sugar effect":

"children's behaviour worsened after eating sweets and cakes during breaks"

Of one pupil, she added:

"he came back and he was bouncing off the walls. I thought he had been on drugs, but he said he had had three doughnuts at break time."

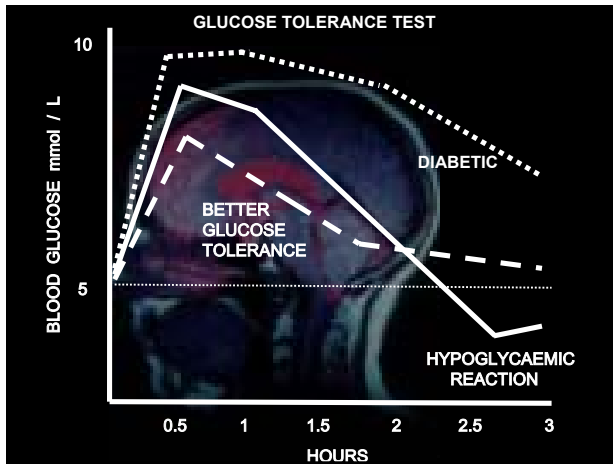
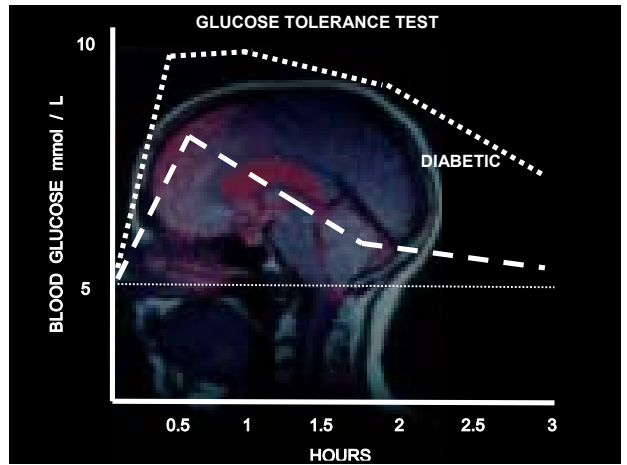
# FOOD FOR THE BRAIN



## BALANCE BLOOD SUGAR

When a child is regularly snacking on refined carbohydrates, sweets, chocolate, fizzy drinks, juices with little or no fibre to slow the glucose absorption, the levels of glucose in their blood will seesaw continually and trigger wild fluctuations in their levels of activity, concentration, focus and behaviour.

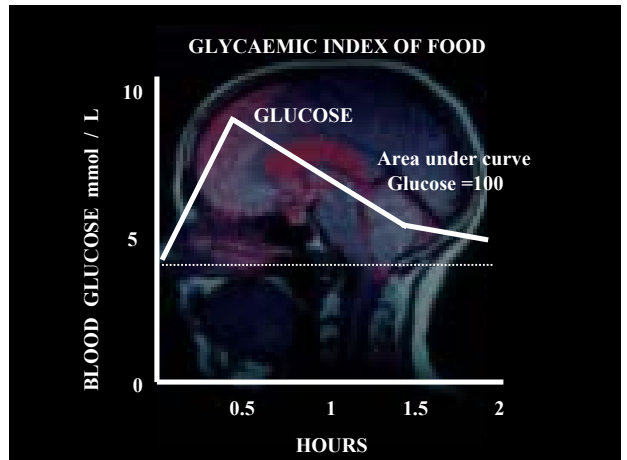
These, of course, are also the symptoms of ADHD.

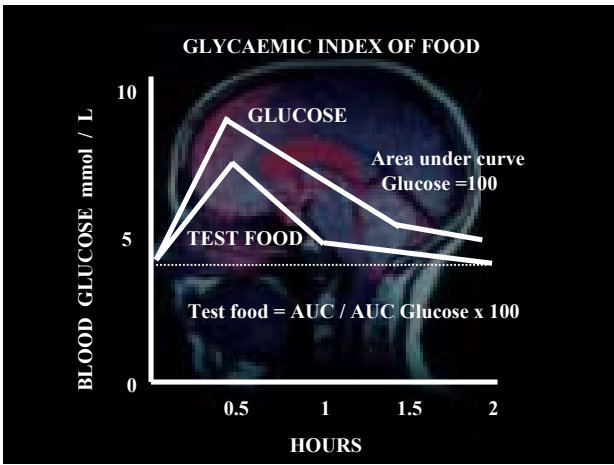


- In normal individuals, fed in a usual manner, clinical hypoglycaemia is uncommon
- Normal diet produces remarkably stable levels of blood glucose

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- Tendency to develop low blood glucose levels, higher than those that can be described as hypoglycaemic, associated with irritability and violence
- Criminals with a history of violence have a tendency to develop low levels of blood glucose






### GLYCAEMIC INDEX

Category	Age Group	Food	GI Value
HIGH	70+	Glucose	100
		Low amylose white rice	88
		Baked potatoes	85
		Cornflakes	81
		White bread	70
MEDIUM	55-69	Spaghetti in tomato sauce	68
		Table sugar	65
LOW	20-54	Banana	52
		Boiled potatoes	50
		Chocolate	49
		Orange	42
		High amylose rice	38
		Apple	38
		Whole meal spaghetti	37

- Nine year old children
- Those who had eaten a small breakfast spent less time on their school work in the late morning
- The adverse effect of a small breakfast was reversed by a mid-morning snack



Benton & Jarvis (2007) Physiology & Behaviour 90, 382-385.

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Benton & Jarvis (2007) Physiology & Behaviour 90, 382-385.


- Seven year old children monitored for four weeks
- On different days ate breakfasts with the same calories differing in the rate of glucose release (glycaemic load)
- Low glycaemic load associated with better memory and attention; less frustration and more time was spent on task in class

Benton, Maconie & Williams (2007) Submitted for publication

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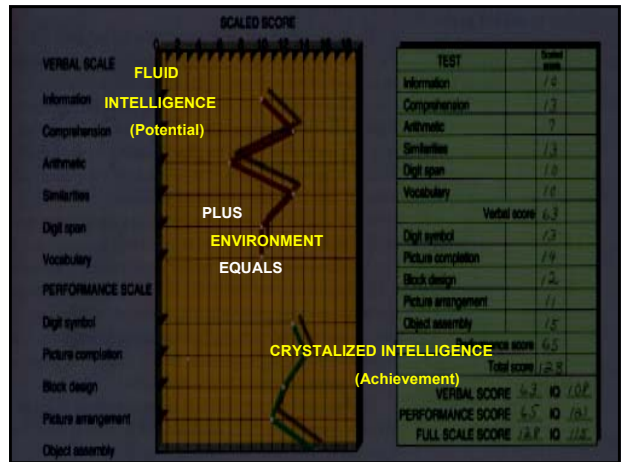
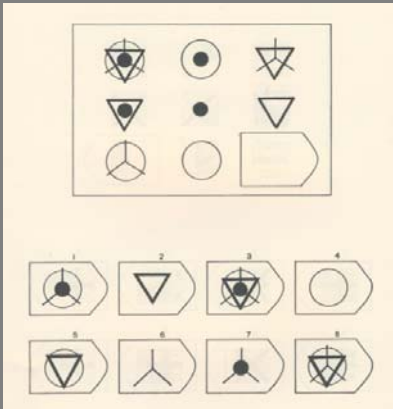
Study	Participants	Intervention	Outcome measure	Finding
Schoenthaler et al. (1997)	N=62 Imprisoned delinquents. Aged 13-17y.	12 vitamins 300% RDA 11 minerals 100% RDA for 3 months.	Violent / non-violent rule violation	Greater decline in violations with supplements. 28% difference (95% CI 15-41%)
Schoenthaler & Bier (2000)	N= 80 Schoolchildren disciplined last 8 months. Aged 6-12 y	13 vitamins 50% RDA 10 minerals 50% RDA for 4 months	Violent / non-violent rule violation	Less anti-social behavior: 47% (95% CI 29 - 65%)
Gesch et al. (2002)	N=231 Imprisoned >18y	13 vitamins, 12 minerals n-3 & n-6 fatty acids for average of 5 months	Violent / non-violent rule violation	Decline in violations of 35% 95% CI 16 - 54%

# VITAMINS DO BOOST CHILD'S IQ

TODAY 7th April 1990

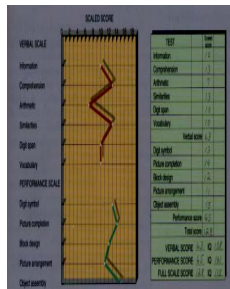
## INTELLIGENCE TEST QUESTIONS

- 1) A knowledge of history is an antidote for sectionalism and narrow nationalism, leading one instead to realize the eternal ( ) of peoples.
  - a) differences
  - b) struggle
  - c) self-consciousness
  - d) interdependence
  - e) evolution
- 2) Pick the phrase nearest in meaning to: 'RETALIATE'
  - a) buy and sell profitably
  - b) whisper insults
  - c) replay evil with evil
  - d) recheck items in a list
  - e) return damaged merchandise



## VITAMIN / MINERAL SUPPLEMENTS AND INTELLIGENCE

- 10 of 13 studies report improved non-verbal intelligence in at least some children
- Improvement in verbal intelligence never reported
- Selective improvement in non-verbal scores predicted theoretically
- Inconsistencies maybe explained by only poorly nourished children responding



Benton (2001) Neuroscience Biobehavioral Reviews, 25, 297-309

- Little association between sugar intake and quality of diet in those over the age of two years
- Associations were "always so small as to be of no clinical significance"



Forshee and Storey (2001)



- Those who eat a lot of sugar also tend to eat more of all nutrients.
- Total energy consumption is a better predictor of micro-nutrient status than the level of sugar intake.

UK Panel on Dietary Sugars (1989)



### Children under two years of age



- Children with Iron deficient anaemia often show problems of language, motor coordination, attention and mood.
- Generally supposed that "the effects of anemia on development in infants and young children are not reversible"

International Nutritional Anemia  
Consultative Group (1998)

### Preschool children – two to five years



- Benefits of iron treatment more apparent than in infants
- Evidence is limited although improvements in attention and cognition from iron supplementation have been reported

International Nutritional Anemia  
Consultative Group (1998)

### School age children – five to sixteen years

- Strong evidence that iron deficient anaemia associated with poorer cognition and school performance



- The adverse effects of iron deficiency appears more transitory than with younger children.

International Nutritional Anemia  
Consultative Group (1998)

## National Diet and Nutrition Survey: young people aged 4 to 18 years

### Volume 1: Report of the diet and nutrition survey

*A survey carried out in Great Britain on behalf of the Ministry of  
Agriculture, Fisheries and Food and the Departments of Health  
by the Social Survey Division of the Office for National Statistics  
and Medical Research Council Human Nutrition Research*

Jan Gregory, Office for National Statistics  
Sarah Lowe, Office for National Statistics

With  
Christopher J Bates, Medical Research Council Human Nutrition Research  
Ann Prentice, Medical Research Council Human Nutrition Research  
Lina V Jackson, Medical Research Council Human Nutrition Research  
Gillian Scallan, Food Standards Agency  
Robert Winkless, Department of Health  
Melanie Farron, Food Standards Agency



## National Diet and Nutrition Survey:

- One in eight children aged between 1 ½ and 2 ½ years had a haemoglobin concentration below 11g/dl, the WHO definition for anaemia in those under six years (NDNS, 1995)
- No defining limit for children over six years. However, 1% of boys aged 7 to 10 years were below 11g/dl
- 1% of boys aged 15-18 years were below the WHO lower limit for adults of 13 g/dl
- In girls aged 4 to 6 years 8% were below 11g/dl.
- In girls aged 7 to 10 years 4% were below 11 g/dl.
- 9% of girls aged 15-18 years were below the adult lower limit



- Anaemia in toddlers is common: associated with developmental delay



- In inner-city Birmingham, 97 children with anaemia, aged 17-19 months,

Iron plus  
vitamin C

Only  
vitamin C

- Those receiving iron had increased weight gain and rate of development.

Aukett et al. Arch Dis Child., 61, 849-57, 1986

### Omega-3, junk food and the link between violence and what we eat

There has been a backlash recently against the hype surrounding omega-3 in the UK from scientists arguing that the evidence remains sketchy.

Part of the backlash stems from the eagerness of some supplement companies to suggest that fish oils work wonders even on children who have no behavioural problems.

Alan Johnson, the education secretary, appeared to be jumping on the bandwagon recently when he floated the idea of giving fish oils to all school children.

The idea was quickly knocked down when the food standards agency published a review of the evidence on the effect of nutrition on learning among schoolchildren and concluded there was not enough to conclude much, partly because very few scientific trials have been done.

Felicity Lawrence - The Guardian October 17, 2006

### Fatty acid supplementation and behaviour Attention deficit hyperactivity disorder

- In only 4 studies did the children have a diagnosis of ADHD: in these cases there was no response

Omega 3 fatty acids are found in oily fish like salmon and flaxseed and canola oils



- Where behaviour was influenced it was in a studies of Dyslexia or Developmental Coordination Disorder

- The composition of the supplement used has not been studied

Benton (2007)

### Fatty acid supplementation and behaviour

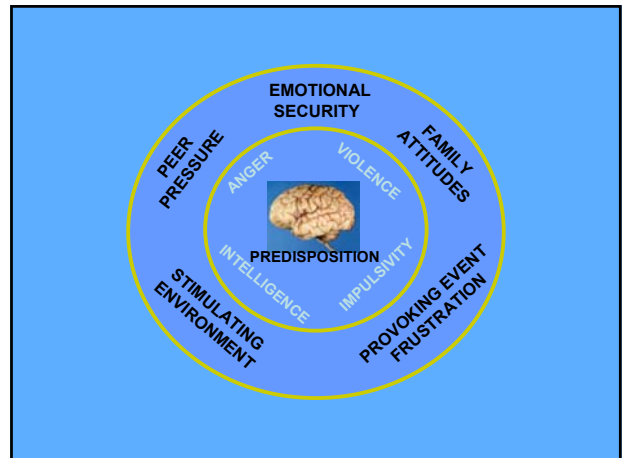
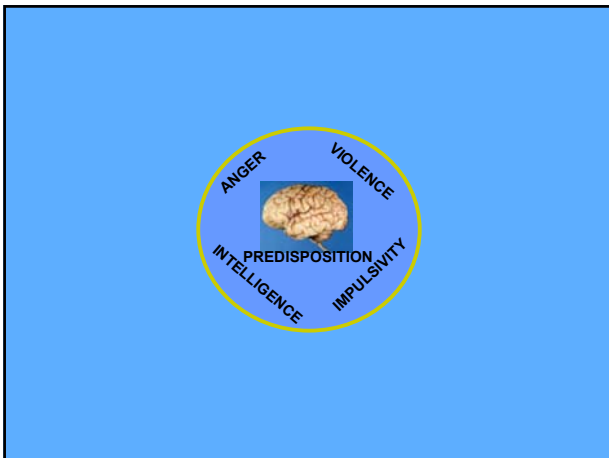
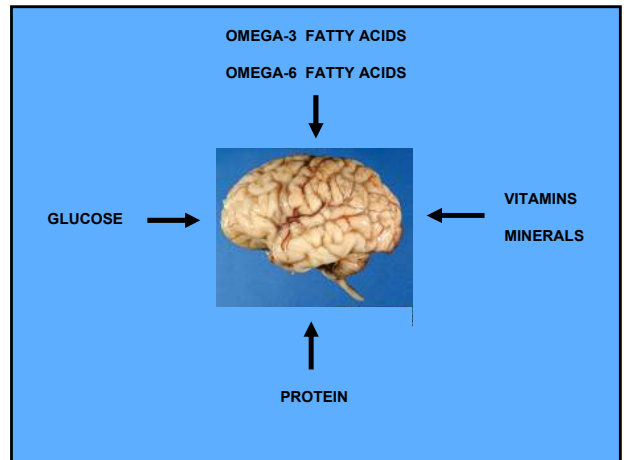
- Studies of hostility / aggression were the exception



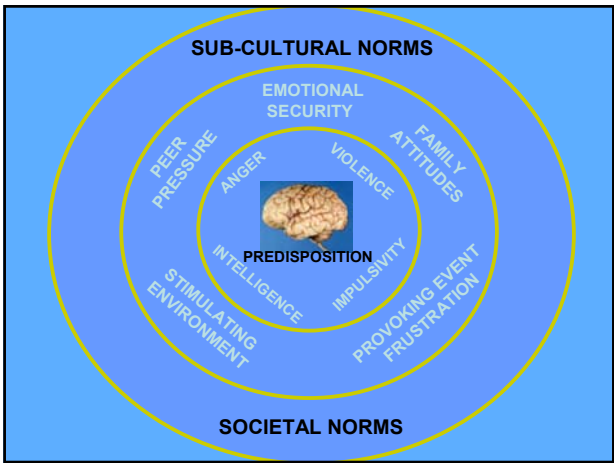
- In eight studies supplementation decreased reports of hostility / aggression
- Meta-analysis produced a significant result -0.61 (95% CI -0.83 to -0.39)

- Studies all gave high levels of omega-3 fatty acids

Benton 2007







**Professor David Benton**  
**UNIVERSITY OF WALES SWANSEA**