ASSOCIATE PARLIAMENTARY FOOD & HEALTH FORUM
The links between diet and behaviour

Statement by Natural Justice

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Natural Justice

What Natural Justice does ……

Aim: Develop more effective and humane ways to respond to antisocial and criminal behaviour

How: Bring together experts from the natural and social sciences to investigate what causes antisocial and criminal behaviour

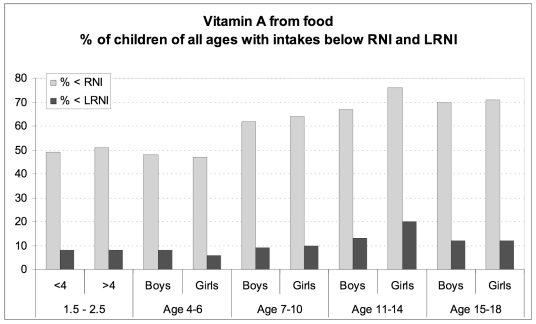
Because: evidence from the natural sciences that is relevant to these problems are largely ignored in criminal justice

Underlying nutritional hypothesis

We seem to have made major changes to modern diets in a relatively short space of time with little or no systematic examination for potential impacts on brain function or behaviour

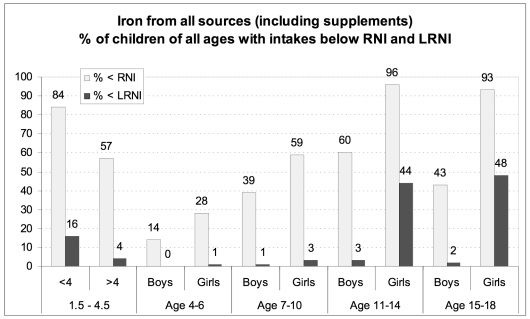
If these changes in diets are causing an increase in antisocial behaviours it should follow that a better diet will cause a decrease in these problems. BUT this depends on the dietary baseline

Vitamin A Status in UK



Source: Gregory et al 2000. National Diet and Nutrition Surveys, HMSO
Supplied by Dr A Richardson

Iron Status in UK



Source: Gregory et al 2000. National Diet and Nutrition Surveys, HMSO
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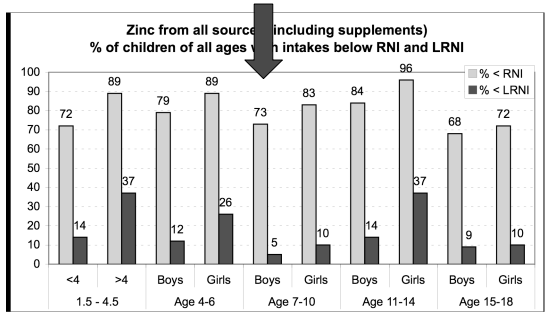
Zinc Status in UK



Source: Gregory et al 2000. National Diet and Nutrition Surveys, HMSO
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Neonatal diet and brain development up to six years of age

Neurologic domain	Risk nutrients for domain	Behavioral	Age of reliability
Global function	Protein-energy, iron, zinc, LC-PUFAs	Bayley Scales	12–36 mo
		WPPSI	>4 y
Myelination	Iron	Speed of processing	4 mo
	LC-PUFAs		
Motor function	Protein-energy	Bayley Scales (PDI)	12–36 mo
	Iron	Activity	Any age
	Copper	Coordination	Any age

Source: Georgieff M.K. 2007. Am J Clin Nutr. 85(2):614S-620

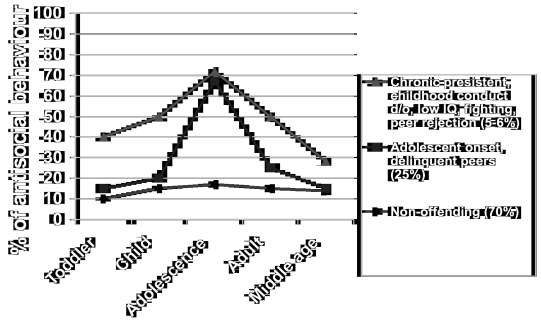
Diet: Crime prevention

Eighty-three children given an enriched nutritional and social environment aged 3 to 5 years were significantly less likely to be involved in antisocial behaviour at age 17 years or criminal behaviour at age 23 years compared with 355 matched controls

Raine, A et al. Am J Psychiatry 2003; 160:1627–1635

See also: Liu, J., et al (2004). Am. J. Psychiatry 161 (11), 2005–13.

Peak age for offending



The NDNS data may be a best case scenario

What about the socially disaffected?

BREAKFAST: Nothing (asleep)

MID-MORNING: Nothing (asleep)

LUNCH TIME: 4 - 5 cups of coffee with 2.5 heaped sugars

MID-AFTERNOON: 3 - 4 cups of coffee with 2.5 heaped sugars

TEA: Fries, egg, ketchup and 2 slices of white bread.
5 cups of tea or coffee, with 2.5 heaped sugars.

EVENING: 5 cups of tea or coffee, with 2.5 heaped sugars
20 cigarettes, £2 worth of sweets, cake and
(if money available) 3 - 4 pints of beer

Criminal Justice: Mind and body are separate?

The classic criminal justice model assumes that antisocial behaviour is purely matter of FREE WILL

How exactly can you exercise free will without involving your brains?

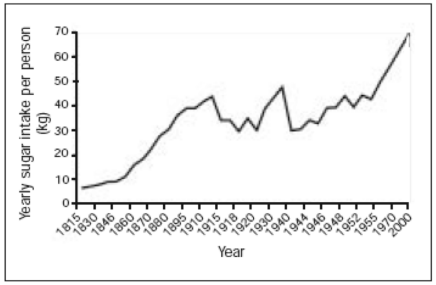
How exactly can the brain work properly without an adequate nutrient supply?

Studies involving diet and antisocial behaviour

Experimental study of 3000 imprisoned juveniles, replaced snack foods with healthier options containing reduced refined and sugary foods. There followed a 21% reduction in antisocial behaviour over 12 month period, 100% reduction in suicides, 25% reduction in assaults and 75% reduction in use of restraints

Schoenthaler, S.J Int J Biosocial Res. 1983; 5(2): 99-106.

Changing nutrient intakes: Sugar



Source: Cordain et al. 2003. Comp Biochem Physiol A Mol Integr Physiol.;136:95-112.

Studies involving diet and antisocial behaviour

Placebo-controlled double-blind randomized experimental trial using the US RDA of minerals and 300% of US RDA of vitamins with 62 13–17-year-old male and female incarcerated juveniles. The active group committed 28% fewer rule violations compared to controls ($p<0.005$). Most effective with low baseline Vitamin C, thiamin, niacin, pantothenic acid, pyridoxine, and folate.

Schoenthaler, et al. (1997). J. Nutr. Environ. Med. 7, 343–52.

Criminal Justice: Methodology

In criminal justice much is made of the causes of crime but little exists in the way of experimental evidence to demonstrate what such causal factors are.

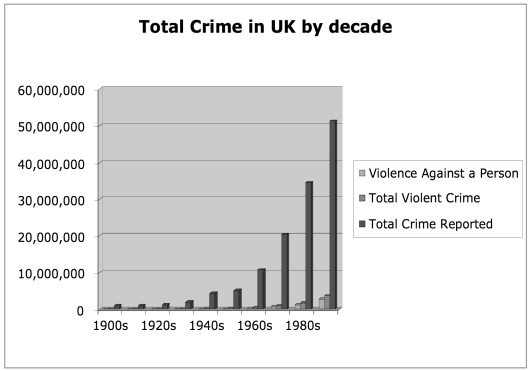
Weak research design has contributed to the lack of knowledge about 'what works'

Source: Home Office Research Studies. 291 2004.

"Progress is often thwarted by Government programmes and strategies that are not based on rigorous evidence"

Source: Bringing evidence based progress to crime and substance-abuse policy:. A recommended federal strategy. 2003

UK Crime trends over 100 years



Source National Statistics Office 2002

Design agreed with UK Home Office

Method: Double blind placebo controlled stratified randomised experimental design with up to nine months baseline and up to nine months treatment

How: Randomly, stratified by prison unit, give out coded real and placebo nutritional supplements so no one in the prison knew who got what. Thus, the only systematic difference between groups should be what is in the capsules

Measure of antisocial behaviour:
Proven Governor's reports
Proven Minor reports

Who: 18-21 year old male offenders

Objective: To construct rigorous test for effect

Does food cause changes in human behaviour?

Hypothesis:
That supplementary intake of vitamins, minerals and essential fatty acids will significantly reduce the incidence of proven offences committed by incarcerated young offenders

What we gave the volunteers

Broadly 100% of our daily needs for vitamins, minerals and essential fatty acids

Why: To ensure all volunteers consumed the full range of essential nutrients recommended by the government

The problem: Diets were OK but many volunteers made poor food choices and bought unhealthy food from the prison shop

Supplementary Vitamins Provided

Nutrient	Potency	UK RNIs
Vitamin A (μg)	750	700
Vitamin D (μg)	10	-
Vitamin B1 (mg)	1.2	1
Vitamin B2 (mg)	1.6	1.3
Vitamin B6 (mg)	2	1.4
Vitamin B12 (μg)	3	1.5
Vitamin C (mg)	60	40
Vitamin E (mg)	10	-
Biotin (μg)	100	-
Nicotinamide (mg)	18	17
Pantothenic Acid (mg)	4	-
Folic Acid (μg)	400	200

*Retinol equivalent from ß-Carotene

UK Reference Nutrient Intakes for 19-50 year old males

Supplementary minerals Provided

Nutrient	Potency	UK RNI #
Calcium (mg)	100	700
Iron (mg)	12	8.7
Copper (mg)	2	1.2
Magnesium (mg)	30	300
Zinc (mg)	15	9.5
Iodine (μg)	140	140
Manganese (mg)	3	-
Potassium (mg)	4	3,500
Phosphorus (mg)	77	550
Selenium (μg)	50	75
Chromium (μg)	200	-
Molybdenum (μg)	250	-

UK Reference Nutrient Intakes for 19-50 year old males

Essential Fatty Acids provided

Linoleic Acid (mg)	1260
Gamma Linolenic (mg)	160
Eicosapentaenoic Acid (mg)	80
Docosahexaenoic Acid (mg)	44

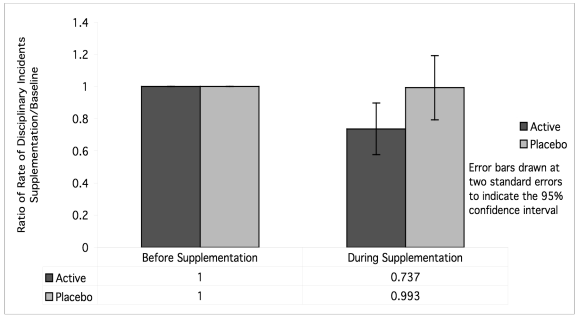
Study found lowered levels of omega 3 and omega 6 essential fatty acids in violent offenders when compared to age matched non offending controls

Corrigan, F.M. et al. *J Forensic Psychiatry.* (1994) 5, 1, 83-92.

The next study we propose to provide 80% Omega 3 and 20% Omega 6

Did it work?: Efficacy

Rate of all Disciplinary Incidents
Intent to treat N=231. NH Test $\gamma_P = \gamma_A$

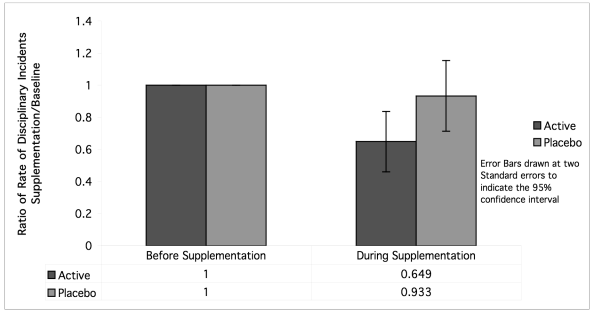


1133 offences: Difference between Active and Placebo Groups
-26.3 (± 18%, 95% CI) p< 0.027, two tailed

Source: Gesch, et al. *British Journal of Psychiatry*. 2002, 181, 22-28.

Did it work: Effect on those treated for 2 weeks

Rate of all Disciplinary Incidents
N=172. Test $\gamma_P = 1$ $\gamma_A < 1$



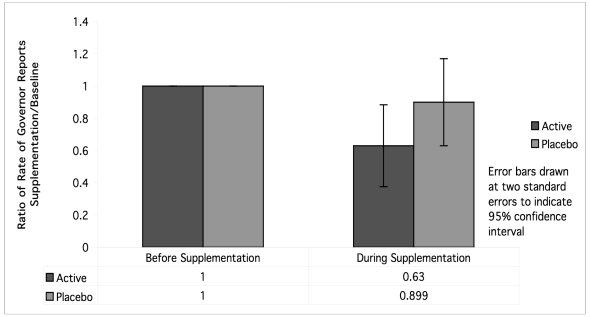
754 offences: Placebo group -6.7%. p>0.1 (± 22%, 95% CI)
Active group -35.1%. p<0.001 (± 18.8%, 95% CI)

Source: Gesch, et al. *British Journal of Psychiatry*. 2002, 181, 22-28.

Did it work: Effect on those treated for 2 weeks

Rate of Governor Reports (includes violence)

N=172. Test $\gamma_P = 1$ $\gamma_A < 1$



	Before Supplementation	During Supplementation
Active	1	0.63
Placebo	1	0.899

338 offences: Placebo -10.1%. p>0.1, two tailed (95% CI ± 35%)

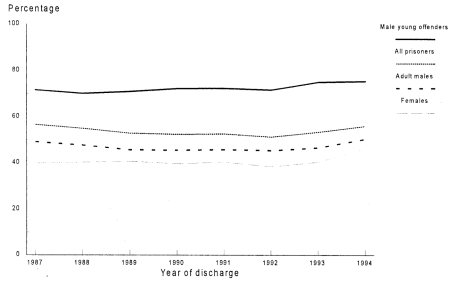
Active -37.0%. p<0.005, two tailed (95% CI ± 25.4%)

Source: Gesch, et al. *British Journal of Psychiatry*. 2002, 181, 22-28.

Peer Review

- **Prof. Curnow President of the Royal Statistical Society RSS**
- **Recommends Independent analysis by Prof. Crowder University of Surrey**
- **Prof. Crowder's independent analysis**
- **Professor Smith, former President of the RSS University of Southampton**
- **Ten month Home Office review involving Professor Copas University of Warwick: Agreed report of findings December 1998**

Offenders reconvicted after two years of custody



Average reconviction rate within two years is 56%

Source: Home Office Stats Bulletin 5/99 1999.

Discussion

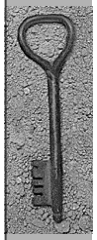
Dietary baselines: The diets consumed by prisoners were probably better than those eaten in the community

We don't know: If the effect came from ensuring all prisoners reached the UK Government's dietary standards or because some would have exceeded them

It is not where you eat that is important but what you eat

Certain dietary choices, including fish consumption, balanced intake of micronutrients, and a good nutritional status overall also have been associated with reduced rates of violent behaviour

WHO. Healthy Environments: Towards an estimate of the environmental burden of disease. 2006. 55

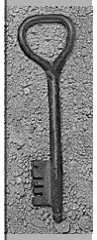


A LESS EXPENSIVE way forward !

The nutritional approach costs 0.2% of the cost of custody
The Economist, June 29, 2002

Public costs of cognitive skills approaches in prisons have cost £150,000,000 and were found to be ineffective
Cann et al. Home Office findings 226, 2003. Times November 18, 2003

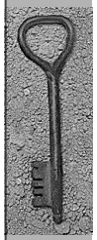
Public cost of evaluating the nutritional approach was £1,000 and was found to be highly effective
Gesch et al. Brit. J. Pysch. 2002. 181, 22-28. Times, Telegraph, Express, Mail, Sun, Mirror, etc 26 June, 2002……



A LESS RISKY way forward !

Conventional approach to offending:
Intervening too early can be prejudicial - escalate offending
Too late - can result in unchecked offending

Nutritional approach:
The only risk from early intervention is better health



Future research: Optimal dosages for antisocial behaviour

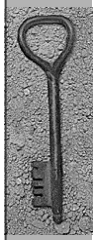
Don't assume that more <u>must</u> be better:

Schoenthaler and Bier found in study of 402 Californian prisoners that those given 100% of the US RDA of vitamins committed fewer offences than those given 300%
Source: Brostoff and Challcoombe. Food, Allergy and Intolerance. Saunders 2002

100% RDA	300% RDA	Placebo
-30.3%	+42.43%	+23.61%

Source: Gesch et al. Analysis supplied to WHO 2004

We still have to discover the optimum RANGE and BALANCE of nutrients for the brain

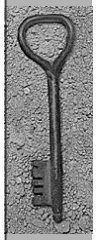


Future research: Optimal dosages for behaviour

Most nutrients interact: Clinical benefit will vary according to existing dietary baselines

Hence we should use a weakest link in the chain model for nutrition not a pharmacological model

To isolate the effect of one nutrient we need to ensure that ALL other nutrients are there in appropriate quantities



Future research: Nutrient status and behaviour

To retest Aylesbury findings: Three institutions including juveniles. Projected population 1000+ Power ‹ 98%

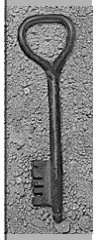
Additional Aims:
Investigate the range and dosages of nutrients involved in reducing antisocial behaviour: advise dietary standards

Investigate possible mediating mechanisms:

Assessments of interpersonal relating

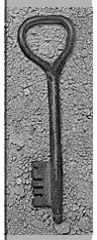
Frontal lobe mediated tasks

Heart rate variability



Applications: Crime in the community

At the invitation of the Home Office, Natural Justice is designing a double blind trial using nutrition as a adjunct to Intensive Supervision and Surveillance Programmes

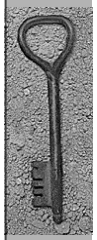


Recommendations

Dietary standards need to be reassessed to take into account possible mental health, behavioural, developmental and cognitive parameters. Particularly among socially disaffected populations

Promising research needs to be replicated in large scale studies, ideally by experienced multidisciplinary teams

There needs to be joined up leadership from Government on this important broad ranging issue



The Research Team

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