

ASSOCIATE PARLIAMENTARY FOOD AND HEALTH FORUM

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Diet and Behaviour

Joint Meeting with the All Party Group on Complementary & Integrated Healthcare

21 January 2003

Atlee Suite, Portcullis House

CHAIRMAN: Lord Rea

SPEAKERS: Bernard Gesch, Director, Natural Justice

Bernard Gesch is Director of the research charity Natural Justice and a Senior Research Scientist at the University Laboratory of Physiology, University of Oxford. He was formerly a Senior Research Fellow at the University of Surrey from where he conducted the HM Prison Service Nutritional Rehabilitation Project which empirically demonstrated that good nutrition reduces antisocial behaviour to a remarkable degree. He is currently collaborating with the Medical Research Council - Human Nutrition Research and the Institute of Psychiatry to replicate these findings and investigate which nutrients are most effective and why. Bernard was sponsored by the Home Office to train as a Probation Officer and has been involved in initiatives that have been influential in the treatment of offenders since the early 1980s, including the development of diversion strategies and the pioneering use of nutrition as part of community sentences.

Dr Joseph Hibbeln, United States Public Health Service

Dr Hibbeln is an Officer of the United States Public Health Service and is Chief of the Outpatient Clinic, Laboratory of Membrane Biophysics and Biochemistry at the National Institute on Alcohol Abuse and Alcoholism. He will be presenting extensive new data linking dietary deficiencies in omega-3 fatty acids from seafood to increased risks of severe depression during pregnancy and to increased risks of homicide mortality.

Associate Parliamentary Food and Health Forum

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Introduction

1. **Lord Rea** welcomed everybody to the meeting and in particular the members of the All Party Group on Complementary and Integrated Healthcare. He also welcomed the President and Chairman of Natural Justice. Lord Rea thanked the Forum's Secretary Lord Baldwin who had been the key instigator of this meeting.

Bernard Gesch

2. **Bernard Gesch** thanked Lord Rea for his introduction and expressed pleasure that the UK/US relationship was being maintained at this meeting.

Social and Physiological functioning

3. Bernard Gesch presented the following findings accompanied by a slide presentation.
4. Humans are both social and physical beings. We accept that food and health are linked but manage to decouple this relationship when it comes to behaviour. There will always be a biophysical analogy to any social situation and hence, our brain needs to be nourished in two ways: nurturing and education as well as obtaining the essential nutrients to sustain our physical being. The brain is a metabolic powerhouse; it makes up only 2% of body mass yet it uses 20% of energy and about 40% of the output of the heart to supply it with essential nutrients. If people do not believe this then they should try a diet consisting of the following:
 - Nothing for breakfast or during the morning
 - 4-5 cups of coffee at lunch time with 2.5 heaped sugars
 - 3-4 cups of coffee during the afternoon with 2.5 heaped sugars
 - Chips, egg, 2 slices of white bread with ketchup and 5 cups of tea or coffee for tea with 2.5 heaped sugars
 - 5 cups of tea or coffee with 2.5 heaped sugars, 20 cigarettes, £2 worth of sweets and cake and (if the money is available) 3-4 pints of beer during the evening
5. The person undertaking this experiment continued to commit high levels of crime including vehicle theft. If the brain's requirement for essential nutrients is not met then there are likely to be behavioural consequences. However, the Food Standards Agency broadly agrees that dietary standards do not address behaviour, despite the physiological importance of essential nutrients required for the brain to function normally. Social influences on behaviour will be apparent to us while these physiological factors are liable to undercut our senses and affect behaviour without our knowledge. Mr Gesch posed the key question of how would one know if one had a zinc deficiency, for example. All these factors are largely ignored by criminal justice yet the question is whether these unseen factors can help explain trends in social behaviour or crimes that defy rational behaviour. Mr Gesch added that, hopefully, the audience would be nearer a view on this by the end of the evening.

Crime Trends

6. In England and Wales, notifiable offences have risen almost ten-fold per head of population since the 1950s; this trend is increasing. The peak age of offending occurs in adolescent males aged between 15 and 18 years of age; this trend is relatively stable and has been for years. It is also cross-cultural. According to Home Office statistics, there is no discernable difference between reconviction rates of community penalties and custody. It would be surprising if crime is socially mediated. Looking at the causes of crime, one can see a myriad of correlations - yet a correlation does not demonstrate cause.

The Natural Justice approach

7. The Natural Justice approach has been discussed with criminologists. It involves bringing together expertise from the natural and social sciences to investigate the causes of offending and antisocial behaviour. The approach requires rigorous experimental designs – this is very difficult with social factors and this explains why a cure has not been found. However, with a factor like nutrition, it can be readily tested. The direct evidence is mounting.

Previous Research

8. Bernard Gesch then summarised relevant previous research:
9. **1976 Wadsworth (MRC) England** ‘Delinquency, pulse rates and early emotional deprivation’ reported stronger correlation between delinquency and lowered resting pulse rate than between delinquency and social deprivation. We now know that poor heart responsiveness is a good predictor of violence and this is linked to the limited supply of omega3 fatty acids in modern diets.
10. **1978 Schauss USA** Compared success of probation with nutrition education to rehabilitate 102 offenders in the community over a 12 month period and found that the re-offending rates (11.9%) of the nutrition education group were almost a third of that of the probation group (33.8%). These are interesting findings from a simple study yet they were never followed up.
11. **1983 Schoenthaler USA** 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 a 12 month period. There was also a 100% reduction in suicides, 25% reduction in assaults and 75% reduction in the use of restraints. Again, although there were methodological reservations with the study, one would have thought that these conclusions might have been worth following up.
12. **1987 Matthew Virkkunen Finland** The study found reactive hypoglycaemia (low blood glucose) of all 68 habitually violent offenders studied.
13. **1990 Schrauzer USA** This is an excellent example of an effect on behaviour that would work without our knowledge. The study found significantly ($p < 0.01$) less homicides,

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suicides and rape in counties of Texas with naturally occurring levels of lithium in drinking water in the range of 70-170µg/L compared to those counties with little or no lithium. This study was followed up with experimental work which verified these effects but lithium is still not considered an essential trace element.

14. **1990 Gesch England** A pilot study in Cumbria combined nutrition with community sentencing to rehabilitate serious juvenile offenders. A girl sentenced with serious offences of assault and burglary agreed to a nutritional programme as part of her community sentence. She had multiple addictions and a serious physical ailment but over a 19-day period, she reported that she had never felt so happy and relaxed in her life. Interestingly, her handwriting was much improved on the response sheet.
15. **1994 Corrigan et al Scotland** A study found lowered levels of omega 3 and omega 6 essential fatty acids in violent offenders when compared to age matched non-offending controls. Both groups were lower. The scientists were able to continue the research in Scotland.
16. **1997 Schoenthaler USA** Randomised placebo controlled double blind experimental trial of nutritional supplements on 62 incarcerated juveniles found a significant reduction in rule violations of 28% in the active group compared to controls. This provided good empirical evidence, though it was a small study.
17. **2003 Zanarini USA** Randomised placebo control study of 30 women with borderline personality disorder given ethyl-eicosapentaenoic acid (E-EPA). The study found that those receiving active capsules (n=20) have significantly reduced aggression and depression as determined by rating scales. Bernard Gesch indicated his agreement with the test hypothesis.

Natural Justice Study

18. There has been an explosion in evidence in the past 3-4 years. The experiment carried out by Natural Justice involved constructing a rigorous test for effect. The hypothesis was that the supplementary intake of vitamins, minerals and essential fatty acids would significantly reduce the incidence of proven offences committed by incarcerated young offenders. This was put to the Government and an approach was agreed with the Home Office in 1992/93:
 - The study must benefit the health of all volunteers – every volunteer was given the option of three months of real supplements afterwards
 - Study must fit in with the normal regime of the institution – its worth noting that prisons were also heavily over crowded in 1996
 - The Study should account for all other explanations to attribute cause.
19. Agreement was reached to use nutritional supplements, to allow the use of placebo capsules even though this could be achieved with a better diet of fresh fish and vegetables.
20. The design agreed with the Home Office was as follows:
 - **Method** Double blind placebo controlled randomised experimental design
 - **Why** This is the only method where a cause can be attributed

- **How** Randomly give out coded real and placebo nutritional supplements so no one in the prison knows who got what. Thus, the only systematic difference is what is in the capsules
- The measure of antisocial behaviour was in the Governor's Report and in Minor Reports
- **Where** HMYOI Aylesbury – a maximum security institution with high levels of assaults on staff

21. The supplementary vitamins and minerals used were broadly in line with UK Reference Nutrient Intakes (RNIs) for 19-50 year old males except for magnesium, calcium and essential fatty acids. See tables below for details of supplementary vitamins and minerals provided.

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

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	-

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**Essential Fatty Acids provided
in Four Efamol Marine Supplements**

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

Baseline Findings – Dietary (Dr Anita Eves)

22. The prison diets are relatively close to Government recommendations (determined by seven day food diaries). The problem was that poor food choices by participants resulted in a significant proportion of the population having a diet that fell below the UK RNI. This is not necessarily a deficiency but is not desirable either.
23. **Zinc** 54% in 1996, 78% in 1997 of the inmates were below the RNI. 3 (3%) in 1996 and 3 (5%) in 1997 were below the LNRI (Lower Reference Nutrient Intake).
24. **Selenium** 96% in 1996, 97% in 1997 of the inmates were below the RNI. 34 (35%) in 1996 and 38 (60%) in 1997 were below the LNRI.
25. **Iodine** 67% in 1996, 78% in 1997 of the inmates were below the RNI. 7 (7%) in 1996 and 10 (16%) in 1997 were below the LNRI.
26. **Magnesium** 73% in 1996, 75% in 1997 of the inmates were below the RNI. 14 (15%) in 1996 and 5 (8%) were below the LNRI.
27. **Potassium** 72% in 1996, 75% in 1997 of the inmates were below the RNI. 5 (5%) in 1996 and 4 (6%) in 1997 were below the LNRI.
28. **Sodium** Intakes were well in excess of maximum recommendations.

Baseline Findings – Psychological (Dr Sean Hammond)

29. With regards to the baseline psychometric tests, two groups could not be split before treatment. For example, the ‘expression of anger’ variable was very similar with both the active supplement as with the placebo.

Baseline Findings – Offending (Dr Martin Crowder)

30. Both groups would commit 16 offences per 1000 man days. Active and placebo groups were matched in terms of proven disciplinary offences at baseline.

Baseline Findings – Dietary Supplementation

31. Active supplementation significantly increased intakes of vitamins and minerals with the exception of calcium, phosphorus and potassium.

Baseline Findings – Compliance

32. Compliance for both groups was within 1% of 90%. Natural Justice is grateful to HM Prison Service for achieving excellent figures for compliance as it is not always easy to persuade people to join.

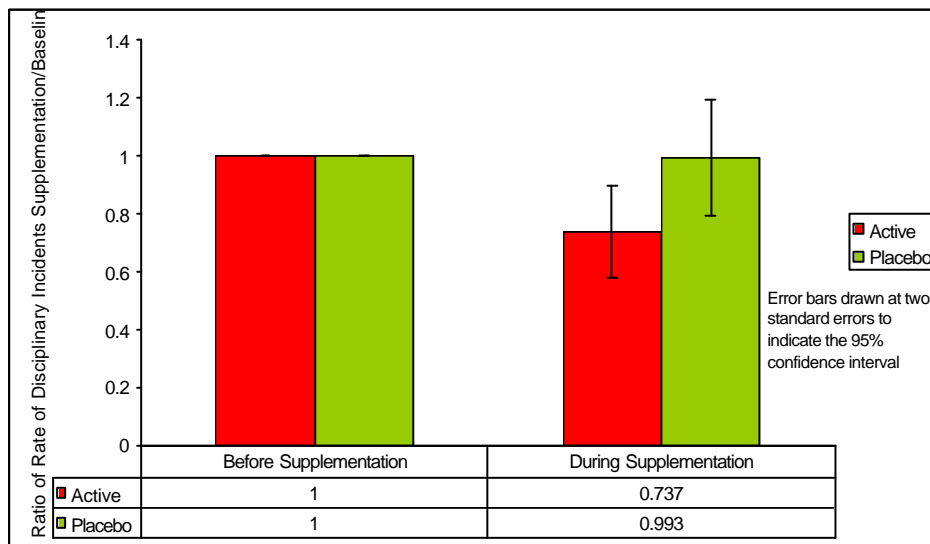
Experimental Findings – Double Blind

33. Guessing the blind allocation was consistent with random guessing in both the active and placebo groups. There was no adverse reaction and the findings have been sent to some high profile statisticians. The Natural Justice study findings are to be cited by the review journals Evidence Based Medicine and Evidence Based Mental Health (broadly a clinical science equivalent to Who's Who). *The experimental findings can be seen below.* The findings clearly show the effect of the active supplements reducing offending whereas the placebo shows relatively little change in the rate of disciplinary incidents. The very considerable drop of 26.3% in the efficacy graph is unprecedented. This analysis includes all 231 inmates recruited to the trial, even those that participated for as little as three days. The second table shows the effect on those that complied and took supplements for at least two weeks. Here the fall in the active group is 35.1% - a huge fall. Again the placebo group stays within the margin of error i.e. did not change over time.

Experimental Findings – Efficacy

Rate of all Disciplinary Incidents

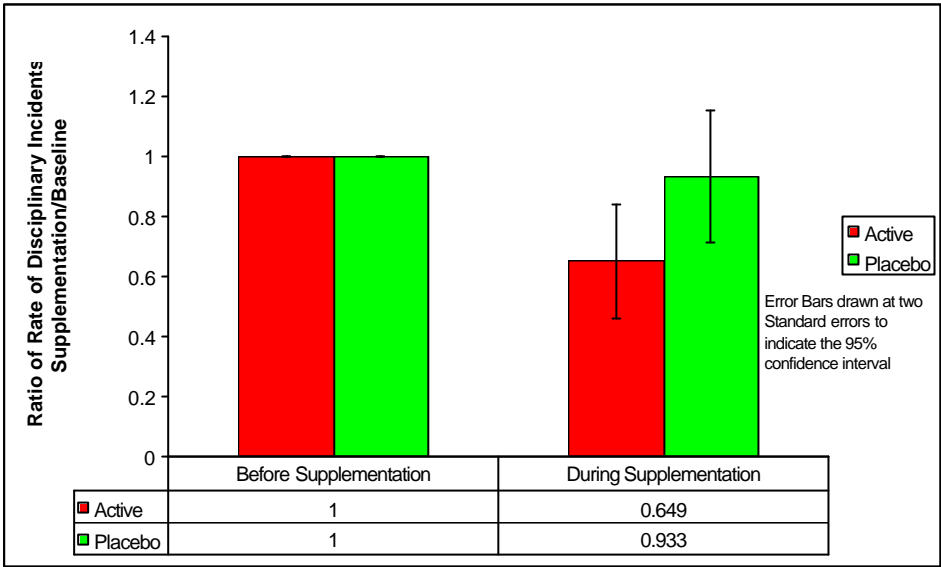
Intent to treat N=231. NH Test $\gamma_P = \gamma_A$



1133 offences: Differences between Active and Placebo groups
 -26.3 ($\pm 18\%$, 95% CI) $p < 0.027$, two tailed

Experimental Findings – Effect on those treated

Rate of all disciplinary incidents
 N=172. Test $\gamma_P = 1 \quad \gamma_A < 1$



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

Conclusions drawn from the experiment

34. Boosting the diet of prisoners with physiological dosages of nutrients reduced their antisocial behaviour to a remarkable degree. A causal link has been demonstrated between nutrient intakes and antisocial behaviours – better nutrition appears to prevent antisocial behaviours. Bernard posed the question, ‘How can you prevent offending if you do not know what the causes are?’ However, we do not know if the effect came from ensuring all prisoners reached the Government’s dietary standards or because some would have exceeded them.

Replication

35. Gesch together with scientists from the MRC the Institute of Psychiatry, Universities of Surrey and Liverpool have designed a replication to retest the Aylesbury findings. The additional aims of this experiment are to investigate the range and dosages of nutrients involved in reducing antisocial behaviour and, also, to investigate possible mediating mechanisms such as assessments of interpersonal relating; frontal lobe mediated tasks and heart rate variability. Looking at the findings, it is true to say that social behaviours in prison may be untypical. However, we all need these nutrients *regardless* of whether you are in prison or not. The important issue is not where you eat your food but the nourishment it provides. The scale of the issue is shown by the fact that 2 million children are in food poverty in the UK.

36. It is important to be cautious before identifying a causal link. However, if there is a causal link, the availability of nutrients would appear to have diminished since the 1950s.

Statistics show that in England and Wales, notifiable offences have risen almost ten-fold per head of population since the 1950s. The trace element content of fruit and vegetables reported in the 1991 McCance and Widowsons study is in many cases significantly lower than the original 1936 publication. A MRC study comparing children's diets between 1946 and 1993 came up with the wonderfully diplomatic conclusion that 'the increase in food choice nowadays may not necessarily be beneficial from a nutritional perspective.' In 1946, the biggest source of vitamin C was fresh vegetables; in 1993, the biggest source was fizzy drinks. It was noted that the ratio of nutrients, eg fatty acids, has also changed over time. If there is a causal link, nutrition should be capable of explaining that the peak age of offending occurs in adolescent males between the ages of 15 and 18. Male growth reaches an unprecedented peak in late adolescence where the brain may be in competition with the rest of the body and like crime rates, its nutritional needs then tail off.

A recipe for peace

37. This would involve getting tough on the causes of antisocial behaviour, ie getting tough on nutrition. Through means such as school meals, it is necessary to ensure that the population reaches existing dietary standards and the advertising of unhealthy children's food should be discouraged. Food standards should take behaviour into account. These are worthy goals even though they might take twenty years to meet.
38. **Lord Rea** thanked Bernard Gesch and explained that copies of his latest research are available at the back of the room. He then welcomed the next speaker, Dr Joseph Hibbeln.

Dr Joseph Hibbeln

Dr Hibbeln's talk was based largely around a series of statistical graphs and tables. These will be available via the Forum's website at www.fhf.org.uk. If you would like to receive this in hard copy or via email, please contact James Evelyn.

39. **Dr Hibbeln** expressed his gratitude at being invited to speak at the meeting and said that the purpose of his talk was to evaluate if Bernard Gesch's Aylesbury findings are consistent with the epidemiology and neurochemical mechanisms associated with violence.
40. Omega-3 essential fatty acids are necessary for optimal brain function as they are critical components of the membranes of neurons. These fatty acids cannot be made by the human body, so the composition of our brains becomes determined by the types of fats we eat. The predominant food sources of the two major types of essential fatty acids are seafood, for omega-3 fatty acids, and seed oils such as soy oil for omega-6 fatty acids. Omega-3 and omega-6 fatty acids compete with each other on several levels of biological function. The first graph (*Homicide Mortality Rates and Seafood Consumption*) compares homicide deaths per 100,000 people to apparent seafood consumption in 26 countries across the world and demonstrates that the homicide rate declines as seafood consumption rises. The Aylesbury findings are consistent with these data. During the 4-5 million years of human evolution the dietary ratio of omega-6 fatty acids to omega 3 fatty acids was approximately 1:1. However, the omega-3 family are getting pushed out of the brain by a huge rise in the intake of omega-6 fatty acids. (Sources of omega-3 include fish, seafood, seaweed, canola oil, walnuts, flax seed and leaf plant. Sources of

omega-6 include soy bean oil, safflower oil, corn oil and meat.) The ratio is now estimated to be in the region of 15:1.

41. A graph (*Soy oil available for food consumption in the USA, 1909-1999*) showing the soy oil (omega-6 source) available for food consumption in the US between 1909 and 1999 highlights a huge rise over the second half of the century. Over the course of the century, there was a thousand-fold increase. Soy oil now contributes 83% of the calories from fat in the US diet. These statistics indicate that the composition of our brains is likely to have changed dramatically over the course of the century. The changes in the UK will not be dramatically different.
42. These changes are consistent with Bernard Gesch's findings. There is a striking positive correlation between the increase in omega-6 fatty acids in the US food supply from 1950 to 1999 and increasing rates of homicide mortality (age adjusted FBI, crime statistics).
43. A comparison of seafood consumption to lifetime prevalence rates of major depression, across 9 countries (*Fish Consumption and Major depression annual prevalence by country*) also shows a strong association. The 50 fold greater rates of major depression are correlated to lower rates of seafood consumption. The World Health Organisation recognises depression is now the greatest cause of morbidity in the world and that it will continue to increase through to at least 2020. Increasing prevalence rates of major depression in the United States are also closely correlated to the increasing amounts of omega-6 fatty acids in the food supply.

Avon Longitudinal Study of Parents and Children (ALSPAC)

44. The ALSPAC study is supported by the University of Bristol, the Wellcome Trust, the Medical Research Council and over 107 international collaborators. 14,437 pregnant mothers were recruited and these parents and children have been followed for 11 years (so far). This is the largest and most complete longitudinal study in the world with thousands of variables being collected, such as eating habits, social situations, violence during upbringing, cell lines (genetic determinants), stress, sexual abuse and bullying.
45. Because omega-3 fatty acids are so important in supporting optimal neurological development in the foetus, mothers actively transfer their stores of these nutrients to the foetus. Without adequate intake, women can become depleted of omega-3 fatty acids during pregnancy and may be at greater risk of suffering depression during or after pregnancy. A graph of data from the ALSPAC study indicated that across six different levels of seafood intake, the risk of suffering major depressive symptoms increased in dose response manner with every lower level of seafood intake. For example even eating the omega-3 fatty acids contained in half a sardine had a protective effect for depression. These data also make it possible to determine if existing dietary recommendations for omega-3 fatty acids might be adequate in preventing depression associated with pregnancy. The recent American Heart Association recommendation of one gram per day of omega-3 fatty acids from seafood does appear to be roughly adequate in preventing depression in 85% of this population
46. The diversity of seafood intake within the ALSPAC population reflects the world's diversity of intake. A graph which compared greater seafood intake with 50 fold lower rates of postnatal depression across 23 countries was nearly identical with the graph of the ALSPAC cohort. The countries with the lowest levels of depression and highest

consumption of seafood during pregnancy were Japan, Hong Kong and Singapore. This does not appear to be an effect of Asian culture as countries such as Iceland, Portugal and Chile have low rates of depression as well.

Adverse behaviour in the children of mothers who do not eat much fish

47. Among the 7 year old children, the risk of having significant behavioural problems was nearly doubled when mothers reported consuming little seafood across six categories of intake. In general, boys tend to have more behavioural problems than girls. However, if a mother does not report eating any seafood then the behaviour of the girls becomes as bad as the worst boy aged 7. The most dramatic effect was on increased risk of conduct disorders, which includes physical fighting, lying, cheating, temper tantrums and disobedience. These findings are especially significant because children with conduct disorders at age 7 are at a significant risk of continuing on a lifetime persistent course of criminality and delinquent behaviours. The 5-6% of people with a lifetime persistent course of criminality are responsible for nearly 50% of all known crimes. Further studies are needed to determine if these findings hold.
48. Dr. Joseph Hibbeln discussed the relationship between low frontal cortex serotonin function and psychopathology, criminality and emotional inhibition and depression. He then drew attention to a rigorous study of 18-day old piglets (*DHA and AA supplemented infant formula increases serotonin and dopamine in piglet frontal cortex after 18 days of life*). Levels of serotonin and dopamine were approximately doubled among piglets fed infant formulas supplemented with essential fatty acids. This is significant as these neurotransmitters also act as neurodevelopmental signals and direct the migration of neurons and development of the connections of the frontal cortex to the rest of the brain. Thus there is good evidence that there maybe a residual lifetime effect of nutritional deficiencies of essential fatty acids during early development.
49. In summary, the Aylesbury findings are consistent with:
- Epidemiological studies across countries and across time for both homicide and major depression.
 - Randomised placebo-controlled trials in major depression and aggression.
 - Longitudinal study of the development of adverse behaviour in children (ALSPAC)
 - Neurochemical mechanism(s) related to violence and impulsive behaviours
50. Dr. Joseph Hibbeln ended his talk on a comparatively cultural note – drawing attention to the symbolism of fish and its association to peaceful behaviours – central to Christianity but also found in other religions – Shinto, Buddhism, Hinduism and Islam.



51. Lord Rea thanked Dr. Hibbeln for his talk and opened the meeting up to questions.

Discussion

52. **Lord Baldwin** said that, in Mr Gesch's research, some of the subjects had only taken supplements for three days and asked whether, with proper compliance, the results might be stronger. **Bernard Gesch** said that he had not been in a position to look at time trends. In 1996, prisons were heavily overcrowded and people were being moved around at short notice. The Home Office asked for some analysis into why people were leaving the trials and it was discovered that people were leaving for a variety of reasons unrelated to the trial. Mr Gesch said that more trials were needed in this area.
53. **David Treddinick MP** said that he was keen to take the good ideas and 'roll them out.' He asked the two speakers what would be an effective method for approaching the Government with these findings. **Bernard Gesch** acknowledged that this was a difficult question but said that governments were starting to take notice. More enquires were coming in from governments overseas and things were generally optimistic. What was required was cheap, humane and easily applicable and could be measured through existing approaches. However, there was a problem when dealing with Government. If you approach the Home Office, they say that it is food related and refer you to the Food Standards Agency who similarly refer you to the Department of Health. He said that it applies to all of these Departments and should be pointed towards the centre for some joined up thinking. **Joseph Hibbeln** said that it was also a matter of cost. The great experiment had already been done by depleting these nutrients. He said that he was prepared to use large numbers of subjects (up to 18,000 people) but it was the role of governments to provide funding.
54. **John Davis** from the University of Illinois said that if these ideas are proven through research then they *can* be proven to the extent of influencing Government. He suggested that a solution might be to fortify foods with Omega 3 which would correct the problem. **Bernard Gesch** agreed and said that the contents of the water we drink has an effect on the way we behave adding that, some years ago, an attempt was made to renaturalise sugar. He asked whether adding physiological quantities of lithium to the water would be any different to adding fluoride, which already takes place in some areas. All these things have a large effect on behaviour.
55. **Carmel Dunleavy-Gimbel of Hygeia Studios** said that a good starting point would be to create awareness in children and young parents. Health and education should be incorporated into the system together. **Bernard Gesch** said that nutrients are the meeting point of the social and physical worlds and that a mixed model approach should be taken to this. He said that we all want to see progress but that research needs to be undertaken first so that governments start to take notice. **Dr Hibbeln** said that there were two answers to this question. Firstly, one has to consider the moral question and decide whether there is enough evidence available. Secondly, there are cost implications such as advertising campaigns. However, Dr Hibbeln asked how many prisoners you needed to have before accepting there is a link between diet and behaviour.
56. Responding to a comment that the foundations are already in place, **Bernard Gesch** said that it was a matter of joining up the dots. The potential savings are enormous but the problem is getting the Government Departments to see the wider picture. **Lord Rea** asked what the cost benefit might be to society. **Bernard Gesch** said that economists had

told him that the cost of such nutritional enhancement was 0.02% of the cost of keeping a prisoner.

57. **Theophilus Gimbel of Hygeia Studios** said that it was a matter of philosophy that children did not get involved, as religion is no longer taught in schools. He cited his experiences in Russia where there was little food yet those with a philosophy survived. **Bernard Gesch** said that the brain needs both social and physical nourishment.
58. **Earl Kitchener** touched on the fact that fish stocks are depleting. **Joseph Hibbeln** said that some seed oils are a good source of Omega 3 as well as fish. He also mentioned that Unilever is changing the composition of Flora for cardiovascular reasons. He also suggested the re-engineering of soy beans.
59. **Susan Mackay, an NHS dietician** asked whether the food choices on the Aylesbury menus were examined. She said that in the NHS, they had a budget of £2.50 per week to spend on meals. **Bernard Gesch** said that the main problem was poor food choices made by the prisoners. Given the funds available in prison, the prison did well to provide a diet close to government standards adding that the diets were comparable to those in the wider community. He acknowledged that the salt and fat content is still too high. Education needs to be reinforced as the 'pie and chips' option was regularly taken. Bernard added that during the research, they have come across prisoners who did not actually know what a vitamin was so they did not have the facility to make a healthy choice.
60. **Dr Alex Richardson, Oxford University** commented that the data was extraordinary but wondered if any research had been done into reading and spelling. **Joseph Hibbeln** said that they had not analysed that yet.
61. **Lord Rea** asked the two speakers about the implications of drug abuse. **Joseph Hibbeln** said that there were two perspectives here. Firstly, there was an increase in the prevalence of cocaine in the late 1970s and this came after an increase in the homicide rate. Secondly, research from his institute discovered that the Omega 3 fatty acid was lost completely from the diet as a result. **Bernard Gesch** added that drug abusers are often at the bottom of the scale in terms of nutritional status and that nutrients are washed out more quickly through the use of drugs. It is possible that replacing these nutrients could assist with the rehabilitation of addicts but he added that he was not aware of any large trials in this area.
62. **Alan Long of VEGA Research** wondered if the results of the research could be reanalysed to look at iodine. He also considered whether there was a link between 'war-like people' and eating meat. **Joseph Hibbeln** said that iodine could be found in fruit.
63. **Rt Rev Hugh Montefiore** asked what happens in countries where there are no fish and are a long way from the sea such as Afghanistan and Tibet. **Joseph Hibbeln** said that there are other sources of Omega 3 such as oils. **Bernard Gesch** added that the balance of nutrients is as important as the nutrients themselves – the wholesale changes in this area have been enormous. He added that he had contacted the Food Standards Agency asking if they are aware of studies into the effect on behaviour.
64. Drawing the meeting to a close, **David Treddinick MP, Secretary of the All Party Group on Complementary & Integrated Healthcare** thanked everybody for their input and acknowledged that the research was breaking new ground. He added that the

recently established All Party Group on Obesity was meeting soon and touched upon what was perhaps a new paradox - the middle classes (and those in prison) could afford or were receiving supplements but what about everybody in between?

65. **Lord Rea** closed the meeting by saying that the Forum's next meeting was likely to be in early March and a notice would be circulated to members.

CLC, February 2003