



ASSOCIATE PARLIAMENTARY FOOD & HEALTH FORUM



The links between diet and behaviour

3.30-5.30pm, Wednesday 23 May

House of Lords Committee Room G

Minutes

Introduction

Lord Rea welcomed members and the guest speakers. He noted that the inquiry to date had focussed largely on the role of essential fatty acids (EFAs), but welcomed the fact that on this occasion two of the guest speakers would be taking a broader view and helping to put the role of EFAs in perspective. Lord Rea then introduced Dr Gemma Harper, the Programme Director from the Research Development and Statistics (RDS) section of the National Offender Management Service (NOMS).

Dr Gemma Harper

Dr Harper (GH) explained that the RDS unit of NOMS is responsible for generating research for policy making and for ensuring that Parliament and Government are informed of that research. GH's responsibility as Programme Director is to generate research and to ensure quality assurance of it.

GH said there is a great deal of research on the links between nutrition and behaviour generally, but they are interested in the links between nutrition and offending behaviour. In an initial literature search RDS NOMS was unable to find research which investigated the impact on offending itself, although she acknowledged that there is some research which has evaluated the impact of nutrition on behaviour in correctional settings in the UK and the USA. These studies reported positive impacts on juvenile and young adult prisoners' behaviour whilst in *prison* (measured by adjudications and rule infractions), but GH said these findings did not apply to offending in the *community*.

A review of international evidence by Rutter et al, (1998)¹ concluded that whilst evidence suggests that toxins and nutrition can have an impact on children's behaviour, the link with anti-social behaviour (and crime) has not been proved. It also stated that nutrition was likely to have a minor role in overall likelihood to engage in antisocial behaviour. Four key aspects of toxins and nutrition are hypothesised to have links to antisocial behaviour - alcohol exposure in utero; lead ingestion; food additives and allergens; and vitamins. However, the review found that whilst dietary elements can have some effect on children's behaviour "that the claims regarding supposed effects of toxins and nutrients on anti-social behaviour go far beyond the evidence."

¹ Rutter, M., Giller, H. and Hagell, A. (1998) *Antisocial Behavior By Young People*. Cambridge: Cambridge University Press.

GH noted that the Rutter Review, which was conducted in 1998, does not include more recent research, including by Gesch et al (2002), in HM YOI Aylesbury.

GH briefly described the trial undertaken at HM YOI Aylesbury, conducted by Bernard Gesch and colleagues in 1997, which had been published in 2002. In her summary she noted that it was a randomised control trial of dietary supplements with young adult prisoners. The participants received either active or placebo supplements. The number of adjudications for the group of 82 young adult prisoners taking active supplements for a minimum of two weeks reduced by 35% and was statistically significant. GH emphasised that adjudications are proven incidents of breaches of prison discipline.

Dr Ian Gibson (IG) asked how the calculations were made. **GH** said there were two sets of figures, one measured adjudications before and while the supplements were being taken; the other compared the results between the two groups and these demonstrated that the active supplements did have a positive impact.

GH acknowledged that this was a well designed trial and had had a statistically significant effect, but she said the sample had been small and the project did not include a cost/ benefit analysis or indicate the impact of the reduction of adjudications on the management of the YOI. GH also emphasised that this study related to adjudications in prison and the findings cannot be generalised to apply to other behaviours or environments.

GH said another trial, undertaken by Schoenthaler in 1997, had looked at the impact of vitamin-mineral supplements on incarcerated juvenile offenders. This also produced some interesting findings, but had similar limitations. It was a randomised control trial of vitamin-mineral supplements in a psychiatric-orientated facility housing 'chronic' juvenile offenders. In this study, the total number of rule infractions for 32 young people on active supplements reduced by 83%; while the total number of rule infractions for 30 young people on placebo supplements reduced by 55%. As some young people (both taking active and placebo supplements) received dietary counselling the overall findings cannot be attributed solely to the supplements. GJ emphasised that these findings relate to rule infractions in a secure institution and we cannot generalise them to other behaviours or environments.

A more recent, meta-analysis by French and Gendreau (2006)² had concluded that behavioural programmes (e.g. cognitive-behavioural programmes) were more likely to have an impact on behaviour in correctional institutions than non-behavioural programmes, such as diet.

This meta-analysis set out to investigate the impact of correctional treatments in reducing misconduct within correctional settings. It included 68 studies which involved 21,467 offenders. Diet interventions were categorised within the group of institutional strategies that had provided very tentative evidence of utility, but were "in dire need of replication". In 5% of the 104 observed effect sizes, effects were attributed to diet interventions.

Lord Rea asked how many of the studies had used dietary interventions. GH was unable to say, but undertook to provide this information.

GH said the key finding of this meta-analysis was that there were substantially higher effect sizes for behavioural programmes compared to non-behavioural (e.g. non-directive therapy and diet) and educational/vocational interventions.

GH said the general conclusion of the RDS was that the effect of dietary intervention on offending behaviour is inconclusive and requires further testing, hence their support for the new Natural Justice application.

² French, SA. And Gendreau, P. (2006) 'Reducing Prison Misconducts: What Works!' *Criminal Justice and Behavior*, 33, 185-218.

RDS NOMS commissions and conducts research in the following areas: public protection and sentencing; interventions and offender management; community integration; and public engagement and substance misuse. They start by looking at the evidence base and identifying where there are gaps; they then identify research questions and commission research. Their Business plan of work is agreed with Ministry of Justice Ministers each year. During the process they consult with members of Strategic Analysis Board to prioritise research requirements. This includes Directors from the NOMS and representatives from the Prison Service and Youth Justice Board.

Questions

IG asked what the budget for the RDS amounted to and whether it was rising or falling. **GH** said it is £3m for external contracts and stable.

IG asked what happens when offenders are taken off supplements used in trials. **GH** said she did not know, but that it is an interesting question which needs to be explored and one of the challenges of this type of intervention.

Ms Sara Kahner

Lord Rea introduced Sara Kahner, who had stepped in to speak at the Forum meeting when Katy Warren, her colleague in the Women and Young People's Group of the HM Prison Service (HMPS), fell ill. Sara explained that she works in the Women and Young People's Group at a Prison Service Governor grade. She also drew attention to the presence in the meeting of Graham Bryant, a Prison Service Catering Manager.

Sara said the Natural Justice application to undertake a study of nutrition supplements was submitted in July 2006 and considered by HMPS's National Research Committee. The Committee approved the study to go ahead subject to the agreement of MREC and the Home Office Project Quality Approval Board (HOPQAB). Those agreements were given in September 2006 and February 2007 respectively. The study will be conducted at HM YOI Hindley

Natural Justice originally intended to conduct the study at HM YOIs Stoke Heath and Warren Hill. The Director General of HM Prison Service and both Governors were content, and this was confirmed to Natural Justice in a letter dated 12 January 2006 from Baroness Scotland. The Minister explained that the necessary HOPQAB approval would first need to be obtained via a formal application. HOPQAB had raised some questions about the study, as a consequence of which the approval decision took a number of months. When HOPQAB did approve the study, it recommended a number of alterations to the original methodology.

The alterations in the methodology meant that Stoke Heath and Warren Hill were now less viable sites and HM YOI Hindley was identified as a suitable alternative site. Hindley is a 'split site'. Its population comprises over 300 sentenced young adult offenders (aged 18-20) and nearly 200 young people (under 18) who have either been remanded or sentenced to the Detention and Training Order. The choice of site took account of information from HMPS as to levels of indiscipline (as evidenced by governors' reports), average length of sentence and average length of stay in individual establishments. The Governor is keen for Hindley to be part of this study, recognising that this is a great opportunity for the establishment, the Prison Service more widely and for the young people in the Prison Service's care.

The staff at Hindley are particularly committed to providing their young people with food which is nutritious, well prepared and served, reasonably varied and sufficient in quantity. In 2006 Hindley – together with Aston, Wigan and Leigh PCT – commissioned a broad-based food assessment by Lancaster University. This was to help develop the establishment's prison health delivery plan and so inform the extent to which current provision meets the food and nutrition needs of the young people placed there.

Hindley will offer practical support to the study, being willing to adapt as far as possible and adopt a flexible approach to regimes while the study is ongoing. The staff from Hindley will attend the monthly project steering group meetings chaired by Natural Justice. The Women and Young People's Group will also keep abreast of the study through representation on the steering group and, if any support is needed from the centre, will seek to provide it.

Sara said that the Prison Service hopes the Natural Justice study will shed further useful light on the possible links between nutrition and behaviour among young people with the potential, depending on the findings, to inform the current development of policy on behaviour management.

Young people present a particular challenge to custodial staff, particularly in terms of behaviour management. The behaviour of young people is often marked by impulsiveness, an inclination not to think ahead but to act to gratify immediate needs and by emotional immaturity.

The potential gains from better informed behaviour management practice are: a safer and more disciplined custodial environment; a reduction in violence and self-harm; and lessons learned that the young people can take back with them into the community and that will help prevent them from re-offending.

Sara emphasised that the Prison Service committed to building the physical, mental and social health of those in their care as part of a whole prison approach to promoting health; and to helping each young person to adopt healthy behaviour that will benefit them both in custody and on their eventual release. The promotion of healthy eating is seen as an essential part of this.

Questions

Lord Rea (NR) said that reports indicate that good food is provided in prisons, but it is difficult to get prisoners to make healthy choices. He asked what measures are taken to persuade young offenders in prison to eat healthily. Sara said that the induction process includes information on the food available in prison and steps are also taken to limit less healthy options. For example, in her last prison they had restricted the provision of chips to three times a week.

Graham Bryant said that 70% of prison caterers had attended a nutrition course and, though they are not qualified nutritionists, they could plan healthy menus. He said the induction package included information on a healthy diet, but food choices remain a matter of choice and many prisoners come from a background where unhealthy eating habits are the norm.

Earl Baldwin of Bewdley (EB) asked if it would be true to say that in absolute terms the cost of supplements was very slight in comparison with the cost of cognitive behaviour programmes and that the general effect of supplements was positive. **GH** agreed that in absolute terms supplements are cheap, but said the RDS has to look at cost benefit analysis it also has to consider the purposes of sentencing which is now laid down in legislation.

EB asked if there is flexibility within Prison Service budgets, which would allow supplements to be introduced under another heading, if they were shown to be effective. **GH** agreed there was sufficient flexibility, but said the Prison Service would first need robust evidence of the effectiveness of supplements.

Lord Rea said that behavioural interventions may well have a longer last effect than dietary interventions which may only last while the supplement/diet is being taken. He asked **GH** if she would agree that if a good diet affects behaviour, then it would be beneficial. **GH** said she certainly agreed and she added that it was not a question of either/or, the Prison Service could adopt a multi-layered approach using both dietary and behavioural interventions if they were cost effective.

Lord Rea noted that there had been a long delay between Bernard Gesch's original work at Aylesbury and approval of this second study, which was thought to be because of a disinclination to take the work forward at a high level. **GH** said she could not comment on views at a high level,

but RDS NOMS has a standard process for commissioning research. It had taken slightly longer than normal in this case because the Quality Approval Board had suggested some changes to the methodology to be used.

Rick Wilson of the BDA asked for information on Natural Justice. **Lord Rea** explained that it is a charity that was established in Cumbria in the late 1980s, led by Bernard Gesch, a former Probation Officer, who had become interested in the influence of diet on behaviour. It has attracted support from senior and well respected figures, such as Hugh Montifiore as Bishop of Birmingham and Lord Ramsbotham.

Jeremy Bourne of the Daily Mail asked for information about the nature of the next Gesch study. **GH** said it would involve a much larger sample to ensure the evidence was robust and that there would be a wider range of measures. **GH** was asked if the implication of the study was that the diet in prison does not provide prisoners with sufficient nutrients. **Graham Bryant** referred to the Audit Commission report, which found that diet in prisons was good and provides all the major nutrients required, and said the problem was not the food offered, but the unhealthy choices made by prisoners.

Courtney Van de Weyer asked when the Home Office would consider enough research had been undertaken. **GH** said the NOMS start from a position of whether an intervention is cost-neutral. If an intervention is found to be effective and cost-effective it is compared with competing demands for resources.

Sarah Stacey of YOU Magazine asked when the results of the new Gesch study would be available. **GH** said she expected the interim results to be available next year.

Professor Andrew Scholey

Andrew Scholey is director of the Human Cognitive Neuroscience Unit, based at Northumbria University, Newcastle upon Tyne. He has recently been involved in two trials which are currently undergoing peer review. These looked at the effect of, first, the fatty acid DHA and, second, a multi-vitamin supplement on the cognitive functioning of healthy children. Dr. David Kennedy of the HCNU was Principle Investigator for both these trials.

Andrew Scholey (AS) explained that he was an experimental psychologist and because it is very difficult to obtain funding for research most of the data he would present today had been supported by industry.

AS is interested in the extent to which food can affect mood and behaviour. He said a big driver in this field at the present time is the imminent EU regulation on nutrition and health claims on food, which will require such claims to be substantiated by evidence. The two types of claims are: Type A claims of enhanced function and Type B claims of a reduced risk of disease. AS noted that many claims on food labelling, such as “helps you work, rest and play”, are nebulous, but he cited others which are more specific: “Increases physical endurance”, “improves and increases concentration and reaction speed” and “boosts alertness and concentration”.

AS accepts the theoretical links between diet and behaviour, but he distinguishes between some influences on behaviour, for example, physiological, biochemical and neuronal, where there is a well established (through large amounts of research) direct influence of nutrition; and others, such as genetic, situational, environmental, where there is no established, direct influence of nutrition (see slide 6).

AS is particularly interested in cognitive performance and he explained there are several ways of looking at cognitive function. Slide 7 illustrates measurable components of cognition, such as memory, language, perception, psychomotor function, attention and executive function. Dispositional and situational factors will affect cognitive performance. AS said it is less easy to

control for dispositional factors, such as personality, history and wellbeing, but this can be controlled methodologically. Situational factors, such as mood, arousal and motivation, are controlled by co-monitoring.

The Human Cognitive Neuroscience Unit (HCNU) at Northumbria University has undertaken some 60 trials that have been published in peer reviewed journals. They tend to use computerised assessment methods to eliminate the effect of expectations. Slide 8 illustrates the way in which a computerised test battery measures tasks.

Over the last 20 years there has been a great deal of interest in the impact of glucose on cognitive function. AS said the brain is incredibly active and requires large amounts of energy. The brain forms only 2% of body weight, but consumes 20% of the body's oxygen and glucose. Furthermore the brain stores negligible amounts of glucose, so it requires a continuous supply.

The brain activity of a child up to the age of 3 is less than that of an adult, but it then accelerates rapidly (see slide 9). This is important because it suggests that a child's brain, which is incredibly active and does not store glucose, may benefit from provision of glucose. If omega-3 is important for the brain structure, glucose is important functionally as the brain's fuel.

AS described the Glycaemic Index: a system for the classification of carbohydrate (CHO) containing foods that is based on their blood glucose raising potential (Jenkins 1980). It was originally devised to aid diabetics control the glycaemic impact of their diet

There have been several studies looking at the effect of eating breakfast on children's performance and various studies – for example, David Benton in 2003 - have looked at the impact of the glycaemic load on children's performance (see slide 11). Perhaps unsurprisingly, compared with skipping breakfast, eating breakfast protects against the decline of children's attention during the morning (see slide 12, Wesnes et al 2003).

AS has been involved in a study comparing the cognitive effects in children of two breakfasts: one with a high glycaemic load (*Coco-pops*) and one with a low glycaemic load (*All Bran*). They found that a low GI breakfast is more effective in protecting against a decline in performance, measured in terms of memory and attention, during the morning (see slide 13, Ingwersson et al 2007).

Another (currently unpublished) study AS undertook looked at the effect of providing children with two kinds of snacks at a mid-morning break in addition to their normal breakfast. The results showed that self-rated feelings of hunger and wakefulness were higher in those who ate the snacks (a banana or a Nutrigrain bar). Moreover the psychomotor performance of those eating the snacks were better than the control group in 3 out of 4 measures for the Nutrigrain bar and on all four measures for the banana (see slide 14)

AS said that Dr Alexandra Richardson is an extremely well respected scientist who is "evangelical" about the importance of essential fatty acids (EFAs). AS and his team have also undertaken research in this area. When they looked at the evidence they found that not one of the 8000 or so studies of EFAs in humans reported an improvement in behavioural function in "cognitively intact" individuals. There was one exception, a study of healthy adults which suggested improved reaction times and mood, but the researchers in this case did not report any statistical difference between placebo and active supplement groups. AS said another study had looked at aggression in children, but they found that the levels of aggression in children in the placebo group increased during the study, which is strange.

AS briefly described a recent randomised double-blind controlled trial which he and his colleagues (Dr. Kennedy and Philippa Jackson) have undertaken measuring the influence of DHA supplementation on healthy, cognitively intact children. The results showed one improvement and one impairment for those in the active group out of 38 outcomes, but they found no convincing positive effect on cognition or mood. AS suggested these results may be false positives and when Lord Rea asked why he thought this, he explained that setting an alpha (significance) value at 0.05

one might expect 1 out of every 20 (approximately 2 out of 38) changes to appear significant (a Type I error) through chance alone.

When the group looked at the younger and older children they found better performance in the older children suggesting that the tests were sensitive to changes in ability.

The HCNU have also undertaken a recent randomised double-blind controlled trial looking at the effect of giving healthy children aged 8-14 years old a multi-vitamin and minerals supplement. The results, which have not yet been published, suggest that multi-vitamin and mineral supplements can improve attentional function in this age group both acutely (3 hours post dose) and chronically (following daily supplementation with tests at 57 and 85 days).

AS summarised his work on the effect of glucose by saying that in healthy young adults the effects of glucose seen most easily during high mental effort. Slow release carbohydrate (low GI) may be more effective than food with a high GI. Snacks may 'top up' glucose, but while the low GI data implies susceptibility, there is very little data available for children and no comparative (child-adult) data. The effects are robust in the elderly, particularly those with poor glucose tolerance.

AS said that most of his work looked at the acute effect of dietary intervention and it is possible that the repeated application of some interventions may have different effects to their acute effect because the brain is so adaptive. AS was asked to clarify if the acute and dietary effects might go in different directions and he agreed they could. He cited the example of Ginseng, which has a positive acute effect on a number of measures (particularly memory) but may have a negative chronic effect on some measures. AS cited the example of nicotine and explained that if the brain is bombarded with nicotine the brain responds by manufacturing more of the receptors which bind nicotine. In the case of foods and supplements it is theoretically possible that the brain will produce opposing effects to those of the intervention. Hence acute and chronic effects could vary although this could only be answered through research.

Questions

IG asked whether AS thinks it is the presence or absence of a nutrient that is important. AS suggested that in the absence of established markers for vitamins it was difficult to be certain.

Lord Rea noted that the children used in the two recent studies were "healthy", suggesting they were not deficient in essential vitamins and minerals, and asked AS to comment as to why he thought the children responded positively to vitamin supplements, but not to DHA supplements. AS said that DHA and vitamins and minerals have different targets. There is no reason to suggest that their thresholds for susceptibility to negative effects (through dietary deficit) and positive effects (through supplementation) should be similar. For example a "normal, healthy" diet may provide sufficient DHA, but could be deficient in some vitamins or minerals. AS stressed that individual differences in baseline dietary status can also be very important.

AS was asked why his team had used a DHA only supplement and he said this was driven partially by commercial factors and partially because it enabled them to avoid the issue of whether the DHA or EPA was responsible for any measured changes.

IG asked how work in the field of nutrition and behaviour was regarded in academic circles. AS said he believed it was gaining credibility. It had been difficult to get early studies of the effect of Ginseng and Lemon Balm published, but the methodology of the HCNU is now viewed as impeccable and more of their work is being published in the best journals.

Professor Jack Winkler

Jack Winkler is the Professor of Nutrition Policy at London Metropolitan University and Director of the Nutrition Policy Unit there. He has been active in the field of nutrition policy for over 25 years.

Jack will be speaking about the implications of the existing evidence on the links between diet and health for food policy.

Jack Winkler (JW) said that most of the people who had given presentations to the inquiry team had suggested that most people would benefit from eating more of the essential fatty acid, omega-3. If the inquiry team accepts that point of view, it faces two questions – how much omega-3 should people eat and where should it come from?

JW's first piece of advice to the inquiry team is that it should ignore the three official guides on omega-3: COMA on Dietary Reference Values (1991), COMA on Cardiovascular Disease (1994), and SACN on fish consumption (2004), all of which produced different targets.

JW referred to the written statement he sent to the inquiry which criticises the logic underlying SACN's fish recommendation. SACN itself said that "this recommendation represents a minimal and achievable average population goal and does not correspond to the level of fish consumption required for maximum nutritional benefit". (Para 1.12) JW said the report contains hundreds of scientific references on other subjects, but not one to justify this pragmatic adjustment.

JW acknowledged that the inquiry team faces a dilemma in deciding whether to make principled recommendations as to what people need or pragmatic recommendations based on what will be acceptable. The desirable intake of certain foods is very different to their actual intake and as a result many committees make recommendations they think will be achievable. JW cited the example of dietary advice on the proportion of our energy which should come from fat as an example. The Committee making that recommendation resolved their dilemma by recommending a short term target which said less than 42% of energy needs should be derived from fat and a long term target of less than 30%. The 2004 SACN report on fish intake had also sought to be pragmatic, but its actual recommendation was based on guesswork.

JW said if the FHF inquiry team wanted to know how much fish we should actually eat, it should refer to two potential recommendations based on the Avon Longitudinal Study of Parents and Children (ALSPAC) study, which has been described as the "best epidemiological study in the world".

The results from the ALSPAC study of the effect of fish and seafood intake during pregnancy were that limiting intake to <340g/week during pregnancy did not protect children from adverse outcomes; this observational study showed beneficial effects on child development when maternal seafood intakes exceeded 340 g/week, with no upper limit of benefit; and these findings were robust after adjustment for multiple potential confounders. JH and his colleagues concluded that their evidence indicates that advice for mothers to limit fish and seafood intake to the FSA recommended level of 280 gm/week during pregnancy is detrimental. The optimum level of fish intake and seafood intake during pregnancy is yet to be determined.

JW also referred to Joseph Hibbeln's (JH) method of developing recommended daily intakes for the National Institute of Health by looking at various epidemiological studies, which chartered different diseases against fish intake internationally. [JH and his colleagues found that some 48% of cardiovascular disease was potentially modifiable. The data also suggested that 98.5% of major depression was potentially modifiable by omega-3, but JH told the FHF inquiry team that he would like to test this finding further.] JW said that JH and his colleagues had found that 2g a day of omega-3 would be needed in the UK to protect 98% of the population from various chronic diseases. This represents 4.5 times the amount recommended by SACN.

JW noted that the omega-3:omega-6 ratio is thought by many people to be more important than the absolute amount of EFAs consumed. JW said many of the experts in this field considered a ratio of 1:1 to be desirable, but the pragmatic would settle for 1:5, whereas our actual current ratio lies between 1:15 and 1:30, and 1:40 for those eating a diet high in vegetable oil. Thus achieving the desirable intake ratio would require a huge change, but there are different ways of achieving it. Rather than trying to increase omega-3 intake, we could try to reduce omega-6 intake.

JW suggested that if the FHF inquiry team wanted to recommend people should consume more omega-3, they might like to consider where it will come from and he referred to a diagram, which depicts a decision-tree featuring various potential sources of omega-3. JW said the fundamental choice was between food and supplements and most nutritionists would recommend nutrients should be derived from food. Of the primary food sources, the choice is between fish and plants. Most nutritionists would prefer fish, but doubt has been cast, not least by the UN's Food and Agricultural Organisation (which has estimated that 75% of the world's fisheries are fully exploited, over-exploited or significantly depleted) about whether fish stocks are sufficient. JW said EU Member States think there are sufficient fish, but they take an optimistic view of their ability to manage fish stocks.

JW said that if we were to take Hibbeln's recommendation as a basis – and try to bring the UK population up to the level of Japanese intake of fish – it would require a six-fold increase in fish consumption in the UK. JW suggested it would be imprudent to assume that we could derive such levels of omega-3 from fish. Plant sources are not as good a source of omega-3 as fish, but they are sustainable. Fish get their omega-3 from algae and we could do the same. Algae production is live political issue at the present time because it is a possible source of biofuels.

JW said a large research effort is now underway to try to raise the omega-3 content of some plants. He acknowledged that altering the nutrient profile of food through genetic modification remains highly controversial in the UK, but said this could soon be a potential source of omega-3. DuPont is expecting commercial plantings of its high omega-3 soybeans next year. Monsanto is not far behind and BASF is developing high omega-3 brassicas. JW suggested that if the FHF inquiry team is going to consider plant sources, it may want to take a position on genetic modification.

Many foods have been fortified with omega-3 and JW referred to a *Daily Mail* article which had listed various foods, including milkshakes and ice-cream. Given that people in the UK do not eat a lot of fish and do not like genetic modification of foods, another approach would be to add omega-3 to the foods they do like to eat, particularly as John Stein had pointed out that there was virtually no risk of over-dosing on omega-3, unlike folic acid. However food fortification raises other issues, including: how it should be delivered; the effective dose available in a normal portion; and the nutrient profile of the carrier food. Do we want to encourage people to eat more of foods high in fat or sugar, such as ice-cream, in order to boost their omega-3 intake?

JW emphasised that this is a fast moving area. An EU regulation on nutrition and health claims is being prepared and the FSA will submit its list of claims in September 2007. If a product fails to be included in that list it will be time-consuming and expensive to obtain an amendment including it at a later date.

JW noted there had been rapid growth in the sale of a wide range of over the counter supplements and some of the earlier FHF guest speakers had suggested these could be appropriate for certain vulnerable groups such as pregnant women (Michael Crawford), young offenders (Bernard Gesch) and children with behavioural problems (Alexandra Richardson), people suffering from depression (John Stein, Malcolm Peet and Malcolm Garland).

JW said several scientific issues remain unresolved, but in his view the issue is of such importance the FHF inquiry team could reasonably recommend the Government should establish a Task Force to look at the evidence and reach conclusions on the evidence.

JW said that he had conducted a personal mini-survey of a local supermarket and found a huge amount of shelf-space devoted to canned tuna, the most popular fish eaten in the UK. Unfortunately during the canning process, most of the omega-3 content is removed at present. JW noted that there are several precedents, such as vitamin E in flora and calcium in bread, for the restorative fortification of food, that is, returning to a food nutrients that have been depleted during

the manufacturing process. JW recommended that the restorative fortification of canned tuna with omega-3 should be mandatory.

Lord Rea asked if he thought the scientific evidence justified that recommendation and **JW** said he believed it did. He said there was a great deal of existing evidence to support the beneficial effect of omega-3 if animal studies were also taken into account.

Lord Rea noted recent reports of a study which found that cardiac patients taking omega-3 had a 40% lower risk of suffering a second heart attack; and he asked whether it was true that the evidence that omega-3 had a beneficial effect on cardiovascular health was stronger than for the behaviour claims made for it. **JW** said he would say the evidence for a physical health benefit was more widely accepted, but he would also say we have too narrow a concept of what constitutes "proof".

Lord Rea asked whether JW believes there are public health issues that are so great that action is justified even when the scientific evidence is not clearly and fully established. **JW** said there was clear cut evidence – resulting from the very well designed ALSPC study – to justify recommending that pregnant women should increase their omega-3 intake.

Lord Rea asked JW to comment on the omega-3: omega-6 ratio. **JW** said that everyone who had testified to the FHF inquiry team had suggested that the present ratio should be changed to reduce the proportion of omega-6. However, reversing the ratio is a much more challenging and expensive task than increasing the absolute intake of omega-3 because it would require transforming all the industrial oils used by the food industry.

Sarah Freeman asked if increasing intake of omega-3 would improve the effectiveness of other drugs, such as steroids. **JW** said he was not technically competent to answer that question.

Peter Clough of Efamol Ltd said that crops would be a sustainable source of omega-3 in the long run, but in the short run it could be obtained by retrieving for human consumption a higher proportion of the global production of fish oil. Currently only 50,000-60,000 tonnes of the estimated 1 million tonnes of fish oil produced each year enters the human food chain, the balance is used for aquaculture, animal feed or industrial use. **JW** agreed and said that 40% of fish landed in Tunisia is wasted. It would be helpful if fish that would be otherwise wasted could be turned into fish oil and fish could be diverted from the animal to the human food chain, but it is not easy to capture the wasted fish and fishmeal is a large source of food for pigs and cows.

Jeremy Bourne of the Daily Mail asked about the actual omega-3 content of different types of fish. **JW** said it was a complex issue on which he could not give advice, but SACN had concluded that 280g of fish would provide 0.45g of DHA.

Conclusion

Lord Rea thanked the speakers for their presentations. He told members that this brought our planned series of public meetings on the links between diet and behaviour to a close, although the inquiry team would be meeting to discuss the evidence and might well seek further advice from the speakers who had addressed the inquiry and other experts. The Forum plans to launch a report on the findings of this inquiry at a meeting for members in the autumn.

CLC, May 2007