



**Associate Parliamentary  
Food & Health Forum**



**Report of the FHF Spring Conference 2006 on  
“Diet and Chronic Diseases”**

**Tuesday, 25 April 2006**

**1 Millbank, London, SW1P 3JZ**

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Please note: it is not possible to circulate the speakers' PowerPoint presentations with this report because of their file size, but members are strongly recommended to refer to them on the Parliamentary Food and Health Forum website because they contain a wealth of detail and many very helpful graphics. The presentations are available at: [www.fhf.org.uk](http://www.fhf.org.uk)

## **Introduction**

### **Lord Rea – Chairman of the Associate Parliamentary Food and Health Forum**

Lord Rea, the Associate Parliamentary Food and Health Forum Chairman, welcomed the guest speakers and FHF members to the conference.

Lord Rea noted that the Food and Health Forum is financed by members' subscriptions, but we would not be able to hold the number of events we do each year and, in particular, organise our annual spring conference without the financial support of the Group's sponsors: Marks & Spencer, Unilever and Waitrose. Waitrose has recently renewed its sponsorship of the Forum, having supported it from 2000 to 2003, and Lord Rea thanked Waitrose for additionally providing the refreshments for the reception which would follow the closure of the conference.

Before introducing the first speaker, Lord Rea explained that each of our distinguished guest speakers would be looking at a different aspect of the relationship between diet and chronic disease.

# Dr Paul Clayton – Diet and Nutrition

## Speaker Profile

Dr Paul Clayton is a pharmacologist who has for many years applied the disciplines of pharmacology to food. His work has contributed to the developing science of pharmaco-nutrition, which starts by analysing the multiple metabolic errors that drive chronic degenerative disease, and cross-references against these errors the known pharmacological activity of food derivatives. Type B Malnutrition is now common in the developed world; Dr Clayton believes that this is a major driver of our poor public health profile, and that conversely, properly designed pharmaco-nutritional support programmes can deliver radically improved personal and public health. This provides the basis for a more effective and a more cost-effective model of health care delivery.



Dr Clayton lectures at the Universities of Westminster and Amsterdam; sits on the boards of the Allergy Research Foundation (London) and Food & Behaviour Research (Oxford) and is the Chairman of the Royal Society of Medicine's Food and Health Forum. He advises a number of multinational companies in the food and nutritional sectors and is the author of Health Defence, a standard teaching text for nutritional therapists.

## Presentation summary

Dr Clayton suggested that we are facing a health crisis: the life expectancy of men and women has increased, but our health expectancy has not kept up, with the result that at the end of our lives there is an increasing health gap during which we consume a disproportionate amount of health care services

This increasing health gap is driving up health care costs in the US and western Europe, although to a slightly lesser extent in the UK. Yet this year the NHS is in crisis again, with very worrying consequences for health programmes. Dr Clayton suggested that no matter how much we spend on health, it will never be enough because health costs are increasing as a result of the increasing health gap, an ageing population with an increasing incidence of chronic diseases, as well as the increasing cost of drugs, diagnostics, health management and lawsuits.

One major factor increasing NHS costs is the incidence of Type 2 diabetes (T2D): there are now some 2 million people with T2D in the UK costing the NHS some £5 billion per year (9% of NHS costs), while it is estimated that a further 1 to 2 million T2D patients remain undiagnosed. The trend in terms of increasing T2D will, if unchecked, lead to hugely escalating costs for the NHS, with estimates of a quarter of the population of the UK becoming diabetic within 10 years, costing some £30 billion and adding 50% to the current NHS budget.

T2D used to be known as "adult onset" diabetes but this term has been dropped as the disease is now increasingly occurring in younger people; the same is true of macular degeneration, which used to be associated with older people, but which is now showing an increase in progressively younger cohorts of patients. Similarly other diseases associated with older people, are now being seen in younger people, for example, osteoporosis, non-tobacco cancers and neuro-degenerative diseases such as Alzheimer's.

The WHO technical report series 916, "Diet, Nutrition and the Prevention of Chronic Disease" attributed the increasing incidence of chronic disease to poor diet and lack of exercise. Old photographs show that in the past people were much less heavy than they are now. Obesity

is becoming increasingly common because although people eat as much they did in the past we have become much less active: the average US adult is now sedentary for 8 hours a day and takes less than 2000 steps a day.

Research published by McCrory et al in 1999 shows that the introduction of new foods, particularly soft drinks, snacks and sweets, correlates with the increasing number of people with a BMI in excess of 25.

Whilst obesity is becoming an increasing problem, we also face a parallel problem of malnutrition because people can no longer get a well balanced nutritional intake from a "healthy diet". This has serious consequences because a poor nutritional baseline is a major contributory factor to most if not all of the degenerative diseases. Since the stone age there has been a huge decrease in our intake of flavonoids, vitamin C, omega 3, methyl groups and the carotenoids. Even since the 1960s intake of other nutrients, for example phospholipids, prebiotic fiber and selenium in the UK, has fallen by some 50%. As a result, a significant proportion of the population are deficient in a wide range of micro- and phyto-nutrients.

In March 2006, the UN acknowledged a new kind of malnutrition. Catherine Bertini of the UN Standing Committee on Nutrition said: "The overweight are just as malnourished as the starving, and nutritional programs in poor countries need to target rising obesity alongside hunger". She also suggested that we need a new definition of malnutrition because food availability is not really the issue. The quality of the food is the problem. This new type of malnutrition, which can be categorised as multiple micronutrient depletion, has been termed 'Type B malnutrition'.

Type A malnutrition (classically associated with a deficiency of water soluble vitamins) is associated largely with developing countries where the population consume inadequate calories and nutrients. Type B malnutrition is more common in the west and is increasingly common because of a low calorific throughput, dietary shifts, changes in life style, and demographic change (ageing populations) Type B malnutrition worsens with age because of a number of factors, including reduced activity, financial hardship, poor dentition, swallowing problems and a loss of sense of taste.

The result of Type B malnutrition is a progressive depletion of anabolic factors and anti-catabolic factors. However evidence demonstrates that some chronic illnesses, such as the loss of cartilage, type 2 diabetes and coronary heart disease, can be stabilised and even reversed if people suffering from multiple micronutrient depletion change their lifestyles, for example by increasing their level of exercise and taking supplements. A recent study by UCLA into prostate cancer prevention indicated that dietary interventions were successful.

Dr Clayton cited evidence (Knoops K et al JAMA 2004) which showed that the most effective diet for preventing diabetes and prolonging a healthy life is the Cretan/Mediterranean diet, although Dr Clayton qualified this view by suggesting that a low GI version of the diet would be more suitable for a largely sedentary population. In conclusion Dr Clayton suggested that a low GI version of the Mediterranean diet would provide a means of achieving significant and long-term reductions in health costs if adopted along with modest physical exercise, the use of multiple vitamin supplements, a modest consumption of alcohol and no smoking.

## Dr Alex Richardson – Diet and Behaviour



### Speaker Profile

Dr Alex Richardson is a Senior Research Fellow at Oxford University's Department of Physiology, Anatomy and Genetics, and a founder director of the UK charity Food and Behaviour Research (FAB Research). She is internationally known for her pioneering work on the role of nutrition – and particularly dietary fat – in brain development and function, and the implications of this for many common disorders of behaviour, learning and mood. Much of her research has centred on developmental conditions that are usually first evident in childhood, such as dyslexia, dyspraxia, attention-deficit / hyperactivity disorder (ADHD) and autistic spectrum disorders; but her interests also extend into the areas of mental health and performance, and the biological determinants of normal individual differences in personality, perception and cognition.

She is involved in several large collaborative research programmes that include leading studies of the genetics of neurodevelopmental disorders, brain imaging and biochemical investigations, and experimental studies of physiological and psychological functioning as well as educational and health implications of nutrition and diet. Her current studies include randomised controlled treatment trials of dietary supplementation with omega-3 fatty acids in both children and adults, with the aim of replicating and extending her existing findings that an increased dietary intake of these essential fats can improve reading and spelling progress, boost attention and concentration and reduce disruptive behaviour in many underachieving children. Dr Richardson's work has always encompassed clinical and educational as well as scientific research perspectives, and its main aim is to develop new, evidence-based methods for assessing and managing difficulties in behaviour, learning and mood.

### Presentation summary

Dr Alex Richardson began by suggesting that more resources should be devoted to the prevention of chronic illnesses so that the cost of providing services to deal with, for example, diabetes can be controlled.

Dr Richardson noted that we tend to focus on the physical results of poor diet and pay insufficient attention to the effects of poor diet on the brain and mental health.

There are four major childhood developmental disorders of behaviour and learning, dyspraxia, dyslexia, ADHD and autism, which overlap: the vast majority of children who have one of these diagnostic labels will have features of one or more of the other disorders, even if these are undiagnosed. Looking beneath these disorders there are often common nutritional deficiencies, involving omega-3 fatty acids and other essential micronutrients that the diet should provide.

Omega-3 fatty acids from fish oils are absolutely essential to the visual system: 30-50% of the retina should be made of the omega-3 DHA; at the very first stage of visual processing, DHA deficiency can reduce retinal signalling by more than a thousand-fold; and omega-3 deficiency is associated with poor night vision and other problems with visual, spatial and attentional processing.

Appropriate nutrition is essential for the growth and development of brains and bodies. At least 39 essential nutrients must be provided by our food. These include vitamins and minerals, essential amino acids, and omega-3 and omega-6 fatty acids. Many of these are

lacking from modern diets and individual differences affect dietary requirements. In some individual cases specific nutrients may be needed in unusually high quantities and there may be allergies or intolerances to certain foods.

The link between diet and behaviour has been clearly demonstrated by Bernard Gesch's study, "Nutrition in Young Offenders (British Journal of Psychiatry 2002). It involved a randomised controlled trial of dietary treatment for 231 young offenders imprisoned at a high-security unit in the UK. Each offender received either a multivitamin and fatty acid supplement or a matched placebo. The number of offences committed by those taking the supplement rather than the placebo fell by 26% overall on the most conservative analysis (intention to treat), while the number of violent offences committed fell by 37%.

Depression also shows strong associations with diet and the omega-3 fatty acids (found in fish and seafood) seem to be a protective factor.

Dr Richardson suggested that the paradigm governing human nutrition in the last century was wrong. The main emphasis was on physical growth and dietary protein, but for human development the most important factor is the development of the brain and the brain is 60% fat – so the amount and type of fat in our diets is crucial. Tens of thousands of years ago, the balance between omega-6 and omega-3 in the human diet was 1:1, now it is about 15:1 or 25:1 and this is thought to be at the root of many degenerative illnesses.

Unfortunately food labels do not help customers choose the right sort of fats to eat. Margarines and commercially baked or fried products usually contain high levels of hydrogenated and trans fats. People eating "junk" food are eating too many of these unhealthy fats and, all too often, it is the foods that are high in unhealthy fats – that is, high in risk with no health benefits – that are supplied through institutions such as prisons and schools.

Two fatty acids are called 'essential', because humans can't make them – so they must come from the diet: Linoleic acid (LA) (omega-6) and Alpha-linolenic acid (ALA) (omega-3). Within the omega-3 and omega-6 series, it is the more Highly Unsaturated Fatty Acids (HUFA) that the brain really needs, although they are not always called 'essential' because humans can synthesise them from the 'parent' essential fatty acids (EFAs).

In general, people eating a modern, western-type diet tend to consume too much omega-6, which is available in vegetable oils, nuts, seeds and grains, and it has been suggested that our over-consumption of omega-6 relative to omega-3 is contributing to a range of inflammatory and other degenerative illnesses. The diets of many if not most people in the UK do not provide enough omega-3, that is the essential fatty acid ALA which is found in green leafy vegetables, seaweed, some nuts and seeds (walnut and flax), and the key omega-3 HUFA (EPA and DHA), which is only found pre-formed in appreciable quantities in fish and seafood.

The conversion of essential fatty acids (EFA) to highly unsaturated fatty acids (HUFA) in humans is poor. It is also affected by our diet and lifestyle, for example the lack of co-factors such as zinc, magnesium, vitamins B3, B6 and C and the consumption of alcohol and smoking. The conversion of EFA to HUFA is also affected by constitutional factors, such as ageing, atopic eczema and being male.

Fatty acids are essential for the structure of all cell membranes - omega-3 and omega-6 increase the flexibility of membranes, which is necessary for proper cell signalling, and brain development.

Fatty acids make up around 20% of dry brain mass and affect brain growth and connectivity. Fatty acids are also essential for the maintenance of optimal brain function throughout life. Cell signalling depends on membrane fluidity and omega-3 and omega-6 fatty acids and their derivatives have very powerful effects on many aspects of cell signalling. The substances we make from them can profoundly affect hormone balance, blood flow and immune system function.

Evidence of the link between EFA deficiencies and behavioural problems first emerged when the individuals with behavioural problems being studied showed clinical signs of fatty acid deficiencies, such as excessive thirst, frequent urination, rough dry skin and hair, soft or brittle nails and 'follicular keratosis' (hard dry 'bumpy' skin). A series of subsequent blood biochemical studies between 1995 and 2003 have confirmed omega-6 and omega-3 deficiencies in young people with ADHD, dyslexia and autism, and PLA2 enzyme abnormalities consistent with increased loss of omega-3 / omega-6 fatty acids in young people with dyslexia and autism.

Randomised controlled tests (RCTs) have already shown that omega-3 (notably EPA) can be beneficial for cardiovascular function and inflammatory disorders. The emerging area is mental health where there have been a number of trials and the evidence is still emerging. Two small trials in 1987 and 1989 of evening primrose oil showed little or no benefit for ADHD. Three RCTs have shown significant benefits from fish oils providing both EPA and DHA (*Richardson & Puri, 2002; Stevens et al 2003; Richardson & Montgomery 2005*).

The 2002 Richardson and Puri study looked at 41 children aged 8-11 who showed specific reading difficulties and who scored above population averages on parent ratings of ADHD symptoms (CPRS-L). All those given daily HUFA treatment showed clear improvements in reading and writing. The Stevens et al study showed some modest benefits from fatty acid supplementation over placebo for children with ADHD-type difficulties according to both parent and teacher ratings

The biggest trial so far is the Oxford-Durham study: a randomised controlled trial of dietary supplementation with fatty acids in children with developmental coordination disorder. This study looked at 117 underachieving children aged 5-12 years from mainstream schools. All the children showed specific difficulties in motor coordination (DSM-IV DCD); 40% were behind expected achievement in reading and spelling; and over 30% scored in the clinical range for ADHD-type symptoms (>2SD above population means). The results showed no significant differences for measures of motor function (where there was a large placebo effect); but highly significant benefits for reading and spelling progress; and highly significant reductions in ADHD symptoms.

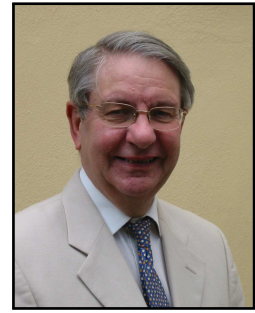
In conclusion, Dr Richardson suggested that further studies are needed to tease apart the relative importance of EPA and DHA and to test general population samples to find out whether increasing omega-3 intake may also improve the behaviour and learning of unselected children in the general population.

Further information on this research is available from [www.fabresearch.org](http://www.fabresearch.org)

# Professor Philip James – Diet and Obesity

## Speaker Profile

Professor Philip James is the Director of the Public Health Policy Group; Hon. Professor of Nutrition, London School of Hygiene and Tropical Medicine, London, UK; and Chairman of the International Obesity Task Force and the Presidential Council Global Prevention Alliance.



Professor James graduated with degrees in physiology and medicine from University College, London, which he followed by 3 years in Jamaica where he obtained his MD, and a year as a Harvard Research Fellow at the Massachusetts General Hospital in Boston, USA. On returning to the UK he was a senior lecturer at the London School of Hygiene and Tropical Medicine and responsible for reorganising the Public Health Nutrition and other courses. Then, in 1974, he became assistant director of the MRC Dunn Nutrition Unit, Cambridge. From 1982 to 1999 he was director of the Rowett Research Institute, Aberdeen, one of the world's largest nutrition research institutes.

As Chairman of the International Obesity Taskforce, he is currently responsible for the funding and organisation of global initiatives relating to food and health with particular emphasis on the pandemic of obesity.

Professor James was chairman of the UN Millennium Commission on global issues relating to nutrition up to 2020, wrote the proposals for the UK Food Standards Agency and those for a new EU Food and Health Authority. He also wrote the first integrated reports on nutritional aspects of health for WHO Europe and then globally (the WHO 797 report). He is currently chair of the Presidential Council of Global Prevention Alliance tackling the global epidemic of chronic diseases with 5 global medical societies related to WHO. He is also on several national and international advisory groups on nutrition and health and responsible for the International Union of Nutritional Sciences' work on developing a global understanding of the scientific basis for the impact of nutrition on adult health. He developed the lithium technique for tracking salt sources and showed that 85% of our salt intake comes from processed foods, initiated the first European studies on diet and cancer and now is on the World Cancer Research Fund's Board reconsidering the evidence on diet and cancer and how policies for preventing cancer need to be developed and applied.

## Presentation summary

Professor James began by drawing members' attention to the work of Geoffrey Rose who, 20 years ago studied defined groups of adults in 52 communities around the world. Although the prevalences of overweight (BMIs 25-29) and of obesity (BMIs  $\geq 30$ ) varied, these extremes reflected a shift in the body weights of the whole population. Thus the thinnest populations, for example China, had negligible obesity rates and an average BMI of 21, whereas in the fattest populations, the average BMI had shifted up to 26 with an overweight prevalence of about 60% of whom 30% were obese. So the whole population becomes fatter when we clinically observe high obesity rates. Asians are now revealing higher complication rates with even small weight gains.

There is increasing evidence that genetics influence individuals' susceptibility to the community's prevailing diet and activity patterns. Within any one country, 40 - 70% of the differences in BMI are attributable to the multiple gene interactions with different dietary factors and the environmental demands for physical activity.

The International Obesity Task Force (IOTF) did a global study in 2001 of the prevalence of obesity around the world. In most countries there was a steady increase in obesity rates from childhood onwards. Women have a greater susceptibility to obesity than men, but this is attributable to biological factors: women tend to store excess calories as fat whereas men tend to store more of it as energy demanding muscle and other lean tissues.

Obesity is increasingly prevalent in children and adolescents internationally. This is important because data coming out of Scandinavia indicates that overweight 7 year old children die prematurely and have more cardiovascular disease. Even modest weight gain increases the risk of diabetes, hypertension and coronary heart disease, and it seems increasingly clear that the best BMI for adults is 21 rather than 25. The Government's Actuary Department estimates that if current obesity trends continue, the projected life expectancy at birth of a male in 2051 will be 77.4 rather than 82.7 because the obesity prevalences will reduce the average life expectancy of the whole population by some five years.

Fifteen years ago, McKeigue and colleagues showed that central obesity (with a high waist measurement) related strongly to the likelihood of having diabetes with Asian immigrants having a 2 to 5 fold increased risk at the same weight and waist measurement. This may be attributable to the disjunction between poor foetal nutrition with a low birth weight followed by rapid growth, particularly after the age of 2. Barker's studies first highlighted the importance of early growth and appropriate birth weights in limiting the risk of developing diabetes, high blood pressure and other complications in British subjects. We should therefore not assume that the Asian susceptibility to diabetes is intrinsic and not preventable.

Foods and drinks high in fat and sugar promote the development of overweight and obesity. Physical inactivity is also important – people should consume progressively fewer calories as they age and become less active. Inactive people have to be on a high quality, low fat (e.g. 20-25%) diet and low sugar intake to avoid weight gain. A food's energy density, determined by its fat, sugar and water content, affects weight gain because people tend to eat the same volume of food whether it is high in energy or not.

Professor James argued that individuals can contribute to making changes to their lifestyle, including physical activity, but their efforts are usually overwhelmed by external pressures. So obesity will not be tackled successfully unless all the stakeholders, including governments and the food and drink industry work together. The key approaches to prevention, as demonstrated by the determinants of tobacco and alcohol consumption, are the price, availability and marketing of foods and drinks. The accessibility of play areas and pedestrian-friendly environments is also crucial to increasing physical activity; the UK has a dismal record on cycle paths.

Elinder and her colleagues from the Swedish Public Health Institute have highlighted the distortion of European food prices. The vast proportion of fruit and vegetables grown in the EU is destroyed to increase their prices whereas butter consumption is supported to the tune of half a billion tonnes a year. EU and American agricultural policies have resulted in the over-production of sugar, butter and oil so these energy dense foods cost less as a result of these political decisions. The Food and Drink Industry have also long recognised that manipulating the price, and determining the availability of their products in prominent positions on supermarket shelves or in separate outlets, for example ubiquitous vending machines, affect purchasing patterns. Intense marketing, particularly to children, is also highly effective so these issues need to be tackled in any prevention programme.

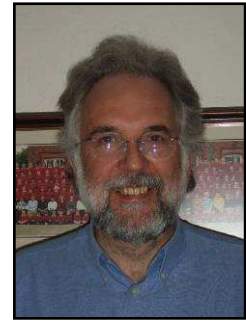
The most cost effective interventions are those that involve specific policy decisions made at a governmental - national or local - level. Education campaigns aimed at the general public have been repeatedly shown to be ineffective. Governments can and do manipulate

consumption. Danish analyses show that reducing the sales tax on fruit, vegetables and wholegrain products but increasing it on butter, cheese, beef, pork, fatty products and sugar could markedly alter purchasing patterns beneficially, particularly of the poorer households, whilst maintaining overall tax revenue.

Professor James outlined a number of strategies to tackle childhood obesity including: promoting breast feeding and proper weaning practices; regulating child minder care with specific requirements for diet and play; legislating to limit the promotion of unhealthy foods in all forms of marketing (including television, radio, text messages, the internet, food product labelling, games, etc); better managing the school environment; adopting pricing policies to affect school aged children and altering the availability of fast food outlets close to schools.

Professor James noted that in Singapore the increasing incidence of childhood obesity rates was partially reversed by draconian measures affecting both schools and overweight children. Nevertheless, 10% of children remain overweight. He suggested a better way forward was the one adopted in Chile where a new cost-neutral government food programme for high quality, lower energy density foods, produced by local farmers for their own communities, is reducing obesity rates. Professor James concluded by suggesting we need to be willing to adopt novel approaches to tackle the problems of excess weight and not just obesity. We should not revert constantly to the feeble mantra of calling for further ineffective health education programmes.

# Professor David Shuker – Diet and Colorectal cancer



## Speaker Profile

Professor Shuker has a BSc (1976) and PhD (1979) in Chemistry from Imperial College London. After postdoctoral work at MIT in the US, he returned to the UK in 1982 to take up a post of non-clinical scientist at the MRC Toxicology Unit in Carshalton working on the detection of urinary biomarkers. David was awarded a Royal Society European Exchange fellowship in 1986 to work at the WHO International Agency for Research on Cancer (IARC) in Lyon where he began to use antibodies to quantitate DNA damage and extended his research interests in diet and cancer. David returned to the UK to rejoin the MRC Toxicology Unit in Leicester where he built up his research group, eventually gaining a major contract with the UK Food Standards Agency to develop biomarkers of dietary exposures.

In 2000 Professor Shuker was appointed to the chair of Organic Chemistry at the Open University in Milton Keynes and from 2002 to 2005 was Head of the Chemistry Department. His research group has been in the forefront of developments to improve sensitivity and robustness of assays for DNA damage in humans.

Professor Shuker is currently a member of the UK Government Advisory Committee on Carcinogenicity of Consumer Products and the Expert Panel on Air Quality Standards. He is the author or co-author of over 110 peer-reviewed scientific papers. For light relief, he is currently studying for an MA in music and is preparing modern editions of Sir William Herschel's organ music.

## Presentation summary

Professor Shuker spoke briefly about the history of the Open University and its research facilities. He acknowledged the support which he has received from his own research team, particularly Drs Sharon Moore and Yao-Zhong Xu, and various colleagues from other universities, including: Dr Sheila Bingham (Cambridge); Dr Phil Burns (Leeds); and Dr Monica Hollstein (Heidelberg). He also acknowledged financial support for his research from the World Cancer Research Fund, the Medical Research Council, the Food Standards Agency and the Open University.

There is a clear understanding of the progression of colorectal (bowel) cancer and Professor Shuker noted that it is only at a relatively late stage that carcinomas appear and symptoms are diagnosed. Intervention at one of the early stages in the disease could stop it.

We currently have very good simple biomarkers for effective interventions to reduce cardiovascular disease and Professor Shuker suggested that we now need similar biomarkers for common preventable cancers such as bowel cancer.

Armstrong and Doll showed in 1975 that there is a correlation between a red meat diet and bowel cancer. Mutations in *APC*, *p53* and *Kras* genes could be caused by dietary mutagens, the key is to identify which, out of the thousands of possible chemicals in our diet, might be responsible.

Only about 5% of cancers are truly genetic; the majority of cancers occur in people with no obvious genetic risk factors. However, the exquisite sensitivity of colorectal cancer to

induced ('somatic') mutations is known through studies of genetic predisposition – in cases where all cells already have one mutation (such as HNPCC).

N-Nitrosation is a simple chemical reaction that can have profound biological consequences. It transforms chemicals in the body which are usually biologically inactive into toxic, mutagenic and carcinogenic chemicals.

Sheila Bingham has discovered that as the amount of red meat in the diet increases (up to 1lb per day), there is an increased risk of faecal ATNC levels. This is not the result simply of eating more protein because a high vegetarian protein or high fish/chicken diet did not show the same correlation (with individual exceptions).

Twenty-five years ago, David Shuker did research which investigated whether the reflux of bile acid conjugates into gastric juice is associated with an increased risk of bowel cancer. This research ultimately led to the recognition that glycine can be converted into a DNA damaging agent and led to the identification of dietary glycine as the most likely substrate for N-nitrosation.

Nitrosation of glycine leads to formation of diazoacetate, which, at physiological pH, is converted to a highly reactive DNA damaging agent. The resulting DNA damage includes formation of O<sup>6</sup>-carboxymethyldeoxyguanosine (O<sup>6</sup>CMdG). O<sup>6</sup>CMdG has proved to be a rather unusual example of DNA damage in that it leads to a unique pattern of mutations when compared to other O<sup>6</sup>-alkylguanines. These results, combined with its apparent lack of repair in DNA, have led to the possibility of using O<sup>6</sup>CMdG as an early biomarker of change to DNA related to diet and ultimately to cancer.

Sheila Bingham has developed a method for recovering exfoliated bowel cells. Immunochemical tests on these cells confirmed that as the change from a vegetarian to a high red meat diet increased the secretion of N-nitrosocompounds this led to higher levels of the O<sup>6</sup>CMdG marker. Further research showed that the crucial element is the amount of haem consumed. Haem is derived from blood and catalyses the formation of N-nitrosocompounds.

In conclusion, Professor Shuker suggested that further work is needed, particularly in the context of the European Prospective Investigation of Diet and Cancer (EPIC), to be certain that O<sup>6</sup>CMdG is going to be a useful biomarker. Nonetheless, O<sup>6</sup>CMdG may be one of the first markers to be useful in determining the efficacy of dietary interventions or recommendations aimed at reducing the risk of diet-related colorectal cancer. Just as biomarkers such as serum cholesterol have been essential to the very successful interventions aimed at lowering heart disease, cancer research now needs biomarkers of similar calibre.

# Professor Ian Rowland – Diet and Cancer Prevention



## Speaker Profile

Professor Ian Rowland has a BSc and PhD in microbiology from University College London and is a Registered Nutritionist. His current position is Professor of Human Nutrition and Director of the Northern Ireland Centre for Food and Health (NICHE) in the School of Biomedical Sciences, University of Ulster, Coleraine, Northern Ireland. NICHE is the largest university nutrition department in the UK and has been top-rated (5\*) for research in the last two UK Research Assessment Exercises.

Professor Rowland's main area of research is diet and the prevention of cancers of the colon, breast and prostate, with specific interests in plant components, probiotics and phytoestrogens. He is on the editorial boards of 5 journals and is the author of over 190 scientific publications. He is a member of the UK Advisory Committee on Novel Foods and Processes and is Vice Chairman of the UK Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment. He was recently awarded an Honorary Doctorate from the University of Gent for his work on nutrition and cancer risk.

## Presentation summary

Professor Rowland began by describing some of the more notable cancer statistics: 1 in 3 people will develop cancer in their lifetime; in the last 10 years, overall cancer rates increased slightly in women (3%), but were static in men; and if the current incidence rates remain the same, by 2025 there will be an additional 100,000 cases of cancer diagnosed each year as a result of the ageing population.

Cancer Research UK research shows that cancer incidence is dominated by four major cancers: breast, lung, colorectal and prostate cancer and these four cancers are responsible for the majority of cancer deaths.

The risk of contracting cancer increases with age. Genetics also plays a role in increasing susceptibility to cancer, as do medical interventions (such as x-rays), breathing pollutants, sexual intercourse, physical inactivity, alcohol consumption and diet.

There is evidence that the risk of contracting certain cancers (colon, breast and prostate) varies up to 25 fold between countries: there is a low incidence of cancer in China, Africa, Japan and southern Europe, but a high incidence in northern Europe, the USA and Australia. However, evidence also shows that migrants acquire the cancer risk associated with their adoptive country. For example, research which looked at Japanese women who emigrated to America (Hawaii) found that their risk of different cancers changed, with their risk of stomach cancer falling in comparison to women in Japan, but their risk of colorectal and breast cancer increasing significantly.

A large proportion of cancer is preventable and changing lifestyle factors, such as the consumption of alcohol and tobacco, can certainly significantly reduce the incidence of certain cancers. Scientists disagree, however, about cancer and diet advice and this is in part because of the difficulties associated with measuring what people eat. Moreover there is a long latency time for cancer development and it can be difficult to determine causal effects. As a result, it is necessary to look for consistency in evidence rather than at individual studies.

There are certain epidemiological associations between diet and colorectal cancer risk, showing an increased risk associated with the intake of fat/energy, alcohol, processed/red meat and obesity; and a decreased risk associated with the intake of vegetables, fruit, cereal fibre, starch, calcium and vitamin D and exercise.

Similarly for breast cancer, epidemiological studies show an increased risk associated with alcohol, obesity (post-menopausal), the intake of fat (total and saturated) and meat; and a decreased risk associated with the intake of vegetables, cereal fibre, Phytoestrogens, and exercise.

The consumption of fruit and vegetables is generally associated with a reduced risk of a number of cancers, including: stomach, colorectal, breast, prostate, bladder and lung cancer. Further questions then arise: what plants are the most effective, what are the active agents and what are the causal relationships?

Professor Rowland and his team have been pursuing two approaches: In vitro, looking at the activity of plant extracts/components on stages of carcinogenesis in cultured human cells; and human intervention studies, investigating cancer biomarkers in tissue biopsies, peripheral lymphocytes or faeces in subjects consuming vegetables.

A series of studies by Professor Rowland's team of the antigenotoxic effects of watercress extract on human colon cells in culture, found that watercress protects against DNA damage, which is an important step in the development of tumours. A further study of people on a watercress diet found that there was a significant decrease in DNA damage in blood cells of the people on the watercress diet compared with the control group.

Professor Rowland's team also studied the effect of eating young sprouting vegetables – (young plants have higher levels of phytoprotective chemicals than mature plants) and found that the people on this diet showed a significantly improved ability to resist DNA damage induced by oxidative stress.

However people do not eat enough fruit and vegetables, so Professor Rowland is also investigating the effect of probiotics and prebiotics on cancer prevention. Probiotics (lactobacilli and bifidobacteria) are live bacteria and a large proportion of them are killed by stomach acids after consumption, so prebiotics (non-digestible sugars such as galacto- and fructo-oligosaccharides) are useful because they feed these and other helpful bacteria which exist in our colon. There is good evidence that probiotics and prebiotics taken together can be used to reduce cancer risk, although many of the studies to date have been conducted on rats rather than humans.

Studies conducted by Professor Rowland's team have found that the combination of probiotics and prebiotics led to the suppression of pre-neoplastic changes and the suppression of pre-cancerous lesions in the colon of rats by some 40%. An epidemiological study has also shown a 50% decrease in risk of adenomas for people eating one yoghurt a day. Furthermore, research testing cell proliferation (by rectal biopsies of polyp patients) showed that whereas cell proliferation increased in the control group, it decreased in the group fed probiotics and prebiotics for twelve weeks.

Professor Rowland concluded by suggesting that given an ageing population will result in some additional 100,000 cases of cancer per year by 2025 and the "big four" cancers (lung, breast, CRC, prostate) are potentially preventable, more research is needed into practical dietary strategies for prevention.

# Catherine Collins – The Mediterranean Diet



## Speaker Profile

Catherine Collins is a Registered Dietitian who has worked full time in the NHS since graduation in 1983, currently specialising in the fields of intensive care nutrition and rheumatology within a tertiary care hospital.

As an active spokesperson for The British Dietetic Association she is frequently quoted in the written and broadcast media as an objective and impartial expert on nutrition and dietary matters. Catherine is a regular contributor on nutritional issues for *'Which'* magazine and was previously dietitian for the 'Behind the Label' column in *The Times*, scrutinising the validity of nutritional claims made by food manufacturers and retailers.

Her dietetic and media experiences have fostered an interest in how novel food and drinks have become nutritional talismen adopted by the public to ward off ill health or modify disease, often without substantive proof of benefit. She is particularly interested in the alternative nutrition and health practices marketed to the general public keen to adopt dietary and lifestyle measures to protect against or manage ill-health.

Catherine Collins is an external lecturer on nutrition for Kingston/St Georges, Kings College and London universities, and an editorial board member for the BDA dietetic reference book, the *Manual of Dietetic Practice*. She has presented clinical research at several national and international conferences, and has published widely on nutrition related issues in specialist health journals.

## Presentation summary

Catherine explained that as a dietitian she seeks to clarify and de-mystify consumer messages and interpret emerging research.

Over the last twenty years we have witnessed considerable changes in the messages on nutrition as new food products have been introduced, from semi-skimmed milk, to functional foods. Nutrient requirements are now measured in terms of absolute and relative intake of macro and micronutrients manipulated for age, sex, life stage or disease factors; or considered in terms of nutrigenetics and nutrigenomics, that is, how diet may impact on our genetic make-up to influence our risk of developing chronic diseases. The public are also interested in the functionality of food, whether of natural food products or food products that have been manipulated or fortified. However we need to look at the whole food matrix because elements of food taken in isolation are not normally as beneficial as the food itself and there are complex interactions between nutrients and food matrices that enhance the 'functionality' of the diet.

One problem for the public in identifying a healthy diet is the amount of nutritional misinformation they are subjected to from various sources, including the media. All too often the media mistake correlation between two factors for cause and effect and there is often inadequate context in broadcast or print article for consumers to interpret findings correctly, for example, as in the Oxford-Durham study of the impact of fish oil consumption on reading and spelling in children with developmental coordination disorder. At the same time, clever marketing to promote a product, such as omega-3 enriched milk, does not make it clear that you would need to consume vast amounts of the milk to obtain the same amount of essential fatty acids as used in the Oxford-Durham study.

Over the years there have been a number of high profile examples of public misinformation where correlation was mistaken for cause and effect, including: dietary cholesterol and blood cholesterol levels; high level vitamins A and E supplements for cancer prevention; single nutrient or anti-oxidant vitamin supplements for primary or secondary coronary heart disease prevention; and folic acid, with vitamins B6 and B12 to reduce homocysteine levels.

In 1969 a study showed that high homocysteine (tHcy) levels were associated with an increased risk of atherogenesis and premature cardiovascular disease (CVD) risk within a population, whereas a low level of tHcy appeared to confer protection against the condition. It was anticipated that reducing high tHcy levels would significantly reduce the risk of heart and circulatory disease and stroke, and as vitamins B6, B12 and folic acid were known to reduce tHcy levels, vitamin supplement studies tested this hypothesis. All three studies – one published in 2004, and two published last month (NEJM 2006) – demonstrated a successful reduction in tHcy levels with vitamin supplementation, but with no significant benefit in reducing heart, circulatory disease, or stroke risk. This result demonstrates the differences between actual and predicted outcomes in relation to nutrition, which in this case are likely to be due to tHcy being a marker, rather than the cause, of cardiovascular disease.

Catherine suggested that whilst a “top-up” of a one-a-day multi-vitamin and mineral supplement appears protective - perhaps where there would otherwise be marginal micronutrient deficiencies, it is recognised that supplement users tend to have a healthy diet and lifestyle. Moreover dietary benefits are more than the sum of the vitamin/mineral content and conventional nutrients may be just ‘markers’ for biologically active, as yet unidentified substances.

Attention has focused on the “Mediterranean Diet” since Dr Ancel Keys a physiologist at the University of Minnesota, directed the ‘Seven Countries Collaborative Study’ (1966). There were some initial concerns about the trial design – it was suggested that Dr Keys had selected certain countries to suit his purposes – but the dietary benefits of the Mediterranean diet have subsequently been confirmed in over 450 published papers. It has also been demonstrated that the benefits of this diet are transferable to different population groups adopting similar dietary goals.

The Mediterranean diet consists of simple food components; regular meals based on wholegrain carbohydrates; at least 5 portions of fruit and vegetables daily; the use of predominant mono-unsaturated fat, for example olive oil; regular omega-3 intake from oily fish and plant sources; and the consumption of modest amounts of lean meat and low fat dairy foods.

Recent studies have shown a serial rise in diabetes, high blood pressure and high cholesterol as the population becomes increasingly overweight. All of these illnesses contribute to blood vessel damage. At the same time, evidence shows that the Mediterranean diet can reduce inflammatory blood proteins, improve the ‘metabolic syndrome’, reduce blood vessel irritation, stabilise circulating LDL (“bad”) cholesterol and reduce platelet stickiness resulting in a reduction in ‘all-cause’ CVD mortality.

Prentice and Jebb (Obesity Review 2003) have looked at the energy density of different diets and their study showed that the Mediterranean diet, which is low in energy density due to its high fruit and vegetable component, enables people to control their weight. Cancer Research UK and the World Cancer Research Fund (WCRF) also recommend a diet high in fruit and vegetables for protective benefits. The WCRF estimates that 30-40% of all cases of cancer are preventable by appropriate diets, increased physical activity and maintenance of appropriate body weight. Evidence of dietary protection against cancer is strongest and most consistent for diets high in vegetables and fruit: over 400g/day (the ‘5-a-day’ message) will prevent 20% or more of all cases, whilst safe alcohol consumption will prevent up to 20%

of cases of cancers of the aerodigestive tract, the colon and rectum and breast. A prospective study on cancer prevention (the EPIC study) has confirmed each aspect of the Mediterranean diet as independently protective, with cumulative benefit the closer one follows the Mediterranean diet.

UK national statistics show the life expectancy of men and women increasing steadily from 1901 to the present day, with a relatively large rise in life expectancy after the Second World War, perhaps reflective of the adult diet available to the British public during rationing (between 1940-1955) being similar in content (bar the saturated fat spreads) to the Mediterranean diet.

In conclusion Catherine suggested that there is a large volume of evidence to demonstrate that the balanced "Mediterranean" diet is healthy and it should be combined with clear positive messages about the beneficial effect of physical activity for global health benefits.

## **Discussion and conclusions**

During the conference FHF members had the opportunity to question the guest speakers – who indeed challenged each other on certain points raised in the presentations.

There was general agreement on the beneficial effect of the balanced, “Mediterranean” diet, while opinions differed on the value of supplements.

Some members and speakers argued that a more critical approach to the value of supplements was necessary, particularly in the face of strong supportive marketing; while others, including Dr Clayton and some members from the floor, argued that it is now difficult to obtain an optimal nutritional intake from an outwardly “healthy” diet alone because the nutrient value of much of the food now available has decreased in recent decades.

In the discussion most speakers felt that there was little or no role for multi-vitamin and mineral supplements to support a properly balanced diet based on natural whole food. The beneficial effect of vitamin, mineral and essential fatty acid supplements as in the Diet and Young Offenders study and the Oxford-Durham study suggests that the diet of the prisoners and children concerned was deficient in some or all of these nutrients, with the inference that this could be rectified by the provision and consumption of a good diet.

***CLC, May 2006***