



ASSOCIATE PARLIAMENTARY FOOD & HEALTH FORUM



Food additives – have they outlived their usefulness?

Minutes

5-6.30pm, Tuesday 20 May 2008

Committee Room 7, House of Commons

Introduction

Lord Rea welcomed members and speakers to the meeting and introduced the first speaker, Professor Jim Stevenson.

Jim Stevenson is Professor of Psychology at the University of Southampton and he has published extensively on social and biological influences on behaviour in children. Jim led the “Southampton Study”, commissioned by the Food Standards Agency (FSA) and published in *The Lancet* (September 2007), which was pivotal to the FSA’s decision to advise UK Ministers to seek to phase out the use of six food colours in the UK and the EU.

Professor Jim Stevenson, University of Southampton

Professor Stevenson began his presentation by defining hyperactivity. He described it as a pattern of behaviour showing marked individual differences in the general population, comprising overactive, impulsive and inattentive behaviour. Children with an extreme degree of hyperactivity may be diagnosed with Attention-Deficit Hyperactivity Disorder (ADHD). Hyperactivity is important because increased it is associated with later educational difficulties and antisocial behaviour; hyperactive children may find it difficult to make friends and their behaviour is challenging for their families. A wide range of contributing factors, including genetic and environmental factors, act in concert to increase the degree of hyperactivity shown by a child

In the 1970s an American paediatrician, Feingold, put forward the hypothesis that artificial food colours were an important contributory factor in the increasing number of hyperactive children. He suggested that a diet free of artificial food colours would reduce levels of hyperactivity in these children. His work, and other evidence, was reviewed by the American National Institute of Health (NIH) in 1983, which concluded there was “no consistent evidence of effect” of food colours on behaviour.

Despite the NIH finding, concern about the possible effect of artificial food colours on behaviour remained and more studies were undertaken. A meta-analysis of the results of fifteen of these studies was undertaken by Schab and Trinh in 2004 and the results were published in the *Journal of Developmental and Behavioral Pediatrics* (see slide 4). All of the studies considered in this meta-analysis were placebo-controlled studies. The results of the meta-analysis show that the additives under consideration had a significant effect on behaviour (about 25% of a standard deviation elevation in the level). Research on children with ADHD since the 1980s has shown that there is a beneficial effect when artificial food additives are removed from their diet.

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The “Southampton Study” published in *The Lancet* in September 2007 extended the scope of this earlier research because it investigated the effect of certain additives on a wide range of children taken from the general population, not just those diagnosed with ADHD. The Southampton Study was a double-blind, placebo-controlled, randomised trial. It looked at two groups of children: 153 children aged 3 and 144 children aged 8-9.

The Southampton Study measured the children’s behaviour when eating their baseline diet (with additives) and then again over a subsequent six week period when additives were removed from their diet and then replaced in a controlled manner in daily drinks given to the child. Hyperactivity was measured by the children’s parents and teachers, independent observers and – in the case of the older children (8 year olds) - by using a computer test of attention. These results were then aggregated to produce an overall score.

The FSA funded the study and they proposed the two mixes of food colours and sodium benzoate used in the study. One mix (A) replicated the mixture of food colours and sodium benzoate used in the Isle of Wight Study (published in 2004), the other mix (B) was a representative mix of the food colours to which children are now commonly exposed. All the findings of the Southampton Study refer to these two mixes of food colours and sodium benzoate, not to any individual food colour used in the mixtures. The levels of additives used in mix B would be the average amount consumed by children in the normal-high range of food colour intake (those children in the 10-15% of the population consuming the most food colours). The individual food colours included in each mixture are listed in slide 7 of Professor Stevenson’s presentation.

The conclusion reached in the Southampton Study was that mixtures of certain artificial colours together with a sodium benzoate preservative in the diet increased hyperactivity in 3 year old and 8/9 year old children in the general population. The results showed the effect size of 18% of standard deviation which was about the same as the benefit shown in Schab and Trinh’s meta-analysis of studies when artificial food colours were removed from the diet of children with ADHD. However it is important to recognise that withdrawing artificial food colours from food will not provide a panacea for reducing hyperactivity in children because it is just one factor affecting hyperactive behaviour.

The hazard presented by artificial food colours is small (18% of a standard deviation), but the exposure to this hazard is high – children are routinely exposed to artificial food colours in the food they eat – and this risk is important because hyperactivity is associated with educational and social problems later in life. As a result of these findings, and because food colours have no nutritional value, the FSA Board followed the precautionary principle and agreed to recommend to Ministers that the use of these six food colours in food and drink in the EU should be phased out over a specific period. The FSA Board also called for voluntary action on the use of these food colours in the UK by 2009.

Dr Paul Clayton, Royal Society of Medicine (PC) asked whether Professor Stevenson could identify which of the colours used in the study were the most important and why the study had not considered the mechanism by which the food colours affect behaviour. **Jim** said it was impossible to conclude from the Southampton Study which of the individual colours had the most effect and the study had not been commissioned/designed to explain the mechanism of effect. **PC** also asked Jim to comment on the variability in the children’s response to the food colours used in the study. **Jim** said the researchers had wondered whether the children whose baseline diets contained the highest levels of additives would show the strongest effect when the food colours were withdrawn, but this was not the case. It was not possible for the researchers to identify whether children who were, for example, less well nourished were more affected by withdrawing food colours from their diet.

Lord Rea introduced Helen Conn, an independent food scientist and food industry consultant, with 38 years of experience of working with food additives and ingredients. Helen said she was speaking at this meeting on behalf of the Food Additives and Ingredients Association.

Helen Conn, independent food scientist and consultant

Helen began by asking why we use food additives and she showed a slide (slide 1) which lists the 22 categories of food additives, including food colours, preservatives, antioxidants, emulsifiers, thickeners, gelling agents and stabilisers. This list suggested some of the important reasons why food additives are commonly used in food. For example, additives are used as bulking agents to add to the fibre content in food. Fibre is commonly used to replace body lost when fats and sugars are removed from food. Antioxidants, such as vitamins E and C, are used to prevent rancidity and the oxidation of food. Emulsifiers, an essential component of cell membranes, are used to maintain emulsions. Pectin, naturally found in food such as apples, is used as a gelling agent. Some of these additives, such as vitamins C and E, are known to have beneficial health properties.

The food additives and ingredients industry is economically significant. A Leatherhead Food International report (2008) (see slide 2) estimated that global sales of food additives and ingredients was worth some \$23 billion in 2007. Food flavours account for some 30% of such sales (\$6500m), whereas food colours (\$1150m) are only ranked seventh. Moreover growth in food colours is now in the area of natural food colours, such as lycopene, which is used as a red dye and which is known to have beneficial health properties. Synthetic food colour sales have remained fairly static.

Between 2004 and 2007 the largest growth in food additives sales was in the emulsifiers category, reflecting the increased demand for low fat and low calorie food products. The predicted growth of the overall range of 22 groups of food additives is 2.5% per annum. This growth is predominantly anticipated because of the growth in expected sales of functional foods, such as probiotics.

Helen concluded by emphasising that all food additives have to go through rigorous safety procedures before they are approved for use. Food additives will continue to be needed in order to improve the keeping quality of food; to enhance its taste and appearance; to provide customers with convenience, variety and choice; to enable the development of low fat, low calorie foods which consumers want; and to enable the development of fortified / functional foods. She emphasised that food additives are a crucial element in our food and they can support important social goals, such as reducing waste, by maintaining the shelf life of food and reducing spoilage.

Lord Rea introduced Dr Paul Berryman, the Chief Executive of Leatherhead Food International. Paul has 27 years experience in food science and food law. He trained as a Food Technologist and Analytical Chemist and he is an expert in the interpretation of scientific data and food law. Paul is the former Head of Science and Food Standards for Hampshire County Council and he was appointed as Chief Executive of Leatherhead Food International (LFI) on 1st January 2008, after serving three years as Director of Research.

Dr Paul Berryman, Chief Executive of Leatherhead Food International

Paul explained that Leatherhead Food International (LFI) is a provider of scientific research, information and consultancy for the global food and drink industry and they are experts in food ingredients and product formulation. LFI was established by the Government as a Research Association in 1919 to support the food industry after World War I. LFI's membership includes over a thousand food companies, it has a staff of 200 scientists and other experts and 110,000 square feet of laboratories, pilot plant, training and conference facilities. LFI prides itself on its independence and it does a lot of work for the FSA and Defra. Its research work for government and the food industry includes food innovation, nutrition and food safety.

Paul echoed Helen's point that there are a wide range of food additives which are used for multiple purposes.

Paul traced increasing concern about artificial food colours to the introduction of "E" numbers. Some of the food additives identified by these E numbers were new, but many such as acetic acid (vinegar) and sodium bicarbonate (baking soda) had been widely used for many years.

Paul agreed that there is now significant concern about the six food colours used in the Southampton Study: Tartrazine (E102), Quinoline Yellow (E104), Sunset Yellow (E110), Carmoisine (E122), Ponceau 4R (E124) and Allura Red (E129). He suggested that campaigning against the use of such food colours had supported the trend towards what he described as “clean labelling”, in which E numbers are regarded as undesirable and consumers look for simple and familiar ingredients. This trend was partially led by a lack of knowledge on the part of consumers about the necessary and helpful role played by some food additives, but it has been largely driven by retailers in response to perceived consumer demand. As a result, many food manufacturers and retailers in the UK already comply with the FSA’s call to phase out the use of these food colours by 2009.

Paul described some of the natural alternatives to artificial food additives. For example, lecithin and soya protein are used as emulsifiers; grape seed, chestnut and olive leaf extracts are used as antioxidants; lycopene, anthocyanin, chlorophyll are used as natural food colours; and cinnamic acid, carvacol, chitosan and lysozyme are used as preservatives. However, some natural food colours can fade so products made using them will have a shorter shelf life than products using artificial food colours.

Natural food additives are not necessarily safer than artificial food additives. Artificial additives have to satisfy rigorous safety standards, but natural food additives are not regulated, unless they are used as novel food ingredients in which case they must satisfy EU regulations, or unless claims are made that they are “fresh”, “pure” or “natural” in which case they must satisfy FSA criteria. Paul cited the example of rosemary extract, which is generally accepted as a flavouring in foodstuffs with secondary antioxidant properties. It can be processed to optimise its antioxidant properties, but EU authorisation would be needed if it was mainly used as an antioxidant

Paul referred to a number of LFI publications which provide further detailed information about food additives, including colours and sweeteners, and the food additives market (see slide 14). He concluded by agreeing with Helen Conn that additives support consumer choice, ease and convenience. E numbers are not necessarily “bad”, some of them have been in widespread use for many years, and “natural” is not necessarily more healthy. At least with we have access to the full toxicology data for artificial food additives whereas with natural food additives we do not. Food additives remain necessary and we will continue to use them.

Questions

Lord Baldwin thanked the speakers for three clear and concise presentations. He asked Professor Stevenson whether he considered it surprising that the effect study shown in the Southampton Study was similar to that identified in the 2004 meta-analysis of studies using hyperactive children. **Jim** said he had been surprised because he thought the effect of withdrawing the food colours might be more marked in ADHD children. It may well be that additives are having an effect on behaviour other than the normal dopamine effect on behaviour found in ADHD. Jim suspects that a histamine effect may be responsible for changes in behaviour relating to food colours, in which case it would not be surprising that changes in ADHD children are the same as those in children with a normal range of behaviour.

Dr Paul Clayton asked Professor Stevenson to describe the results if the non-responsive children were removed from the findings. **Jim** said it was impossible to define non-responsive children in this way because responses to additives were on a continuum. It was not just a distinct group of children with a large response that was producing the effects seen.

Ailbhe Fallon of Fallon Currie Consulting asked Professor Stevenson to clarify whether his remark about the possible histamine effect related only to the six colours used in the Southampton Study and he confirmed it did.

Professor Jack Winkler asked Paul Berryman to confirm if it was his view that the six colours used in the Southampton Study only affected those children who are particularly susceptible to artificial food colours and whether LFI does any DNA testing. **Paul** confirmed it was his understanding that the “Southampton six” did affect children who were particularly susceptible. **Jim** intervened to confirm that the findings of the Southampton Study showed that children within the normal range of childhood behaviour, not simply hyperactive children, had been shown to be affected by the two mixtures of food colours. Jim and Paul both agreed that there may be children who are not affected at all by artificial food colours. **Jim** said that, as with concern about the effect of lead in petrol on the behaviour and IQ of children in the past, the precautionary principle supports the FSA decision to seek the removal of the six food colours used in the Southampton Study from food in the EU.

Jim briefly referred to children with polymorphisms whose behaviour may be particularly affected by artificial food colours and he emphasised that these polymorphisms are not rare, but could include 30% of children. He also emphasised that the effect of food colours on behaviour would not be limited to children with this genetic make-up because it was just one possible contributory factor.

Alan Long of Vega Research emphasised that some food additives had been used for many years, commented on the difficulty of maintaining the shelf life of food products using only natural preservatives and asked what was being done about the use of food colours in pharmaceutical and cosmetic products. **Paul** said the use of colours in cosmetics is controlled by cosmetic regulations and said that sensitivity to colour would depend on the chemicals responsible for the colour. He suggested that the amount of food colour ingested via drugs is very small in comparison with the use of food colours in food and suggested that it was arguable that it is not therefore as important to change them. **Helen** said that there are many over the counter remedies that use artificial food colours and there are significant cost implications of changing them because food colours cannot be removed without changing the composition of these remedies and so they would need to be re-licensed.

Lord Rea asked what the commercial effect would be of requiring the food industry to remove the six colours used in the Southampton Study and other azo dyes from food. **Paul** said the consumer might need to accept less attractively coloured food. **Lindsey Bagley of the Institute of Food Science and Technology** said that it was entirely possible to remove artificial food colours from food and indeed this was largely happening with the exception of tinned strawberries and mushy peas, where suitable alternatives had not yet been identified.

Claire Hughes of Marks and Spencer said they had started removing artificial food colours from their products three years ago and they no longer use 55% of food additives approved for use in the EU. M&S have removed all artificial food colours and azo dyes from their celebration cakes, with no complaints from their customers. The major challenge M&S experienced was with their food suppliers, especially on the continent, who asked why they wanted to make these changes.

Emma Hockeridge of The Soil Association asked the speakers to comment on the contribution food additives make to the broader health agenda, for example by supporting the wider availability of convenience foods rather than fresh food and natural ingredients. **Paul** suggested food additives were a double-edged sword because while they might make convenience foods more available they also enabled the development and production of low-fat, low-calorie, low-salt foods. Paul emphasised the importance of clear labelling so consumers can make informed choices about the food they buy.

Tim Lobstein of the National Heart Forum said that artificial food colours were largely used to make foods that should be consumed in moderation – such as sweets, cakes, and coloured cereals – more attractive to children. He argued that there is therefore a case for reviewing the use of food colours in foods high in fat, salt and sugar, especially in children’s food.

Lord Rea asked whether there is a case for identifying the presence of artificial food colours with a traffic-light type labelling scheme. **Helen** suggested there was enough information on labelling already and what was needed was better education about food.

Earl Baldwin asked how much weight we should give to the Southampton Study given that it was just one study and the number of children involved was not very large. **Jim** said there had been many studies since the 1980s and the Southampton Study should be viewed in that context. He also emphasised the cost of such research (the Southampton Study cost £750,000) and the length of time such research takes. He suggested that if policymakers felt they were not in a position to recommend action now, they would not be in a better position in the medium term and he believes action is justified according to the precautionary principle.

Paul's conclusion is that food additives remain necessary for a wide range of food products, but the food industry needs to ensure that they are safe and if evidence becomes available, such as the Southampton Study, which suggests there are safety concerns, then the additives in question should be replaced with healthy alternatives.

Lord Rea thanked the speakers and members for their contributions and announced that the next meeting would take place on 24 June, when the Forum would consider the links between vitamin D and chronic diseases.

CLC, May 2008