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Dietary Management of Attention Deficit Hyperactivity Disorder: a review

Dengate S

Food Intolerance Network, Woolgoolga, Australia. confoodnet@ozemail.com.au

Abstract:

The effects of diet on ADHD behaviours is reviewed. Early studies failed to eliminate sufficient problem-causing foods, to recognise the validity of parental observations, to rate adequately some of the most common symptoms such as irritability and sleep disturbance rather than hyperactivity; and focused on the effects of sugar, which has been shown not to cause behaviour changes. More recent studies show that additive-free diets alone are of little benefit and broader dietary intervention is required. The mechanism for behavioural reactions to foods is food intolerance, not allergy. A low-chemical elimination diet followed by challenges can assist in identifying provoking food chemicals. Dietary management can be part of multimodal treatment of ADHD. Parents who wish to pursue dietary management should be assisted in their efforts and referred to a dietitian.

Review:

Dietary Management of Attention Deficit Hyperactivity Disorder

Scientific attitudes to dietary management of ADHD are changing. The possibility that children's learning and behaviour could be affected by diet was first suggested seventy-five years ago (Shannon, 1922). When American allergist and paediatrician Dr Ben Feingold suggested that food additives and salicylates may be associated with an apparent increase in hyperactivity and learning disabilities (Feingold, 1974), there was great interest in testing his hypothesis. In 1980, the results of a selection of studies were judged inconclusive and the Feingold hypothesis was discredited (NACHFA, 1980).

The need for a comprehensive elimination diet

Studies testing the food-behaviour connection use either a set of disguised elimination diets, or an elimination diet plus challenges with items such as food dyes. It is now realised that an elimination

diet must be comprehensive, containing only foods which are unlikely to provoke symptoms. Inadvertent consumption of an offending chemical often prevents complete resolution of symptoms and may render challenge results invalid (Clarke et al, 1996). Many early elimination diets excluded only food additives (Goyette et al, 1978). Subsequent researchers found that so few children reacted only to additives that an additive-free diet by itself would be of little benefit (Carter et al, 1993). In some studies, chocolate cookies were used as both excipient and placebo (Goyette et al, 1978). A later study found 59% of hyperkinetic children reacted to chocolate (Egger et al, 1985).

Feingold's diet excluded not only of food additives but also salicylates, which occur naturally in some fruits, vegetables, herbs and spices. Although some early studies excluded salicylates, the findings were still negative (Harley et al, 1978). Feingold's salicylate list had been based on German analyses of salicylate content done at the turn of the century. A new determination of salicylate contents showed that some foods which were permitted on the Feingold diet, such as pineapple, were high in salicylates (Swain et al, 1985). Salicylates were found to affect 74% of a group of hyperactive children in a double blind placebo-controlled study (Loblay and Swain, 1986). The original Feingold diet also failed to exclude amines and natural monosodium glutamate (MSG) which were found to provoke adverse reactions (See Table 1).

Table 1. Reactions to challenges among 140 mostly children (72% male) presenting with behavioural symptoms.

Challenge	**% reacting**
Salicylates	74
Preservatives	67
Nitrates	60
Tartrazine	54
Antioxidants	41
Amines	40
M.S.G.	39
Lactose	18
Gluten	0
Sucrose (placebo)	3

Adapted from Loblay and Swain, 1986, p.173

Since 1985 the following major studies have shown that observations of change in behaviour made by parents can be reproduced using double-blind methodology and objective assessments. In Canada, 58% of 24 hyperactive boys showed reliable improvement on a disguised restricted diet (Kaplan et al, 1989). In London, 79% of 76 hyperkinetic children responded to the Few Foods diet and double-blind trials reliably provoked behavioural problems in a group of responders (Egger et al, 1985). A repeat of this experiment with 78 diagnosed ADD children obtained similar results (Carter et al, 1993) as did a study in the USA where 73% of 26 children meeting the criteria for ADHD responded favourably to an elimination diet (Boris and Mandel,1994).

Value of parental observations

All of the above studies were criticised for their dependence on parental rating scales (Wolraich, 1996). Yet researchers in an Australian study of 64% of 34 children with suspected hyperactivity who were identified as clear reactors to tartrazine yellow food dye challenges tested the validity of parental ratings and noted "contrary to prevailing wisdom, parents were found to be reliable observers and raters of their children's behaviour" (Rowe and Rowe, 1994).

Which behaviours?

Fifty years ago, irritability was one of the features of children's behaviour problems linked with allergy (Randolph, 1947). Children became "more manageable and more amenable to reasoning rather than less active or better able to concentrate" in a London study (Carter et al, 1993). Although irritability, restlessness and sleep disturbance were the responses to tartrazine most commonly reported by parents, the frequently used Conners Abbreviated Parent-Teacher Questionnaire places little emphasis on irritability and contains no measure of sleep disturbance, raising the question of whether previous studies may have missed identifying some reactors (Rowe and Rowe, 1994).

Effects of sugar

Since the early Feingold studies, the majority of American researchers turned their attention to possible behavioural effects of sugar. In a meticulous study, researchers removed all food from households and provided all the food on three different diets for nine weeks for the families of 25 normal preschool children and 23 school aged children described by their parents as sensitive to sugar. Disguised experimental diets contained either sugar, aspartame or saccharine. No significant difference was found in the children's behaviour on any of the diets (Wolraich et al, 1994). Despite a strong public perception that sugar is related to hyperactivity, a meta-analysis of 23 studies did not find any significant behavioural or cognitive effects from sugar (Wolraich et al, 1995). Parents who blame sugar may have misinterpreted the child's reaction to food chemicals such as additives or salicylates which are also present in many sweetened foods (Swain et al, 1991).

The mechanism of behavioural reactions

Bernard Weiss, Professor of Toxicology at Rochester University, concludes that studies consistently show that some children respond adversely to food dyes and that the most sensitive children seem to be the youngest. Neurobehavioural reactions have been observed during the early stages of many toxic episodes and serve as early warning signals of toxicity (Weiss, 1983). Behavioural reactions to food additives are not a true allergic response which is characterised by the production of measurable immunoglobulin E antibodies but an intolerance reaction whose nature is like the response to a drug. Food intolerance is dose-related and there are variations in individual susceptibility (Weiss, 1983; Loblay and Swain, 1986). Reactions can be cumulative, can be caused by many foods, can be delayed for up to 48 hours and are difficult to detect for these reasons (Loblay and Swain, 1986).

Scientific attitudes to dietary management of ADHD

Dietary treatment of ADHD is considered to be unproven and is not recommended by such internationally recognised authorities as American psychologist Dr Russell Barkley, who refers to the negative results of sugar studies and cites the review by Conners (1980) as evidence for negative findings on the effects of food chemicals (Barkley, 1990). In a more recent review Conners concludes, "I have to admit that I have changed my mind about the Feingold idea since the 1970s". He recommends that the evidence is strong enough, at least for preschoolers, and especially for those with confirmed "allergic" symptoms, that a broad range of unnecessary and possibly harmful ingredients should be eliminated from these children's diets (Conners, 1989).

Psychologist Dr Joseph Sargeant, University of Amsterdam, suggests that at least a few children with hyperactive behaviour are reacting badly to food, but that an elimination diet will help only a minority (Taylor et al, in press). His belief is based on a community survey which indicated that the majority of children whose parents believed them to be food-sensitive were not (Young et al, 1987). In this survey, 7.4% of more than 18,000 respondents to a questionnaire assessed themselves as food intolerant. After studying 132 of these respondents, researchers decided that the true prevalence of food additive intolerance was less than 0.1 %. The flawed method used was the same additive-free diet followed by food dyes or preservative challenges which produced inconclusive results in the original Feingold studies. Other researchers suggest that although the prevalence of food allergy is generally agreed to be highest in infancy, falling to 1% or less in adults, the prevalence of food intolerance is unknown but is estimated to be much more common, occurring in perhaps 10% of the population (Clarke et al, 1996).

The low-chemical elimination diet

According to the Dietitians Association of Australia review paper on management of food intolerance, a patient's request for investigation of diet is an indication for a trial of a low-chemical elimination diet, as refusal usually results in patients seeking advice from unorthdox practitioners or altering their diet on the basis of misconceptions about food allergies (Clarke et al, 1996). The low-chemical elimination diet excludes more than fifty food additives, a comprehensive list of salicylates, natural chemicals called amines and naturally occurring monosodium glutamate, and when indicated, dairy foods and wheat. Challenges take the form of foods grouped according to their chemical composition. The diet is used for such manifestations of food intolerance as urticaria and eczema; gastro-intestinal symptoms such as abdominal pain, flatulence and diarrhoea; respiratory symptoms including nasal congestion, sinusitis, some cases of asthma with bronchial hyperreactivity; and neurological symptoms like headaches, migraines, lethargy, impairment of memory and concentration, tinnitus and hyperactivity.

Researchers have noted that hyperactive children who have a personal or family history of one or more symptoms such as migraine, skin rashes, stomach aches, asthma or nasal congestion have been seen to improve on diet (Kaplan et al, 1989; Rowe and Rowe, 1994; Carter et al, 1993; Conners, 1989). Another study found that those without "allergic" symptoms did as well as those with them (Egger et al, 1985).

The problem of compliance

Even the smallest mistake on a daily basis during an elimination diet can mean failure. The Few Foods diet from Britain is typically two meats (often lamb and turkey), two carbohydrate sources (rice and potato), two fruits (often banana and pear), a range of root and green vegetables, bottled water, sunflower oil and milk-free margarine. It is criticised by researchers as expensive and difficult to carry out (Carter et al, 1993; Taylor et al, in press). By comparison, the Australian low-chemical elimination diet allows a minimum of one fruit (pear), twenty vegetables, a range of fresh meats, seafood and eggs, a range of cereals, grains and flours, various sugars, syrups and confectionery, several oils and margarines, a range of dairy foods for most individuals, and many of the packaged foods available in supermarkets.

Behaviour management

One study found that dietary management seemed less likely to produce a change where there were discordant marital relations (Carter et al, 1993). Behaviour management and support for parents may be an important factor (Dengate, 1994). Australian dietitian Joan Breakey used a low additive, low salicylate diet in the treatment of 516 children aged 2-16 who were referred to a metropolitan child psychiatry clinic for learning or behavioural problems (Breakey et al, 1991). They were referred for diet therapy if parents believed that food affected their child, if there was a family history of "allergy" or if other interventions were partially unsatisfactory or unsuccessful. A positive response was obtained in 80% of the children, with a normal range of behaviour achieved in 54%. Of the 25% in whom diet was necessary but not sufficient, half also required stimulant medication. Milk and other foods like chocolate were excluded where required. The role of the dietitian in this study included helping families with behaviour management, social occasions, peer pressure, difficult teenagers, and support for parents. Breakey suggests that a dietitian familiar with the diet and its management in children with behaviour problems is essential. In her method, children were encouraged to become "diet detectives", to keep diaries and to manage their own food intolerance. Breakey (1997) comments that dietitians working with children meet motivated families who manage difficult diets every day.

In the long-term

Following up after two years on families using the Feingold diet, researchers found 13 out of 14 mothers described their children's behaviour as having improved since the end of the study. Typically, they reported a steady, gradual increase in self-control and a marked improvement in schoolwork (Conners, 1980). In a study which had used the Few Foods diet, 92% of children in the study were still continuing with the diet when last seen. Researchers commented that being on an acceptable diet did seem to make a remarkable difference in the lives of many of these families (Egger et al, 1985).

Researchers recommend dietary management may be used to control symptoms of ADHD (Boris and Mandel, 1994); as part of multimodal treatment including medication and behaviour management (Breakey, 1991; Conners, 1989); particularly in younger children or those with a history of "allergy" (Weiss, 1983; Kaplan et al, 1989; Conners, 1989); if parents notice some effects of diet (Carter et al, 1993; Weiss 1983, Egger et al, 1985); if conventional treatments fail

(Wolraich,1996); and that a dietitian should be consulted before any strict elimination diet is attempted (Taylor, in press; Clarke, 1996; Breakey, 1991).

Conclusion:

Since 1985, studies have shown diet to affect a significant number of children in double-blind placebo-controlled trials. The mechanism of behavioural reactions to food is intolerance not allergy. Additive-free diets alone have been shown to be of little benefit and broader dietary intervention is required. Challenge tests after a low-chemical elimination diet can aid in the identification of provoking food chemicals. Dietary management is seen as part of multimodal treatment of ADHD. If parents wish to pursue dietary management or if conventional methods of treatment are unsuccessful, families should be referred to a dietitian.

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