

Review article

Food and behaviour

Allergy, intolerance or aversion

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Even the most sceptical clinician is able to accept that food can sometimes cause acute allergic reactions. An immediate response with catastrophic anaphylaxis or angio-oedema and urticaria is usually associated with positive allergy skin tests and detectable IgE antibodies, which makes the diagnosis easy and obvious. However, it is far more frequent for the paediatrician to be presented with a child who appears to have a reaction to food which cannot be related to an obvious immune response and in which the reaction occurs some hours after ingestion of the food. Thus, the term food intolerance has been used to encompass any reproducible abnormal non-psychologically mediated reaction to food. This can be due to a variety of mechanisms which may be immunological or may be due to an enzyme deficiency, a pharmacological reaction, a toxic effect, or due to another disorder such as liver, gall bladder disease or cystic fibrosis. Apart from excluding other disorders, in the absence of a known mechanism no objective simple test will identify food intolerance other than dietary exclusion and challenge with subjective evaluation of the response. Intolerance must be distinguished from food aversion in which reactions to foods only occur consistently when they are identified by the patient (1,2).

Food aversion

Food aversion includes psychologically-based food avoidance where there is a conditioned response elicited by the recognition, appearance, smell or taste of particular foods as would be the case with food phobias and fads. These may have arisen following an unpleasant experience of a genuine reaction, for instance in association with gastroenteritis, or even previous genuine food allergy. Such a reaction does not occur if the food is disguised in a double-blind challenge. At its most severe, food aversion may be associated with anorexia nervosa and the bulimic syndrome. The most pernicious paediatric form occurs as part of the so-called, "Munchausen by proxy". In this condition the parents, usually the mothers, present children with multiple unproven allergies and often on very abnormal diets (3). Symptoms are fabricated to fulfil a psychological need in the mother. Not only are the diets nutritionally inadequate, but the children become socially isolated from their peers and are taught a disease model from an early age which may persist for life. Some children eventually are submitted to even worse forms of abuse (4).

Table 1. Classification of abnormal reactions to food

Diseases	Timing	Categories
Anaphylaxis Angio-oedema Urticaria	Immediate	Often type 1 hypersensitivity (Allergy)
Atopic dermatitis Rhinitis Asthma Small bowel enteropathy Infantile colitis	Immediate and/or late (hours or days)	Sometimes allergy Type I, III or IV hypersensitivity, and sometimes intolerance (mechanism unknown)
Migraine Hyper-kinetic syndrome Chronic fatigue syndrome	Immediate and/or late	Intolerance or aversion
Anorexia nervosa Bulimic syndrome "Munchausen-by-proxy"	Immediate and/or late	Aversion

Diagnosis

Implicit in the above is that an objective diagnosis of much food intolerance can only be based on double-blind food challenge (5). This is extremely difficult to perform and for scientific validity, active and placebo foods must be administered on three occasions with consistent responses each time, to truly validate the diagnosis (6). Clearly, this is often not acceptable to patients and their parents with putative food intolerance. Few clinics feel they have either enough experience or time to devote to such painstaking diagnostic procedures. This has left the field wide open to fringe medicine to take over the mantle of diagnosing and managing individuals with possible food-related disorders (7). Sadly, conventional medical opinion has tended to polarize towards a total rejection of the concept thus, "throwing the baby out with the

bath water", and providing no help for the patients.

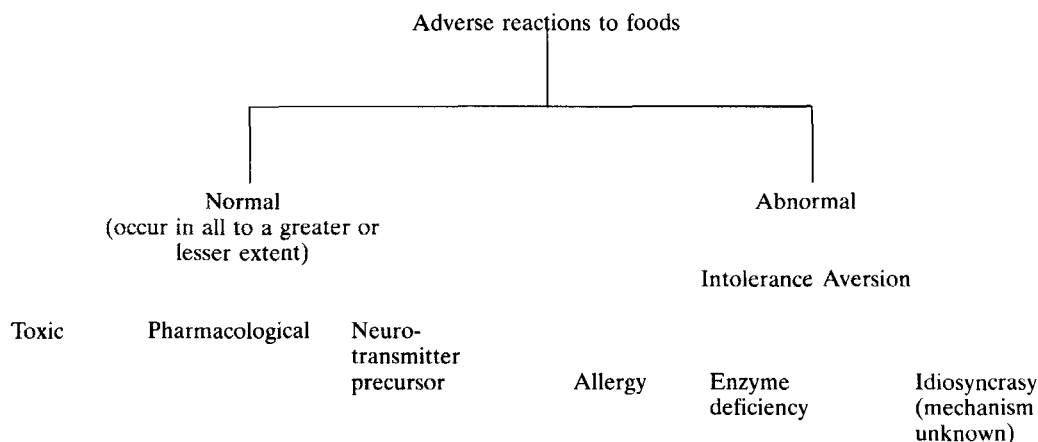
The media consider allergies to be newsworthy and they feature widely in newspapers, radio and television. Pressure groups have sprung up criticizing the economic motivation of food industry particularly with regard to food additives. This has contributed significantly to the rise in the general public's awareness of allergies and because medical opinion has tended to reject the concept, this has fostered intense suspicion of conventional medicine. Furthermore, confusion exists amongst doctors concerning the meaning of the words allergy and intolerance and the likely manifestations associated with such problems (1). The general public perceive that food-related problems are under-diagnosed, whilst many doctors feel they are over-diagnosed.

The High Wycombe (UK) Food Intolerance surveys identified that 20.4% of the population believed that they had food intolerance and 7.4% that food additives were a particular cause of problems (8,9). However, on double-blind challenge the estimated population prevalences for food and additives were 1.4–1.8% and 0.01–0.25% respectively. Whilst these data tend to support the professional view, 1.5% of the population constitutes a vast number of sufferers, most of whom have little or no access to good allergy clinics. Indeed, there is some evidence that the majority do not even bother to consult a doctor about the problem.

Food and behaviour

One of the major public obsessions is that foods can affect behaviour. This opinion has been fuelled by a number of publications, perhaps best exemplified by the Feingold revelations in the early 1970s that 50% of children with hyperactivity were cured on a diet that excluded artificial colour, preserva-

Fig. 1.



tives and naturally occurring salicylates (10). Despite the lack of acknowledgement of any placebo effect or the evidence from scientific study, this hypothesis has received wide publicity and led to the formation of support groups of people dedicated to propagating the belief that there is a connection between foods and behaviour disturbance (11).

It is self-evident that some foods contain pharmacologically active substances which might effect behaviour in all individuals to a greater or lesser extent (Fig. 1). Thus, caffeine in coffee and other drinks increases wakefulness and concentration but can also cause irritability. However, there is a far wider range of other pharmacologically active substances which might equally have effects such as tyramine in cheese and histamine in scombroid fish (1). Individuals predisposed to irritable or difficult behaviour will tend to show a greater degree of response to similar quantities of such foods than relatively placid individuals.

There are peptides in milk and wheat which contain exorphin-like activity. Some amino acids are precursors for neuro-transmitters or vaso-active mediators such as tryptophan for serotonin. Thus, such foods or their breakdown products will affect behaviour, mood and appetite. However, this will occur in all individuals to a greater or lesser extent (12).

Where children have behaviour problems, it is infinitely more acceptable for parents to believe that their child is being affected by extrinsic factors such as foods or additives rather than to consider that the disturbance is due to psycho-social problems. Natural parental anxiety may lead to interpretation that a particular symptom is due to food. Apparent resolution when the food is avoided may represent a placebo effect of resolving parental anxiety or recovery from intercurrent infection or a genuine food intolerance.

The belief that food is causing problems often arises during weaning which coincides with rapid changes in the infant's physical responses and behaviour. Thus, perfectly normal changes such as occur in an infant's stool character and frequency, or activity and sleep cycles, may be wrongly considered abnormal and caused by food intolerance. The parental conviction is further reinforced by the extensive mass media publicity and the medical profession's inability to cater for the public concern. Collusion of fringe medicine in this obsession will entrench the belief as anxious parents are only too ready to accept a simple explanation for what they perceive as a problem. Indeed, one allergist has commented that "not since mesmerism and phrenology were in vogue in the 19th century has

the public appeared so gullible and so vulnerable to fashionable nostrums" (13).

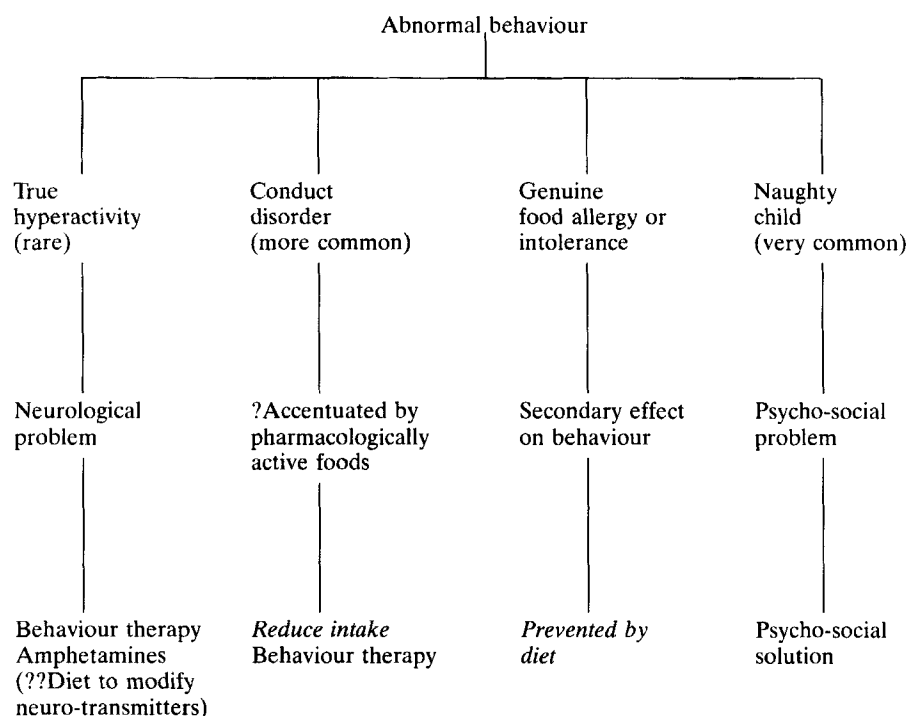
It must also be emphasised, however, that "it is not enough to castigate the concept and to ignore the patient". It is necessary to adopt a sensitive but firm approach utilising objective evaluation to help parents and children through the minefield, hopefully leading to an accurate diagnosis and, therefore, appropriate treatment.

Hyper-kinetic syndrome

Exclusion diets have been employed with great enthusiasm since Feingold's original report. The rationale for natural salicylate exclusion has been shown to be without foundation, with many excluded foods containing no salicylate whilst some remaining in the diet contained significant quantities (14). Subsequent trials, most of which were open to considerable criticism, either failed to show any significant effect of colour and preservatives on behaviour, or unconvincing improvement in a small percentage of children (15). One trial showed a significant improvement in behaviour when hyperactive children were on exclusion diets. However, only a minority of the children subsequently had double-blind challenges and the results from this were not so conclusive (16). Indeed, there was an enormous order effect and the significance of difference between a single active and placebo challenge was not great.

Our own double-blind challenge study in a group of children whose parents were convinced that food additives precipitated difficult behaviour, failed to validate the parents' perception. Unexpectedly, on a detailed daily Connor's rating of behaviour, there was a significant difference between the active and placebo challenge periods. However, these were small changes that were not detected by the parents (17). This suggests that a high intake of artificial food additives can produce a measurable change in behaviour scores in a group of children predisposed to abnormal behaviour. Our study found no relationship to somatic symptoms or atopic status. As we have also demonstrated that large doses of food additives can have a pharmacological effect in releasing mediators such as histamine from basophils, it is likely that the small effect on behaviour is also pharmacological (18). There are unvalidated assertions of other authors that the effect of diet on behaviour is likely to be allergic in origin (16, 19). The latter study recommended hyposensitization for children with apparent, not objectively substantiated, food induced hyperkinetic syndrome. However, the scientific justification for the study is highly dubious. The children had no excess of

Fig. 2.



atopy but an array of ill-defined symptoms. The so-called enzyme potentiated vaccine containing 45 foods and 10 food colourants, was prepared by one of the authors and, therefore, will be impossible to replicate. The closing sentence of the discussion of the paper contradicts the author's previous publication (16) by stating: "Restricted diets are socially disruptive, expensive and, because of nutritional inadequacy, may be dangerous..." (19). This statement perhaps most appropriately summarises the state of the art in this area.

Double-blind challenge

Our studies of double-blind challenges with natural foods have not been able to validate a reproducible behavioural response in the absence of other manifestations. However, we have never ceased to be surprised at the variety of reactions that can occur. Indeed, sometimes the parents have been unaware of the physical response to the foods and have only detected the behaviour disturbance. Such reactions as urticaria producing intense pruritus have been ignored because at the same time the child has become very irritable which is not surprising (20).

It is important that parents of children with behavioural problems receive a sympathetic hearing and that their ideas are not dismissed out of hand. Many factors that are known to influence behaviour need to be explained to parents as should the limited evidence for the role of food additives and foods. It is also useful to explain the transient

nature of food intolerance in childhood (21). Dietary manipulation might result in nutritional inadequacy and may adversely effect health and, therefore, it is important that all such consultations should involve a dietician.

Double-blind challenges are of value clinically and are certainly not just appropriate for research. In one study of 323 patients with chronic allergic rhinitis, 21 had improvements on cow's milk-free diet and relapse on open milk challenge. However, only 2 of the 21 reacted on subsequent double-blind challenge (22). Thus, reliance on open challenge results (the usual routine in clinical practice) would have resulted in 19 of 21 patients being placed on unnecessary, expensive, intrusive and possibly even nutritionally unsound diets. In another study of 104 severe adult migraineurs, 38% improved on a diet, 26% reacted on open challenge with food but only 15% had reproducible symptoms on double-blind challenge (23). Even in the highly questionable hyposensitization study of children with hyper-kinetic syndrome, only 54 of 185 patients had significant changes on diet and open challenge (19).

Conclusion

In conclusion, associations between ingestion of food and changes in behaviour occur in a number of circumstances (Fig. 2). Hyperactivity is rare in its true form and is a neurological problem requiring a multi-disciplinary approach including behaviour therapy and drugs. It is conceivable that

dietary modifications might have an effect on neuro-transmitter levels which could influence the problem. The more common conduct disorders may be accentuated by pharmacologically active constituents of food. Reduction in intake rather than total exclusion would be the only justified dietary approach. Only true allergy and intolerance with secondary behaviour disturbance consequent upon the discomfort caused by constitutional symptoms, would require total exclusion diets. Far more commonly, behaviour disturbances have a psycho-social cause and require a psycho-social solution. Obsession with diet only detracts from the real cause of the problem and its solution.

Acknowledgement

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