



■ Diet and Behaviour

Current Theories on the Role of Food
in Behavioural Problems
and Autism

Diet and Behaviour

- Experts do not agree on whether diet can influence behaviour
- Several different studies in Britain, Canada and U.S.A. provide evidence both for and against the theory that food allergy or food intolerance can cause behaviour changes

■ Diet and Behaviour

- Adverse effects of food on behaviour suggested to be the result of:
 - Physiological manifestation of food intolerance, possibly a pharmacological response
 - Psychological factors, including suggestion or conditioning

Experimental Design Problems



- Difficulties in research include:
 - No clear diagnostic criteria for various categories of behavioural disorders (e.g. ADHD)
 - Lack of diagnostic tests for food allergy and food intolerance
 - Difficulty in determining if change in behaviour is due to food or other cause, such as increased parental attention
 - Difficulty in determining if change in behaviour is secondary to child feeling worse or better as a result of allergy symptoms

Current Theories on Diet and Behaviour

- Effect of allergy symptoms:
 - Child feels ill, miserable, restless
 - May have difficulty sleeping
 - Leads to difficulty in concentration
 - Child expresses illness through unacceptable behaviour
 - Removal of allergen allows child to feel better
 - Behaviour improves



■ Current Theories on Diet and Behaviour

- Effect of Mediators of Allergy
 - Some of the chemicals responsible for allergy cross the blood-brain barrier and stimulate the central nervous system
 - Removal of the allergen eliminates the mediators

Current Theories on Diet and Behaviour



- Chemicals in foods have a direct pharmacological effect
 - Natural chemicals (e.g. benzoates, salicylates, annatto)
 - Synthetic additives (tartrazine and other food dyes, preservatives, and some flavourings)
 - Removal eliminates the “drug-like” response

Reasons for Improvement on Restricted Diet

- Exclusion of food allergens leads to remission of allergy symptoms:

Child feels better and behaviour improves

- Removal of excess sugar and additives eliminates “junk food” from the child’s diet:

A more nutritious diet reduces the negative behavioural effects of malnutrition

- A special diet requires extra care and attention:

A change in family dynamics may have a positive effect on the child’s behaviour

Dietary Management in Behavioural Disorders

- Some behaviourally disordered children do respond positively to dietary manipulation
- The opportunity to improve the quality of life of the child and family justifies a trial on dietary and life-style changes
- Best candidates for dietary intervention are children with:
 - Physical symptoms of allergy, as well as behavioural problems
 - Family history of adverse reactions to foods, additives, stimulants and air-borne allergies
 - Poor eating habits

Dietary Guidelines

- Initial elimination diet excludes:
 - Suspected food allergens based on:
 - Medical history
 - Appropriate tests
 - Careful record of food intake and symptoms
 - Simple sugars
 - Stimulants such as caffeine
 - Artificial food additives
 - Preservatives
 - Food dyes
 - Flavourings

Dietary Guidelines: Example of Research Diet

- Eliminate most usual food allergens:
 - Milk and milk products
 - Wheat
 - Corn
 - Peanut
 - And all other suspected food allergens
 - Tomato
 - Apple
 - Orange
 - Grapefruit

- Eliminate food additives, especially:
 - Benzoates
 - Artificial food colours
 - Artificial flavours
 - Aspartame
 - Preservatives
 - BHA and BHT
 - Nitrates and nitrites
 - Sulphites

Dietary Guidelines: Example of Research Diet

- Eliminate foods high in naturally-occurring chemicals:
 - Benzoates
 - Caffeine
- Limit simple sugars
 - Dilute fruit juices half and half with water
 - Offer high sugar foods at the end of a meal, not as between-meal snacks
- Small frequent meals; one every 2 - 2½ hours
- Avoid exposure to chemicals e.g. perfumes, markers, solvents

■ Dietary Guidelines: Example of Research Diet

- Diet should be followed for a limited time
 - Four weeks is usually sufficient initially
- Each food and additive should be challenged individually
 - Child's behaviour is monitored as each food component is reintroduced
- Final diet is formulated to avoid the foods that trigger a response, and provide alternatives to ensure complete balanced nutrition



Diet and Autism

Current Theories



Current Theories

- Much controversy amongst medical practitioners
- Probably several different neurological conditions are impacted by components of foods
- Way in which body responds is due to metabolic defects
- There may be several distinct physiological processes that result in central nervous system response causing behavioural changes

Associated Conditions

- Incidence of autism seems to be higher in children with:
 - Genetic predisposition to asthma, hay fever, eczema
 - Food allergy and/or intolerance
 - Immunodeficiency
 - Frequent infections
 - Repeated courses of antibiotics
 - Abnormal response to vaccinations
 - Family history of allergy



Effect of These Conditions in Autism: (Theory)

- Most cases of autism appear around the age of 16-24 months
- Prior to this, the child seems to develop normally, without signs of neurological impairment
- Suggested that several factors come together to result in abnormal changes:
 - Development of food allergy leads to change in gut lining because of local inflammation
 - Frequent infections and antibiotics change the nature of the micro-organisms living in the bowel
 - Fungal overgrowth might lead to abnormal fermentation of foods
 - Vaccines might affect the immune system

How Diet Might Help

- No diet will benefit all autistic children
- Each child must be treated individually
- Taking foods out of the diet one by one is seldom effective because usually several foods are involved in producing symptoms
- Clinical experience of some doctors suggests that up to $\frac{1}{2}$ of autistic children might benefit from diet manipulation
- All restricted diets must be carefully supervised to reduce the risk of nutritional deficiencies

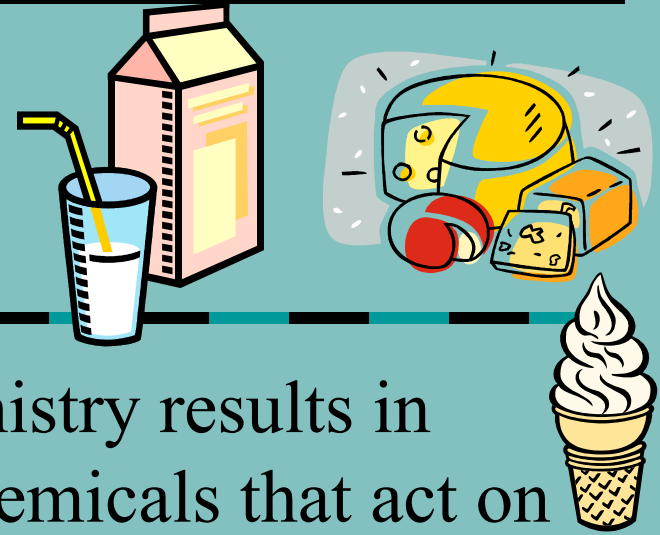
Anti-Fungal Diet

- Some doctors believe that treating the fungal overgrowth might allow the gut micro-flora to return to normal:
 - Use of anti-fungal drugs (e.g. nystatin)
 - Diet:
 - Low sugar
 - Low yeast
 - Avoidance of fungal foods and foods where fungi are used in their manufacture
 - Followed for 6 weeks initially

Casein Proteins

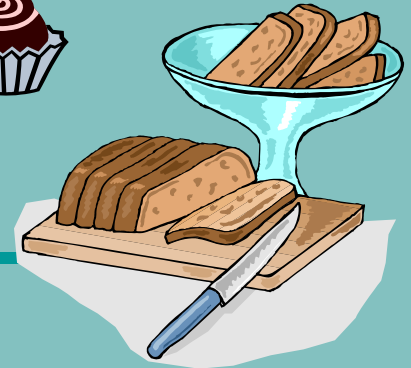
- Rationale:
 - Milk protein (casein) is broken down to peptides in the normal process of digestion
 - Peptides pass into the blood stream and are further metabolised for body structures and functions
 - In certain types of autism, the peptides are not properly metabolised
 - Drug-like chemicals, opiates, excreted in urine

Casein Proteins



- Suggests that abnormal biochemistry results in production of these drug-like chemicals that act on the brain in the same way as hallucinogenic drugs (e.g. opium and heroin)
- Theory:
 - These children lack an enzyme that would normally break down casein peptides
 - Peptides are passing into the blood stream before being completely digested
- Diet: Complete avoidance of all milk proteins

Gluten Proteins



- Present in many grains, including:
 - Wheat
 - Oats
 - Barley
 - Rye
 - Spelt
 - Kamut
 - Triticale
 - Semolina
 - Durum
- Suggested that opiates may be produced by abnormal digestion of these proteins also
- Such opiates can lead to addiction, and child seems to crave these foods
- Other studies indicate that antibodies (distinct from those produced in allergy) are formed against gliadin: these may play a role in neurological disorder (as in celiac disease)

Nutrient Supplements

- Some research indicates that certain nutrients may be deficient. Those discussed include:
 - Zinc
 - Manganese
 - Magnesium
 - Vitamin B6
 - Molybdenum
- Other deficiencies may be associated with low enzyme function, for example:
 - Sulphate

Sulphate Levels in Autistic Children

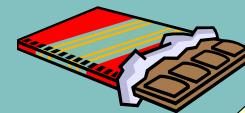
- Plasma sulphate levels shown to be much lower than normal in certain autistic children
- Sulphate is derived from nutrients in the diet, particularly from sulphites
- Enzyme (sulphite oxidase) responsible for converting sulphite into sulphate may be deficient
- Allergic, especially asthmatic children are often sensitive to sulphites in foods such as dried fruits: sensitivity may be due to lack of sulphite oxidase

Consequences of Low Sulphate

- Sulphate is required for converting some brain chemicals (neurotransmitters, especially catecholamines) to the inactive form which is rapidly excreted from the body
 - deficiency may result in high levels of neurotransmitters
 - this may cause mood swings, disturbed behaviour and hyperactivity

Consequences of Low Sulphate

- Sulphate is also required for similar deactivation of amines in foods such as:
 - Serotonin and tyramine in banana
 - Phenylethylamine in chocolate
 - Tyramine in cheese



Consequences of Low Sulphate

- Sulphate is also required for mucin formation in the digestive tract
- Lack of sulphate leads to a breakdown in the protective function of mucin: Results in:
 - Inflammation
 - Digestive tract dysfunction
 - Increase in permeability (“leakiness”)
- Allows passage of incompletely digested proteins, such as “opioids” from casein and gluten, to pass through and be transported to the brain

Consequences of Low Sulphate

- Sulphate is required for efficient function of digestive hormones that control protein digestion
- Gastrin and cholecystokinin release secretin which controls release of digestive enzymes from the pancreas
- Lack of the enzymes results in incomplete digestion, especially of proteins
- Results in peptides, rather than individual amino acids, being absorbed into circulation
- Some of these have opioid characteristics and may be transported to the brain

Suggestions for Increasing Efficiency of Digestion

- Provide secretin (available from some homeopaths)
- Supplemental zinc (zinc is a required co-factor for some digestive enzymes)
- Provide digestive enzymes or bromelain
- Avoid antacids that reduce gastric acid, which is required for complete digestion of proteins and is often low in certain autistic children

■ Dietary Suggestions

- Try gluten-free, casein-free diet for at least 6 months
- Avoid chocolate, banana, citrus fruits (amine-rich foods) at the same time
- Try sulphate supplements, such as small quantity of magnesium sulphate
- Use Epsom salts in the bathwater - dermal absorption of sulphate
- Supplemental molybdenum, zinc and vitamin B6 may aid digestive processes