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
  - Tomato
  - Apple
  - Orange
  - Grapefruit
  - And all other suspected food allergens

- 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
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 microorganisms 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.
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)
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 molbdenum, zinc and vitamin B6 may aid digestive processes