

# NUTRITIONAL, METABOLIC AND ENVIRONMENTAL INFLUENCES IN CHILDREN'S HEALTH:

Or what can you do to improve the health and behaviour of your child.

**Dr Robyn Cosford**  
**MBBS(Hons)FACNEM**  
**Director**  
**Northern Beaches Care Centre**  
**Conjoint Lecturer**  
**University of Newcastle**  
**School of Biological Sciences**

In the face of great technological and medical advances of the 'scientific age', patterns of childhood illness are changing. The rates of asthma have doubled over the past 20 years, now affecting up to 35% of children in some estimates, with Australia having the 3rd highest prevalence in the world. Allergies are increasing, with 54% of UK children in a recent study having atopic (allergic) symptoms at some time, and atopic eczema now affecting about 18% of children in the first 2 years of life, up from 2% a few decades ago. These conditions are recognised as reflecting an underlying immune system shift, from Th1 to Th2 (allergy-prone). Otitis media (ear infections), uncommon 30 years ago, are now so common that 80% of children will have had at least 2 infections by the age of 3 years, and by 6 years, 15% of children will have glue ear in winter.

The incidence of gastrointestinal and auto-immune diseases in children is also increasing, with increased incidence of juvenile Crohn's disease, previously a disease predominantly of young adults, and auto-immune diseases such as auto-immune thyroiditis, previously a disease predominantly in middle-aged women, and autoimmune diabetes. The connection between these diseases and atopy, underlying Th2 shift, has also been demonstrated. The incidence of obesity and what was previously known as maturity-onset diabetes is also increasing, with 10% of children now weighing greater than the 97th centile. Interestingly, obesity doubles the risk of asthma especially in boys.

Patterns of neurological disease are also changing. Childhood brain tumours have increased in incidence by 35% over the past 20 years, and cerebral palsy rates have increased, with an increase in the incidence of severe impairment

form 15% to nearly 30%, and a change in the pattern of symptoms. It is increasingly recognised that birth asphyxia or adverse events at the time of birth are not a common cause of cerebral palsy.

Patterns of mental illness are also changing, with the age of onset of depression becoming younger, now being diagnosed in children as young as 5 years old. In Queensland, thousands of children are on antidepressants, and a recent UK study found that 20% of children had 'mental health' problems, ranging from anorexia to bed-wetting. This is not an issue to be taken lightly: the long-term outcome for adolescents admitted to psychiatric wards is as poor as if they have cancer, with a 10 year mortality rate of 40%. In males who have a history of drug abuse and disciplinary problems, 95% end up with a criminal record, disability or dead. In the USA, there has been a dramatic increase in the use of psychotropic (brain-acting) medications, from 1987 to 1996, of 2 to 3 times, with now 6% of adolescents on these medications, the increase especially in 'mood stabilisers.'

It is in this context, that we find the incidence of behavioural and learning disorders in children to be up to 20% in some studies, with ADD in up to 17% of children. The diagnosis rate in the USA has risen from 900,000 in 1990 to over 5,000,000 in 1997, with over 3.5 million using Ritalin and 1.4 million using other medications, mostly dexamphetamine in 1997. In Australia, dexamphetamine use has increased from 16,405 in 1992-1993 to 162,497 in 1997-1998. Perhaps more concerning, is that developmental impairment of speech and language is now the most common developmental disorder in children under 5 years old, with 5 to 8% of children in the UK in 2000 affected by this. Toddlers with speech delay are more likely to have social and emotional adjustment difficulties and other dysfunction, indicating that this developmental disorder is a marker for other problems. In a recent Australian study of 4500 children, 14% of Australian children were found to have a mental health problem, with depression in 3% and attention deficit hyperactivity in 11%. Considering autism, previously estimated to affect 4 in 10,000 children in 1985, more recent estimates indicate a rate in the UK of 1 in 150, and in parts of the USA, 1 in 90.

## **SOME POSSIBLE CONTRIBUTORY FACTORS IN CHANGING PATTERNS OF CHILDRENS ILLNESS**

Numerous factors have been implicated as contributing to these modern patterns of illness. Factors in pregnancy include smoking, caffeine, chemical exposure, sound, stress, and intrauterine growth retardation. Of these, the strongest evidence is more the effect of smoking and intrauterine growth retardation on the risk for later learning and behavioural disorders.

In infancy, important factors include handling practices, breastfeeding and antibiotic use. In our society, it is regarded as normal for infants to cry for 3 hours a day at the age of 6 weeks, and mothers are encouraged to allow their children

to cry to sleep to learn to self-settle. This is in stark contrast to traditional cultures where babies are held close, carried and comforted, and it is well documented that these infants initiate crying less and in a whole village of 100 infants there may not be a single infant crying. Animal studies also demonstrate that increased maternal contact reduces infant stress and alters the level of their neurological and hormonal stress responses. Breastfeeding is well documented to reduce the incidence of infection, reduce allergy and promote brain development. This protection is so strong that it has been officially recommended that normal infant cognitive development should be based on the development of infants exclusively breastfed to the age of 6 months. Not being breastfed correlates with increased risk of attentional problems and reduced school performance, and the introduction of cow's milk formula feeding also correlates with increased risk of the development of ADHD and autism.

With regards to otitis media (OM), acute OM is now the most commonly diagnosed illness in children, with breastfeeding giving protection for up to 3 years if breastfed for 3 to 4 months. Formula feeding is the most significant predictor of OM, in addition to exposure to cigarette smoke. Acute OM is one of the commonest reasons for antibiotic prescription, however, there is increasing development of antibiotics resistance, with a change in bacterial patterns in the mouth after antibiotics, and the recurrence rate post antibiotics some 2 to 6 times that of placebo. Interestingly, males under 15 years old are the highest antibiotic usage group, with 6% having used antibiotics in a 2 week period on 1997 figures. This incidence of infections in boys is important, as it has been demonstrated that there is an association between infections in childhood and speech difficulties in boys in particular. Recurrent otitis media in infancy is also correlated with a greater incidence of ADHD, increased distractibility in later life, lower IQ scores and increased behaviour problems at school. There is also a correlate with the incidence of otitis media and the development of autism, with the earlier age of otitis media and increased incidence of otitis media correlating with more severe forms of autism.

In addition to the development of antibiotic resistance, there are other issues with the use of antibiotics. Antibiotics use is associated with the increased incidence of allergy, with a single dose in pregnancy and the use of antibiotics in infancy resulting in increased risk of asthma. Antibiotics promote Th2 (allergy-prone) immune system shift, perhaps via their effect on the gastrointestinal bacteria and the gastrointestinal wall. Antibiotics are well known to disrupt the normal pattern of gastrointestinal bacteria, which function to provide essential nutrients and protect the gastrointestinal wall from invasion by pathogenic bacteria. In the absence of beneficial bacteria, the intestinal wall is at risk of becoming hyperpermeable or 'leaky', which results in the disruption of normal digestive processes and the passage of large molecules across the gut wall, through the gut-associated-lymphoid tissue (GALT), to the liver. This overrides the normal food tolerance and results in an allergenic stimulus, (Th2 shift) favouring allergic reactions. This is a marker for food allergy. Intestinal hyperpermeability is well

documented in gastrointestinal inflammatory disorders, other auto-immune disorders such as rheumatoid arthritis and has been documented in atopic conditions such as eczema, and ADHD and autism. In one study, children who have had fewer vaccines, fewer antibiotics and have diets containing live lactobacilli have a reduced incidence of atopy (13% children in group with fewer vaccines etc have allergies, compared to 25% children with vaccines and antibiotics). The correlation between atopy and ADHD has been documented. It is feasible that abnormal gastrointestinal bacteria secondary to antibiotic use may be contributing to the development of neurological and behavioural abnormalities such as ADHD and autism: one study of 36 children with autism demonstrated a significant loss of E Coli and overgrowth of Enterococcus/Streptococcus in the faeces of children with autism compared to healthy controls.

Another significant change in modern society is the introduction of vaccines, with the current vaccine schedule (before the introduction of the varicella and meningococcal vaccines) recommending the administration of 32 vaccines (some conjugates) before school entry. Although there is much dispute about whether certain vaccines are directly related to the development of autism, it is clear that vaccines induce an immune system shift (World Health Organisation data). They also contain biologically active adjuvants such as aluminium to promote immune responses, preservatives such as mercury, now removed, and organic solvents such as formalin, and are grown on living tissue, including foreign animal tissue and human foetal tissue (manufacturer inserts). That some children develop significant acute responses and severe long side effects is indisputable. The true side-effect rate is not known as it is now recognised that, even with standard drugs, only 5 to 10% of true side effects are reported, and there is no compulsory reporting of vaccine side-effects. There are no long-term studies comparing the incidence of allergy, asthma, ADHD and autism in non-vaccinated as compared to vaccinated children, for example. We must fall back onto the old Hippocratic Oath: First do no Harm.

Another area in which there has been major change over recent generations is that of diet. Traditional diets in general contain high levels of complex carbohydrates, little or no refined sugar but predominantly natural sugars from fruits, dates, figs and honey, soured dairy products, and high levels of omega 3 essential fatty acids (EFA) from sources such as fish, seeds and nuts.

The modern diet in comparison is very high in refined carbohydrates, with cane sugar in manufactured foods being consumed at a rate of 31.7 kg per capita (1997), and total of 42.8kg per capita, compared to our bread intake of 51 kg per capita. We have increased our omega-6 EFA intake, mostly processed oils, and our trans-fatty acids, now recognised as a major contributor to heart disease. The reduction of omega 3 EFA is significant as DHA is a dietary requirement for brain growth and development, and maintenance of the nervous system. It has been documented to be low in boys with ADHD, for example. There is also a low fresh fruit and vegetable intake, halved from 1961 to 1985, with many adolescents

eating only potato as a vegetable and orange juice as fruit (1997 ABS statistics). As fresh fruit and vegetable has been documented as protective against many diseases including cancer, heart disease, and childhood asthma, this trend is a concerning one.

The Australian diet is also characterised by a very high wheat and dairy intake, with dairy predominantly in the form of milk, mean intake 250gm per day. True cow's milk allergy affects 2 to 5% of children as measured on allergy testing, and can result in a variety of diseases, ranging from urticaria (allergic hives), angioedema (acute severe allergic reaction), and atopic dermatitis to infantile colic, gastroesophageal reflux, oesophagitis, infantile proctocolitis, food-associated enterocolitis, constipation and sleep difficulty in infants. In addition, cow's milk sensitivity can cause a range of conditions. In young children, milk is documented to cause microscopic intestinal bleeding and iron deficiency anaemia, and is commonly associated clinically with otitis media and glue ear, nasal congestion, diarrhoea or constipation. In sensitive people, dairy also results in behavioural change. A dairy-free trial in adults resulted in reduction of numerous symptoms related to memory and learning difficulties, mood instability, headaches and insomnia. A high intake of dairy has been correlated with behavioural disorders and aggression in children, with a reduction in these symptoms on reduction of dairy consumption. Casein in milk has also been implicated in autism, with many children responding well behaviourally and with improved function to casein-free and gluten-free diets.

Wheat is the major grain used in Australia, and wheat intolerance is common, presenting with a variety of symptoms, predominantly gastrointestinal. Abnormal immune responses to gliaden, the major component to wheat is more common than previously thought, and can be found in a wide variety of conditions including gastrointestinal disorders, autism and ADHD, and types of neurological and dermatological disease. Gluten removal has been shown beneficial in a number of these conditions including behavioural disorders and autism.

The last 30 years has seen a dramatic increase in the chemicals in our environment and food supply. What is actually added to our foods is not recorded, but over 400 different additives are allowed. The cost of chemicals used in the agricultural and dairy industry for food production totalled \$1,236,248,833 on 1997 figures, with \$713,601,454 spent on herbicides and \$268,380,569 on insecticides. The level of human exposure to pesticides is far greater than previously estimated, and children are at particularly high risk for the neurotoxic effects from regular inadvertent exposure to pesticides as comes from common foods. **Children are also at increased risk from chemicals in the home and school environment.** In addition to the modern chemical pollution is the question of electromagnetic radiation (EMR) pollution. Children absorb 3 times more radiation than adults, and EMR has been demonstrated to reduce the quality and quantity of sleep and affect memory and learning.

The increase in the use of television, computers and hand-held computer games is one source of EMR in children, with toddlers now watching 2 1/2 hours average a day of television. However TV watching is also associated with inactivity, obesity, behavioural and sleep disturbance, and less favourable belief systems. The effect of these is so strong that after a particular episode of a soapie portraying an adolescent suicide, there was a dramatic increase in the number of attempted suicides by adolescents by paracetamol overdose only in those who had witnessed the television show. Evidence for the adverse effects of computer video games and hand held computers is also compelling. The other problem with the increasing use of TV and computers is the loss of play time for children and increasingly structured activities. Animal studies have shown the necessity of play with other young and adults, for correct neurological and sociological development, and a history of abnormal play behaviour has been noted in adults incarcerated for violent crimes.

There have also been major societal changes over recent generations, with increasing levels of family stress, loss of family and community networks, and increasing numbers of single parent families. Fathers since the industrial revolution have been increasingly removed from their families and their sons in particular, with breakdown of traditional male role models and support systems. Some people have renamed ADD DAD – Dad Attention-Deficit.

In conclusion, there are numerous factors in modern Western society which impact upon the health of our children, and it is difficult to quantify these influences. There is no single causative factor for the increasing levels of childhood illness and there is a need to be open-minded and cautious, as many of these influences are new in the history of mankind.

The influence of adverse environmental factors on children who have developmental disabilities, from any cause, particularly genetic or chromosomal abnormalities, is greater, as these children have metabolisms which are already challenged. As a rule, these children are more likely to suffer recurrent infections, gastrointestinal disturbances including colic and reflux as babies, and constipation as they grow older, behavioural and psychiatric disorders like attention-deficit disorder and autism, obsessive-compulsive disorder and oppositional defiant disorder. Previously, these conditions have simply been placed under the umbrella of the developmental disability.

In these children, consideration should be given to the removal of chemicals from their food sources and environment as far as possible, reduction of TV and computer exposure, increased play time and avoidance of antibiotics. Dietary change should also be considered, to increase fruit and vegetables, fish, nuts and seeds and whole foods, with removal of refined products, sugar, wheat and dairy and possibly supplemental multivitamin and minerals, omega3 EFA and probiotics to replace lost gastrointestinal bacteria.

In summary, there are common factors in the aetiology and perpetuation of common childhood illnesses, which are arguably more significant in children with disorders like Cornelia De Lange Syndrome, and attention to these factors can contribute significantly to the overall health and functioning of these children.

*For copies of the full lectures on this and related topics, contact*

*Dr Robyn Cosford at:*

*Northern Beaches Care Centre*

*1789 Pittwater Road*

*Mona Vale, NSW, 2103*

*Australia*

*Phone: 61 2 9979 9444*

*Fax: 61 2 9979 9016*

*WEB SITE: [www.mindofachildaustralia.org](http://www.mindofachildaustralia.org)*