



INTESTINAL PATHOPHYSIOLOGY IN

AUTISTIC SPECTRUM Intestinal Permeability

There is a growing interest in the significance of gastrointestinal pathophysiology of autistic sufferers. Many abnormalities such as immunological dysfunctioning within the common mucosa, the dysbiotic state and the relevance of both to overall functionality opens a new chapter in the treatment of autistic spectrum disorders. Within this issue of the Autism File the aim is to identify the potential aetiology of gastrointestinal permeability and dysbiosis and the way in which they may be managed through dietary manipulation and food supplementation. For this issue I shall be concentrating on intestinal permeability and then in Issue 21 will discuss dysbiosis.

Introduction

Autism was first identified in 1943 by the psychologist Dr Leo Kanner.

It is a life long developmental disorder affecting as many as 1 in 150 children and has a ratio of 1 girl to 3 boys who are affected. The diagnosis of autism is usually confirmed when the child is 2 to 3 years old. Autism has become epidemic in the industrialised societies. In the United States of America epidemiology studies from California State have recorded from 1987 to 1998 that autism has risen by 273% during that time. (Autism Research Institute Journal Issue number 15).

"Autistic spectrum Disorders" (ASD) covers many 'ranging' degrees of autism, ranging from Dyslexia, Dyspraxia, Attention Deficit Disorder, Aspergers Syndrome, Attention Deficit Hyperactivity disorder and Autism. It is a devastating disease for the children and their families.

There are a number of possible reasons as to why the numbers of autistics has ballooned over the past two decades:

1. Increased antibiotic therapy.
2. Thiomersal (methyl mercury) as the preservative used in vaccines.
3. Increase in live combined viral vaccines.
4. Increase in the number of childhood vaccines and the earlier the age of receiving them.
5. Decreased Omega 3 and 6 essential fatty acids.
6. Decreased vitamin and mineral availability from dietary sources.
7. Greater exposure to xenobiotic toxins.

One particular aspect that both parents and professionals seem to agree on is that autistic sufferers

often tend to suffer from gastrointestinal problems. Altered and disrupted gut function exists in many cases, having seen a number of children through the Autism File clinic I have become very aware that GI disturbances play a significant role in the majority of children I have seen and many do not have constipation or diarrhoea.

Pathogenic flora exist and leaky gut syndrome was found to be present in eight out of nine tested.

Recorded evidence supports the following gastrointestinal disturbances in ASD.

- a. Poor digestion, absorption and elimination of foods including intestinal permeability and inflammation.
- b. Nutrient deficiencies, B Vitamins, Fat soluble Vitamins, magnesium, calcium, zinc, selenium and Essential Fatty Acids.
- c. Altered gut ecology. The presence of disorganised microbiota and growth of yeasts, parasites and pathological bacteria.
- d. Food allergies or intolerances including intolerance to gluten and casein.
- e. Abnormalities in detoxification and sulphation
- f. The use of broad spectrum antibiotics and Non Steroidal Anti-Inflammatory Drugs.
- g. Benefits from secretin hormone, Intravenous Immunoglobulin therapy, transfer factor and digestive enzymes and Betaine Hydrochloride with pepsin.
- h. Multi vitamin and mineral supplementation, pro and pre biotics, 1-3 and 1-6 Beta Glucan, immune modulators such as green mussel extract, Earth Dragon.
- i. Common mucosal immune system dysfunction.
- j. Inflammation with increased inflammatory cytokines.

SPECTRUM DISORDERS

ability



A number of studies reporting new observations of significant gastro intestinal pathology in ASD may provide a new input of research that may lead to the amelioration and improvement of autistic symptoms in some cases.

The pathology of selected gastrointestinal disturbances observed in autistic patients shall be discussed with specificity to recent studies that have identified the possible role of gastro intestinal disturbances and their relatedness to the possible causative factors associated with Autism.

Autism and Gastro Intestinal Symptoms

Horvath (1999) states:

“Recent clinical studies have revealed a high prevalence of gastro intestinal symptoms, inflammation and dysfunction in children with autism.

Mild to moderate degrees of inflammation were found in the upper and lower intestinal tract.

In addition, decreased sulphation capacity of the liver, pathogenic intestinal permeability, increased secretory response to intravenous secretin, and decreased digestive enzyme activities were reported in many children with autism. Treatment of digestive problems appears to have positive effects on autistic behaviour.

These new observations represent only a piece of the unsolved autism “puzzle” and should stimulate more research into the brain-gut connection”.

Certainly the experience of most parents who have undertaken interventions in the GI tract would confirm that there is a positive change within their child's behaviour.

What is Leaky Gut Syndrome?

The Gastrointestinal tract involves the mouth, oesophagus, stomach, duodenum, jejunum, ileum, colon and rectum where foods are masticated, swallowed, digested and absorbed with waste faecal matter passing out via the anus.

The contents of the gut lie outside the body and

contain a toxic/antigenic load from which the body needs to be protected.

The Leaky Gut Syndrome is the name given to a very common health disorder in which the intestinal lining is inflamed and more permeable (porous) than normal where the membrane become weakened. I have already identified that this is an extremely common disorder amongst the autistic children I am treating in clinic.

The abnormally large spaces present between the cells of the gut wall allow the entry of toxins, allergenic peptides and the movement of pathogenic bacteria, fungi, viruses and parasites and foreign material into the blood system that would, in healthy individuals be repelled and eliminated. These toxins may play a

significant role in the functioning of the “autistic” brain as there seems to be growing evidence of the link between the integrity of the gut, the immune system, the nervous systems, the flora residing within it and the brain.

Many autistics have a reduced ability to detoxify these increased levels of toxins and liver support through selenium and zinc plus milk thistle, dandelion and nettle seem to help their abilities. It is also important to look at the way in which these autistics convert sulphite to sulphate and this enzyme requires molybdenum, for which many are

deficient.

Crissinger, (1990) identified that protection is supplied by complex mechanisms which support each other; intestinal secretions (primarily mucus and secretory IgA), the mucosal epithelium and intramural lymphocytes. *Sacchromyces boullardi* stimulates secretory IgA as it contains beta glucans, a supplement produced by Kirkmans and can stimulate the secretory IgA production faster than *sacchromyces*.

The cost of detoxification is high as many free radicals are produced and antioxidants utilised, any compromise of intestinal barrier function will therefore lead to many problems that may lead to health problems and disease.

These may stem from detoxification problems from

The diagnosis of autism is usually confirmed when the child is 2 to 3 years old.

endotoxins, polyamines (toxic forms of amino acids from pathogenic bacteria) immunological reactions, (Deitch. 1990. Hazenberg. 1992. Braganza. 1983), allergenic responses to food and to components of normal gut flora. Pathogenic responses to bacteria, viruses, fungi and parasites which may cause specific and non-specific activation of inflammatory processes initiated by cellular, cytokine and complement pathways.

D'Eufemia et al suggest from their studies that "leaky gut" has been shown to be associated with autism in cases where ASD children have a predisposition to diarrhoea or constipation with the following features: Pain, bloating, soiling, Reflux, flatulence, malodorous stools and mucus in the stool.

What causes it?

Leaky gut syndromes are usually provoked by exposure to substances which damage the integrity of the intestinal mucosa, disrupting the desmosomes which bind the epithelial cells. I have listed the common "triggers" below;

Pathogenic opportunists - The bad guys

The commonest cause of damage are infectious agents such as viral, fungal (esp. Candida), bacterial (esp. clostridium as their endotoxins increase gut permeability) and parasites. Use of the Comprehensive Digestive Stool analysis has been a key in the identification of such bacterial, parasitic and fungal opportunists. These can be treated and eliminated but selective responsible agents have to be used. I prefer to use natural treatments as these are more gentle on the elimination and therefore kinder to the impact on the liver. Antibiotics may play a role but the use of pre and probiotics is a must with back up from antifungal therapies to reduce the susceptible gut from becoming host to an increase in candida and other fungal species.

There are many species linked even to the causation of autism such as clostridia and candida. Many healthy looking autistic children, on the outside are riddled with pathogenic overgrowths and these need to be identified, eliminated and replaced by beneficial bacteria.

Non-steroidal anti-inflammatory drugs (NSAID's)

Playford et al (2001) demonstrated that individuals taking the NSAID, Indomethacin experienced a 3 fold increase in gut permeability after taking the medication for 2 weeks. (These drugs inhibit protective prostaglandins and as a result increase inflammation and hyper permeability). How often did you use Nurofen for infants and Calpol?

Fungal overgrowth

Bjarnason's research (1986) into the effects of non steroidal drugs on the small intestine found that they promoted fungal overgrowth. The yeast in this hypha form imbed themselves into the lining of the intestinal tract. Shaw 1998 in his research has shown that autistics have a tendency towards fungal overgrowth and in part may be due to disrupted aspects of the common mucosal immune system through inflammation, allergies, food allergens, poor gut function, heavy metals, liver and sulphation and others such as deficient secretory IgA and a distorted T helper cell ratio with a deficiency of TH1 and an excessive TH2 response. These arms of the immune system are pivotal in the total bodily response and a deficient TH1 response is a common problem, immune modulators such as green mussel extract, colostrums are quite often used.

Antibiotics

Many parents who have submitted questionnaires in the past or for their children in The Autism Clinic have shown multiple courses used for respiratory tract infection and glue ear in the first year (68% of all cases).

Berg (1981), found that treating mice with oral penicillin reduced the total population of anaerobic bacteria including beneficial lactobacilli by a factor of 1,000. This study also reported translocation of harmful bacteria into the lymph nodes. Many autistics have allergenic responses to gluten and casein which on an immunological basis represent a similar inflammatory response to a pathogenic organism. Many allergenic responses in the child's first year especially can often be seen as an infection and treated with course after course of broad spectrum antibiotics. These not only wipe out the beneficial bacteria but may reduce total immunity and create resistant strains to become dominant especially fungal overgrowth. This of course sets up the gut environment which is open to infection. Why does the measles virus reside in the gut. Perhaps it has become open to infection as the immune system has been obliterated by the overuse of antibiotic use as the lack of bacteria reduce the production of the mucosal's main line of defence, secretory IgA.

Chronic stress

Chronic stress inhibits gut function as the blood supply



is restricted to this area and is concentrated on supply to the brain and muscles for the flight or fight response. Gut contractions, reduced Secretory IgA and immune suppression results. By completing a simple adrenal stress test by shining a torch light into the pupil and then observing the pupil over a 20 second period. If fluctuations in size occur then this may indicate adrenal insufficiency and may require support. How many of our children are over sensitive to noise, lights, people and strange surroundings..why? Their adrenal glands are working overtime and may become exhausted especially if nutrient depletion is present.

Low fibre diet

A low fibre diet slows transit time and promotes dysbiosis. (too many bad guys) Many autistic children are very faddy eaters and may select a very limited range of fibre rich foods that may be insufficient to meet with their needs on a therapeutic level. Soluble fibre in particular that derived from beans, peas, lentils, Jerusalem artichokes, onions and garlic are good sources of soluble fibre. The beneficial bacteria produce butyrate and other short chain fatty acids from the fermentation of this fibre and this feeds predominantly the cells of the large intestine. Without the fuel for repair how does a leaky gut repair. Simple answer, it struggles. We all know how difficult it is for our children to accept fibre rich foods don't we.

Allergenic foods

Barau (1994) showed that children with cow's milk allergy exhibited inflammation of the intestinal lamina propria and partial villous atrophy. Milk may therefore initiate intestinal permeability accounting for the intolerance of this particular food group in autism. Urinary peptide analysis through Sunderland and FACTesting through IVDL and Immunolabs are great tests to look for an allergenic issue here. Many parents struggle with the gluten and casein free diet, I personally feel it is worth identifying a true allergy and leaky gut first. A Leaky gut will allow many undigested peptides through and generally a multiple allergenic response is set up. Clear out the bad guys, put in the good and heal the gut and of course identify the allergens also.

MMR vaccine

Do I need to go over this one again? There has been much discussion over the apparent association between the Measles, Mumps and Rubella (MMR) vaccine and the regression of normally developing children into an autistic state. Dr Andrew Wakefield was the first enterologist to come across these findings in a paper published in the Lancet in 1998. Endoscopies revealed that 10 out of 12 children displayed ileal lymphoid nodular hyperplasia (LNH). Further studies showed this inflammation in 88.5% of a further 60 children examined with developmental disorders including the



original twelve, five with Aspergers syndrome and two with disintegrative disorder. The authors characterised this pathology as "a subtle new variant of inflammatory bowel disease that lacks the specific diagnostic features of either Crohn's disease or ulcerative colitis". The results of these studies suggest that significant GI pathophysiology may accompany autism. This study has recently been replicated by American scientists and there should be a total abolition of the MMR until further trials have been conducted. Identify whether the immune system is competent, look for levels of inflammation and then decide, why do they stipulate that the vaccine should not be given to children who are compromised when they do not even look to see if they are. I am currently working on a simple blood test that looks at the immune competence within children prior to their first vaccine. I shall hopefully have some concrete news for you in Issue 20.

Zonulin Complex Proteins

These proteins have recently been discovered to play a role in intestinal permeability. Beneficial bacteria in the small intestine stimulate surface cells to secrete zonulin which disengage pathogenic species from the epithelial surface and cement the cells together. Many children have dysbiosis, another reason why testing is important.

Mercury antibodies have also been associated with intestinal permeability. (13).

What are the associated symptoms?

Leaky gut syndromes are clinical disorders associated with increased intestinal permeability. They include inflammatory and infectious bowel diseases (Katz 1989 Pironi 1982), skin conditions such as acne, psoriasis, rashes, (Juhlin 1983, Hamilton 1985) many diseases triggered by food allergy including eczema, urticaria, and irritable bowel syndrome (Paganelli 1990. Barau 1990) and associated allergy symptoms such as headaches, migraines, sore throat, runny/stuffy nose, postnasal drip, ear infections, asthma, eczema, psoriasis, acne, fluid retention, heart palpitations, nausea/vomiting, muscle pains/aches and cravings. Chronic fatigue syndromes, chronic hepatitis, pancreatitis, cystic fibrosis. Increased toxicity and liver stress due in part to poor sulphation of phenolic and amine toxins. Common ailments such as bloating, abdominal pain, flatulence, diarrhoea, constipation and indigestion. Many psychological disorders have also been linked to leaky gut such as anxiety, memory and cognitive defects, depression and mood swings.

Malnutrition and nutrient deficiencies and a failure to thrive are due to damaged mucosal cells, hypochlorhydria (low stomach acid) and pancreatic dysfunction. Autistic sufferers suffer from many of these symptoms and therefore require further examination into the possibility of such a condition if appropriate management and treatment is to follow.

What are the consequences?

Hepatic stress

The endotoxins, xenobiotics, pathogens and undigested food particles once absorbed are presented to the liver for detoxification. Toxic wastes secreted in the bile is rich in free radicals further damages the small-bowel mucosa, exacerbating hyper permeability it may also deplete the sulphation pathway. Poor sulphation has been identified by Waring et al (1997) in autistics. It is therefore important to support liver function in autistics, have it tested prior to chelating heavy metals with EDTA or DMSA, look at sulphate levels, molybdenum, zinc and selenium as these are the main co-factors in enzyme function (phase 1 and 2) and ensure sufficient anti-oxidants are present especially glutathione, lipoic acid, n-acetyl cysteine (if methylation is fine), vit C, E, A, CoQ10, carotenoids, flavones and isoflavones.

What can be done to test for Leaky gut?

Measure permeability using the lactulose/mannitol test. These two sugar molecules are of two different sizes and the smaller molecules, mannitol will pass through the healthy gut mucosa and into the urine via the kidney and the larger molecules will not. If there are sufficient levels of the large lactulose molecules present it indicates the gut mucosa is hyper permeable and therefore "leaky". IWDL run this gut permeability test.

How to treat a leaky gut

Exposures

Stop exposures (whenever possible) to Non steroidal anti inflammatory drugs such as ibuprofen (NSAIDS) or any potentially cytotoxic drug.

Infection of the gut

Stool analysis ie CDSA 2 with parasitology (IWDL) to look at dysbiosis, candidiasis, parasites and such like in comparison with beneficial gut flora.

Food Allergens

Eliminate allergenic foods, IgG or IgE Antibody assay (IWDL FACTest). Many food allergens are caused by undigested proteins passing through a permeable gut wall. These are then identified by the immune system as being foreign and are attacked by the immune cells. These form immune complexes by the antigen (food particle) swamped by antibodies to it and circulate

throughout the blood circulatory system and if allowed to attach to mucosal surfaces form a tissue bound immune complex causing inflammation. Poor digestion of proteins is common in autistics and the use of secretin, digestive enzymes and betaine hydrochloride with pepsin have been beneficial. A simple beetroot test can be used here to look at possible deficiencies in Hydrochloric acid and it may be that increasing B6 and Zinc may increase it.

Food sensitivities and allergenic foods are absorbed via the leaky gut and altered dysbiosis of the gut lumen. Panksepp in 1979 proposed that excesses of casomorphine and gliadomorphine have neurological implications on brain function resulting in abnormalities in perception, behaviour, cognition, central nervous system development and emotional disturbances. Reichelt et al 1981 produced evidence of abnormal peptides in the urine of autistic children. It was proposed that these were from incomplete digestion of certain proteins namely gluten and casein. Chiba et al, (1989); Meisel (2001); Fukudome and Yoshikawa (1992), have suggested that gastrointestinal permeability may be higher in autistic than in non-autistic individuals and that this may be responsible for the increased levels of opioid peptides in autistic urine over controls. Recent studies have shown autistic children on a strict gluten and casein free diet have developed significantly better than control subjects over a one year period (Knivsberg et al.2002). To help leaky gut syndrome the diet must be completely changed to one which is as hypoallergenic as possible reducing inflammatory responses to allergens.

Probiotics

Include live yogurt, buttermilk, acidophilus milk, kefir which contains lactobacilli have been found to be beneficial against pathogenic bacteria and parasites and Candida. These include soy yogurts. Foods which have natural antibiotic qualities include cabbage, Brussels sprouts, broccoli, raw garlic, onions, leeks, radishes, fenugreek, ginger-root, hot chilli, lemon juice, turmeric, mustard and rosemary. Raw garlic is the most powerful antibiotic for the gut. Rosenfeldt et al demonstrated that using lactobacillus Rhamnosus may stabilize the intestinal barrier function. Probiotics have produced some reasonable results. The problem is getting capsules and the best way to take them, how many cells per capsule when to give ie with food or on an empty stomach or whether we need to use bicarbonate and lots of water to neutralise the acids within the stomach. Probiotics may also require prebiotics, does one need to clear out the pathogens first, does one need to push through very high dose probiotics, what is the best way to assure they survive to the gut, is the intestinal pH correct and with what do they attach themselves? This area needs further research.

The use of Prebiotics such as Fructooligosaccharides (FOS)

Probiotics such as lactobacillus acidophilus, bulgaris and bifido bacteria aid in restoring "normal" gut floral populations. Fructooligosaccharides as prebiotics have been helpful in restoring healthy bacterial populations (Rosenfeldt 2004), and are found in Jerusalem artichokes, onions, leeks and cruciferous vegetables. Recent research findings by Katz and Hollander (1989) suggest that bacterial sensitization is an early complication of altered permeability and exacerbates hyper permeability by inducing an inflammatory enteropathy.

Sheppach (1994) found that prebiotics are also used as the fuel source for beneficial bacterial species to synthesise short chain fatty acids. The short chain fatty acid Butyrate has been shown to be effective in reducing mucosal epithelial atrophy in colonic leaky gut syndrome.

Due to intestinal permeability increasing the risks of food allergens passing through the epithelial wall Neesby (1990), identified that butyric acid complexes reduced food sensitivities after a one to two week period at 700-1400mg per day. Neesby also suggested that butyrate encouraged the adhesion of lactobacilli and bifidum bacteria in the colon. It may also feed the pathogenic species such as klebsiella.

Reduced intake of refined carbohydrates and sugar containing foods

These foods such as refined flour and confectionary not only provide glucose which Candida fungal species are reliant upon for reproduction and growth but can upset the blood sugar balances associated with mood swings, fatigue and lethargy commonly associated with leaky gut syndrome.

Enzyme food therapy

Relating back as far as the 1950's Dr. Edward Howell discovered that the use of plants, as foods, containing proteases, lipases, amylases and cellulase improve the digestion and assimilation of foods. This is important for patients with leaky gut as the digestion of foods, namely proteins being broken down into their amino acid form is important if peptides and polypeptides (antigenic macromolecules) are not to be absorbed through the porous gut membrane. (Stoll 2003). Murray et al (1991) identified that many autistic sufferers have been shown to have leaky gut through the lactulose/mannitol sugar molecule test and by effectively using plants rich in proteases such as bromelain derived from pineapple and papain derived from papaya and amylase (which enzymatically cleaves the toxic carbohydrate portion of gliadin have been effective in reducing opioid peptides derived from wheat and rye proteins that may be, in part responsible for autistic behavioural problems. This suggests that

plant derived enzymes may be effective in reducing food allergies, immune dysfunction and certain inflammatory bowel conditions. Raw fresh foods containing natural enzymes and also providing necessary fibre and nutrients are to be encouraged. Heating destroys virtually all of the enzymes in our food. (Lopez 1990).

L-Glutamine

Glutamine has been researched and has had beneficial effects on improving leaky gut syndrome. It is an amino



acid important for the maintenance of intestinal metabolism, structure and function especially the small intestine as Glutamine provides 70% fuel source for the repair of this area of the gastrointestinal tract. Hall (1996) demonstrated that glutamine is second only to short chain fatty acids, namely butyrate as the preferred fuel for the epithelial cells of the large intestine.

Roth et al (1996) concluded that glutamine had many positive interactions with the common mucosa; it stimulated protein synthesis, influenced cellular hydration, increased cell growth and reduced intestinal permeability by preventing the adhesion of pathogenic bacterial species to the gut wall. Van der Hurst et al (1993), Found in high quantities in parsley and spinach.

Antifungal foods

Candida species have commonly been identified in association with leaky gut syndrome. Once Candida gets a firm hold (this is commonly associated with a disturbed gut floral balance and an over indulgence of refined carbohydrates and sugar based foods) their hyphae extend through the gut mucosa and create

spaces within the mucosa and can possibly spread from the gut to a systemic infection. Increase foods such as ginger root, turmeric root, olive leaf. Caprylic acid is also a sensitive substance to use against candida, problem is that most taste disgusting.

Hepatic Stress

In attempting to eliminate toxic oxidation products the liver depletes its reserves of sulphur containing amino acids such as cysteine and methionine. (Whitcomb and Block 1994). Sulphur is an important element in the junctions within the gut mucosa. Therefore foods containing sulphur rich nutrients are advisable. Such as eggs. Increased fibre from fruit and vegetables will also provide better elimination of toxins from the bowel and further reducing hepatic stress. Edelson (1998) showed abnormal liver detoxification in 20 autistic children with toxic overload.

Low sulphation results in impaired breakdown of proteins and increased intestinal permeability. Dr. Rosemary Waring 1997, from the University of Birmingham believes the lack of sulphation in phase 2 liver detoxification is a key problem in autistics. The sulphate is important to provide sulphation of glucosaminoglycans which reduces the integrity of the gut and increases the risk of pathogenic infection. Murch et al (1993) found that "sulphated glucosaminoglycans are distributed in the extra cellular

matrix and vascular endothelium in intestinal tissue and are important for binding macromolecules such as Super oxide dismutase, fibroblast activity and regulating cellular diffusion". This study further implies that disturbed sulphation pathways in autism from either disrupted cysteine or methionine metabolism, dietary deficiencies in sulphur rich foods, an excess of carbohydrate or a lack of phenosulphotransferases may account for abnormalities not only in hepatic detoxification but also on gut integrity. Include sulphur containing foodstuffs within the diet or supplement with MSM or Epsom salts in a bath.

Fibre

Shiau and Chang (1986) identified that fibre has been shown to decrease permeability such as pectin (from apples), and other forms of hypoallergenic fibre derived from bananas, carrots, beets, cabbage, dried peas and okra. Low fibre diets increase permeability. Rabbani GH et al 2004, showed from a peer reviewed study that green banana and pectin improved the intestinal permeability in Bangladeshi children.

Essential fatty acids

Essential fatty acids from milled flax, flax seed oil, evening primrose oil, borage oil, olive oil, fish oils and blackcurrant seed oil and other nuts and seeds. Substrates for prostaglandins, esp. Omega 3 derived

L-Carnosine

It is well established that individuals suffering from autism have a number of dysfunctional biochemical and metabolic issues from digestive disorders, immune problems and deficiencies with certain essential fatty acids, amino acids, trace elements, vitamins and minerals.

It is therefore accepted that dietary interventions and supplementation may restore certain deficiencies and can therefore lead to improvements in areas where these nutrients are used.

I have recently been reading about the effects of **L-Carnosine** supplementation and felt it should be shared with those of you who feel it may be of some benefit to your child.

Please seek advice and guidance from a qualified Nutritionist prior to supplementation.

L-Carnosine is a compound consisting of two amino acids, alanine and histadine – it is a dipeptide.

It has been shown in a study conducted by Michael. G. Chez et al that supplementing 800mg of **L-Carnosine** per day over an eight week period on 31 autistic children showed statistically significant improvements in speech.

The mechanism of **L-Carnosine** is not well understood but it was concluded that it may

enhance neurologic functioning in the frontal lobe.

Homocarnosine is formed when g-aminobutyric acid (GABA) binds to Carnosine. Carnosine appears to modulate the influx of copper and zinc into the cells near GABA receptors and thereby may affect potential epileptic seizures.

It is also thought that **L-Carnosine** appears to stimulate brain function in the areas of the brain that control emotion, abstract thinking and may lead to improvements in social skills and awareness of surroundings.

L-Carnosine is also a potent anti-oxidant, an anti-oxidant is a compound that neutralises free radical damage to the cells and therefore helps protect the body from the damage caused by oxidation. It may also be effective in binding to heavy metals and supports the immune system.

L-Carnosine appears to be extremely safe however in some cases children have shown increases in hyperactivity which subside when the supplement has been stopped.

It is suggested that 400mg in the morning and 400mg in the evening 20 minutes before food or 2 hours after food should be supplemented.

from fish oils reduce inflammatory response in gut from pathogenic and allergenic sources.

Zinc rich foods

It has been shown that foods rich in zinc may be beneficial to individuals suffering from leaky gut. Sturniolo et al (2002) also demonstrated in rats that rats with increased intestinal permeability and were given high dose zinc improved and it was concluded that zinc may regulate tight junction permeability, with possible implications for healing processes in inflammatory bowel diseases.

Vitamin A rich foods

McCullough (1999) showed in a study that vitamin A was effective in treating intestinal permeability in children of weaning age. Foods rich in vitamin A are liver, oily fish, eggs, carrots, broccoli, dark green leafy vegetables, red peppers, pumpkins and mangoes. Leaky gut syndrome within autism is a real issue, due predominantly to NSAIDs and overuse of antibiotics and restricted diets high in refined carbohydrates, sugar, allergenic foods and deficient in fibre and nutrients. As previously outlined, the aetiology of many health problems, including autism may in part be related, directly or indirectly to leaky gut syndrome. It is important to realise that there have been many studies completed on intestinal permeability but I feel its aetiology remains unknown.

Therapeutic effects have been seen using certain nutrients and these have been reflected on improvements within autistics, however these play important roles in stimulating so many other biochemical, immunological and physiological responses (zinc for example) it may be this factor that has the beneficial effects on intestinal permeability.

Nutrilink provide an excellent range of supplements from Allergy Research to support gut permeability. Listed below are some of my favourites. Tel. 01626 205417. Please seek advice from myself or a Nutrilink practitioner before ordering and using.

PermAvite powder. Combination to heal leaky gut
Fructooligosaccharides (FOS) prebiotic powder
Probiotic range including the following:

- BifidoBiotics with L sporogenes
- GI Flora
- Lactobacillus GG (Culturelle)
- Lactobacillus plantarum/rhamnosus/salivarius
- Symbiotics with FOS powder

They also have a good range of antimicrobials and liver supporting supplements.



Conclusion

As a result of the many known complex interplays as well as individual uniqueness, autism must be viewed as a multi-factorial disorder.

There are significant findings through peer reviewed research literature of some of the identified anomalies associated with autism and practitioners should aim to identify through thorough investigative use of genetic predisposition, inflammatory health problems within parents and grandparents and using detailed questionnaires and diagnostic testing identify the focus areas.

I have briefly outlined one area of gastrointestinal pathophysiology within this text but there are many other associated aberrations within autistic sufferers which also need to be identified if an accurate and specific protocol is to be devised for each sufferer.

These may include:

- Heavy metal toxicity and metallothionein dysfunction/deficiency.
- Sulphation and hepatic detoxification problems.
- Nutrient deficiencies/excesses.
- Inflammation. (pathogens, allergens and reactive oxygen species and toxins)
- Immunological imbalances, deficiencies and/or dysfunction plus autoimmune issues.
- Essential fatty acid imbalances.
- Mitochondrial dysfunction.
- Increased toxins and pathogenic metabolites.
- Neurotransmitter disturbances.
- Digestive deficiencies in secretin, Cholecystokinin and enzymes and malabsorption.

Last year the Defeat Autism Now Congress in Los Angeles, U.S.A opened with 1,000 recovered autistic children. This must be viewed that this condition, in some cases, is treatable. Let us hope many other autistic children are given the time and opportunity to be included, one day, in that group. I have thoroughly enjoyed looking after the children I have seen in clinic I try and identify through comprehensive questionnaires, discussions and diagnostic tests the specificity and uniqueness within each child and the problems that may lie beneath the surface. If you would like to speak to me regarding a clinic appointment please call The Autism file on 0208 979 2525.

You have my very best wishes.
Jonathan