



## CHOCOLATE CAKE

4 eggs  
100g C/F Margarine  
100g castor sugar or 80g fructose  
100g carob  
100g ground almonds  
1 heaped Tbsp potato flour

Separate eggs carefully. Melt the carob in a glass mixing bowl over simmering water, or in the microwave on medium for 1 minute. Beat in the margarine and sugar, egg yolks and ground almonds. Beat the egg whites separately in a glass bowl until stiff, then fold gently into the mixture, together with the potato flour. Pour mixture into baking tin lined with baking paper.  
Bake at 160°C for 1 hour

Icing:  
75g icing sugar  
50g C/F margarine  
1 Tbsp cocoa powder  
1 Tbsp G/F vanilla Essence



Cream the margarine and icing sugar until light and fluffy. Add cocoa and essence.

## BANANA & NUT MUFFINS

1 egg  
¾ cup sugar/fructose  
¼ cup oil  
2 cups G/F flour  
1 Tbsp bicarbonate of soda  
½ tsp ginger  
½ tsp cinnamon  
¼ tsp salt  
1 cup C/F milk  
3 mashed bananas  
Handful of chopped nuts



Mix together all ingredients and bake in greased muffin pans at 190°C for 15 – 20 minutes

It is often possible to determine which of these two dietary elements are likely to be more significant for a given individual by looking at the clinical history and by examination of the urine for the appropriate peptides. It must be stressed that the effects of these peptides are, in this instance, of a toxic rather than an allergic nature. Blood tests are designed to determine antibody levels which are reflective of allergic reactivity rather than toxicity. They are, therefore, largely irrelevant but can sometimes be useful if allergic reactivity is suspected as, for example, where coeliac disease is a possibility.

It is often simpler to just test the effectiveness of excluding these elements from the diet in turn. We normally suggest that parents consider removal of dairy produce first. This is usually simpler than removing gluten and, where it is a factor (which it usually is) results are evident within a few days. We normally suggest that parents remove casein from the diet for about three weeks and then assess the situation. We are conditioned to believe totally in the benefits to be obtained from drinking milk but one has to ask the question about the appropriateness of human beings drinking such large amounts of milk from a different species (cow). Some children can get away with goat milk but the majority tend to remove mammalian milk entirely and use soya or some other vegetable milk. Milk is a good source of vitamins and minerals so we do suggest that parents ensure an adequate intake by means of supplements. It is normal practice for parents to take advice from a qualified dietician or equivalent in this respect.

There is a good chance that withdrawal effects will be seen and these could last for a variable period of time. With small children (2-4 years old) these can be dramatic but they do not last long. The intensity increases but the time increases with age but they would normally disappear within 10-21 days.

After this period, parents or carers will have to assess the effectiveness of withdrawing dairy produce. At this point the role of gluten should be considered. Gluten is, technically speaking, the protein from wheat but the name is usually applied to the proteins from other cereals as well. In particular, barley, rye and oats should be excluded although, usually, maize (corn), rice and potatoes present no problems. Although results are usually evident much sooner, we generally suggest that gluten be removed and the subject monitored for at least three months. We are aware of a number of instances where parents have seen significant improvements only after a much longer period of time sometimes six months or even a year. It may be expecting rather too much faith from parents when these situations pertain especially when the withdrawal effects may be rather persistent, although mild.

## OTHER FOODS

Once the big two (gluten and casein) have been removed we can sometimes see the unmasking of other problems. It is always a good idea to keep a diary of what is eaten on any day and the behaviours, mood and general patterns seen in the subject. By doing this, one can often determine which other foods may be a problem. It must be borne in mind that when one food is removed from the diet it will be replaced so possible effects of these replacements must be considered. If a food is suspect it should be removed

## BACTERIAL

Suspicion is now being turned towards bacteria living in the intestine. There are countless billions of organisms in the intestines and not all will be desirable. It is possible, but not clearly demonstrated (yet?), that some of these bacteria may be producing toxic substances which will, in the presence of an abnormally leaky gut, penetrate into the bloodstream and cause very serious problems. Once again, normalisation of the intestinal flora using intestinal bacteria is practised. Further developments are expected in this field.

## THE INTESTINAL WALL

There are a number of measures, which people are using in an attempt (whether they know it or not) to improve the integrity of the gut wall and, therefore, cut down on the permeability. In essence, if one could eliminate this excessive permeability a normal diet could be eaten without problems. That must be the aim of therapists but it would seem to be sensible to remove the offending foods as an initial step rather than to treat the intestinal wall in isolation.

Some of these elements have already been referred to briefly (L-Glutamine and Candida) in the previous section.

## SULPHOTRANSFERASE AND PHENOLIC FOODS

Interest in these aspects came about as a result of parental observation and study. It was observed, by parents, that particular foods appeared to result in the appearance of bad behaviours in their children. These foods such as apple juice, citrus fruits, chocolate and paracetamol were precisely those that were known to precipitate migraine attacks in susceptible individuals. The parents also noted the high incidence of migraines within the families of people with autism. These observations set the parents, who were without formal training in these areas, to biochemistry textbooks. They noted that certain enzymes tended to be functioning sub-optimally in migraine and wondered if the same situation pertained in autism. They coerced Rosemary Waring, a well-known researcher into these aspects, into testing a group of children with autism. The results were published some years back (Ref) and have only recently been replicated and extended in dramatic fashion.

It would seem that the sulphotransferase systems are functioning at sub-optimality in people with autism. There are a number of consequences including effects upon the metabolism of classical neurotransmitters; impaired breakdown and metabolism of the bile pigments bilirubin and biliverdin; impaired action of the hormones CCK which would result

## BEEF BURGERS

500g organic minced beef  
1 medium onion finely chopped  
1 clove garlic – crushed  
1 egg, pepper and salt  
1 – 2 tsps mixed dried herbs or freshly chopped parsley and thyme,  
1 tsp paprika pepper  
(use which ever seasonings you prefer)

Peel and finely chop the onion and crush the garlic.  
Put minced beef, onion and all seasonings into a large mixing bowl and mix thoroughly – use a hand to make sure all ingredients are well combined.

Beat the egg in a cup and add to the other ingredients – mix together  
Shape the ingredients into burger patties.  
To cook them either oven bake, grill or pan fry.



## LAMB CASSEROLE



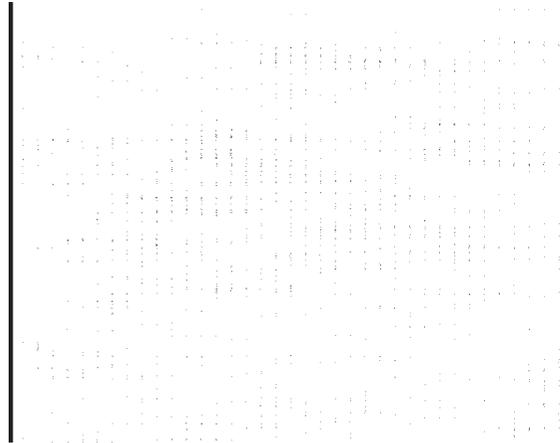
450g organic lamb neck fillet or chump steaks  
1 onion finely chopped, 1 carrot, 1 leek, 1 parsnip  
1 stick celery (optional)  
1 tblsp rice flour, Pepper and salt  
Three quarters pint stock – cube or homemade  
2 – 3 sprigs fresh rosemary, 1 tblsp olive oil



Cut meat into small pieces and coat with rice flour.  
Peel onion, carrot, leek and parsnip and cut into small pieces.  
Sweat finely chopped onion in a little olive oil until transparent.  
Remove from saucepan, add rest of oil and fry the pieces of lamb fillet until browned.  
Return onion to the pan with the lamb, pour on the stock, add all the vegetable, season and bring to the boil stirring to remove flour from the base of the pan.  
Add rosemary and when casserole has come to the boil transfer it to a casserole dish with a lid and cook in the oven at 160° '3fC for 1-1,5 hours. When cool, freeze in individual portions in small plastic containers or freezer bags. Serve with jacket, mashed potatoes or squash, or boiled rice.

This increased permeability could also be the consequence of infections lodged in the intestines. The possibility of a lingering measles infection, introduced during vaccination processes, must be considered. Many parents feel that the symptoms presented by their child appeared with dramatic rapidity at this time.

Increased CNS levels of peptides would be the consequence of irregularities in the blood brain barrier (Fig. 1d). For example, such damage could be consequent to physical damage or upon infection from some serious disease such as meningitis or encephalitis. It could also be consequent upon infection from diseases, particularly those of viral origin, which may have gone largely un-noticed at the time.



INTERVENTIONS

There are, therefore, three areas to which our attention could be directed in minimising these problems. The unorthodox approaches, which parents utilise, are based on these three areas.

### INSIDE THE INTESTINES.

#### GLUTEN AND CASEIN FREE DIETS

This is, as has been explained, where the concepts first developed. If the toxic agents (the peptides) are derived from gluten and casein, the obvious course of action is to remove them from the diet. Our own group (Whiteley 1999), as well as the Norwegian group (Knivsberg 1995) and the Americans (Cade 1999) and Italians (D'Eufemia 1996) have demonstrated the effectiveness of such interventions. There are literally thousands of parents who are prepared to attest to the efficacy of such interventions. There are very few, if any, other forms of medical intervention that have been demonstrated as being effective by so many groups. In most cases, both gluten and casein are implicated but with some individuals one or other component is of much greater significance than the other.

### PIZZA



Base:  
1 egg  
2 sachets orley whip  
275g G/F flour

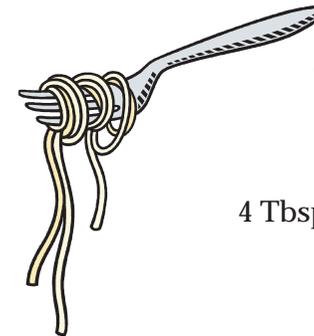
Beat the egg and orley whip and stir in the flour. Roll out on a lightly floured board and transfer to a greased baking tray.

Tomato paste:  
1 small tin tomato paste  
½ onion, chopped  
Fresh origanum

Fry the onion in a small amount of C/F margarine until transparent, add tomato paste and fresh herbs and simmer for 10 minutes. Spread the topping onto the pizza base and top with:

Sliced tomato  
Tofu  
Garlic  
Olives  
Chicken strips

### SPAGHETTI BOLOGNAISE



100g mince  
1 onion, chopped  
2 cloves garlic  
4 Tbsp Ina Parmans stock powder  
2 tomatoes, chopped  
1 large carrot, grated  
1 bottle vegi-juice

Brown onion and garlic with a little C/F margarine. Add the mince until brown. Add the rest of the ingredients and simmer for 30 minutes. Serve with G/F Spaghetti or Rice noodles.

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And

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us to reproduce some of their recipes.

## OTHER BROCHURES AVAILABLE FROM AUTISM SOUTH AFRICA

INFORMATION FOR PARENTS  
INFORMATION FOR TEACHERS  
INFORMATION FOR DOCTORS  
THOUGHTS OF A SIBLING  
3 BOOKS WRITTEN BY AN ADULT WITH AUTISM  
ASPERGER SYNDROME

## INTRODUCTION

In spite of the disapproval of the larger part of the medical profession, parents and carers have been making use of dietary interventions in an attempt to help people with autism spectrum disorders (ASD) for many years. This disapproval has ranged between the benign “Well at least it cannot do any harm” to outright hostility, the removal of parents from the medical practice of physicians amidst accusations of maltreatment and unpleasant verbal and written communications. It has been customary to deride the work of early advocates of these interventions, such as Dohan (1966) and Reichelt (1981), but attitudes are now changing fast. Professionals with minds that are more open, are beginning to realise that there are elements of these interventions which are applicable. It is for these open minded professionals, as well as parents and carers that this review has been prepared. Those who live with autism have always been aware that the therapies generally employed; medications; educative techniques etc are aimed at treating the symptoms of autism. In the dietary approaches described here, the emphasis is on inhibiting the causative mechanisms which underlie the problem. The two approaches are not oppositional; they are not alternatives but totally complementary to each other.

### HISTORICAL PERSPECTIVE

The original observations upon which these interventions have developed came not from trained physicians and researchers but from parents without the formal training of scientists. A number of them noticed, totally independently, that their children were adversely affected by certain foods. Fingers have been pointed at many potential problem foods. Of course, with a spectrum disorder such as autism and with the variability inherent in human beings anyway, the offending foodstuffs vary considerably between individuals. Nevertheless, certain products appeared time and time again. Gluten and casein; citrus fruits; chocolate; pigmented foods; paracetamol; salicylates; tomatoes; aubergines: all have been implicated in individual but not all cases.

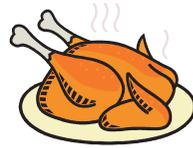
Parents have noticed that a particular food seems to cause problems; they have tested the effects of withdrawing the food and of re-introducing it to the diet. They have, in effect, developed hypotheses based upon their observations. They have designed and performed experiments to test these hypotheses and have passed on the results. That is what true science is about. In the early day, convincing supportive evidence, from scientists, was virtually non-existent. When Dohan (1966) first propounded his ideas about the connections between gluten and schizophrenia the evidence was largely of a circumstantial nature and so the ideas were dismissed out of hand.

Reichelt (1981) was impressed by the case made by parents and so investigated their claims further. It is interesting to speculate upon how Dohan felt when he first received Reichelt's supportive paper. It was published on the very day that Dohan died and it is said that he saw a copy before he died.



## SAVOURY CHICKEN AND VEGETABLE RICE

75g (3oz) White rice  
 300 ml (half a pint) boiling water  
 75g (3oz) frozen mixed vegetables  
 1 Raw chicken breast chopped  
 1 tablespoon of oil, 1 vegetable stock cube  
 half a teaspoon of salt, pinch of black pepper  
 1 teaspoon of parsley.



Put all the ingredients except the chicken and the oil into an oven proof dish. Cover the dish with cling film and pierce several times.

Make sure that the edges are sealed. Cook in the microwave on high for 14 minutes. Meanwhile, fry the chicken pieces in a little oil for 4 – 5 mins until thoroughly cooked. When the rice and vegetables are cooked, stir in chicken and serve.

NB: Most stock cubes contain yeast



## BASIC WHITE BREAD

450g (1lb) lifesty gluten-free flour, sieved  
 1 Level tablespoon of dried yeast  
 575ml Soya rice milk  
 25g (1oz) Sugar or 1 teaspoon of honey  
 50 g (2oz) Dairy-free spread  
 1 Egg (optional)

Warm a large mixing bowl. Melt the spread, the honey (or sugar) and the Soya milk together and allow heat. Pour into the mixing bowl and allow to cool to a warm temperature. Sprinkle the yeast over the mixture and whisk. Add a beaten egg, continue whisking, now add the flour little by little. You are aiming for a thick batter.

Sometime you may not need all the flour. Leave the mixture in a warm place for 20 minutes, cover the bowl with a cloth. The batter will increase in size and become spongy. Oil the baking tin, pour in the batter. Leave for 10 minutes. Place in the middle of a hot oven for 25 minutes. The bread is done if it sounds hollow when tapped.

Turn out onto a wire tray to cool. The bread can be frozen but the fresh bread does not last more than 2 days.

## SECRETIN

Although not strictly speaking a dietary intervention, mention must be made of the hormone product secretin which has received considerable publicity of late. The rationale for it's use was it's ability to stimulate the pancreas to produce peptidase enzymes. It could be working in a number of alternative ways. The results of preliminary trials are somewhat equivocal and clarification is awaited. However, a discussion at this point is beyond the scope of this presentation.

## BETAINE (TRI METHYL GLYCINE) HYDROCHLORIDE

As with the enzymes, referred to above, TMG has been used for many years in the treatment of hyperactivity even though the mode of action has remained unclear. This compound will, by slowly releasing hydrochloric Acid, increase the acidity of the stomach contents. There is soft evidence that some people with autism have insufficient acid in the stomach (achlorhydria) and that, as a consequence, the stomach enzymes act inefficiently to break down the proteins. It may also be of relevance to consider that secretin is produced in the intestines as a consequence of acid in the stomach. Thus, if there is insufficient acid there could be reduced levels of secretin produced.

## PARASITIC INFESTATION

### ANIMAL

Again this is, strictly speaking, off topic but worthy of consideration. It is known that parasitic organisms such as worms and protozoa will produce substances to depress the host's immune system. Many of them produce opioid peptides for this purpose. We are not suggesting that autism spectral disorders are the result of these infections but they should be eradicated as far as possible as they could exacerbate the situation.

### YEASTS

Yeasts are a common accompaniment to autism. Many people with autism are infected with candidal organisms but the relationship, in terms of cause and effect is not proven. If the immune system is depressed, as a result of opioid peptides or the overzealous and unnecessary use of antibiotics these organisms will be encouraged. Alternatively, as Shaw (1998) has pointed out on numerous occasions, these organisms could be producing compounds, which may be deleterious in term of symptoms. Whether or not they are of prime importance, there can be little doubt that they could exacerbate the situation in terms of increasing permeability of the intestinal wall. Even more worrying is the ease with which they can become systemic and, perhaps, even increase permeability of the blood brain barrier. Medications such as Nystatin may be utilised for their control but many are opting to avoid medication of this sort by using dietary supplements such as acidophilus bacteria or grape seed oil.

for a trial period and the results observed. Eggs; maize; soya; beef; tomatoes and aubergines are all amongst the foods to which some children have been shown to have negative responses.

### VITAMINS AND MINERALS.

We are keen that any person using a dietary approach ensures a satisfactory intake of vitamins and minerals. Without these co-factors, the normal metabolic processes will not be possible. A good quality, balanced, vitamin and mineral intake is important and we recommend consulting a dietician (or equivalent in other parts of the world). All of the vitamins are important. The mineral needs will vary between individuals but Zinc, Magnesium and Calcium must be included.

AFTER the gluten and casein have been removed and the situation has partially stabilised it may be appropriate to test to see if there are any especial requirements for the individual. We suggest that testing is performed at this stage, as we are aware that, in some instances, apparent shortages of particular vitamins and minerals have evaporated once these offending foods have been removed.

### AMINO-ACIDS

There are number of disorders which can result directly from amino-acid irregularities. Histidinaemia; PKU; Homocysteinuria and others could be involved in the causation of symptoms. Tests to rule out these gross problems should be performed routinely. There is considerably anecdotal evidence that certain amino acids are beneficial to people with autism. Supportive evidence tends to be lacking but supplementation could be considered and, in any case, their use is unlikely to cause any harm. L-Glutamine has found favour amongst many parents even though the precise mode of action is unknown. It is used routinely in medicine to encourage growth of villi and thereby improve absorption from the intestines. It has been suggested that glutamine levels, in the blood, are low in people with autism in any case so supplementation may be no bad thing.

5-Hydroxy Tryptophan (5HTP) is a metabolite of the amino-acid tryptophan and is used in the formation of the transmitter substance serotonin. It may be that serotonin levels, in the areas where it is required, are low and that supplementation with 5HTP is helpful. Many people feel that this is the case although, once again, evidence of efficacy in autism is lacking.

### SUPPLEMENTARY ENZYMES

If the peptides in the gut are not being broken down adequately, this could be a result of insufficient levels of peptidase enzymes. For many years, parents of children with hyperactivity have been utilising enzymes (orally) to ameliorate the problems. Many such products are on the market. Some of the plant-derived enzymes are particularly effective and we are aware of many parents who feel that the enzyme from pineapples, bromelain produces beneficial results. We understand that a product especially designed for people with autism will be commercially available soon. We await it's introduction with considerable interest.

### LENTIL AND BACON SOUP

- 175g red lentils (soaked overnight)
- 1.7 litres of chicken or vegetable stock
- 1 clove of garlic (crushed)
- 200 g bacon rashers cut into small pieces
- 226 g can of chopped tomatoes
- 1 medium onion chopped
- Salt and Pepper
- 3 medium potatoes cut into chunks
- 1 parsnip diced
- 1 carrot diced
- piece of butternut squash – diced
- 2 sticks of celery,
- 1 clove of garlic
- 1 bay leaf, 1 tbsp tomato puree
- 1tsp sugar (optional to bring out flavour)



Fry bacon to release some fat, then fry the chopped onion in this fat. Add lentils (which have been soaked and strained) and sauté lightly. Add the can of tomatoes, stock, carrot, potato, parsnip, butternut squash, crushed garlic (other veg.) Stir well; bring to the boil and add 1 tbsp tomato puree, the sugar, seasoning, clove and the bay leaf. Simmer for about 45 mins to an hour. Remove the clove and leave soup to cool. Puree soup with a blender leaving some pieces of vegetable whole if you wish. Cool and freeze in small bags.

### CHICKEN WITH OLIVES & SUNDRIED TOMATOES



- 2 free range chicken breast fillets
- 3 cloves garlic, crushed
- 1 Tbsp fresh herbs
- 2 Tbsp olive oil
- 1 cup depipped black olives, sliced
- ½ sundried tomatoes
- 2 Tbsp soft brown sugar
- ½ cup vegi-juice
- ½ cup chicken stock (1 Tbsp Ina Parmans stock and water)



Combine first 4 ingredients and cook until brown. Add rest of ingredients and simmer for 15 minutes until cooked. Serve with G/F Pasta

Our own involvement dated from about this time. We too had heard these reports from parents but with the publication of Reichelt's paper we felt encouraged to explore the situation further. It is, perhaps, worth recording that the other groups investigating this area (Cade at the University of Florida and Friedman at Johnson and Johnson) became involved as a result of parental involvement and pressure.

Our groups have merely taken the work of the parents and examined the mechanisms by which their results may have been obtained. We can assure readers of my own extreme scepticism when first introduced to these ideas and we understand that the situation is mirrored in all of our groups. It was only when we obtained results supportive of the parents that our minds, our attitudes and our approaches have changed so dramatically.

The other element in the story was the work of Panksepp (1979) who noted the similarities between the symptom of autism and the effects of morphine like substances (endorphins) which occur naturally in the brain. Although, at first sight, there would appear to be little connection between these two elements Panksepp's ideas are completely compatible with and do much to explain these dietary approaches. It has taken many years for these ideas to take root at all. No one is claiming that this is the whole story and no one says or believes that these are the only approaches which are valid. However, a momentum is building up and it is interesting to see how attitudes, particularly in the United States (where, perhaps, physician-worship is less common,) are changing. At the recent DAN conference (Defeat Autism Now - Cherry Hill, New Jersey, October 1999) there were many professional nutritional companies offering services to parents.

## THEORETICAL BASIS

Before going on to look at the actual therapeutic interventions, it is necessary to have some understanding of the theoretical model upon which they are based. There are a number of such models and this is but one. Some models emphasise one aspect (say the immune system or infectious agents) rather more than is evident in this model. It is totally agreed that these are elements in the equation that are given less prominence in this model and that this model is, to some extent, simplistic.

This model is based upon the effects of opioid substances derived from the incomplete digestion of certain foods and, in particular, gluten which is the protein from wheat and some other cereals and casein which is the protein derived from milk and dairy produce. Proteins consist of very long chains (thousands) of small units called amino-acids. These amino acids can be likened to letters in the way that they are built into chains (such as this paragraph). When a protein is digested it will be broken down into its constituent amino-acids but at some stage short chains of the amino-acids -known as peptides - occur. These are akin to the words which make up this paragraph.

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## A FEW INTERNATIONAL CONTACTS TO GET YOU STARTED.

It is worthwhile joining various international associations and thus obtaining their regular publications. Many organisations provide additional excellent resource centres.

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Autism Research Institute (USA)  
This institute is headed by Dr. Bernard Rimland, Ph.D. and is a most interesting resource centre. Dr Rimland focuses on a wide variety of treatment methods and is a great believer in dietary and vitamin therapy. The Institute's monthly journal "Autism Research International" makes for most thought provoking reading.  
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Some of these peptides have biological activity and, in particular opioid activity. That is, they can mimic the effects of substances, called endorphins, which have morphine-like (opioid) activity and occur naturally in the brain. It is hypothesised that these peptides cross from the intestines into the bloodstream. If they are present in the bloodstream, the majority will pass to the urine where we (and the others already named) find them. Some of these peptides will cross what is termed the blood brain barrier (BBB) and enter the Central Nervous System (CNS) (scientific jargon for brain and spinal cord). Once there, they can affect transmission in all the systems and so affect many aspects of normal functioning and development. These have been extensively described in the past (Shattock 1990 and 1991).

Peptides with opioid activity are produced when casein (casomorphins) or gluten (gluteomorphins) are digested. We all produce these substances, as they are the result of normal physiological processes. They should, however, be broken down further or excreted as such. Unless there is something abnormal in the intestines, they should not persist or be available for absorption into the bloodstream.

Our model (See figure 1.) is, therefore, based upon a metabolic abnormality or, perhaps, a series of such irregularities. It is best summarised by reference to Figure 1. In these diagrams, the small black spiders represent peptides with opioid activity.

Fig. 1a. It is accepted that we all have some peptides in our gastro-intestinal tract (Gut). In fact, it is impossible to envisage the breakdown of proteins into amino acids without passing through this interim stage. Schoolboy science taught us that only the individual amino acids would be absorbed through the gut wall but this is now known to be false. Peptides will pass through in lowish levels even where the gut wall is intact. The CNS is protected by a barrier, the blood brain barrier (BBB), which is partly chemical and partly physical. This is designed to prevent the entry of noxious substances from the blood but, once again, low levels of peptides can cross this barrier. This is all part of the normal physiological processes which are necessary for normal life.

If, as shown in Fig. 1b, there are much higher levels than normal of peptides in the gut, there will be much higher levels, which eventually reach the CNS. There could be many reasons for the levels being high. It could be that the peptidase enzymes are not functioning correctly because their levels are inherently too low; that the acidity in the gut is wrong or that the co-enzyme fractions (vitamins and minerals) are insufficient. Some parents and some professionals are aware of this and take a variety of steps to remediate the situation (see below)

Another reason for the increased levels of peptides in the CNS could be, as shown in Fig.1c, a greatly increased permeability of the intestinal wall. There could be many reasons for this and many of the unorthodox approaches, which parents employ, are based upon attempts to limit the leakiness of the gut. Controlling candidal and other parasitic infections would be useful. Correcting deficiencies in the sulphotransferase systems by adding Epsom Salts (Magnesium Sulphate) to the bathwater is also logical and is reported as being beneficial by many parents in spite of professional scepticism.

## SALICYLATES

Ever since the days of the Feingold Diets people have been aware that foods high in salicylates may be problematic for people with autism. Salicylates (such as aspirin) are used medicinally for their anti-inflammatory, antipyretic (temperature lowering) and anti-pain properties. These effects are achieved by blocking the actions of enzymes called COX1 and COX2. These enzymes, as well as causing the production of inflammatory and other responses, are necessary for the production of certain prostaglandins which are essential for the maintenance of intestinal integrity. Drugs such as aspirin which inhibit COX1 reactions will have serious effects on the intestines and lead to greatly enhanced permeability especially in susceptible individuals. Some parents find it advisable to avoid such foods as almonds and others which contain salicylates. For others, no such problems exist.

## FATTY ACIDS (FATS AND OILS)

There is a popular misconception that fats act as nothing more than storage systems for energy or as packing material. Only recently has it become acknowledged that fats have a very significant role in the metabolism and development of the body. There exists a clear need for a greater understanding of the role of fatty acid metabolism in the maintenance of membrane permeability throughout the body. There are intriguing data being produced but, as yet, there is no total consensus on which elements are of relevance and which are not.

At this point I hesitate to make definitive statements about which interventions are appropriate and I must suggest that those interested in the topic obtain advice elsewhere until the position clarifies. Although definitive evidence has yet to be presented, it would appear that there are abnormalities in the fatty acid content in the circulating bloodstream as well as in the bound forms and there is no agreement as to whether circulating levels accurately reflect the situation in membranes.

Many have extolled the benefits of flax seed oil; of cod liver oil; of olive leaf oil and many others but for a variety of reasons. Evidence is accumulating that any intervention should involve a balanced approach of (what are termed) omega 3 and omega 6 acids rather than gross overloading of one form. One element in which there does seem to be universal agreement is the use of Evening Primrose Oil. The benefits may be a consequence of its containing acids which are incorporated into the structure of those prostaglandins required to maintain intestinal integrity. (Even here, it is suggested that it should be avoided where there is a risk of epilepsy.)

## BLOOD BRAIN BARRIER

It is possible that appropriate balances in the intake of the fatty acids, described above, could help to maintain the integrity of the blood brain barrier but, as far as I am aware, there are no nutritional supplements designed specifically for this purpose.

## OTHER SUPPLEMENTS

There are a plethora of substances which whilst, strictly speaking, are not medicines in the legal sense of the word, do have actions which push the borders between what could be considered as Nutritional Supplements and sold accordingly.

Ginkgo (biloba) has been used extensively for its action in increasing blood flow and, therefore, the supply of oxygen to the brain.

Very high levels (500 - 1000mg/day) of Vitamin B6 (balanced by magnesium and other vitamins of the B group) are advocated and many claim benefits from such usage. There are theoretical risks involved and attempts have been made, in the US as well as the UK, to limit availability. However, I am unaware of anyone who has ever seen the deleterious effects described in the literature.

## CONCLUSIONS

Interventions involving manipulations in diet, in terms of avoiding certain components or taking dietary supplements are being increasingly used for autism spectrum disorders as well as many other conditions. Western cultures are geared very much towards the use of drugs, often synthetic and very potent, to give symptomatic relief for particular problems which interfere with the quality of life of the affected individual.

This approach is acceptable only up to a point. Parents and carers are becoming increasingly interested in the processes which may underlie the symptoms and, where possible, intervening and thereby minimising the presentation of the symptoms. For sure, the predisposition, the fragility, the seeds of the autism will remain but by minimising the triggering factors amelioration of the problems is possible.

Many interventions are advocated and, at first sight, they would appear, especially to the non-interested professional, to be a ragbag of ideas without substance. The majority of these interventions have been discovered through empirical means but as a result of serendipity and investigative common-sense mechanisms which are reasonable, logical and justifiable, have been established. These interventions do integrate and can be utilised to form individualised plans for each individual. They offer the clinician opportunities for intervention which hold promise and/or which supportive evidence is accumulating. Professionals who do not consider such interventions are in danger of missing the boat.

## RECIPES



### BASIC TOMATO SAUCE

12 large ripe tomatoes, skinned and chopped  
2 green peppers, seeded  
2 onions, chopped  
6 sticks of celery, chopped  
2 tablespoons chopped fresh or frozen parsley  
2 tablespoons chopped fresh or frozen basil  
2 cloves of garlic, finely chopped.



Combine all the ingredients in a saucepan and bring to the boil and simmer uncovered for 45 minutes and then puree in a food processor. Refrigerate overnight before using as this improves the flavour. The sauce may be frozen for future use

### EASY-PEASY CHOCOLATE BROWNIE MUFFINS

90 g/3 oz PURE Sunflower  
250g/8oz light brown sugar  
60g/2oz cocoa powder  
3 medium eggs, beaten  
120g/4oz rice flour  
5g/1tsp baking powder  
90g/3oz ground almonds



Pre-heat the oven to 180° '3fC, 350° '3fF, Gas Mark 4. Gently cream the PURE and sugar with wooden spoon until fluffy. Sieve rice flour, baking powder and ground almonds on to a plate. Mix 100 ml boiling water with cocoa powder in a bowl. Add to the PURE and sugar mixture. Beat the eggs and add to the mixture together with the dry ingredients to give a dark batter -like mixture.

Put muffin cases into a muffin tin and divide the mixture between the cases.

Bake for 30 minutes. Cool for 10 minutes. Remove from the tray. Leave to cool on a wire rack. Sieve icing sugar over the muffins.

in decreased secretion of bile from the gall bladder and biliary tract into the intestines. This could, once again, result in low uptake of certain vitamins and other nutrients from the intestines; reduced activity of gastrin in the stomach (and subsequent reduced secretion of stomach acid, mucus and pepsin in the stomach (and perhaps reduced production of secretin further downstream).

Perhaps of even greater importance is the effect on intestinal permeability. The intestines are lined with a slimy layer of mucoproteins. This layer, as well as containing important immunoglobulins (specifically of the IgA class), provide lubrication and protection for the intestinal wall as food passes down the alimentary canal. These mucoproteins must be sulphated if they are to be continuous, protective and effective. If they are not sulphated, the proteins clump together and leave exposed intestinal material and so the transport of peptides into the tissues will be encouraged.

It would seem that this sub-optimality of sulphotransferase activity is a function of low plasma sulphate levels rather than of deficits in the actual enzyme. Thus, any foodstuff which requires or uses up sulphate ions during its metabolism, will make the situation worse. These foodstuffs will include apple juice, citrus fruit juices, chocolate and paracetamol. In fact, any chemicals with a high proportion of phenolic groupings will have this effect and enhance the problems referred to above. Many colouring materials, whether of natural or synthetic origin, possess phenolic groupings. For this reason, some practitioners recommend the removal of all pigmented foods from the diet.

There are those in whom these foodstuffs, including paracetamol, seem to make no difference at all but there are individuals who would be well advised to avoid such products.

The role of sulphation may well be one of the pivotal factors in the causation of autism yet it is poorly understood and has received scant attention. The role of sulphate in the immune system, in the effectiveness of hormones and in maintaining the integrity of intestinal function, kidney function and detoxification systems is deserving of much greater attention than it currently receives. Susan Owens (yet another parent) has drawn the attention to the importance of sulphation issues in chemical bodies called GAGs which have huge implications for many functions including brain development.

Sulphate ions are but poorly absorbed from foodstuffs but may well be absorbed through the skin. That is the rationale for the use of a cupful of Epsom Salts (Magnesium Sulphate) in the bathwater of children with autism. Alternatively, MSM may be given orally in an attempt to elevate blood sulphate levels. Efficacy has not, however, been demonstrated.