Chapter 8 The Digestive System- exploring a forgotten continent

Contents

There is such a thing as food and such a thing as poison. But the damage done by those who pass off poison as food is far less than that done by those who generation after generation convince people that food is poison. **Paul Goodman**

Holistic Nutrition

Our essential nutrients are:

- Oxygen
- Water
- Food (carbohydrates, fats, protein, fibre, vitamins, minerals and wild food – see below for more about this component)
- Love
- Light
- Connecting with nature
- Sensory stimulation – sound, sight, smell, taste, touch, good electromagnetic radiation and others

With each nutrient, too little leads to illness or death; too much will also lead to illness or death. We all die eventually but it has been mooted by one doctor that the human body should be capable of lasting 150 years – he thinks that the primary cause of shorter life spans is grief and loss or, rather, how we deal with it. We can view illness as an opportunity, as our bodies/ourselves reminding us that perhaps our environment is not feeding us, we need to alter our internal or external environment.

For example, sunlight does not cause disease; we need it. However, if we spend most of our time without this nutrient and then gorge on it inappropriately health problems will occur. In traditional cultures people adapt their time outside to be in step with light radiation; the function of the siesta was in part to spend that time of day in the shade. There is evidence to suggest that light received by the eye causes an electron reaction similar to photosynthesis, which actually nourishes our organs. It has also been discovered that we have photoreceptors cells throughout various tissues in our bodies, including the pineal gland.

Sunlight enables us to photosynthesise vitamin D in our skin; taking Beta carotene helps protect the skin against light damage, protects against UV radiation (or even better eat plenty of carotenoid rich foods, including carrots and sweet peppers, and wild greens); plants use carotenoids as photosynthetic molecules for harvesting light and also to protect against excess UV radiation. Also, flavonoids, particularly anthocyanins, are produced to protect plants against UV radiation, as are certain essential oil constituents and other molecules. Perhaps this means that if one lives at high altitude one needs to eat the plants adapted to the local environment in order have a natural ability to deal with the high UV levels, and eat fresh too!! Research is beginning to be carried out into the benefits of containing plants that have adapted to protect themselves against excess radiation into the diet as a way of protecting ourselves. Edelweiss is used in sun protection creams; it is adapted to living at high altitudes in the Alps where UV radiation is higher than at sea level and it would appear that the compounds that it produces to protect itself also protect our skin when applied topically.

Another area that has been researched more fully is the value of including wild or hunter-gather foods in the diet. These are sometimes referred to as famine foods since they would have supplemented the diet at lean times of the year. Our ancestors would have made use of a far wider range of foodstuffs than those we limit ourselves to these days. They would have used 'wild herbs' as part of their diet. More traditional cultures continue to do this, it is likely that part of the health-giving benefits of the Mediterranean diet is to do with the wider range of plant foods and wild greens used, often in much larger quantities, as well as the olive oil, tomatoes and fish. We have vestiges of this practice in dishes such as nettle soup. Ironically, wild foods are now gaining a certain gourmet caché, so one might find dandelion leaves, chickweed, samphire and others on the menus of elite restaurants. Research is beginning to suggest that hunter-gather elements in the diet can be of great benefit. People following such a diet are eating local food (exposed to the same environmental factors), in season. The food tends to be very fresh, or preserved naturally by drying, or fermenting/pickling (we will explore the value of fermented foods later on). However, what is also emerging is the benefit of the micronutrients in these foods. These include chemicals that can be toxic in large amounts, but in small amounts stimulate the immune system into healthy function. The diet contains small amounts of a wider range of foods – no more 'broccoli is the good green, or eat lots of carrots'. Instead, one would graze on small amounts of what is in season getting a huge variety of

information through the diet. Many of the substances in these plants have medicinal benefits, plenty of anti-oxidants, anti-inflammatories, different fibres that slow down simple sugar and saturated fat absorption and reduce cholesterol, plant proteins, prebiotics that encourage a healthy gut flora, immuno-modulators and much more. It is also apparent that local game or domestic animals that have grazed on a wide range of foods and got plenty of exercise have a better fat profile in their meat, less saturated fats, more omega 3 fats.

By following the foods in season there can be many benefits, for example:

Tomatoes contain lycopene which protects against sunburn and they ripen during the sunniest part of the year. Elderberries are produced at a time of year when our immune systems need a bit of a boost. Elderflowers are produced around the hay fever season. Nettles are a timely spring tonic along with other emerging greens such as chickweed, bitter cress, dock leaves and ramsons. The staple root crops that traditionally nourish us through the winter are a valuable source of inulin, a polysaccharide which is hugely beneficial for our immune system, and our bones (at a time of lower vitamin D synthesis); the lists could go on forever. Researchers started to look at the implications of ingesting higher quantities of micronutrients in the diet in the early part of this century. They noted that primates, such as chimps, ingest huge quantities of plant food which meant a higher level of dietary intake of substances such as vitamin C, and other vitamins, and of specific minerals that are concentrated in a plant rich diet. They started to ask the question whether this was 'simply a non-functional, unavoidable by-product of their... diet, or whether they might actually be serving important as yet undetermined immunological or other beneficial function' . We are beginning to learn that animals are actually quite sentient and intelligent about how and what they eat. It has also been shown that some female primates adjust their diet according to whether they wish to be fertile or not; this is something human females used to do too.

Researchers have noted that, when following a traditional lifestyle, the Masai get about two-thirds of their daily calorie intake from milk and meat products. However, they are nomadic pastoralists who get plenty of exercise when following their herds. They also supplement their diet with wild plant foods which make up a third of their diet. Additionally, their cattle are feeding on wild food rather than monoculture grass, or processed food. Many of the wild foods contain valuable micronutrients, including vitamins and minerals. When they follow this

lifestyle, the Masaai are not prone to 'Western' diseases such as heart problems which are prominent in Westerners eating a meat rich diet. There could be several factors involved here; firstly, they supplement their diets with the forest foods – a big one, secondly they are not sedentary, thirdly their animals are not factory reared, fourthly, both the people and the animals are spending all their time in nature, it is their home. As urbanization occurs and they move from their traditional way of life they tend to start to develop more and more Western diseases. A similar situation has been seen with middle-aged Asian men. The development of late-onset diabetes becomes greater as these people move towards western diets. However, if they are given dietary and lifestyle counselling to remind them of their traditional ways their symptoms disappear within 6 weeks without recourse to medication – the disease disappears.

Grivetti and Ogle wrote a fascinating paper entitled Value of traditional macro- and micronutrient needs: the wild plant connections (well I did not claim the title was good, just the content). In it they discuss how edible wild foods have been known to be valuable since antiquity; as medicinal plants have. They make the point that it is only recently that people have started research them; also a bit like medicinal plants. There is little profit in such exercises. They also point out how such investigations are cross-disciplinary and there has not been sufficient communications between the different faculties, does this all sound very familiar? We need communication between different disciplines, between the members of the ecosystem in order to be healthy and get a comprehensive story or view of any issue. They state that there is a lack of adequate data bases which limits the educational efforts in using these plants to improve dietary health in developing regions; so we go in and destroy their verbal lore, the traditional data bases and then throw our hands up. We do not put money into recovering the information for those we have stamped it out from; there is no product at the end of it so who would fund such a thing? In our own fields some particularly delicious wild food plants are dismissed as weeds of agriculture; fat hen and the other chenopodiums are as good as, if not better than, spinach. These grow widely as 'weeds of agriculture' because they were once the crops raised by Neolithic peoples. Fat hen is our 'native quinoa' and was raised as both a leaf and a seed crop. The seeds of this plant and others such as nettle are full of most nourishing proteins, a great range of fatty acids vitamins and minerals; equal to, or surpassing, many of the imported super foods.

We have limited our food plants to around 30 out of a potential few hundred locally, and several thousand globally. New ones only reach the market if there is a profit potential; turn them into a functional food or nutriceutical product. If these are processed locally in the area of production, and the community that harvests them is ensured economic, environmental and social sustainability by allowing them to add value to the products, then this can be a good thing. However, if a multi-national rolls in and only asks for the wild harvested product, does not recognize any intellectual right of the indigenous community regarding their knowledge and therefore adequate payment then it amounts to theft; the technical term is bio-piracy. It is a more complex situation that this. If marketing the product de-stabilises a sustainable indigenous way of life then this is surely a crime.

We also need to remember that it is not all just about humans, we share these wild food plants with many other species. When we tie into this the potential for GMOs to decimate some of these wild food plants for consumption of all animals then it gets scary. In Mexico 240 traditional heritage varieties of maize were wiped out by GM pollen pollution drifting across the US border. Not only were these varieties lost, the peasant farmers lost their right to their land due to the patent rights of the multinational that owned the GM patents unless they had the money to pay the company back.

On immunological and other levels we can consider how eating the wilderness brings us in touch with our local environment, bringing meanings into our bodies, feeding the meanings to our gut brain so that we can make sense of where we are living and adjust our physiology accordingly. If we then return our physiological information into that environment (through the use of our excrement as manure, by walking barefoot on the earth, by working with the soil with our bare hands, by sucking seeds gently in our mouths before planting them) then it becomes a two way conversation with the plants adjusting to us and us likewise to them, an intriguing idea; truly reconnecting with the web. It is a conversation not a technique.

Which leads us neatly onto

The Gut Brain

In classical conventional Anatomy and physiology we are taught that the nervous system consists of the Central nervous system (the head brain and spinal cord), the cranial nerves, of which the vagus nerve is one, and the peripheral nerves. We are taught that the most dominant and important part of this system is the neo-cortex, which is conscious and in charge, the dictator, that receives information from the other parts and makes all the decisions. Although the neo-cortex does have a degree of veto it is not a complete one. We are taught that the gastrointestinal tract consists of the mouth, oesophagus, stomach, small intestine and large intestine; also the ancillary organs of the liver/gallbladder and pancreas. We are told that its function is to break down and absorb food and excrete the residual material (we also excrete through our kidneys, skin, lungs and eyes). Brief mention is also made of the gut flora, and their role in absorption and excretion. Conventional teaching does include the idea that the functions of the gut are controlled by the autonomic nervous system. But there's really a lot more going on, and a lot more connections to be made; so we are going to start into a small exploration of the lost continent, the whole amazing concept of the brain-enteric-gut-microbiota complex. We will explore it's hormonal, immunological and endocrine functions, it's connection to the HPA, the way the vagus nerve connects it to the horizontal cardiac axis. We will briefly visit it's interconnection to the skin (which is another under-explored continent) and finally tip into what relevance this has to how we understand our plant medicines and our food, and how we work with them. Of necessity this is going to be a bit of a lightening tour of some of the major attractions rather than a slow meander, but hopefully the brief glimpses will encourage you to take a more leisurely trip at a later date. More recent research has shown that our concept of what the guts do is severely restricted – they have an important role to play in our endocrine, nervous and immunological function, as well as digesting and absorbing and excreting on a physical level (and on other levels if we wish to take a more energetic approach). Also there is far more to the nervous system that we have been taught; the neo-cortex is not actually in charge (it brings decisions to consciousness if we allow it to, but how often do we act from other parts of ourselves??) we have at least 5 brains and each has it's own specific part to play in our being.

Sensing (Skin)

Thinking (Triune brain) Feeling (Heart)

Inuiting (Enteric brain)

Michael Gershon's book The Second Brain was the first popular publication that talked about the existence of the Enteric brain. It is not actually our second brain; in evolutionary terms the enteric brain was the first to evolve. The first nerves evolved in the guts; it's a complicated business to co-ordinate digestion, making sure enzymes, acid and all the other right things are secreted in the required quantities and that the entire incredibly long length of the gastrointestinal tract moves, churns and squeezes at the rate that allows food to be adequately digested, the nutrients to be absorbed and the unneeded portions excreted. So, nerves were involved to help co-ordinate all this activity. Then the reptilian part of the triune brain evolved, with the limbic system and neo-cortex getting added further along the way.

In embryological terms both brains (the ENS and the CNS) develop from the neural crest; this tissue divides as the embryo develops to form the two separate brains; as we know with tissues that have that embryonic connection, a close association continues into the fully developed human. The ENS is composed of about 100 million neurons and carries out autonomous function even if connections with the CNS are severed. However, the two brains are connected via both the sympathetic and parasympathetic branches of the autonomic nervous system, allowing information to flow in both directions between them – more of this later. In addition, the ENS has support cells for the neurons and ganglia that make them up and the ENS has a diffusion barrier similar to the blood-brain barrier to protect against infections and poisons. In a similar way to the two layers (white and grey matter) in the Triune brain, the ENS also has two layers; the mesenteric layer is found in the muscle layer of the gut wall and is involved in muscle function (peristalsis and so forth) and the submucosal plexus in the submucosa which is involved in controlling secretion. The ENS secretes and responds to neurotransmitters such as serotonin, acetylcholine, nitric oxide, dopamine and benzodiazepene-like substances; something like 95% of the body's serotonin is found in the gut. The serotonin produced in the gut cannot cross the blood brain barrier, only 5HTP (which converts to serotonin) can. Irritable bowel syndrome can also arise in part due to too much serotonin in the gut, especially the type where there is a predominance of diarrhoea. Serotonin in the guts may also play a role in osteoporosis and in some people with autism. However, there is evidence to suggest that a happy gut brain

will help the head brain to produce serotonin. The gastrointestinal tract also secretes hormones in the stomach, pancreas and small intestine; these help to control the functions of the digestive system, but many of them have also been shown to act as neurotransmitters and neuro-modulators in the CNS and peripheral nervous system. A brief aside to note that this also the case with our heart brain; it secretes neurotransmitters and hormones which affect nervous system function, especially enhancing parasympathetic tone when the heart is functioning healthily. The electromagnetic field of the enteric brain reads the information from foods and medicines and anything that we ingest in order to determine whether it is nourishing or toxic. Babies and children who put everything in their mouths are building up a library or database of information for the gut brain and the immune system. The two layers or networks of the gut brain use different neural pathways; the first analyses the electromagnetic information and uses dopamine as the main neurotransmitter, the second needs to calibrate with taste and then uses electromagnetic information and its main neurotransmitter is serotonin. The more children are encouraged, or allowed, to eat what they want the better body wisdom they develop. Bees have a very similar gut brain to humans; but then we know that there is a really close co-evolutionary connection between bees and humans.

Both the heart and the guts have a pacemaker. The gut pacemaker is the interstitial cells of Cajal which sends out rhythmic pulses in a similar way to the pacemaker in the heart. It is quite possible, indeed likely, that these two pacemakers can entrain and that heart coherence work can improve bowel function. The heart is a stronger neural and electromagnetic resonator so it is more likely that the heart will entrain the gut; however, extremely strong signals from the gut may disrupt the heart energy – there are always feedback mechanisms in the body.

It has also been discovered that diseases that affect the CNS are echoed in the gut. The amyloid plaques formed in Alzheimer's are found in both the brain and the gut; the Levvy bodies of Parkinson's are also found in both locations.

When we experience stress the ENS shuts down the digestive processes and initiates an inflammatory response. This allows energy to be temporarily diverted to running away or fighting; the inflammatory response prepares the immune system to heal any injury to the guts and to prevent infection in wounds. This system works well when stress is temporary; it works when stress is a short-term crisis that is dealt with and then a more parasympathetic/ heart/

cholinergic pattern would re-establish until the next emergency. Chronic, persistent stress, being stuck in the HPA apex or with a high RAS rate, means that digestion is continually delayed and that the GIT is permanently inflamed. This can lead to conditions such as Crohn's, colitis, IBS, indigestion, migraine, food intolerance and so forth. It can also lead to weight gain, type II diabetes, hyperlipidaemia and other conditions associated with the digestive system. Since information flows in both directions there can also be mental and emotional effects from constant physical gut irritation. If the gut lining is inflamed from exposure to antibiotics, heavy metals, foods that do not suit then there can be detrimental effects on mood and outlook; the guts can initiate thoughts, behaviours and emotions. This means that problems in the gut or a stressed ENS can lead to depression, anxiety, panic attacks, ADD or ADDH, Aspberger's, autism. By treating the gut (see below) the emotions and behaviours can move back towards balance.

Also, the ENS can trigger the fear, flight and fight response. One simple test for food sensitivities or intolerances can be to test the pulse rate after eating – if it becomes elevated then this indicates a sensitivity to the food. Elevated pulse rate is part of the adrenal response. This has huge implications as regards the types of food that we eat and the information it gives us about our environment. Since we are by nature part of Nature if we only eat synthetic, highly processed food then our guts will get alarmed. If we include local fresh and wild foods then our ENS gets the message that we are at home in the place we need to be, connected into the web. If a baby gets its food delivered through a silicon teat and then progresses to processed jars fed to them off a plastic spoon then what messages is it receiving about the world? Remember also that the buccal cavity is a highly enervated area and that eating is a tactile experience as well. This may give us some insight into why some foods are inflammatory whilst others are anti-inflammatory; inflammatory foods gives us messages that send us into the HPA fear, flight, fight response, anti-inflammatory foods feed the parasympathetic heart/cholinerginc axis which is involved with rest, repair, restore, relax , nurture and nourish.

The Microbiota

The GIT is inhabited by 10^3-10^4 microbes; this is about 10 times as many cells as there are human cells in our bodies. Those cells contain maybe 150 times as many genes as our genome.

There are probably about 1000 species in there and maybe 7000 strains. This ecosystem contains bacteria, mostly anaerobes, viruses, protozoa, archae and fungi. There may be a few worms too! Really it is very similar to a compost heap or a healthy soil ecosystem in its diversity. Compost needs a variable diet to nourish the soil well; we need variety too to feed our soil. In many traditional systems the guts are also deemed to be the place where we process or store emotional and psychic material for recycling. There are organisms living in the entire length of our GIT from the buccal cavity to the anus. Little is known about those in the small intestine due to the logistics of sampling this area. The gut flora have much in common with the soil microflora, they are quite closely related. The colonization of the gut starts in infancy when delivery exposes the baby to the complex microflora after 9 months in the womb (although the placenta has a microbiome too). The initial microbiota will have a maternal signature for obvious reasons; the baby may pick up microflora as it travels through the vagina if delivered naturally, but those delivered by caesarean will get microflora from skin contact. The un-weaned child has a relatively simple gut flora and it tends to be more individualized (one research team at UCC are now using baby faeces as the start material for growing probiotics.

As conventional medicine starts to understand the importance of a healthy gut flora another novel treatment approach that has been developed is to use faecal implants to treat conditions such as antibiotic resistant Clostridium infections in the gastrointestinal tract- the donor is usually someone living in the same household.

The population size and diversity of the gut flora community increases with environmental exposure and with a widening diet so that by the time the child is one the microbiome has become more complex and more similar to that of the adult. Environmental exposure to 'good dirt' is important for the development of the gut flora and also therefore the immune system. Fermented foods have been shown to help balance the gut flora – this includes products such as sauerkraut,kimchi, kvaas, yogurt, kefir, live vinegar, soya sauce, tofu and miso. These were traditionally produced in each home or at least on a local level. Thus, the fermentation process and organisms were adapted to the same environment as those eating the fermented products thus adapting the gut flora to the local environment. Now these products are often procured in large factories with everything being sterilized to conform to GMP and health and safety

requirements for the food industry. Such products have been shown to be less beneficial as regards probiotic activity.

Many fermented foods are produced by lacto-fermentation in brine. Salt is an essential part of the process since it impedes the growth of all but the lacto-bacilli which are the organisms which preserve the food and also benefit our gut flora. This is why ruminants need salt blocks to lick in the winter so they have healthy gut fermentation. IT is also why we need salt in our diets when they are high in fibre. Salt is essential for good health and salt free diets are not good for our digestion or our mood and emotional health.

The Western diet which is high in processed foods, especially refined sugars and carbohydrates and food additives may well have a huge effect on the development of this population. Although there is huge individuality in the gut flora there are certain population ranges that enhance health. Factors such as infection, disease, diet, stress and antibiotics can alter the gut flora but it will tend to revert to its keynote stable diversity once the distorting factor has subsided. As we move from young adult to elder there are also shifts in the gut flora – whether this is 'normal' or as a result of impacting factors is an interesting question. What can be said is that shifts in composition can contribute to adverse health in the older person.

The appendix is not a vestigial organ, it is actually a reservoir of gut flora. If we experience a digestive upset due to infection or food poisoning then the gut can re-colonise from this reserve population. Some hunter-gatherer populations living a traditional lifestyle in Africa shift their diets from virtually vegan at certain times of year to heavily meat based at other times; as this shift occurs their gut flora shift significantly to be compatible with the diet and this is possible because of the appendix containing these reserve populations.

We tend to hear about the fungal part of our gut flora only when it becomes a problem when it goes out of balance to become a 'pathogen' – in the form of candidiasis or of candida arising in other parts of the body. The candida organism is part of our healthy gut flora. However, when it forms and overgrowth this can become a problem and give rise to a number of symptoms. There is another way of looking at this – what if the candida only starts that overgrowth as an attempt to balance the environment in which it grows? Often, the overgrowth occurs in people who have large amounts of mercury in their systems from filings etc (reduce heavy metals and it

might drop?) or who have had large numbers of antibiotics killing off the bacteria (perhaps in this instance they are filling that niche left behind?), who are immune-compromised as a result of medication or disease – perhaps they are trying to supplement the intestinal immune function, or possibly to protect the lining of the gut from further damage, or to balance the pH. In addition they will feed off high levels of certain substances – if too much sugar or refined carbohydrate is taken in, they are trying to mop up the excess. In both CAM and orthodox approaches the stance taken has been to kill off the invader – a more holistic view would be to balance the environment to allow these valuable fungi to reduce their population down to a sustainable level. Under this approach one would look at the root cause – if heavy metal toxicity use organisms such as chlorella, blue green algae , spirulina, other seaweeds and medicinal mushrooms to remove these from the system; all algae and fungi which fill a similar niche in the larger ecosystem. Also, use medicine like Rumex, Arctium, Coriandrum to flush out the heavy metals. Bitters can help by stimulating the production of bile which is our natural gut flora balancer. Use seaweeds, and fibre rich foods such as stewed apple and herbs such as Ulmus, Althea radix as prebiotics to provide a good growing medium for healthy flora at the same time. Another valuable treatment is to introduce **Saccharomyces boulardii** , which although a yeast itself, reduces the levels of C. albicans in the body, by up to 90%. It does this by crowding out the candida by binding to the same sites in the intestinal wall; by excreting capric, caprylic and caproic acids which kill of Candia and inhbit its ability to adhere to the intestinal wall and form biofilms and also S. boulardii may decrease C. albicans in the liver, spleen and kidneys in systemic conditions as well as reduce inflammation. IF ther is candida overgrowth it is important to proceed with re-balancing the gut flora in a slow and steady manner since a large die off in one go will release toxins which can make one feel quite unwell. Slow and steady is best.

Worms are a really interesting one. Our culture tends to be revolted at the idea of having these 'parasites' as part of our intestinal fauna. However, researchers are discovering that a few of these guys can benefit our immune systems by reducing certain immune over reactions which cause atopic reactions (allergies) and autoimmune disease. Worms have been successfully used to treat conditions like Crohn's disease and even MS. The worms inhibit the action of Th17 cells and augment the activity of regulatory T cells which inhibit Th 1, Th2 and Th 17 cells; Th 17 cells are particularly implicated in inflammatory diseases. If we go back 50 years or so allergies

were relatively uncommon in the Western world, and worms were still enjoying a relatively good relationship with humans. As worms were eradicated allergies rose. In other parts of the world where worms are still relatively common the incidence of allergies is much lower. Also, people tend to live in a closer relationship with nature in general – is it the worms or the relationship? Well, the fact that using worms to treat Crohn's works shows that it is part of the picture.

Our gut flora are involved in our gut motility (the CNS, and ENS are also involved in this, it's complex – but then although we are very simple in some ways we are also complex). The composition of our gut flora will affect how well we maintain the barrier function of the epithelium of the GIT (we will explore how all this information can help us add layers of insight into the medicines the plants we work with give us). The healthier the gut flora the higher the turnover of epithelial cells; because the epithelial cells in all our organs and in our skin are from the same embryonic origin we start to see how important gut health is in treating any of the mucosa and our skin. TCM has made this link thousands of years ago by pairing the Lungs and Large Intestine meridians.

70% of our immune system is in our guts. There are cells in the small intestine that secrete a large variety of anti-microbial peptides but they will only do this if the microflora is complete. The microflora are also essential for the development of the gut-associated- lymphoid tissue; this tissue is important as regards IgA secretion and controlled inflammation (a healthy immune response) – a healthy microflora is needed for this expression and a few whip worms can help. An insufficient gut flora can lead to decreased plasma cells, decreased expression of activation markers on intestinal macrophages, decreased nitric oxide levels, decreased histamine levels in the small intestine. There will also be less and smaller Peyers patch follicles and mesenteric lymph nodes. But the good news is that re-colonisation will reverse this. Wildfood/herbs/ hunter-gather foods in the diet may well be very valuable in helping this, both in their role as prebiotics, but also due to the fact that they are from the same environment and therefore help remind us of our natural state. Also, there is a lot of information in these foods and many micronutrients which benefit our tissues but also the flora.

Absorption and digestion

The gut flora can optimize both the release of calories from oligosaccharides that our own digestive enzymes cannot breakdown; they can also modulate absorption. A healthy gut flora will metabolise dietary fibre into short chain fatty acids. If the gut flora is absent an animal will need a higher calorific intake to maintain their body weight and will be more prone to vitamin deficiencies especially vitamins B and K. We tend to think of thin nervy adrenal people as needing more calories because of burning off more but maybe all that adrenaline is having an adverse effect on their gut flora too. There are some really interesting possibilities with this information.

The Brain-gut-microbiota axis and neuroendocrinology

We saw earlier that neurological diseases such as Alzheimers and Parkinsons give rise to signs in the gut complex as well as the nervous system We also postulated that there is feedback in both directions. This means that the microflora may be involved in the regulation of neurological function, or more properly neuro-endocrine function via the vagus nerve connections and the HPA. The HPA is involved in the initiation of the adrenal stress response. In animals with a reduced or absent gut flora a mild stress produces an exaggerated release of corticosteroids and ACTH. Re-colonisation of the gut flora helped to normalize the response. It has also been suggested that healthy development of the gut flora in early life is necessary to ensure normal development of the HPA axis; early administration of antibiotics, high stress environments, inappropriate weaning, and indeed the more sterile birth rout of a Caesarian section may impede this; but we can always remediate this through appropriate probiotics, prebiotics and herbs. As it has been shown that treatment with probiotics will enable the stress response to normalize. Another possibility is that the gut flora are involved with pain perception since Lactobacillus strains can induce the expression of opiod and cannabinoid receptors in the intestinal epithelial cells and can mimic morphine in promoting analgesia. Both anxiety and memory dysfunction have been shown to be treatable by probiotics or other interventions via the gut microbiota. From this information we start to get a hint that some of our nervines and endocrine herbs may actually be feeding into this place as well as other parts of our organism.

In the same way the brain can alter the gut flora. The brain can induce the secretion of signalling molecules into the gut lumen which can affect gut motility, gut secretion and gut permeability. This causes a change in the gut environment which will in turn alter the population size and composition. Stress has also been shown to make the gut lining more permeable so that bacteria and antigens can cross into the mucosal layer and initiate an immune response that will alter the composition of the gut flora. Acute stress will induce changes in permeability, alter mast cell behaviour and induce high secretion of various substances involved in immune response- leaky gut. Adrenaline and noradrenaline have been shown to show an ability to promote the growth of *E. coli* strains (both benign and pathogenic). Prenatal stress and postnatal trauma such as maternal separation have been shown to have an effect too. We can start to realize that the gut flora and the whole complex can have a significant effect in many conditions from dementia to autism to IBS and beyond.

Connections with the vagus nerve (pneumogastric nerve or cranial nerve X)

So here is the next connection, the one that links the BGM axis, HPA axis and the heart/parasympathetic axis to make the vertical and horizontal cross axes.

We have all heard of the vagus nerve (so called because it is a vagrant, meandering vague entity – but you'd have to be to make all the connections this one does).

The vagus nerve is the major part of our parasympathetic nervous system; and 80-90% of its' fibres are concerned with taking information/messages **from** the viscera to the brain rather than the other way around. The head gets a lot of info from other places.

Secondly, this amazing nerve connects up various parts of us from our ears, to our lungs (this is why we cough when we clean out our ears with a cotton bud), to our heart to our intestines. They are all connected. The vagus nerve is a whole country in its own right so we can only do the edited highlights here. The one place it does not connect to is the adrenals.

The vagus nerve has a centre called which is stimulated by tastes so when we eat herbs and local wild food it is getting a lot of info about being in nature (all our brains prefer natural stimulation). It is probable that this stimulation does not just occur via the taste receptors on our tongues; there are similar receptors throughout our GIT and also in other places such as our respiratory system.

However, the point is that our head brain is connected to our heart brain, our heart brain is connected to our gut brain, our gut brain is connected to our gut flora and they are all in a conversation all the time.

This means is that pain, disease and/or stress in quite widely separated parts of the body can affect other regions. It also means is that we can utilize this knowledge to bring about amazing therapeutic effects with our plant medicines but also with some simple ways of activating the parasympathetic flow through the vagus nerve to treat for example IBS, colitis, sinusitis, neurogenic coughs, supraventricular tachycardia, atrial fibrillation, heartburn – the list is quite remarkable. A commonly reported symptom is a sensation of a lump in the throat accompanied by digestive disturbance; this is due to adrenal response in the nerves of the oesophagus giving a choking feeling – that's why CST and nervines will help to resolve this, as will herbs that work on vagal tone and parasympathetic balance.

So, we need to become aware of when we get gut responses, we need to listen to our guts and resolve any problems before ploughing on. We need to be aware of how happy guts feel.

The investigations of the gut could be expanded on much further and longer; a new factor that has come to light is that taste receptors do not just reside in the tongue, they are throughout the digestive tract (and in other locations I the body such as the respiratory tract; this explains why bitters such as Carduus can be effective even when taken in capsules). There are also taste receptors for substances other than salt, sweet, sour, bitter and unami, including ones for calcium and fatty acids. However, we will now move onto how this impinges on our relationship with our plant allies.

Re-Evaluating Our Diet

Wild, Local Foods Give Us Info To Feed Our Gut Brain.This facilitates a harmonisation with our habitat, our bioregion. They facilitate an entrainment of our gut flora with our locality and also our community; we have an individual microbiome but also a communal one.

Wild foods tend to have higher levels of omega 3 fats. As well as all the other benefits we know they have, Omega-3 fatty acid intake can boost mood and vagal tone, dampen nuclear factor-*k*B activation and responses to endotoxins, and modulate the magnitude of inflammatory responses to stressors.

Local probiotics, either home grown or at least community-produced, will have a different composition and therefore different therapeutic effect. More in tune with the local ecosystem therefore more beneficial. Research has shown that factory produced do not do the same thing.

Is sugar bad (this is a dualistic question which often means surface, reductionist approach is being taken)? Sugar feeds the neo-cortex since its primary food is glucose,that is what it needs to work so glucose is not bad, it is necessary**, but** there is a difference between glucose produced and released from whole food sources, especially those rich in fibre and glucose from refined sugar sources. When a food contains both sugar and complex carbohydrates/fibre it feeds both brains, plus the gut flora brain, and the heart brain. Equally, fibre needs to be in a whole food form since minerals, vitamins, micronutrients and glucose are needed too to use it effectively.

Fibre is pre-biotic, and also helps reduce rapid absorption of too much glucose and of too much cholesterol or saturated fat. Neither of these substances are bad – we produce cholesterol to repair our tissues, cholesterol in the CV is trying to repair damage, [the broken heart, the displaced cordial axis]. Circulating cholesterol is also trying to keep up with the demand for cholesterol- based hormones specifically cortisol and adrenaline when the system is under stress. Because these are survival hormones they will be produced before sex hormones etc. If we are

continually in over-dominance of HPA then there will be raised cholesterol and continual inflammation (that's another story – autoimmune disease, atopy, inflammatory diseases such as post viral syndrome, post lyme syndrome). We need to put back in place the Cordial axis, remember the importance of the feminine principle of nurture and dream, relax, restore, repair- a particular kind of strength).

The masculine principle (and the HPA) is not bad, that is a dualistic piece of nonsense; the masculine principle gives focused direct action – another kind of strength that balances that of the feminine principle. It is the over dominance of survival fear, of patriarchal dominator model that causes the wounds and sickness. Maturity recognizes the equal value of feminine and masculine principles.

In addition to the central digestive tube from the mouth down to the anus we have the additional digestive organs; the liver and gallbladder and the pancreas. In TCM the spleen and pancreas are paired together in one meridian. When we look at the digestive system from the point of view of the meridians the stomach and spleen/pancreas are both governed by the Earth element which responds to natural sweetness (not the empty sweetness of sugar, fruit and refined carbohydrates) and we will explore this below; the Small Intestine meridian is governed by Fire; the Liver and Gall bladder are governed by Wood, and the Large Intestine is governed by Metal. Immediately we can see the huge importance put on the digestive system in this system of energetics since Water is the only element which is not represented. However, there is a strong connection to the water meridians of kidney and bladder since they receive some of the waste products of digestion in order to release them from the body. Below are some small snap shots of the different areas; this is not a book on TCM but it can be helpful to incorporate some of these ideas and decide whether this energetic approach is one that will help our understanding and relationship with the herbs.

The Spleen/Pancreas and Stomach

The spleen/pancreas and stomach are associated with the Earth and our relationship with earth and nature. A craving for empty sweet foods can often indicated that we are too cerebral or that we have lost our connection to the earth. The pancreas is deeply involved in digesting the food adequately so that nutrients can be absorbed and circulated to the tissues to nourish them. In Western terms the pancreas releases pancreatic juices into the small intestine to help with this. In TCM spleen deficiency can give rise to under nourished tissues and lots of mucus due to improperly digested food.

The Small Intestine

is the main place of digestion according to both Western and TCM medicine. It's function is to digest, return the clear energy back to the spleen for circulation and pass water to the urinary system and liver for excretion. The meridian is considered to be the yang partner of the heart and therefore it can also be seen to be involved in the digestion of emotional energy. It is governed by Fire and therefore bitters can help to tonify the small intestine.

The Liver and Gall bladder

are associated with the Wood element. The gall bladder releases the bile produced in the Liver to help us digest fatty foods and helps us be decisive. The Liver is very much to do with digestion, manufacture and processing wastes. As well as helping break down waste products of digestion, it deals with our emotional waste as well. The Liver can become stagnant if it does not feel able to process all that is coming it. It can become overburdened with all the stresses of modern life. Liver cleansing can help to release this. The emotion associated with the Liver is anger or determination which is the energy to change the things we do not like but also to change our attitude to things when necessary. If we are not flexible like supple tree branches, if we are too rigid then it can lead to a build-up of rage and anger rather than positive energy for change.

The Large intestine

is governed by metal and therefore is helped by pungent herbs and foods, although too much can insult it. It needs sufficient moisture and does not like being too dried out. It is involved in water balance and also in waste excretion and can be strongly affected by emotions (well all our systems and meridians can be) and how we are dealing with grief in particular. A healthy Large Intestine is good at accepting change and challenges.

Classifications of herbs beneficial to the GIT

Although all herbs and foods can have a therapeutic effect on the guts there are some classes that are seen as having particularly useful benefits

Bitters

stimulate the production of bile in the liver and its release from the gall bladder. They can also stimulate the release of pancreatic juices. These two effects help to encourage healthy digestion and so bitters are traditionally taken before eating (eg vermouth, campari, suzé-all combinations of bitters, aromatics and alcohol) or after in the form of coffee, almonds, dark chocolate. Bitters also help to engage the enteric nervous system but some mechanism. In addition, they are cooling, clearing and help to drain stagnant energy in the body and move the circulation. We know that many bitters have a reputation as nervines and specifically for the treatment of depression. So *Gentiana lutea* contains xanthones (bitter substances which have been described as having an MAOI effect), but perhaps bitters act on the gut brain as well as the CNS to elicit these effects. Hepatics, cholagogues, choleretics

Arctium lappa, Artemisia sp., Azadiratchta indica, Berberis vulgaris et aquifolium, Calendula officinalis, Carbenia benedicta, Carduus marianus Coffea Arabica, Chicorium intybus, Citrus aurantium fructus, Commiphora molmol, Curcuma longa, Cyanara scolymus,Erythrea centaurium, Gentiana lutea,

Glychyrrhiza glabra, Humulus lupulus, Matricaria recutita Marrubium vulgare, Rumex crispus, Stachys betonica/officinalis, Taraxacum officinale, Theobroma cacao, Urtica dioica, Verbena officinalis Teasel

Mucilage rich

Mucilages act as demulcents, soothing inflammation in the gut wall. They also act as prebiotics for the development of a healthy gut flora. Mucopolysaccharides are aclass of mucilage's found particularly in roots, seaweeds and mushrooms that are particularly valuable as immunomodulants

Seaweeds, Althea officinalis, Avena sativa, Hordeum vulgare, Inula helenium, Malus sp.,, Plantago lanceolata,/major/psyllium, Pulmonaria officinalis, Tilia europea, Ulmus falva,

Aromatics, carminatives

Carminatives are plants rich in essential oils that relax, the guts so that they can absorb food and digest it more easily. Some probably also have a relaxing effect on the vagus nerve. They are often warming, encouraging the circulation to the guts to aid digestion.

Anethum graveolens, Angelica archangelica, Citrus aurantium and other species, Foeniculum vulgare, Humulus lupulus, Lavandula angustifolia, Matricaria recutita, Melissa officinalis, Mentha x piperita, Ocimum basilicum et sanctum,Origanum vulgare, Pimpinella anisum, Piper nigrum, Rosa damescena, Rosmarinus officinalis, Salvia sp., Thymus vulgaris, Tilia x europea, Zingiber officinale, Pinus, Curcuma, cumin, coriander, clove, Star Anise, Cinnamon, Cardamon.

Cyanogenic glycosides

work on the vagus nerve to relax the digestive system, heart and respiratory system

Prunus serotina, Achillea millefolium, Sambucus nigra

Spasmolytics/ antispasmodics

Citrus aurantium flos, Matricaria recutita, Mentha x piperitia, Valeriana officinalis, Viburnum opulus

Anti-inflammatories

mucilage rich and anthrocyanin rich and *Scutellaria baiacelensis,* resin herbs

Anthocyanin rich

Foods and medicine high in these constituents help repair collagen and nerve tissue amongst other things

Sambucus nigra fructus, Vaccinium myrtillus, Rosa Canina, Sour cherries, beetroot

Resins

are known to be anti-inflammatory and increase leucocytosis; by doing this in the GIT it would promote a more systemic reduction in inflammation, especially in the case of atopic reaction elicited by food and connected to leaky gut.

Boswellia sp, Commiphora species, Curcuma longa

Sour astringents

Hibiscus flos, most summer berries, lemon, rosehips, sumac, pomegranate, gooseberry, blackcurrant, rhubarb, sorrel, barberries

Astringents

help to heal mucus membranes in the gut

Agrimonia,Achillea millefolium, Alchemilla vulgaris, Cameillia sinensis, Cinnamomum zeylanicum/verum, Mentha x piperita, Rubus idaeus

Anthroquinones

are irritant laxatives, they stimulate peristalsis in the gut. They are not suitable for spasmodic constipation and need the present of bile to work properly so a bitter needs to be included in the formula. A carminative is also usually included to prevent cramping

Rheum, Rhamnus, Rumex Senna

Serotonin

Urtica dioica and tryptophan rich foods

Saponins

– *Glycyrrhiza*

Vulneraries

Repairing the gut wall gives a better sense of integrity and restores boundaries eg

Calendula, Filipendula, Achillea, Camellia, Cinnamomum, Mentha, Alchemilla, Rubus

Essential fatty acids

Walnuts, Hemp seed , flax seed, blackcurrant seed, oil raspberry seed oil, borage/starflower oil, rosehip oil and also evening primrose oil

Immune modulants

are herbs and foods that help balance and enhance immune function. There are many classes of immunomodulants and since 70% of our immune function is down to our gut flora most herbs that enhance gut health are immune modulant.

Glucosilinates

are the mustard oils. They are immunomodulant and stimulate digestion in small doses. In larger doses they can be emetic.

Brassica sp., Armoracia rusticana, Capsella bursa-pastoris

Juniper can help raise low levels of stomach acid. Acorus can raise or lower them depending on the dose.

GERD or GORD can give a huge range of symptoms from burping, heart burn and acid burning to ear ache, sore throats and other symptoms if the acid reflux is silent. However, low stomach acid can give similar symptoms. To test whether the symptoms are due to raised or low stomach acid levels (since the symptoms can be the same for both) dissolve a ½ teaspoon of bicarb of soda in water and sip. If within 10 minutes you are burping lots then acid is high. No burping means acid is too low to digest properly.

Tuning into the Guts, the forgotten continent

For many people their abdominal region is a forgotten continent, a place never visited, the route to listening to this most fundamentally important brain forgotten. It is a place of wonders and may hold some very friendly demons who can help us negotiate the world.

So, in the same way that we have connected with the heart and with the breath we can take time to listen to the stories of our guts.

Take time to ground yourself as we have with each exercise. Remember that for the journey to the guts it is especially important to be grounded as this is our place of internal composting and the places of our roots. Ground and centre yourself with some deep breaths. Let the tension flow out of the body. Remind yourself on the image of the surface that one is sitting on is the supportive, protective, loving hands of the Earth.

Then breathe through your heart since this is the first place to visit on the journey to the guts back to our centre of entrainment. From that place we can reach down into the guts with a translator if it is a forgotten region. Remember to approach this from that pure innocent child energy we have explored and remember that the guts are. truly a region of gestalt so the inner child is a great ally. Now bring your focus into your abdomen. Listen to the tissues of the belly, the stomach, the small intestines, the bowel. How do they feel, are they relaxed or constricted or asleep? Are they toned or tense? How are your gut flora, are they a happy balanced ecosystem or do they need something from you- more water, more fibre, more appreciation, some massage, some bitters or aromatic teas? Are the bowels holding onto old emotional junk or physical junk? Take time to listen and tune in. You may find the guts responding by relaxing and releasing wind or gurgling loudly, that is fine. The guts may decide they need to release other things too. A great time to do this exercise is between 5 and 7 am which is the time of day for the Large Intestine meridian and this can help to establish a healthy bowel motion first thing in the morning. Anyhow, once you have finished talking to the guts thank them. Remember to thank them for the work they do before and after your meals too if you feel like it, or if they seem to want that.

Anti-Inflammatory foods and life style

Many of the conditions that afflict us in the modern urbanized and industrialized world have inflammation as a root cause. Inflammation may be triggered by many causes; atopy or allergic responses to substances external to ourselves (hayfever, eczema, dermatitis and so forth), auto-immune diseases where our bodies fail to recognize our own tissues as self (Graves disease, rheumatoid arthritis, Crohn's disease, and so forth), reactive conditions caused by an initial inflammatory response to infection (Lymes, reactive arthritis, Post viral syndrome, and many

more). Stress induced inflammatory diseases (elevated cholesterol, heart disease etc.), post injury syndromes such as whiplash etc.; the list is endless.

The signs of inflammation are: **Heat Swelling Pain Redness Loss of function**

If the inflammation is on the surface of the body then these signs may be visible; if the inflammation is internal then the signs may not be visible. When inflammation occurs it is part of the body's attempt to heal itself, the first response of the immune system to infection or irritation; in this healing process the body may produce elevated levels of cholesterol to aid with tissue repair. Thus, raised cholesterol is a sign that the body is dealing with stress and inflammation. Therefore, the answer is not to switch off this response with medication rather to use means that help reduce the inflammatory response because healing is occurring. Note that immune responses are significantly affected by our emotional and mental state, as are our hormone levels; the scientific study of this is called psychoneuroendocrinimmunology (PNEI).

There are no magic formulae here. Actually, there are magic formulae but the primary one is to take the time to feel into what will work for ourselves, take an individual approach to what will help to reverse that inflammatory response. By reducing factors that fuel the inflammatory response we can re-programme our bodies, re-programme our DNA, switch off the genes that cause that response, remind ourselves who we are, remember our native natural humanness and move towards a connectedness to our health.

In the Key Model Sean Collins describes a programme of clinically evidenced approaches, many others write about factors that can affect, effect these changes from a less evidence based, but nonetheless empirically proven perspective.

- The right kind of exercise – there is no perfect form of exercise for everyone; the type(s) that suit vary from person to person and may change at different times of their lives

- Therapies such as massage, shiatsu, acupuncture, reflexology, CranioSacral therapy, hydrotherapy

- Balanced sleep patterns

- Hydration (this one really is key)

- The right kind of mindfulness – meditation, prayer, a feeling that we are part of a community, knowing our life path, soul goals or whatever works for the person

- Finding a balance between work and recreation (how do we re-create ourselves?)

- And what we nourish ourselves with- spiritually, emotionally, mentally, physically. How do we relate to our nutrition?

To my mind, it is all about being in the Heart space, about finding how to be in the Parasympathetic **rest, relaxation, repair place** as our default mode of existence, rather than the Sympathetic fear, flight and fight place (which is supposed to be for emergencies only!). It is not about not feeling the fear, anger, grief, but how we deal with those emotions. It is possible to experience these emotions and elect to move into the parasymphathetic in order to ensure that we do not self destruct, literally. Once again, it is about finding the balance between these places. Many people spend most of their time in the Stress, Symapathetic mode, which will give a tendency towards inflammation in the body. More information about this in a separate article.

Lifestyle

Exercise can be a really beneficial part of reducing inflammation; this depends on the type of exercise and how we feel with doing it. It the depends on the environment in which we carry out the exercise and how we feel about that – a lot of this has to do with how we feel, or how does it sound to us, or how does it look?

Then we need to remember that we needs sufficient sleep in order to repair from the wear and tear of life. Sleep deprivation is one of the most effective torture techniques yet many people effectively do this to themselves all the time. The amount of sleep needed varies from person to person; it is generally accepted that 8-10 hours are necessary for the body to repair and to carry out the parts of hormone production and other biochemical processes. In some traditions it is thought that the timing of the sleep is also important, some Ayurvedic texts state that one needs to be asleep by 10 pm in order to restore properly! Another thing that has been researched is

that catnaps during the day can enable us to get by with a shorter stretch of sleep at night and can help with creativity, energy etc.

Hydration- it is generally accepted that the average adult will need to drink between 1.5-3 litres of water per day. Hydrated tissues are more flexible, sufficient water allows the kidneys to filter more efficiently and obviously the fluid will help to flush out metabolic by products and so forth. There is some disagreement about what actually hydrates us; some argue that only water will do it but this is obviously not the case. Someone taking smoothies, soups and other high fluid foods will get some hydration this way. It is generally accepted that tea and coffee do not give proper hydration due to their diuretic effect. Also, if the diet is high in processed foods, salt, sugar and other dehydrating factors then more water is needed.

Foods with anti-inflammatory effects

Funnily, enough they are the basic whole food principles with a couple of things that might surprise some people.

- Herbs and spices can be added to foods in quantity, both for flavour and because they have been shown to have significant anti-inflammatory properties; e.g. turmeric, ginger, cinnamon, oregano, thyme, rosemary, garlic, chilli, cocoa, licorice, mint, basil, tulsi, parsley, fennel, cumin, coriander. Quite probably all herbs and spices have some anti-inflammatory effects.

- Omega 3 oils Oily Fish contain eicosapentaenoic and docosahexaenoic acids (omega-3 fatty acids) which have been shown in many studies to help to prevent heart disease, cancer, autoimmune diseases and support the health of the nervous system. This includes salmon, anchovies, mackerel, sardines, herring and tuna. Fish oil supplements can also be used. Eat wild fish rather than farmed fish which is treated liberally with antibiotics. Oily fish do not manufacture the fatty acids, they obtain them from the algae that they eat; thus, a person can obtain omega 3 oils by including algae (seaweeds), spirulina or chlorella) in the diet. Omega 3 oils are also food in walnuts, flaxseed, pumpkin seed, hemp seed, brazil nuts and olive oil.Alpha-linolenic acid, which the body

can convert to EPA and then to DHA, is present in a far wider range of foods. However, various conditions appear to reduce the body's ability to convert ALA to EPA and DHA; therefore in some conditions it is necessary to ensure that EPA and DHA are in the diet. Also, the dietary balance between omega 6 and omega 3 oils is important; the ration should be 3-4: 1. Omega 6 fatty acids should not be consumed in excess amounts – these are found in large amounts in some of the polyunsaturated vegetable oils such as safflower, soybean, corn and sunflower. Such oils are unstable for cooking and are often refined rather than cold pressed. Extra virgin olive oil is high in polyphenols which protect the circulatory system and heart from inflammation. It also contains monounsaturated fats which are anti-inflammatory and help to balance HDL and LDL cholesterol. It is reasonably stable for cooking with. Avocado oil is also good and apparently even more stable for cooking with. Almonds also contain a particularly good fatty acid profile. The oil is not normally used to cook with but the nuts can be used in a wide range of dishes, whole or ground into a flour. Virgin coconut oil is also good and very stable for cooking with.

- To some extent all mushrooms have some anti-inflammatory properties since they contain a group of polysaccharides which are immune modulators and also contain fibre. Particularly beneficial are the following varieties: shiitake, maitake, enoki, oyster mushrooms. Get ones that are grown without pesticides.

- Papaya – contains papain which helps to reduce inflammation and improve digestion, particularly of protein. Pineapple contains a similar compound called bromelain which has been shown to be as effective as some NSAIDs.

- Berries high in anthocyanins – blueberries, blackberries, bilberries, raspberries, blackcurrants, cranberries, strawberries, goji berries, cherries (not a berry, but still good). Better to go for chemical free, organic, wild crafted or home grown to avoid the pesticides that are used in conventional growing. They contain anti-oxidants that are very beneficial for the micro-circulation and also for the lining of the gut. Beetroot is also high in anthocyanins.

- **Brassica** vegetables contain glucosilinates which are excellent immunmodulants in small quantities. If the thyroid is under active then large quantities of these vegetables are not a good idea since they suppress thyroid function.

- **Sweet potato** and other vegetables high in beta-carotene such as **pumpkins** and **squashes, carrots, red peppers** and leafy greens such as **spinach**. **Tomatoes** contain a carotenoid called lycopene; this has been shown to be particularly beneficial for the prostate, skin, colon, lungs, liver and adrenals-cooked tomatoes are more beneficial than raw ones.

- Fruit and vegetables are also rich in vitamin C which has been shown to be a powerful antioxidant, strengthens the immune system and helps to mop up free radicals. It has been shown to lower levels of C reactive protein, a marker for imflammation, so it reduces the inflammatory response. As well as other fruit and vegetables, kiwi, guava, lemon, lime are all good sources of vitamin C and other constituents.

- Apples and pears contain a combination of soluble fibre and polyphenols – it is better to eat them with their skins on. Citrus fruit also contain pectin- a soluble fibre but oranges should probably be avoided in acute inflammation.

- Citrus rinds, buckwheat contain rutin, a bioflavonoid which is particularly beneficial for the blood vessels. Onions contain another bioflavonoid, quercetin (also found in apples and tea)

- Beans and pulses, including green beans, contain many beneficial constituents such as soluble fibre. Although some authors say that they should be avoided in inflammation because they contain purines which break down to uric acid evidence shows that plants sources of purines do not seem to contribute towards acid and inflammation in the body. 1-2 portions of these foods in the diet per day would appear to have more benefits than side effects.

- Some people find that the nightshade family increase inflammation (though this may be more to do with the pesticides used than the plants themselves). If there is no sensitivity

then these plants can be extremely good anti-inflammatories- including the humble potato which can be both ingested and used externally in poultices.

- Seaweeds contain polysaccharides (complex carbohydrates) that have been shown to reduce inflammation, modulate the immune system (therefore can reduce infections and in some cases may be anti-tumorgenic) and anti-oxidant, helping to repair and prevent tissue damage. Seaweeds also contain fibre which will slow fat absorption, help with cholesterol levels and improve satiation (in other words they help you to feel full so that one is less likely to overeat). Examples are kombu, kelp, wakame, arame, dulse. In Ireland there are several companies harvesting and selling dried seaweeds which can be added to soups, stews, stir fries, or brown rice. Seaweeds should be unprocessed and harvested from unpolluted waters (a challenge in itself).Research on kelp nd other seaweeds such as kombu have shown that they contain fucoidan- a polysaccharide that is anti-inflammatory, anticarcinogenic (it may help to control liver and lung cancer), is anti-oxidative and promotes collagen synthesis. The fibre in seaweed helps to give a feeling of satiation, slows fat absorption and helps with weight balance.

- Green tea (and black tea)

- Wild foods; some fascinating research on the Masai and other indigenous people show that the low prevalence of 'Western" or inflammatory diseases is due to the fact that they include significant amounts of wild food plants in their diet. So, rather than feeding the dandelions, nettles, chickweed, bitter cress etc. etc. to the compost heap try including them in stir fries, salads and other dishes. Some wild plants are not edible – for a fairly comprehensive list of edible ones visit www.veriditashibernica.org and read the wild food article.

Foods to avoid in any thing other than small quantity include:

- Sugar- substitute agave or stevia which are both low GI sweeteners. Carob is also good. However, also try to educate the palette to recognize fruit and unrefined carbohydrates as sweet and to enjoy other flavours Learning to appreciate the bitter flavour helps reduce sweet cravings, and sour tastes help too.

- Dairy products – more particularly processed cow's milk. Organic milk products and those from goats, sheep seem to be less inflammatory and have a better fatty acid profile

- Refined grains- substitute whole grain alternatives, but make sure that they are not laced with sugar (this includes honey, which is essentially a form of sugar, although it has some benefits in therapeutic doses).

- Refined fats and trans fats, including vegetable oils that are not cold-pressed and unrefined

- Processed foods containing preservatives, including dried fruit with sulphur dioxide.

- Intensively reared red meat and farmed fish

Reducing body fat to a healthy level also helps. The fatty tissues of the body secrete hormones that aid in regulation of the immune system and regulation of inflammatory responses in the body. However, if the body fat is too low or too high then these hormones are not produced in healthy amounts. Three of the hormones produced in fatty tissue are leptin (controls appetite); resistin, increases insulin resistance; adiponectin, makes tissues more sensitive to insulin and therefore lowers blood sugar. In general, following an anti-inflammatory diet will automatically lead to a balancing of body weight and lean:fat ratio.

The emphasis should be eating plenty of fruit and vegetables with small amounts of flesh (only wild or organically reared/free range) and suitable amounts of complex carbohydrates (amounts depend on levels of physical activity). Taking sufficient water/ fluid is also a mainstay of this approach, as is including plenty of herbs and spices in the diet (helps to reduce sugar and salt cravings as well as the direct benefits of the plants themselves). Try to eat organic (or chemical free) and unprocessed food as much as possible.

However, do remember that relaxation and positive thinking is part of the anti-inflammatory lifestyle so if you break out occasionally, get caught out when traveling and need to eat things not on your list then enjoy it and revert to plan A after the lapse.

If these eating patterns are very different to the way that you are eating at present then do the change one step at a time. Start with getting hydration levels up and increasing fruit and vegetables; often these two steps will lead to a natural attrition of the more inflammatory elements of the diet. Another way of looking at this is to try to make the diet more alkaline. Alkalising diets contain foods that are broken down into more alkaline forms in the body; this means that some foods that appear acidic (e.g. lemon juice and cider vinegar) are actually alkalizing. In general the following foods are more acid forming:

Oranges, dairy products (although organic and goat and sheep milk products and yogurt are less so); Red meat, especially pig meat (wild game and free range meat is less so); Refined carbohydrates – sugar, honey, maple syrup, white flour, white rice, whole grains less so; Alcohol, although small amounts 1-3 units a day, can actually reduce inflammation; Fish, Nuts, Oxalate rich fruit and vegetables, Pulses

Thus, it can be seen that one would not follow an acid free diet, but the balance of acid/alkaline foods needs to be more in favour of the alkalizing foods. What determines the pH value is the end metabolites. Thus citric acid is converted to a base form of citrate by the body, and can be further alkalised to bicarbonate; this is also true of the acetic acid in live vinegars.

Barley and wheat grass are both particularly good alkalisers, but it is likely that all sprouted seeds and fresh forage foods have a similar action.

Recommended reading:

Recipes for Self Healing Daverick Leggett

In Defence of Food Michael Pollan

Prannie Rhatigan's Seaweed Kitchen

Sally Fallon Nourishing Traditions

Daphne Lambert Living Food. Fermenting http://www.greencuisinetrust.org

Brain–Gut–Microbe Communication in Health and Disease

Sue Grenham,1 Gerard Clarke,1,2 John F. Cryan,1,3 and Timothy G. Dinan1,2* *Frontiers in Physiology*