3

Supporting Detoxification

We are what we eat, drink, breathe, touch and can't eliminate.[1]

While there are many different definitions of detoxification, this chapter focuses on the process of 'biotransforming' potentially harmful molecules into metabolites that can be safely excreted.

Normal body processes produce myriad compounds (such as hormones, neurotransmitters and cytokines), all of which need to be safely deactivated and disposed of, once they have done their job. In addition, the food, drink and medications that we consume need to be detoxified, as do all the other molecules to which we are exposed on a daily basis. These include toxic metals, traffic pollution, bacteria, alcohol, cleaning chemicals and cigarette smoke, to name but a few (see Focus box 10.2 in Chapter 10). We are, each and every one of us, gradually accumulating hundreds of chemicals, as we go through life.[1]

The extent to which such toxicants (now commonly referred to as 'toxins') affect our health depends not only on our level of exposure but on how well our detoxification systems are functioning. Many organs are involved, the main ones being the liver, the gastro-intestinal mucosa, the skin, the lungs and the kidneys. These organs make use of various enzymes, transporters and elimination pathways to recognise and disable toxins. It is the liver that undertakes by far the greatest share of the work, through a process technically known as hepatic biotransformation (see Focus box 3.2).

For a fuller discussion of the sources of different types of toxins and the ways in which detoxification processes work, see Muller and Yeoh (2010).[2]

Some typical signs and symptoms of excessive toxic load

Symptoms are usually rather unspecific, so look for a cluster from the following:

- Headaches.

- Night sweats.
- Fatigue and sluggishness.
- Skin eruptions.
- Low mood and irritability.
- Poor cognition.
- Chemical, odour or pollution sensitivities, such as sneezing, wheezing, nasal drip and/or dermatitis.
- Adverse reactions to foods and/or food additives, such as sulphites (found in wine, salad bar food, dried fruit and many processed foods).
- Excessive recovery time required after anaesthesia.
- Bloating, excess wind and constipation.
- Chronic itching.

Various laboratory evaluations can be used to help identify a need for detoxification support:

- Tests to assess the level of toxic load. These include hair, urine and/or blood levels of toxic metals, porphyrins and xenobiotics.
- Tests assessing detoxification potential. These include challenges with drugs, such as aspirin and paracetamol; and measurements of urine and/or blood levels of essential detoxification nutrients, such as amino acids, B vitamins and glutathione. (Note that the challenge test can only be prescribed by a medic because it uses drugs.)
- Tests indicating liver function. These include levels of liver enzymes (alkaline phosphatase (ALP) and aspartate transaminase (AST)).

Abnormal levels of certain urinary organic acids (namely 2-methylhippurate, benzoate, hippurate, orotate, glucarate, alpha-hydroxybutyrate and/or pyroglutamate) can also indicate the functional effects of certain toxins, as well as the status of particular nutrients required for detoxification.[3]

What health conditions is a high toxic load linked to in the long term?

Toxicity leads to a range of physiological problems, such as oxidation (see Chapter 9) and inflammation (see Chapter 8), and is thought to contribute to many of today's degenerative diseases, such as:

- Cancer. Endocrine disrupting pollutants, for example (see Chapter 7), may increase the risk of oestrogen-driven breast cancers.[4] What's more, toxicants have been found to become more carcinogenic in cases where the detoxification enzymes are sub-optimal.[5] Studies indicate that phase 2 enzyme induction (see Focus box 3.2) reduces susceptibility to carcinogens.[6]
- Fibromyalgia, chronic fatigue syndrome, Parkinson's disease[7] and other neurodegenerative diseases.[8]
- Autoimmune diseases. Environmental toxins may be possible triggers for these conditions.[9] Mercury – for example, from dental amalgam – may be a risk factor for autoimmune thyroiditis in some individuals.[10] Poor oestrogen detoxification may increase disease activity in systemic lupus erythematosus (SLE).[11]
- Cardiovascular disease. Long-term exposure to inorganic arsenic, for example, has been found to contribute.[12]

Biomarkers of reduced detoxification capacity have also been found in autism.[13] It has even been hypothesised that exposure to toxins may disrupt human weight control systems[14] and that this may explain why some individuals appear not to respond to normally successful obesity interventions.[15]

Key nutritional interventions to consider

Overall aims

- Minimise toxins from foods and drinks.
- Ensure a good supply of antioxidants to help disable the free radicals produced from phase 1 biotransformation (see Focus box 3.2).
- Consume plant bioactives that support phase 2 conjugation (see Focus box 3.2).
- Get regular amino acids for the phase 2 conjugates, especially the sulphur amino acids methionine, cysteine and taurine.
- Get a good supply of B vitamins and other cofactor nutrients for the detoxification process.
- Optimise gastro-intestinal (GI) function. This may help to minimise the production of toxic gasses (from dysbiosis), prevent toxic molecules from translocating across the gut membrane into the bloodstream (from leaky gut) and promote regular elimination (constipation can lead to the reabsorption

of toxins). See Chapter 2 for more information on these and for GI dietary and lifestyle support.

What to eat and drink

- Eat organic or wild foods, where possible, to minimise exposure to pesticides, antibiotics, growth promoters and other drugs.
- Consume a wide range of brightly coloured fruits, vegetables, herbs and spices, for their important phytochemicals (see Chapter 9). Many of these reduce the activity of certain phase 1 enzymes and/or up-regulate the function of certain phase 2 enzymes, enabling toxicants to be more efficiently disabled. This ability to alter detoxification function is thought to be a key mechanism by which certain phytochemicals may reduce the risk of cancer.[16]

  Key foods in this respect are cruciferous vegetables (see Focus box 3.3),[17] pomegranate juice,[18] berries,[19] green tea,[20] coffee,[21] turmeric,[22] ginger,[23] onions and garlic,[23] a range of common culinary herbs, such as coriander (cilantro), dill, parsley, rosemary and mint,[23] citrus zest[24, 25, 26] and beetroot.[27, 28]

  The phytochemicals in these plants also act as antioxidants, which help to disable the 'free radicals' produced from phase 1 detoxification reactions (see Focus box 3.2). Chapter 9 has more information on antioxidant-rich foods.

Focus box 3.1 Should we be drinking coffee?

The detrimental effects of excessive caffeine intake are well known and can include dependency, gastric upset and disrupted sleep. But a substantial body of recent research indicates that in some cases the benefits of regular coffee consumption may outway the risks.

Caffeine enhances exercise endurance,[29, 30] mood and cognition[31, 32] and preliminary data indicates it may even reduce the risk of Alzheimer's disease[31, 32, 33] and Parkinson's disease.[31, 34]

Moreover, coffee is rich in polyphenols, the most well-researched being chlorogenic acid. Through their antioxidant activity, and their ability to modulate insulin sensitivity, intracellular signalling and other biochemical pathways, coffee polyphenols appear to reduce the risk of type 2 diabetes,[35, 36, 37] liver diseases,[38, 39] certain cancers and other age-related diseases[31] in a dose-dependent manner.

We believe that it is time to reassess our negative assumptions about coffee; and that the level and type of coffee consumption should be set according to your unique set of needs, including your individual caffeine threshold. Decaffeinated (organic) varieties would be a better option for those who are caffeine sensitive.

- Eat high-quality protein, as this contains sulphur amino acids required for the phase 2 pathways and for glutathione synthesis (see Focus box 3.2).[40] Good choices are lean organic or wild meat, game, poultry, fish and eggs. Vegetarian sources of sulphur amino acids are eggs, nuts, seeds, beans and pulses.
- These protein foods provide the range of B vitamins required as detoxification cofactors. Wholegrains are also good sources of some B vitamins. Gluten-free grains are preferable, due to gluten's negative effect on the gastro-intestinal mucous membrane (see Chapter 2).
- Olive oil or other monounsaturated fats (MUFAs) should be your main source of fat. Also add polyunsaturated fats (PUFAs) from oily fish, nuts, seeds and cold-pressed seed oils. MUFAs and PUFAs have been found to increase bile production,[41] which is helpful for excreting the toxic conjugates produced from the phase 2 enzyme system.
- For gut health, eat probiotic and prebiotic foods (see Chapter 2).
- It is also worth noting that an iron deficiency may affect the functioning of phase 1, as iron is a vital component of the cytochrome P450 enzymes.[42] The most bioavailable iron is haem iron from lean red meat, especially liver and the darker meat from game, poultry and oily fish, as well as eggs. Vegetarian iron, which is less bioavailable, is found in beans, pulses, dark green leafy vegetables and dried fruit. It is better absorbed when eaten with foods rich in vitamin C, such as fruit and raw or lightly cooked vegetables. (Note that some raw green leaves, such as spinach, beet greens, Swiss chard, okra and parsley, contain oxalic acid, which can impair mineral absorption in humans. Boiling and steaming reduces the oxalate load to some extent.[43])

What not *to eat and drink*

- Avoid alcohol, as it rapidly depletes glutathione stores in the liver. Alcohol's phase 1 metabolite acetaldehyde (which causes hangover symptoms) is far more toxic than alcohol itself and is linked to increased cancer risk.[44, 45] The World Cancer Research Fund recommends avoiding alcohol for cancer prevention.[46]
- Minimise your intake of well-done meat, which contains potentially carcinogenic heterocyclic amines and, if barbecued, polycyclic aromatic hyrdrocarbons (PAHs) (see Chapter 9). Keeping cooking temperatures to below 200°C/400°F, pre-microwaving meat prior to conventional cooking and eating high-fibre foods at the same meal, may help to prevent the activation of these toxic compounds.[4]

- Avoid damaged fats: *trans*-, oxidised or hydrogenated (see Chapter 4).
- Reduce the intake of saturated fat (full-fat dairy and fatty meat products). Excessive saturated fat may reduce bile acid production, leading to increased cholesterol[41] and less efficient excretion of toxins. See Chapter 4 for more on fats.
- Don't eat processed foods, as these can contain chemical additives, such as colourings, preservatives, sweeteners and other flavour enhancers, in addition to high levels of salt.
- Note that grapefruit interacts with many commonly used medications, including calcium channel blockers, statins and antihistamines.[47] Grapefruit bioflavonoids affect the activity of certain drug metabolising enzymes and transporters, thus altering the bioavailability of these and other drugs.[48] If you are taking medication you should ask your doctor about such potential interactions and in cases of doubt, grapefruit should be avoided.

How to eat

- Follow the general dietary guidelines in Chapter 1.
- Treat commercially marketed 'detoxification programmes' with caution. In particular, it can be counterproductive to fast for periods of more than 48 hours. During a lengthy fast, as the body's storage of fat is broken down to release energy, toxins are released from the adipocytes into the bloodstream. This puts an additional burden on the detoxification pathways, which, in turn, require more amino acids from protein and a whole array of micronutrients (as seen) to function well. Thus, a nutrient-rich diet is crucial for optimal detoxification. Lack of these detoxification nutrients is a key cause of the headaches, nausea, skin eruptions, severe fatigue, low mood, slow cognition and irritability that are often experienced during a fast. (In addition, fasting can be extremely problematic for anyone with less than optimal blood glucose control.)

Lifestyle

- Reduce your exposure to environmental pollutants in the home, at work and when out of doors. For more information see Focus box 10.2 and the free access article from Crinnion (2010).[49]
- If you need to lose weight, do it gradually, so as to temper the rate at which any stored toxins are released from adipocytes into the bloodstream.

- Reduce or avoid smoking and recreational drugs. As nicotine is so strongly addictive, many people find hypnotherapy and/or psychotherapy helpful.
- Discuss with your doctor the extent to which it may be possible to reduce your intake of medical drugs.
- Pay attention to oral hygiene, brushing and flossing correctly twice a day. Have regular dental check-ups and professional cleans – agree the frequency with your dentist.
- Make sure you are physically active on a daily basis. For example, aim to walk five miles a day. Sweating, from exercise, saunas and infrared saunas and/or steam baths, can promote toxin elimination through the skin.
- Try not to use cling film or tin foil – switch to baking parchment. Use glass storage, rather than plastic. Switch to glass, iron or ceramic cookware, rather than non-stick, aluminium or stainless steel. Use glass or china in the microwave, rather than plastic.

Focus box 3.2 Hepatic biotransformation – what's actually going on?

Your liver detoxification capacity depends on your genetic inheritance, as well as your age, gender, diet and lifestyle.

Genetic inheritance is important because the liver is highly 'polymorphic'. In other words, there are wide genetic variations in liver enzyme function, meaning that individuals metabolise molecules at very different rates. Hence, for example, some people are more affected by caffeine than others. Similarly, certain compounds in well-cooked meat are more carcinogenic in people with particular genetic polymorphisms in their phase 2 'glucuronic acid' pathway (see below).[4]

There are two phases of hepatic biotransformation. In simple terms, their role is to transform a fat-soluble compound into a water-soluble compound, attaching it to another molecule (a 'conjugate'), so that it can be safely excreted. Without this process, fat-soluble toxins remain in the body and are generally stored in fatty tissue. (But note that not all toxins are fat-soluble – thus, not all require both phases in order to be eliminated.)

The enzymes in phase 1 start the process. The most common phase 1 enzymes are known as the cytochrome P450 family, or CYP enzymes. They use either oxidation, reduction or hydrolysis to form a reactive site on the toxic molecule. This can make the toxin more potentially dangerous than it was prior to entering phase 1 and it therefore needs to be swiftly taken up by the phase 2 system. Enzymes in phase 2 add a water-soluble conjugate to the reactive site, enabling the toxin to be excreted in the bile or urine. The main conjugates are sulphate, glutathione, glycine, glucuronide and acetyl and methyl groups; they require dietary amino acids in order to remain in good supply.

Note that there are also support systems to phases 1 and 2, such as the 'anti-porter' system and the metallothioneins. In the anti-porter system, sometimes referred to as 'phase 3 detoxification', special transporters pump toxins out of the cell. The metallothioneins bind toxic metals to transfer them out of the cell.

Phase 1 is generally up-regulated by exposure to toxins (although there are exceptions). However, if phase 1 starts working faster than phase 2, phase 2 may become unable to ring-fence all the activated metabolites from phase 1, and this could result in an increased toxic load. Reactive oxygen species produced during phase 1 can cause tissue damage, leading to degenerative diseases (see Chapter 9). Thus, the aim should be to optimise both phases 1 and 2.[1, 50, 51]

A useful graphic illustrating the process can be found in Liska, Lyon and Jones (2005, p.278).[50]

Focus box 3.3 Cruciferous vegetables

Cruciferous vegetables are particularly important components of a detoxification diet. Key vegetables to include are broccoli (especially broccoli sprouts), cauliflower, kale, watercress, rocket (arugula), cabbage, turnips, Brussels sprouts, turnips, radish, pak choi, spring greens, collard greens, Chinese cabbage, daikon and kohlrabi.

Large population studies suggest that eating cruciferous vegetables may be more effective than other fruits and vegetables at reducing cancer risk.[5, 52] These vegetables contain glucosinolates, which are converted to isothiocyanates, including sulforaphane, through the processes of chopping, chewing and being acted upon by gut flora.[5, 52]

The isothiocyanates are able to down-regulate phase 1 enzymes (preventing excessive production of toxic intermediates), and induce certain phase 2 enzymes.[52] In turn, these phytochemicals have been found to reduce susceptibility to carcinogens[5] and reduce cellular levels of toxic metals, such as arsenic[53] and mercury.[54]

Sulforaphane has also been shown to influence other processes involved in cancer growth, namely inducing cancer cell apoptosis, suppressing cell cycle progression and inhibiting angiogenesis and inflammation.[55] In addition, another active component of broccoli, indole-3-carbinol, may offer protection from cardiovascular and neurodegenerative disease.[56]

November 2011 saw the launch of a new 'superbroccoli', marketed as Beneforte.[57] Eating the superbroccoli has been found to result in 2–4 times the level of sulforaphane in the blood than when eating standard broccoli. This, in turn, enhances the glutathione S-transferase (GST) phase 2 liver detoxification enzyme, especially in individuals with a particular GST genetic variation (polymorphism).[52]

See the three-day meal plan for some ideas of how to incorporate more cruciferous vegetables into your daily diet, even as tasty between-meal snacks.

Three-day meal plan

Dishes and snacks in italics are supported by recipes in this chapter or other chapters as indicated.

Day 1

Breakfast: 2 eggs scrambled with a little coconut oil and mixed with wilted (very lightly steamed) chopped baby pak choi drizzled with a little *Supergreens Pesto* (Chapter 1)

Snack: *Green Herb Cleanser*

Lunch: *Apple and Borscht Soup* with an optional piece of lightly toasted *Buckwheat and Almond Bread* (Chapter 11). Optional dessert: *Green Tea Poached Pears*

Snack: 1 tbsp *Roasted Garlic and Bean Dip with Crudités*

Dinner: *Grilled Sardines with Salsa Verde*. Serve with a *Cauliflower Tahini Mash*: steam a head of cauliflower until tender. Place in a food processor with a little tahini and process to form a mash, seasoning it to taste

Day 2

Breakfast: *Supergreens Berry Smoothie*

Snack: Handful of raw, mixed nuts

Lunch: *Watercress and Celeriac Soup with Sprouted Seeds*, optional rice cake or gluten-free oat cake

Snack: *Baked Cauliflower with Curry Spices and Turmeric*: toss cauliflower florets in a little coconut oil, curry powder and turmeric; bake in the oven for 20–30 minutes at 180°C/350°F, gas mark 4, turning half way through (may be prepared in advance and eaten hot or cold)

Dinner: *Salmon Kedgeree* with a side of steamed broccoli and salad

Day 3

Breakfast: Porridge made with gluten-free oats, sugar-free almond or hemp milk and 1 tsp of ground sprouted flaxseed for extra fibre and essential fatty acids. Top with a handful of berries or pomegranate seeds. Or *Soaked Muesli*: place 3 tbsp porridge oats (oatmeal), and a handful each of nuts, seeds and dried fruit in a bowl and cover with a little apple juice and almond or hemp milk. Soak overnight in the fridge. Add chopped fruit and a spoonful of natural yoghurt to serve

Snack: *Alkaline Detox Broth* or fresh beetroot juice

Lunch: *Warm Artichoke and Feta Salad with Lemon Dressing*

Snack: *Tangy Kale Crisps* (Chapter 7)

Dinner: *Balsamic and Soy Marinated Veggies* served with mixed beans or shredded cooked chicken. Optional dessert: *Citrus Salad* with *Flaxseed and Almond Biscuits*

Drinks

- It is important to keep up fluid intake. Drinking water is best filtered if possible. Plumbed-in filters are preferable to jug filters, to minimise the likelihood of bacterial growth during storage.
- The *Alkaline Detox Broth* can be sipped throughout the day. Herbal teas include dandelion, milk thistle, lemon and ginger, nettle, chamomile, fennel, liquorice. Use aloe vera in water, coconut water, green vegetable juices and occasionally beetroot juice.

Recipes

Breakfast

Supergreens Berry Smoothie

A simple breakfast option or snack, this cleansing smoothie contains supergreen powder and probiotics to provide additional nutrients to support detoxification and gut health. (Note that this smoothie may not be suitable for individuals with GI dysbiosis – see Chapter 2.) A scoop of protein powder has been included to make it more substantial but this can be omitted if desired.

- SERVES 1

250ml/8fl oz/1 cup water or coconut water
Handful of raspberries or frozen berries
1 apple, cored and chopped
2 large handfuls of baby spinach or kale
1 scoop protein powder, vanilla or plain
1 tsp supergreen powder (optional)
1 tsp probiotic powder (optional)
1 tsp glutamine powder (optional)

Blend all the ingredients in a blender until smooth and creamy.

Best drunk immediately.

Nutritional information per serving
Calories 187kcal
Protein 12.8g
Carbohydrates 22.8g of which sugars 16.5g
Total fat 4.6g of which saturates 1g

Lunch

Apple and Borscht Soup

A lovely vibrant soup. Beetroots contain phytonutrients called betalains, including betanin and vulgaxanthin, which may provide antioxidant, anti-inflammatory and detoxification support. This wonderful combination of earthy beetroots and sweet apple is delicious served hot or cold.

▪ SERVES 4

1 tbsp coconut oil
1 tsp cumin seeds
1 onion, chopped
¼ red cabbage, chopped
2 eating apples, peeled, cored and chopped
4 medium-sized beetroots, washed and grated
660ml/23¼fl oz vegetable stock
1 star anise
Sea salt and pepper
Lemon juice or apple cider vinegar

Melt the coconut oil in a large pan over medium heat. Add the cumin seeds and onion and sauté for 1–2 minutes.

Add the cabbage, apple and beetroot and sauté for 5 minutes until the vegetables start to soften.

Pour in the stock, add the star anise and bring to the boil. Cover and simmer for 10 minutes.

Remove the star anise and purée the soup with a hand-held blender until smooth. Add a little water to thin if needed.

Season to taste; add a little lemon juice or apple cider vinegar to taste.

Nutritional information per serving
Calories 61kcal
Protein 1.6g
Carbohydrates 8g of which sugars 7.4g
Total fat 2.8g of which saturates 2g

Watercress and Celeriac Soup with Sprouted Seeds

Watercress, like other cruciferous vegetables, contains sulphur compounds to assist liver function and the production of glutathione. This delicious soup is rich and creamy, with the addition of celeriac, and contains soluble fibre, useful for supporting elimination. Adding the watercress at the end of the cooking time helps preserve its nutrients and creates a wonderful vibrant green soup. Top with broccoli sprouts for an additional supply of glucosinolates. Accompany with oat cakes or gluten-free bread if desired.

▪ SERVES 4

1 tbsp coconut oil
1 onion, roughly chopped
1 garlic clove, crushed
275g/9¾oz celeriac, peeled and chopped
550ml/1 pint vegetable or chicken stock
200g/7oz watercress, roughly chopped
Sea salt and freshly ground black pepper
Handful of broccoli sprouts

Heat a frying pan and melt the coconut oil. Sauté the onion and garlic until softened, about 2–3 minutes.

Add the celeriac to the pan and stir to coat in the oil. Pour over the stock and bring to the boil.

Reduce the heat and simmer for 15 minutes, until the celeriac is just tender.

Add the watercress and simmer for a further minute.

Purée the soup with a hand blender or in a jug blender until smooth and creamy.

Return the soup to the pan and season with sea salt and freshly ground black pepper, to taste.

Top with broccoli sprouts to serve.

Nutritional information per serving
Calories 83kcal
Protein 3.1g
Carbohydrates 4.8g of which sugars 3.5g
Total fat 5.6g of which saturates 4g

Warm Artichoke and Feta Salad with Lemon Dressing

Globe artichokes have traditionally been used to support liver function. They increase bile flow from the liver to the gallbladder, aiding the digestion of fats, and are also a good source of soluble fibre. Anecdotally, artichoke is thought to help protect the liver from the occasional overindulgence in alcohol. Baby artichokes are widely available and are the easiest to use, as their undeveloped chokes require minimal preparation. If you are short of time, you could substitute fresh artichokes with those marinated in olive oil. This delicious Mediterranean-style salad includes bitter greens, such as rocket (arugula) (a cruciferous salad leaf), which can help stimulate digestive juices. Include plenty of zest in the lemon dressing to provide limonene, which may support phase 2 detoxification pathways.

▪ SERVES 4

Lemon oil dressing
Juice and zest of 1 lemon
1 tbsp honey
3 tbsp flaxseed oil or an omega-blended oil
2 tbsp extra virgin olive oil
Freshly ground black pepper

If using raw artichokes, fill a large bowl with water and add the lemon juice.

Trim the stems of the artichokes and peel them to remove the outer tough parts. Trim the tops off the outer coarse leaves.

Scoop out the choke (if present) inside with a teaspoon or melon baller.

Slice the artichokes in half and place them in the acidulated water.

Juice of 2 lemons
12 baby artichokes or artichoke hearts marinated in olive oil
400ml/14fl oz/scant 1⅔ cup chicken or vegetable stock
250g/9oz rocket leaves or mixed bitter greens (e.g. watercress, rocket/argula, baby spinach)
Handful of chopped fresh basil leaves
200g/7oz cherry tomatoes, halved
12 black olives, halved
200g/7oz feta cheese, cut into chunks
Handful of broccoli sprouts or other sprouted seeds (e.g alfalfa)

Place the chicken stock or vegetable stock in a pan and bring to the boil. Add the artichokes and simmer, covered, for 15 minutes, or until the artichokes are tender. Leave in the pan to keep warm.

Whisk all the dressing ingredients together.

Place the rocket leaves and basil on a platter and scatter over the cherry tomatoes, olives, feta cheese and sprouts. Spoon out the artichokes from the pan, or use the artichokes in oil, drained, and add to the salad. Drizzle over the lemon oil dressing to serve.

Nutritional information per serving (with 1 tbsp dressing)
Calories 179kcal
Protein 10.7g
Carbohydrates 3.7g of which sugars 3.5g
Total fat 13.6g of which saturates 7.4g

Dinner

Grilled Sardines with Salsa Verde

Salsa verde is packed with flavour and nutrients. Parsley is a rich source of antioxidants, particularly flavonoids, vitamin C and beta-carotene. It also contains folic acid, important for methylation. This delicious sauce is perfect as a dressing over baked fish, seafood and poultry. Accompany with a simple mixed salad for a healthy lunch or light dinner dish, or with a cauliflower mash for something more substantial. Instead of sardines you could also use 4 mackerel fillets.

▪ SERVES 4

8 fresh sardines, gutted and cleaned
Sea salt and freshly ground black pepper

Salsa verde
1 large bunch of flat leaf parsley
Handful of basil leaves
2 garlic cloves, crushed
1 tbsp fresh mint leaves, chopped
2 anchovies, rinsed
2 tbsp capers, rinsed

Preheat the grill to high.

Remove the heads from the sardines, then cut open along the belly from the head end to the tail and open out, flesh side down. Press down along the body with the heel of your hand, then turn the fish over and lift out the bones. Some fishmongers will do this for you.

Place the sardines on to a grill tray skin side down and season with sea salt and freshly ground black pepper. Place under the grill for 3–4 minutes, or until completely cooked through.

2 tbsp red wine vinegar
1 tsp Dijon mustard
3 tbsp flaxseed oil
4 tbsp extra virgin olive oil
½ red onion, finely chopped

For the salsa verde, simply place in a food processor all the ingredients except the oils and onion. Process the mixture until chunky, then slowly add the oils and mix thoroughly. Stir in the red onion. Spoon the salsa verde over the sardines to serve.

Nutritional information per serving
Calories 417kcal
Protein 26.6g
Carbohydrates 0.9g of which sugars 0.4g
Total fat 34g of which saturates 6g

Salmon Kedgeree

This is perfect for a weekend brunch but also makes a tasty, light dinner dish. Although smoked haddock is traditionally used, we have included salmon to provide omega-3 fats. Mackerel or trout could also be used.

▪ SERVES 4

450ml/16fl oz/generous 1¾ cups fish stock (homemade – Chapter 1 – or chilled ready-prepared fish stock)
250g/9oz salmon fillets, skin on
200g/7oz hot smoked salmon, flaked
2 tbsp fresh dill, chopped
1 tbsp coconut oil
1 medium onion, finely chopped
1 tsp curry powder
½ tsp turmeric
175g/6oz brown basmati rice
3 spring onions (scallions), finely sliced
1 tbsp lemon juice
Handful of watercress, trimmed
Sea salt and freshly ground black pepper
3 hard-boiled eggs, halved

Bring the fish stock to the boil in a medium saucepan. Reduce the heat to a simmer and add the fresh salmon. Poach for 6–8 minutes, then carefully remove with a slotted spoon, reserving the fish stock.

Remove the skin from the poached salmon. Flake into a bowl with the hot smoked salmon. Add the dill.

For the rice, melt the coconut oil in a large saucepan and fry the onion for 4–5 minutes, or until softened. Stir in the spices and rice and fry for a further minute. Add the reserved fish stock and bring to the boil. Cover with a lid, reduce the heat and simmer for 10–12 minutes. Remove the pan from the heat and set aside to steam for 10 minutes.

Gently stir in the spring onions, lemon juice, salmon and watercress, and season to taste. Spoon on to plates and garnish with the hard-boiled eggs.

Nutritional information per serving
Calories 317kcal
Protein 22.7g
Carbohydrates 28.6g of which sugars 0.7g
Total fat 12.4g of which saturates 4.2g

Balsamic and Soy Marinated Veggies

This is a great way to serve vegetables. Pouring the marinade over the warm vegetables allows them to soak up the lovely tangy flavours. This is best prepared the day before you wish to eat it to really let the flavours develop.

▪ SERVES 4

Marinade
6 tbsp extra virgin olive oil
3 tbsp balsamic vinegar
2 tbsp tamari soy sauce
2 cloves garlic, crushed
Freshly ground black pepper

1 head of broccoli, broken into florets
1 head of cauliflower, broken into florets
150g/5oz green beans, trimmed
225g/8oz button mushrooms, halved

Mix all the marinade ingredients together.

Steam the broccoli, cauliflower and green beans for 2–3 minutes until only just tender but still crunchy.

Place in a large bowl with the mushrooms and pour over the marinade. Toss to coat thoroughly.

Marinate overnight. Serve at room temperature.

Nutritional information per serving
Calories 209kcal
Protein 6.5g
Carbohydrates 4.6g of which sugars 3.7g
Total fat 18g of which saturates 2.7g

Snacks and desserts

Green Herb Cleanser

Juices are simple and quick to prepare and an easy way to boost your intake of nutrients in an easily absorbable form. Although best drunk immediately, you can store them in the fridge covered for 24 hours. When juicing leafy vegetables, it is better to use a masticating juicer, as this will extract more of the juice and nutrients. Parsley and coriander (cilantro) are useful herbs to support detoxification. They contain beta-carotene, vitamins C and K, and a range of volatile oil components and flavonoids, including myristicin, limonene, eugenol and linalool. Coriander also contains caffeic and chlorogenic acids. These herbs have diruretic properties, useful for easing fluid retention. The apples provide a little sweetness to the juice.

▪ MAKES 1 LARGE GLASS

Large handful each of parsley and coriander (cilantro)
2 green apples
1 lemon
2 sticks celery
½ cucumber

Simply place all the ingredients through a juicer alternating between soft and hard ingredients.

Best drunk immediately.

Nutritional information per serving
Calories 89kcal
Protein 2.5g
Carbohydrates 19.5g of which sugars 19.3g
Total fat 0.6g of which saturates 0g

Green Tea Poached Pears

A refreshing, lightly spiced dish, rich in antioxidants from the green tea, the berries and the citrus rind. Use a peeler or zester to remove the rind from the lemon and lime. This is best served warm as a dessert or a breakfast dish, with a little natural yoghurt or nut cream.

▪ SERVES 4

400ml/14fl oz/scant 1⅔ cups apple juice
2 green tea bags
2 star anise
2 cinnamon sticks
Rind of 1 lemon and 1 lime
4 firm pears, peeled, halved and core scooped out with a spoon
Handful fresh or frozen berries
Natural yoghurt or nut cream to serve (optional)

Place the apple juice, tea bags, spices, lemon and lime rind into a big saucepan and bring to the boil. Stir well, then add the pear halves. Cover and simmer for 12–15 mins until the pears are just tender.

Lift out the pears, then turn up the heat and add the berries. Boil for a few minutes until syrupy. Discard the tea bags. Serve the pears with the warm syrup poured over.

Add a spoonful of yoghurt or nut cream if desired.

Nutritional information per serving

Calories 100kcal
Protein 0.6g
Carbohydrates 25.4g of which sugars 25.4g
Total fat 0.3g of which saturates 0g

Roasted Garlic and Bean Dip with Crudités

This creamy homemade dip makes a delicious alternative to hummus and is an ideal snack or lunch option with salad. Roasting the garlic mellows and sweetens its flavour.

▪ SERVES 8

1 garlic bulb
Olive oil for drizzling
400g/14oz can cannellini beans or butter beans, drained
Zest and juice of ½ lemon
½ tsp smoked paprika
2–3 tbsp extra virgin olive oil
Sea salt and freshly ground black pepper
Selection of vegetable crudités to serve (e.g. carrots, peppers, cucumber, celery, mange tout/snow peas, cauliflower and broccoli florets)

Preheat the oven to 180°C/350°F, gas mark 4. Place the garlic bulb on a large piece of foil, drizzle on a little olive oil and tightly seal the foil. Roast for 45 minutes. Remove from the oven, open the foil and allow to cool slightly.

Squeeze out the garlic pulp and place in a food processor. Add the remaining ingredients and process until smooth and creamy. Season to taste.

Serve with a selection of vegetables.

The dip can be stored in the fridge for 2–3 days or frozen for up to 1 month.

Nutritional information per serving (2 tbsp)

Calories 63kcal
Protein 2g
Carbohydrates 4g of which sugars 0.4g
Total fat 4.3g of which saturates 0.6g

Alkaline Detox Broth

This is a great electrolyte-rich broth to drink throughout the day. The concept of diet-induced acidosis is gaining interest as a possible contributing factor to chronic disease, although more studies are needed. Increasing your levels of electrolytes, such as potassium and magnesium, may help to improve the acid–alkaline balance of body fluids.[58] For something more substantial, you can blend the vegetables and serve it as a soup.

▪ SERVES 4

3 stalks celery
2 carrots
1 onion
2 cloves garlic, crushed
3 small potatoes, unpeeled
Handful of fresh spinach leaves
Bunch of fresh parsley, finely chopped
1 litre/2 pints filtered water
2 bay leaves

Coarsely chop all the vegetables. Cover with water and place in a pan. Add the bay leaves.

Bring to the boil, reduce heat and allow to simmer, covered, until the broth has a rich flavour, about 20 minutes.

Strain and drink hot or cold throughout the day as a snack, or, alternatively, blend the soup with all the ingredients and eat for lunch.

Nutritional information per serving
Calories 57kcal
Protein 2.2g
Carbohydrates 10.9g of which sugars 3.4g
Total fat 0.5g of which saturates 0.1g

Citrus Salad

A simple cleansing fruit salad rich in vitamin C and lycopene. It also contains limonoids, phytonutrients that promote the formation of the detoxification enzyme glutathione S-transferase. (Note that grapefruit may be best avoided if you are taking certain medications – see page 61.) This salad is delicious served with yoghurt or nut cream and makes an ideal breakfast or snack option.

▪ SERVES 4

1 red grapefruit, peeled
2 clementines or tangerines, peeled
4 oranges, peeled
½ tsp ground cinnamon
2 tbsp crystallised ginger, chopped

Cut the grapefruit, clementines and 3 of the oranges into thin slices. Place into a bowl.

Juice the remaining orange and pour the juice into the bowl with the cinnamon and ginger.

Allow to marinate to enhance the flavours.

Flaxseed and Almond Biscuits

A wonderful light biscuit, delicious as a snack to help satisfy sweet cravings. These biscuits are gluten-free and grain-free and provide a good source of protein and fibre.

▪ MAKES 12 BISCUITS

125g/4½oz/1 cup almonds
Pinch of sea salt
3 tbsp ground flaxseed
½ tsp bicarbonate of soda
3 tbsp sesame seeds
65g/2½oz/⅓ cup tahini
1 tbsp olive oil
2 tbsp yacon syrup, maple syrup or honey
1 tbsp xylitol
Zest of 1 orange
1 free-range egg
2 tsp vanilla extract

Preheat the oven to 180°C/350°F, gas mark 4.

Place the almonds in a food processor and process to form a fine flour.

Place in a bowl with a pinch of sea salt, the flaxseed, bicarbonate of soda and sesame seeds.

In a separate bowl, mix together the remaining ingredients.

Add the wet ingredients to the almonds and mix well.

Using a dessertspoon, place spoonfuls of the dough on to a lined baking sheet, spacing apart as they will expand a little on cooking.

Bake in the oven for 10–15 minutes until golden. Cool on a wire rack to firm up.

The dip can be stored in the fridge for 2–3 days or frozen for up to 1 month.

Nutritional information per biscuit
Calories 161kcal
Protein 5.3g
Carbohydrates 4.2g of which sugars 3.2g
Total fat 13.8g of which saturates 1.7g

References

1. Roundtree, R. (2011) *Genetic and Environmental Determinants: Toxins, Toxicity and Biotransformation*. Presentation given at the Advance Functional Medicine in Clinical Practice (AFMCP) symposium, October 2011. London: IFM.
2. Muller, A. and Yeoh, C. (2010) 'Compromised Detoxification.' In L. Nicolle and A. Woodriff Beirne (eds) *Biochemical Imbalances in Disease*. London: Singing Dragon.
3. Lord, S. and Bralley, J. (2008) 'Clinical applications of urinary organic acids. Part 1: Detoxification markers.' *Alternative Medicine Review 13*, 3, 205–15.
4. Kortenkamp, A. (2006) 'Breast cancer, oestrogens and environmental pollutants: A re-evaluation from a mixture perspective.' *International Journal of Andrology 29*, 1, 193–8.
5. Felton, J.S. and Malfatti, M.A. (2006) 'What do diet-induced changes in phase I and phase II enzymes tell us about prevention from exposure to heterocyclic amines?' *Journal of Nutrition 136*, 10, Suppl., 2683–4S.

6. Talalay, P. and Fahey, J.W. (2001) 'Phytochemicals from cruciferous plants protect against cancer by modulating carcinogen metabolism.' *Journal of Nutrition 131*, 11, Suppl., 3027–33S.
7. Liska, D.J. (1998) 'The detoxificaiton enzyme systems.' *Alternative Medicine Review 3*, 3, 187–98.
8. Williams, A.C., Steventon, G.B., Sturman, S. and Waring, R.H. (1991) 'Hereditary variation of liver enzymes involved with detoxification and neurodegenerative disease.' *Journal of Inherited Metabolic Disease 14*, 4, 431–5.
9. Hess, E.V. (2002) 'Environmental chemicals and autoimmune disease: Cause and effect.' *Toxicology 181–2*, 65–70.
10. Bártová, J., Procházková, J., Krátká, Z., Benetková, K., Venclíková, Z. and Sterzl, I. (2003). 'Dental amalgam as one of the risk factors in autoimmune diseases.' *Neuroendcrinology Letters 24*, 1–2, 65–7.
11. McAlindon, T.E., Gulin, J., Chen, T., Klug, T., Lahita, R. and Nuite, M. (2001) 'Indole-3-carbinol in women with SLE: Effect on estrogen metabolism and disease activity.' *Lupus 10*, 11, 779–83.
12. Wang, C.H., Jeng, J.S., Yip, P.K., Chen, C.L. *et al.* (2002) 'Biological gradient between long-term arsenic exposure and carotid atherosclerosis.' *Circulation 105*, 15, 1804–9.
13. Adams, J.B., Audhya, T., McDonough-Means, S., Rubin, R.A. *et al.* (2011) 'Nutritional and metabolic status of children with autism vs. neurotypical children, and the association with autism severity.' *Nutrition and Metabolism 8*, 1, 34.
14. Baillie-Hamilton, P. (2002) 'Chemical Toxins: a hypothesis to explain the global obesity epidemic.' *Journal of Alternative and Complementary Medicine 8*, 2, 185–92.
15. Hyman, M. (2007) 'Systems biology, toxins, obesity and functional medicine.' *13th International Symposium of the Institute for Functional Medicine*, 134-139. Available at http://drhyman.com/downloads/Toxins-and-Obesity.pdf, accessed on 25 July 2012.
16. Moon, Y.J., Wang, X. and Morris, M.E. (2006) 'Dietary flavonoids: Effects on xenobiotic and carcinogen metabolism.' *Toxicology in Vitro 20*, 2, 187–210.
17. Talalay, P. and Fahey, J.W. (2001) 'Phytochemicals from cruciferous plants protect against cancer by modulating carcinogen metabolism.' *Journal of Nutrition 131*, 11, Suppl., 3027–33S.
18. Faria, A., Monteriro, R., Azevedo, I. and Calhau, C. (2007) 'Pomegranate juice effects on cytochrome P450s expression: In vivo studies.' *Journal of Medicinal Food 10*, 4, 643–9.
19. Duthhie, S.J. (2007) 'Berry phytochemicals, genomic stability and cancer: Evidence for chemoprotection at several stages in the carcinogenic process.' *Molecular Nutrition and Food Research 51,* 6, 665–74.
20. Yuan, J.M. (2011) 'Green tea and prevention of esophageal and lung cancers.' *Molecular Nutrition and Food Research 55*, 6, 886–904.
21. Huber, W.W. and Parzefall, W. (2005) 'Modification of N-acetyltransferases and glutathione S-transferases by coffee components: Possible relevance for cancer risk.' *Methods in Enzymology 401*, 307–41.
22. Osawa, T. (2007) 'Nephroprotective and hepatoprotective effects of curcuminoids.' *Advances in Experimental Medicine and Biology 595*, 407–23.
23. Craig, W.J. (1999) 'Health-promoting properties of common herbs.' *American Journal of Clinical Nutrition 70*, 3, Suppl., 491–9S.
24. Crowell, P.L. and Gould, M.N. (1994) 'Chemoprevention and therapy of cancer by d-limonene.' *Critical Reviews in Oncology 5*, 1, 1–22.
25. Van Leishout, E.M., Posner, G.H., Woodard, B.T. and Peters, W.H. (1998) 'Effects of the sulforaphane analog compound 30, indole-3-carbinol, D-limonene or relafen on glutathione S-transferases and flutathione peroxidase of the rat digestive tract.' *Biochimica et Biosphysica Acta 1370*, 3, 325–36.
26. Van der Logt, E.M., Roelofs, H.M., van Lieshout, E.M., Nagengast, F.M. and Peters, W.H. (2004) 'Effects of dietary anticarcinogens and nonsteroidal anti-inflammatory drugs on rat gastrointestinal UDP-glucuronosyltransferases.' *Anticancer Research 24*, 2B, 843–9.

27. Lee, C.H., Wettasinghe, M. and Bolling, B.W. (2005) 'Betalains, phase II enzyme-inducing components from red beetroot (beta vulgaris L.) extracts.' *Nutrition and Cancer 53*, 1, 91–103.
28. Georgiev, V.G., Weber, J., Kneschke, E.M., Denev, P.N., Bley, P.T. and Pavlov, A.I. (2010) 'Antioxidant activity and phenolic content of betalain extracts from intact plants and hairy root cultures of the red beetroot Beta vulgaris cv. Detroit dark red.' *Plant Foods for Human Nutrition 65*, 2, 105–11.
29. Ryu, S., Choi, S.K., Joung, S.S. *et al.* (2001) 'Caffeine as a lipolytic food component increases endurance performance in rats and athletes.' *Journal of Nutritional Science and Vitaminology (Tokyo) 47*, 2, 139–46.
30. Conger, S.A., Warren, G.L., Hardy, M.A. *et al.* (2011) 'Does caffeine added to carbohydrate provide additional ergogenic benefit from endurance?' *International Journal of Sports Nutrition and Exercise Metabolism 21*, 1, 71–84.
31. Downey, M. (2012) 'Discovering coffee's unique health benefits.' *Life Extension Magazine, January*. Available at www.lef.org/magazine/mag2012/jan2012_Discovering-Coffees-Unique-Health-Benefits_01.htm, accessed on 25 July 2012.
32. Eskelinen, M.H. and Kivipelto, M. (2010) 'Caffeine as a protective factor in dementia and Alzheimer's disease.' *Journal of Alzheimer's Disease 20*, Suppl 1, S167–74.
33. Rosso, A., Mossey, J. and Lippa, C.F. (2008) 'Caffeine: neuroprotective functions in cognition and Alzheimer's disease.' *American Journal of Alzheimer's Disease and Other Dementias 23*, 5, 417–22.
34. Prediger, R.D. (2010) 'Effects of caffeine in Parkinson's disease: from neuroprotection to the management of motor and non-motor symptoms.' *Journal of Alzheimer's Disease 20*, Suppl 1, S205–20.
35. Zhang, Y., Lee, E.T. and Cowan, L.D. (2011) 'Coffee consumption and the incidence of type 2 diabetes in men and women with normal glucose tolerance: the Strong Heart Study.' *Nutrition, Metabolism and Cardiovascular Diseases 21*, 6, 418–23.
36. Muley, A., Muley, P. and Shah, M. (2012) 'Coffee to reduce risk of type 2 diabetes? A systematic review.' *Current Diabetes Reviews*.
37. Natella, F. and Scaccini, C. (2012) 'Role of coffee in modulation of diabetes risk.' *Nutrition Reviews 70*, 4, 207–17.
38. Masterton, G.S. and Hayes, P.C. (2010) 'Coffee and the liver: a potential treatment for liver disease?' *European Journal of Gastroenterology and Hepatology 22*, 11, 1277–83.
39. Muriel, P. and Arauz, J. (2010) 'Coffee and liver diseases.' *Fitoterapia. 81*, 5, 297–305.
40. Hunter, E.A. and Grimble, R.F. (1997) 'Dietary sulphur amino acid adequacy influences glutathione synthesis and glutathione-dependent enzymes during the inflammatory response to endotoxin and tumour necrosis factor-alpha in rats.' *Clinical Science 92*, 3, 297–305.
41. Li, Y., Hou, M.J., Ma, J., Tang, Z.H., Zhu, H.L. and Ling, W.H. (2005) 'Dietary fatty acids regulate cholesterol induction of liver CYP7alpha1 expression and bile acid production.' *Journal of Lipids 40*, 5, 455–62.
42. Enns, C.A. and Zhang, A.S. (2009) 'Iron homeostasis: Recently identified proteins provide insight into novel control mechanisms.' *Journal of Biological Chemistry 284*, 2, 711–5.
43. Chai, W. and Liebman, M. (2005) 'Effect of different cooking methods on vegetable oxalate content.' *Journal of Agricultural and Food Cheimistry 53*, 8, 3027–30.
44. Coronado, G.D., Beasley, J. and Livaudais, J. (2011) 'Alcohol consumption and the risk of breast cancer.' *Salud Pública de México 53*, 5, 440–7.
45. Testino, G., Ancarani, O. and Scafato, E. (2011) 'Alcohol consumption and cancer risk.' *Recenti Progressi in Medicina 102*, 10, 399–406.
46. World Cancer Research Fund (2011) 'Alcohol and cancer prevention.' Available at www.wcrf-uk.org/cancer_prevention/recommendations/alcohol_and_cancer.php, accessed on 18 January 2012.
47. Hare, J.T. and Elliott, D.P. (2003) 'Grapefruit juice and potential drug interactions.' *The Consultant Pharmacist 18*, 5, 466–72.

48. Hanley, M.J., Cancalon, P., Widmer, W.W. and Greenblatt, D.J. (2011) 'The effect of grapefruit juice on drug disposition.' *Expert Opinion on Drug Metabolism and Toxicology 7*, 3, 267–86.
49. Crinnion, W.J. (2010) 'The CDC fourth national report on human exposure to environmental chemicals: What it tells us about our toxic burden and how it assist environmental medicine physicians.' *Alternative Medicine Review 15*, 2, 101–9.
50. Liksa, D., Lyon, M. and Jones, D. (2005) 'Detoxification and Biotransformation Imbalances.' In D.S. Jones (ed.) *The Textbook of Functional Medicine.* Gig Harbor, WA: Institute for Functional Medicine. Page 278.
51. Liska, D. (1998) 'The detoxification enzyme systems.' *Alternative Medicine Review 3*, 3, 187–98.
52. Gasper, A., Al-Janobi, A., Smith, J., Bacon, J.R. *et al.* (2005) 'Glutathione-S-transferase M1 polymorphism and metabolism of sulforaphane from standard and high-glucosinolate broccoli.' *American Journal of Clinical Nutrition 82*, 6, 1283–91.
53. Shinkai, Y., Sumi, D., Fukami, I., Ishii, T. and Kumaqai, Y. (2006) 'Sulforaphane, an activator of Nrf2, suppresses cellular accumulation of arsenic and its cytotoxicity in prmary mouse hepatocytes.' *FEBS Letters 580*, 7, 1771–4.
54. Toyama, T., Shinkai, Y., Yasutake, A., Uchida, K., Yamamoto, M. and Kumaqai, Y. (2011) 'Isothiocyanates reduce mercury accumulation via an Nrf2-dependent mechanism during exposure of mice to methylmercury.' *Environmental Health Perspectives 119*, 8, 1117–22.
55. Juge, N., Mithen, R.F. and Traka, M. (2007) 'Molecular basis for chemoprevention by sulforaphane: A comprehensive review.' *Cellular and Molecular Life Sciences 64*, 9, 1105–27.
56. Jeffery, E. and Araya, M. (2009) 'Physiological effects of broccoli consumption.' *Phytochemistry Reviews* 8, 1, 283–98.
57. John Innes Centre (2011) 'British research leads to UK launch of Beneforte broccoli.' Available at http://news.jic.ac.uk/2011/10/british-research-leads-to-uk-launch-of-beneforte-broccoli, accessed on 17 January 2012.
58. Pizzorno, J., Frassetto, L. and Katzinger, J. (2009) 'Diet-induced acidosis: Is it real and clinically relevant?' *British Journal of Nutrition 103*, 8, 1185–94.