

A close-up portrait of a young man with thick, curly brown hair and a light beard. He is smiling broadly, showing his teeth, and looking slightly upwards and to the right. He is wearing a light grey V-neck sweater. The background is a soft, out-of-focus outdoor setting with greenery and a bright sky.

Viva!

VEGAN FOR

Health

Why vegan diets are the best, how to eat well and protect your health

By Veronika Charvátová MSc and
Dr Justine Butler, Viva!

Viva!

BYEBYE
BABY!

Just born, she'll be taken away from her mother within the next 24 hours. No matter how agonisingly they call to each other across the farmyard, their separation will be permanent.

Not one bad farmer but the industry standard. Viva's undercover teams have regularly exposed the many cruelties there are in milk – and sales are falling. Please support us and help us to continue fighting for animals.

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ABOUT VIVA! HEALTH

Viva! Health is the health and nutrition slice of Viva! – the vegan charity at the forefront of campaigning for a vegan world. It is the number one source for information on vegan health and nutrition for health professionals and the public.

We are on-hand to support people on their journey into veganism. We take the latest scientific studies and make them accessible to all, producing reports, guides and factsheets. We challenge and correct misinformation about diet, health and nutrition. In our ground-breaking reports and health campaigns – from dairy to zoonotic diseases – we provide all the evidence on why a vegan diet protects against all the major diseases and can help keep you happy and healthy.

Viva! Health is also a prolific producer of nutrition advice – have a look at our A-Z of Nutrients. It's great! viva.org.uk/a-z-of-nutrients

Viva!
H E A L T H




VEGAN FOR Health

By Veronika Charvátová MSc and Dr Justine Butler, Viva!
Editor Juliet Gellatley, Viva!

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Produced by:
Viva!, 8 York Court, Wilder St, Bristol BS2 8QH
Tel: 0117 944 1000
E: info@viva.org.uk

viva.org.uk
viva.org.uk/health
veganrecipeclub.org.uk

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DIET DEFINITIONS

Vegans don't eat, wear or use anything from animals — whether from land animals (meat, dairy, eggs, honey, shellac, leather, fur etc) or from water animals (fish, prawns, crab, lobster etc). Vegans also exclude, as far as is practicable, all forms of animal exploitation and cruelty.

Plant-based is a diet entirely or almost entirely based on plant foods (vegan) but people following it may not be strict about avoiding animal products at all times and in products other than food.

Vegetarians avoid any products from slaughtered animals. So vegetarians don't eat meat or fish (and avoid flesh from other water animals such as crabs, prawns and lobster), and do eat eggs/dairy and honey.

There are three types of vegetarian – according to whether they eat eggs/dairy:

- **Lacto-vegetarians** eat dairy but not eggs
- **Ovo-vegetarians** eat eggs but not dairy
- **Lacto-ovo vegetarians** eat both eggs and dairy

Pescatarians avoid all meat (red and white) but eat fish and other animals from water habitats (crabs, prawns, lobsters etc). They may or may not choose to eat products taken from living animals such as dairy and eggs.

Flexitarians sometimes known as semi-vegetarians, eat a predominantly vegetarian diet but occasionally eat meat or fish.

Meat-eaters (omnivores) eat meat, fish, dairy, eggs and other animal products.

WESTERN DIETS

Over the last few decades, the average diet in Europe and North America – the so-called Western diet – has become more meat-, dairy- and egg-heavy than ever before. What is now considered normal would have been seen as opulent not that long ago and reserved only for special occasions. This diet is seen as desirable by many because animal foods are a symbol of affluence. Western diets and all the junk foods they contain have become aspirational in many developing countries, despite carrying with them a number of diseases, such as increased rates of type 2 diabetes, heart disease and obesity – aptly called diseases of affluence. Where Western diets go, certain cancer rates follow and we're facing a global public health crisis.

A Western diet – high in fats, protein and sugar and lacking in fibre and fresh foods – is not healthy in any way, but it is highly addictive. Processed foods combining fat and salt or fat and sugar are incredibly moreish and help line their manufacturers' pockets. Meat, dairy and egg industries pour millions into advertising every year, ensuring that billions of people are growing up exposed to their aggressive marketing. Many health groups are sounding an alarm, warning about an entire generation of children in such poor health that they will be the first that fails to outlive their parents.



WHAT'S A HEALTHY VEGAN DIET?

A vegan diet can be the healthiest of them all, protecting your health in both the short- and long-term. However, a vegan diet is not necessarily healthy if it's based on biscuits, cakes and chips.

There are four cornerstones of a healthy vegan diet:

- **Fruit and vegetables** – fresh, frozen, steamed, cooked, blended in a fresh smoothie or dried
- **Wholegrains** – cooked on their own (eg brown rice, quinoa, barley), used as the main ingredient in wholemeal bread or wholewheat pasta, turned into breakfast cereal (eg oats, muesli) or added to salads
- **Pulses** (eg peas, beans, lentils, chickpeas, soya) – cooked, canned or turned, for example, into tofu, burgers, sausages, hummus, falafels and soya mince
- **Nuts and seeds** – raw, lightly roasted, blended into butters or chopped in nut roasts

Add to that a reliable source of vitamins B12 and D (because it's not sunny enough in the UK!), a source of omega-3 fats and a sprinkling of seaweed for iodine (an important mineral) a couple of times a week and you can't go wrong!

Any extracts, such as oil or sugar should be used only in small amounts – and the same applies to treats.

Staying hydrated is also crucial for your body, and particularly your kidneys, to work well – make sure you drink enough water or tea daily. Fruit juice is not the best choice unless it's fresh because commercial products tend to be pasteurised (treated with high heat that destroys many nutrients) and is little more than just sweet water.

WHAT I NEED TO EAT EACH DAY

NO. OF SERVINGS At least 8

FOODS **Fruits:** Berries, apples, pears, peaches, oranges, kiwi fruit, bananas, raisins, mango etc.

Eaten whole or in smoothies (juices are more acidifying because they don't contain fibre and provide fruit sugar more readily than whole fruit).

And Vegetables: Broccoli, cauliflower, spinach, kale, leeks, carrots, peppers, tomatoes, squash, green beans, sweet potatoes, celery, lettuce, cabbage, Brussels sprouts etc.

HEALTHY PORTION SIZE

Fresh fruit: 1 medium piece (the size of a tennis ball)

Dried fruit: 1-1½ tablespoons or 1 golf ball

Green or root vegetables: 2-3 tablespoons or ½ tennis ball

Salad vegetables: 1 large cereal bowl or 80g

- TO PROVIDE**
- Beta-carotene (makes vitamin A), Vitamins B2, B3, B5, B6, B9 (Folate), Vitamin C, Vitamin E, Vitamin K
 - Minerals/trace elements such as Calcium, Iodine, Iron, Magnesium, Manganese, Phosphorus, Potassium
 - Fibre



NO. OF SERVINGS 3-4

FOODS **Wholegrains:** Wholemeal

Pasta, Wholemeal Bread, Brown Rice, Oats, Rye, Buckwheat etc.

HEALTHY PORTION SIZE

Cooked grains: 2-3 heaped tablespoons or ½ cup

Breakfast cereal: 25g or 1 regular-sized cereal bowl

Muesli: 45g or a small-sized bowl

Cooked wholemeal pasta: 1 cup as side dish or 2 cups as main dish

Wholemeal or rye bread: 2 slices

TO PROVIDE ● Vitamins such as B1, B2, B3, B5, B6

- Minerals/trace elements such as Calcium, Copper, Iron, Magnesium, Manganese, Phosphorus, Potassium, Zinc
- Fibre, Energy, Protein



2

NO. OF SERVINGS 3-4

FOODS **Pulses** (eg all types of Peas, Beans and Lentils), **Nuts and Nut Butters or Seeds**

HEALTHY PORTION SIZE

Peas, Beans and Lentils: ½ cup (cooked)

Nuts or Seeds: 2 tablespoons or a small handful

TO PROVIDE ● Vitamins such as B1, B2, B3, B5, B6, B9

- Minerals/trace elements such as Calcium, Copper, Iron, Magnesium, Manganese, Phosphorus, Potassium, Selenium, Zinc
- Protein, Energy, Fibre



3

NO. OF SERVINGS Small amounts

FOODS **Vegetable Oil** (Flaxseed, Hemp Seed, or Virgin Olive Oil used cold; Sunflower, Rapeseed or Soya Oil for cooking)

Vegetable Margarines

HEALTHY PORTION SIZE

½ tbsp flaxseed oil or 1½ tbsp of ground flaxseeds

TO PROVIDE ● Vitamins such as Vitamin E (Vegetable Oils), Vitamins A & D (Fortified Margarine)

- Energy
- Essential Omega-3 and Omega-6 Fats (Flaxseed, Soya, Walnut and Hemp Oils)



4

NO. OF SERVINGS 1 daily supplement

Vitamin B12

50 micrograms of B12 a day (or take a higher dose less often – up to 2,000 micrograms a week)

TO PROVIDE ● Vitamin B12



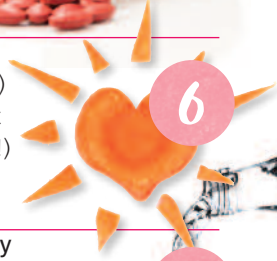
5

NO. OF SERVINGS Small amounts

FOODS **Vitamin D** (made by sunlight on skin)

If you live in the UK take a vitamin D supplement during winter months (no matter what your diet!)

TO PROVIDE ● Vitamin D



6

NO. OF SERVINGS 1.2-1.5 litres of fluid every day (6-8 glasses) should also be consumed as part of a healthy, balanced diet.

FOODS Water is the best choice. Hot drinks, plant-based milks and juices can contribute but as juice contains sugar, you should limit consumption to no more than one 150ml glass a day.



7

Chart by Juliet Gellatley BSc, Dip CNM , Viva!
For a laminated wallchart go to
vivashop.org.uk/goodhealthwallchart

Nutrition essentials

Variety is the key to a healthy, well-balanced vegan diet. All plant foods contain a mixture of nutrients in different quantities – protein, carbohydrates (including fibre), fat, vitamins and minerals – but to get the maximum benefit, it's best to aim for a varied, colourful diet – eat the rainbow! It will provide you with all the nutrients you need and boost your health with antioxidants and other beneficial phytochemicals.

PROTEIN

Protein forms the basis of your muscles, hair, nails and collagen (the protein that holds your body together). It is also needed to make your brain's messengers (neurotransmitters), hormones, red blood cells and DNA. Another important role that protein plays is in maintaining a healthy immune system.

Protein is made up of small building blocks called amino acids. There are 20 amino acids, of which nine are classified as essential; meaning the body cannot make them and so they must be obtained from the diet. A varied, vegan diet provides more than enough protein and all the essential amino acids (Marsh *et al.*, 2013; Clarys *et al.*, 2014; Karlsen *et al.*, 2019; Marriotti and Gardner, 2019).

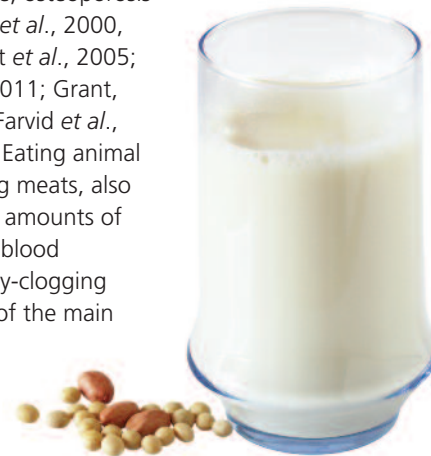


THE PROTEIN COMBINING MYTH

It's a myth that vegans don't get enough protein; all plant foods contain the full range of 20 amino acids, including the nine essential ones. But because different plant-based foods contain variable amounts, some people suggest that vegans need to combine plant foods to ensure the optimal amino acid intake at every meal. However, this is considered outdated thinking and research shows that protein combining is not necessary, provided you eat a varied diet with enough calories and not just one plant food all day! (Marriotti and Gardner, 2019; Marsh *et al.*, 2013; Hever and Cronise, 2017). Eating a variety of plant foods is important not just for protein but to obtain all the other nutrients needed for good health, too.

Excellent sources of protein include soya products (eg edamame beans, tofu, tempeh, soya milk, soya yoghurt), black beans, kidney beans, baked beans, lentils, chickpeas, wholegrains (eg brown rice, wholewheat pasta, wholemeal bread, oats, quinoa, buckwheat), nuts and seeds of all types.

Meat contains all the essential amino acids, but is far from a healthy food – animal (but not vegetable) protein has been linked to some cancers, heart disease, osteoporosis and kidney damage (Allen *et al.*, 2000, 2002, 2008, 2013; Weikert *et al.*, 2005; Lanou, 2009; Moe *et al.*, 2011; Grant, 2013; Marsh *et al.*, 2013; Farvid *et al.*, 2014; Kitada *et al.*, 2019). Eating animal products, even lean-looking meats, also means eating considerable amounts of saturated fats, which raise blood cholesterol. It is these artery-clogging substances which are one of the main causes of chronic diseases in the UK and across all 'developed' nations as will be explained later.



HOW MUCH PROTEIN DO WE NEED?

An average person needs 0.8 grams of protein daily per kilogram of bodyweight (or 0.36 grams per pound). So for example if you weigh 65 kilograms, you'll need around 52 grams of protein a day; if you weigh 88 kilograms, you'll need around 70 grams of protein. If you want to build muscle, do challenging physical work or train hard, you'll need to increase your protein intake according to your physical activity – elite athletes eat up to two grams of protein per kilogram of bodyweight daily.

On average, men should eat at least 55 grams and women 45 grams of protein daily.

Children, adolescents and breastfeeding women need a bit more protein but it's not rocket science, simply make sure you include good protein sources in your daily diet and eat enough.

HOW MUCH PROTEIN IS IN COMMON FOODS?

| Food | Medium serving size | Protein per serving (g) |
|---------------------------|---------------------|-------------------------|
| Chickpeas | 1 cup (160g) | 15 |
| Baked beans | ½ can (210g) | 10-12 |
| Tofu | 100g | 18-23 |
| Lentils | 200g | 18 |
| Peanuts | 28g (small handful) | 7.4 |
| Almonds | 28g (small handful) | 6 |
| Wholewheat pasta (cooked) | 2 cups (280g) | 15 |
| Oats | 80g | 13.6 |
| Brown rice (cooked) | 1 cup (200g) | 5 |



CARBOHYDRATES

Carbohydrates or carbs – we cannot live without them. Your body breaks down carbohydrates into glucose (sugar) and other molecules. Glucose is essential for our cells – every single cell in your body uses glucose as the main fuel to perform millions of life-supporting tasks. Yet, that doesn't mean eating sugar is good for you. Confused? The key is in choosing the right carbs.

Some carbohydrate molecules are small and release glucose fast – these are **simple carbohydrates (sugars)** and they can give you a sugar rush (eg sweets, dates, biscuits, white bread, sugared cornflakes). If you don't use up all that fast sugar, you may end up gaining extra weight.

Then, there are carbohydrates with large molecules, forming chains – those are **complex carbohydrates: starches and fibre**. Foods that contain these release their sugar slowly and are great for long-lasting energy.

Starch is a component of many foods; such as wholegrains, pulses, root vegetables, pumpkins and courgettes, all of which belong in a healthy diet and are a good energy source.

Fibre is the name for a large group of complex carbohydrates that we cannot digest.

Soluble fibre dissolves in water to form a gel, which makes you feel fuller for longer after a meal and makes stools soft and easier to pass. It feeds the friendly bacteria that inhabit your gut that produce health-promoting compounds. The best sources are wholegrains, fruit, pulses and root vegetables.

Insoluble fibre is tougher and does not dissolve but absorbs water, increasing stool bulk and helping to keep you 'regular'. It can help prevent and treat constipation, diverticulitis and irritable bowel syndrome (IBS) and may be partially fermented by gut bacteria. The best sources are wholegrains, breakfast cereals, unpeeled fruit and dried fruits, vegetables, nuts and seeds.

Resistant starch is sometimes called the third type of dietary fibre. It resists digestion in the small intestine and is fermented further down in the large intestine by bacteria generating numerous health benefits. Good sources include: plantain, peas, beans, lentils, wholegrains, including oats and barley, and cooked and cooled rice, as used in sushi, for example.

All three types of fibre have health benefits so remember to eat a variety of fibre-containing foods.

Fibre is naturally found in unrefined plant foods but never in animal-based foods. Even though we can't digest it, it's a very important part of any diet because it keeps our digestive system healthy and slows down sugar absorption. This helps with healthy weight management, can reduce blood cholesterol and the risk of heart disease, some cancers (particularly colon cancer) and type 2 diabetes, and encourages the 'good' bacteria in our gut (Park *et al.*, 2011; Murphy *et al.*, 2012; Kim *et al.*, 2013; Li *et al.*, 2014a; O'Keefe *et al.*, 2015). It's easy to get plenty of fibre from fruit and vegetables, wholegrains, pulses and nuts and seeds. All you need is in plant wholefoods!



WHAT ABOUT FRUIT AND SUGAR?

In recent years, sugar has become the new villain in the world of nutritional science, said, by some, to be worse than fat. Fructose, the sugar found in fruit, has received a particularly bad reputation because of its links to non-alcoholic fatty liver disease, high blood pressure, obesity, diabetes, heart disease and cancer. However, it is only industrially produced fructose – the type found in table (or granulated) sugar and high fructose syrups that may have these harmful effects. There is no evidence that the fructose from whole fruit harms in the same way. This might be because of the fibre and/or the powerful antioxidants fruits contain. Fruit is one of the healthiest foods out there so there's no need to limit your intake. It's best to eat raw fruit (fresh or frozen) or blended in a fresh smoothie but avoid canned varieties.

Beware of shop-bought fruit juices as they contain almost no fibre and unless they're freshly made, they undergo a pasteurisation process that destroys most of the goodness. The result can be little more than sweet water.



SHOULD WE LIMIT OUR CARB INTAKE?

We have evolved to thrive on a diet full of natural carbohydrates so it's best to build your diet around wholefoods, such as fruit and vegetables, wholegrains and pulses, which release their energy gradually and promote good health by providing many vital nutrients. There's no need to limit those carbs as they are our best fuel.

On the other hand, processed or refined foods, such as white bread, pastries, processed snacks, cakes, sweets, sweetened breakfast cereals, fizzy and sweet drinks, are full of sugar (simple carbs) and may contribute to a host of health issues. Like any other junk food, if you have them occasionally, you're fine but they shouldn't be your daily go-to choice.

LOW-CARB DIETS?

Low-carb, ketogenic or paleo diets usually focus on foods high in protein and fat, and severely restrict carbohydrates. This forces your metabolism to change and draw energy mostly from fat and protein, which makes you less hungry and leads to weight loss. Your body can do this for a while but it's not a natural way for your metabolism to work. It's why these diets are effective only for short-term weight loss but if followed for long periods of time, they have a whole range of unpleasant adverse effects such as constipation, headaches, kidney fatigue, bad breath, increased cholesterol levels, increased risk of heart disease, cancer and even premature death (Bilsborough and

Crowe, 2003; Fung *et al.*, 2010; Banach, 2018;

Farhadnejad *et al.*, 2019; Mazidi *et al.*, 2019).



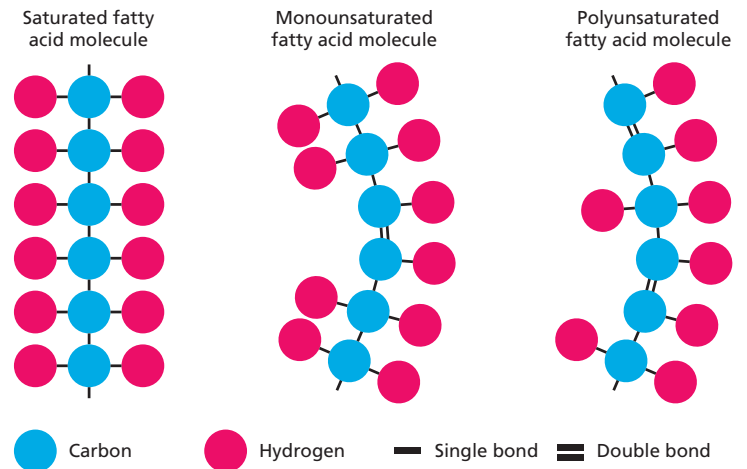
FAT

We need fat for many body functions; it is a component of cell membranes and brain tissue, it helps our bodies absorb fat-soluble vitamins (eg A, D, E and K) from food, provides energy, insulation and forms cushioning to protect our vital organs.

Fat is the most energy dense of all the main nutrients, containing more than twice as many calories weight-for-weight as protein or carbohydrate. That's why it's a good source of energy, both for immediate use and when stored in the body for use when food is scarce.

Plants tend to store their fats in seeds (eg nuts, seeds, soya beans and corn), and sometimes in the fleshy layer protecting the seed inside (eg avocados, olives and coconuts). Animals, including humans, mostly store fat within and between their muscles, around the organs (visceral fat) and under the skin (subcutaneous fat), often found around the belly and hips. Visceral fat is more harmful to health than subcutaneous fat as it is strongly linked to metabolic syndrome, insulin resistance and an increased risk of death, even for people who have a normal body mass index (BMI).

Fats are divided into different categories based on their chemical structure:



SATURATED FAT

Saturated fats have the maximum number of hydrogen atoms possible attached to their carbon backbone. This makes them less flexible, so they tend to be solid at room temperature, such as lard and butter. You don't need any saturated fat in your diet as your body can make all you need. Diets high in saturated fat raise blood cholesterol levels and increase the risk of heart disease, stroke, obesity, type 2 diabetes and some types of cancer, such as prostate cancer (Allott *et al.*, 2017; Sacks *et al.*, 2017; Korakas *et al.*, 2018; Luukkonen *et al.*, 2018).

The main sources of saturated fats in the diet are animal products (eg meat, eggs, dairy), pies, pastries, processed foods, fatty spreads, palm fat and coconut oil.

Coconut oil

There are many health claims made for coconut oil; some say, for example, it can help you lose weight and may slow the progression of Alzheimer's disease. The majority of these claims are not supported by the evidence. Coconut oil is healthier than butter, lard and hydrogenated, trans-fat containing fats, but it is unlikely that including additional coconut oil in your diet would be beneficial. Whereas, replacing saturated fats with unsaturated fats (found in vegetable, olive, flaxseed and rapeseed oils, nuts and seeds), has been shown to offer a range of health benefits.



UNSATURATED FAT

Unsaturated fats have at least one double bond along their carbon backbone, meaning that they have not been saturated. As a consequence, they are more flexible, which is why these fats tend to be liquid at room temperature. Based on how many of these double bonds a fat molecule contains, it is either mono- or polyunsaturated.



Monounsaturated fats offer a range of health benefits such as helping maintain healthy cholesterol levels in the blood. The most common one in a vegan diet is oleic acid – omega-9 fat. It is the main component of olive oil, macadamia oil and some types of sunflower oil. The Mediterranean diet, known for its health benefits, has a moderate amount of fat, but much of it comes from healthy monounsaturated fats and polyunsaturated omega-3 fats.

Polyunsaturated fats, again depending on their structure, can be omega-3 or omega-6 fats. In omega-3s, the first double-bond occurs at the third carbon atom in their backbone, in omega-6 fats, it occurs at the sixth.

These are two essential fats (fatty acids) that we need in our diet:

- **Linoleic acid (LA)** – omega-6 fat: found in seeds, nuts, corn, soya oils etc
- **Alpha-linolenic acid (ALA)** – omega-3 fat: can be obtained from ground flaxseed/linseed (this is the richest source by far), walnuts, hemp seeds, chia seeds, rapeseed oil, soya beans and green leafy vegetables (although vegetables are generally very low in fat)

The body converts ALA to the longer chain omega-3s – EPA and DHA – which are required for healthy brain function. These can also be obtained directly from some species of algae and there are many vegan algae-based omega-3 supplements available.

OMEGA-3 — DO I NEED A SUPPLEMENT?

Most people get plenty of fat in their diet but the key is to consume the right balance. Unsaturated fats are the healthy kind but it's good to bear in mind that whilst olive oil and sunflower seeds have their health benefits, they don't contain the essential omega-3 fats we need. To ensure a sufficient omega-3 intake, make ground flaxseed, hempseed or chia seeds a part of your daily diet – add a heaped tablespoon to your morning cereal, smoothie or sprinkle on a soup, salad or rice bowl before serving; use flaxseed oil in dressings (don't cook with it as that destroys the beneficial properties), grab some walnuts as a snack and use small amounts of cold-pressed rapeseed oil for cooking. Omega-6 fats are important too but are abundant in nuts and seeds, soya, other oils and products so most people get more than enough.

Fish get their omega-3s from algae, which are naturally rich in omega-3 fats. You can buy omega-3 vegan supplements produced from algae, which contain EPA and DHA. The algae used are usually grown in controlled conditions away from the sea so it doesn't impact on marine ecosystems or deprive fish of their natural food. By avoiding fish and fish oils you'll be doing yourself and the environment a favour, whilst getting the safest, toxin-free omega-3 fats.



TRANS-FATS

Trans-fats (also called trans fatty acids or hydrogenated fats) are bad news. They increase your risk of heart disease and stroke by raising harmful cholesterol levels. Their effect on blood cholesterol is twice that of saturated fats.

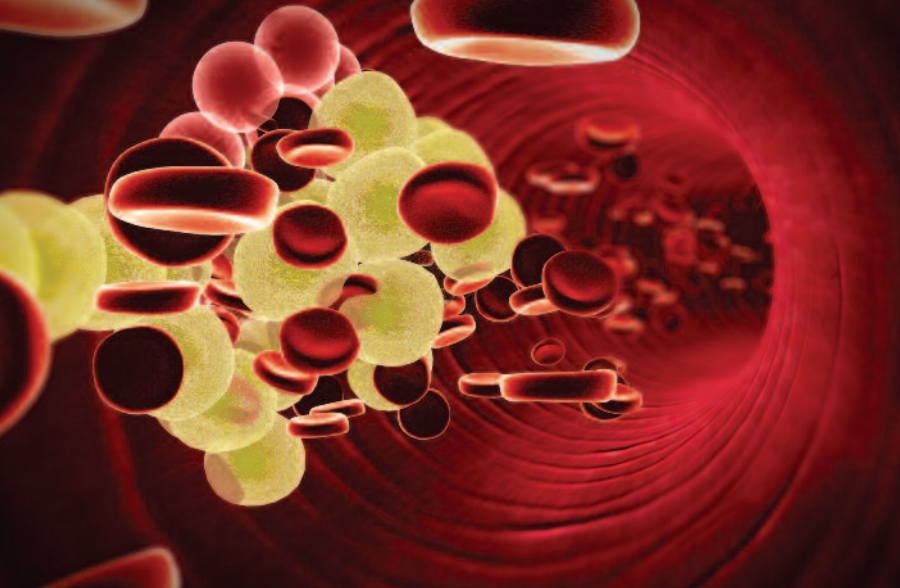
Low levels of trans-fats are naturally found in dairy products, lamb and beef fat. Larger amounts may be found in processed foods.

Trans-fats are made by an industrial process known as hydrogenation, which converts liquid vegetable oils into solid or semi-solid fats. The final product is called hydrogenated vegetable oil or hydrogenated fat – which is essentially just a different term for trans-fats. They are sometimes used in biscuits, cakes, pastries, shortening and many processed foods. Avoid products containing trans-fats (which always have to be declared in the ingredients) to keep your diet healthy.

Since 2008, members of the British Retail Consortium, which includes major UK supermarkets and fast food chains, stopped using trans-fats in foods. However, food produced outside the UK may still contain them. Check the list of ingredients used in your food, if 'partially hydrogenated fat/oil' or 'hydrogenated fat/oil' is listed, the food contains trans-fats.

Note on margarine: margarine used to contain hydrogenated fats and that's why it gained a bad reputation but most manufacturers have since changed their product ingredients so margarine quality has improved considerably and there's no reason to believe the scare-stories (always check the ingredients though).





CHOLESTEROL

Cholesterol is a soft, waxy substance. Small particles of it can be found carried in the bloodstream, it is also built into cell membranes and forming some hormones. However, high levels of cholesterol in the blood are a major risk factor for heart disease and stroke.

Your body produces its own cholesterol according to your needs. And so do the bodies of animals, which is why animal products contain it too. High levels of cholesterol may be found in egg yolks, meat, poultry, shellfish and dairy products. On the other hand, plant-based foods do not contain any cholesterol – even high-fat plant foods such as avocados, nuts and seeds. So a vegan diet is completely cholesterol-free.

You have no need for dietary cholesterol as your body can make all it needs. However, as we make cholesterol from saturated and hydrogenated fats in the diet – the more of these fats we eat, the higher our cholesterol levels go, increasing the risk of heart disease (Sacks *et al.*, 2017; Korakas *et al.*, 2018). See Cholesterol, heart disease and stroke, page 51.

A-Z OF NUTRIENTS

Worried about iron or calcium? Ever wondered how much protein you need or what the difference between good fat and bad fat is? Do you know where to get important health-protecting vitamins, minerals and those super-powered antioxidants? Find out about carbohydrates, omega-3 fats, zinc, iodine, vitamin D and vitamin B12 – and be reassured.

Our A-Z of **Nutrients** has all the answers and more.

Find out if bananas really are a great source of potassium and why Popeye loved spinach so much – the answer is not what you think!

For each nutrient, we tell you how much you need, why it is important and where you can get it.



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viva.org.uk/a-z-of-nutrients

VITAMINS & MINERALS

Vitamins and minerals are natural compounds that we need in variable, but generally small, amounts – which is why they're called micronutrients.

However, those small amounts are vital to our health. Vitamins and minerals play a crucial role in our metabolism and hormones, are a part of our cells and tissues and help regulate muscle and nerve function.

Some of them are antioxidants too, and so protect our bodies from damage caused by free radicals – harmful by-products of our metabolism but also produced by alcohol consumption, cigarette smoke, environmental pollution, stress and lack of sleep. Antioxidants roam around the body disarming free radicals – providing your body with antioxidants is like sending in the cavalry. There are a multitude of antioxidants in plant foods, such as vitamins A (beta carotene), C and E, selenium, lycopene and polyphenols and many, many more. The best strategy is to eat plenty of brightly coloured plant foods – fresh fruit and vegetables (eg sweet potato, red cabbage and black grapes), black beans, red lentils, wholegrains, nuts with skins on, edamame, cinnamon, turmeric and mushrooms.



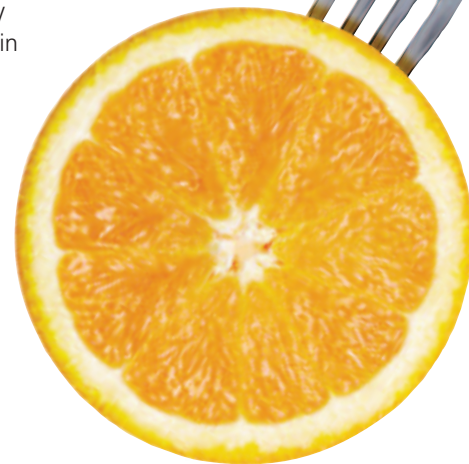
Some of the most notable vitamins and minerals include:

VITAMINS A, C AND E

Vegans get plenty of vitamin A, essential for healthy vision, by eating foods containing beta-carotene, which our bodies convert into vitamin A. The best sources include carrots, sweet potatoes, red, orange and yellow peppers, tomatoes, green leafy vegetables, mangoes, apricots, pumpkins, cantaloupe melons and romaine lettuce.

You'll find plenty of vitamin C, important for wound healing and the growth and repair of all our tissues, in kiwi fruit, berries and currants, oranges, grapefruit, broccoli, spinach, cabbage, peas, strawberries, peppers and other fruit and vegetables.

The powerful antioxidant vital for a healthy immune system, skin and cell membranes, vitamin E, can be found in nuts and seeds, wholegrains, green leafy vegetables, tomatoes, avocados, olives and kiwi fruit.



THE B VITAMINS

This vital group of vitamins consists of B1 (thiamine), B2 (riboflavin), B3 (niacin), B5 (pantothenic acid), B6 (pyridoxine), B7 (biotin), B9 (folic acid) and B12 (cobalamin). Most of the B vitamins are involved in releasing energy from food and enable growth and repair of our body's tissues. Wholegrains (eg wholemeal bread, cereals, brown rice, wholewheat pasta), yeast extracts, pulses, nuts, seeds, dark green leafy vegetables, avocados and bananas are all great sources of almost all of them.

Nutritional yeast is sold in tubs of flakes that can be sprinkled on dishes or added to sauces. Very popular with vegans, it even has its own nickname – nooch! A five gram teaspoonful provides much of your daily requirement of B vitamins (with the possible exception of biotin) providing you buy one fortified with vitamin B12 to cover all bases!

Vitamin B12 (cobalamin) is important for the maintenance of a healthy nervous system and normal blood formation. B12 is made by bacteria found in soil and water and traditionally, people and animals got B12 from eating food from the ground. However, now food production systems are so sanitised, we need to take a supplement or ensure a sufficient intake of fortified foods. Animal products contain vitamin B12 because farmed animals are given a supplement too. This makes the recommendation to eat animal products for B12 somewhat invalid.

The B12 used in fortified foods and supplements (cyanocobalamin) is produced commercially by growing bacterial cultures in large vats. Cut out the middleman and get B12 straight from the source!

Foods fortified with B12 include some breakfast cereals (check the ingredients label), yeast extracts (eg Marmite or Meridian yeast extract), vegetable margarines, plant milks and yoghurts. Whether you choose fortified foods or supplements, you need to consume these regularly. There's no need to take extra high doses, 50 micrograms a day is sufficient, but if you do, taking up to 2,000 micrograms a day of vitamin B12 is unlikely to cause any harm.



VITAMIN D

Vitamin D helps regulate levels of calcium and phosphate in our bodies, keeping our bones, teeth and muscles healthy. It also helps to support our immune system. Previously, the government only recommended vitamin D supplements for babies, pregnant women and the elderly, assuming most people got enough from sunshine. However, on realising how common low vitamin D levels are in the UK population, in 2016 Public Health England changed their advice and now say that during autumn and winter, everyone needs a dietary source of vitamin D supplying 10 micrograms a day. For most people, regardless of diet, this means taking a supplement.

Plant-based food sources include vitamin D mushrooms (exposed to UV sunlight for long enough for them to produce the vitamin), fortified plant milks, margarines and breakfast cereals – unless labelled suitable for vegans, these often include vitamin D3 extracted from the lanolin in sheep's wool. Vitamin D2 is always vegan. There are vegan D3 supplements (made from lichen) available as an oral spray or in tablets.



CALCIUM

Calcium is important for healthy bones, teeth and normal muscle function. The popular myth that we need dairy milk for calcium is slowly but surely crumbling. Not only is calcium found in many plant-based foods, such as nuts (eg almonds) and seeds (eg sesame seeds and tahini in hummus are a great source), pulses (including calcium-set tofu and tempeh), dried figs, dark green leafy vegetables (eg broccoli, kale, watercress and cabbage) and fortified plant milks, but plant sources are also better for you than dairy milk.

Excessive amounts of animal protein (from meat, milk, fish and eggs), sugar and processed foods in the diet may contribute to calcium losses from the bones in older people or those with compromised kidney function – weakening the skeleton and increasing the risk of osteoporosis (Frassetto *et al.*, 2018). This is due to animal protein containing more sulphur amino acids than plant protein – these form acid in the body which needs to be neutralised and it just so happens that calcium is the body's main acid-neutralising agent. If the amount readily available in the blood or muscles is not enough, calcium may be drawn from the bones. Dairy milk does not help despite being promoted as important for bone health – it offers no bone health benefits and can even increase the risk of fractures (Lanou, 2009; Michaëlsson *et al.*, 2014). Vegan diets produce much less acid and scientific studies link this fact to the bone protective effects of plant-based diets (Knurick *et al.*, 2015; Burckhardt, 2016).

Consider the fact that over 70 per cent of the world's population are lactose intolerant and can't digest the sugar (lactose) in milk, but that most osteoporosis occurs in the countries that consume the most dairy – it clearly does not protect! You are better off getting your calcium from plant-based foods. Don't forget, vitamin D helps your body absorb the calcium it needs.



IRON

We need iron for our red blood cells to be able to transport oxygen to all parts of the body. In the UK, almost one in every two girls (48 per cent) aged 11 to 18 are failing to meet even low targets, along with over a quarter of women (27 per cent) aged 19 to 64 (Public Health England, 2016). Most of these women aren't vegan or vegetarian so the idea that we need meat for iron simply doesn't stand up. What we do need is a diet with good iron sources and a healthy vegan diet can provide just that (Karlsen *et al.*, 2019).

You don't need to eat meat for iron, in fact, the type of iron meat contains, haem iron, is linked to a number of health problems. It is readily absorbed in the body, but that is not a good thing as it can build up and cause damage. Excess levels encourage the production of harmful free radicals and may increase the risk of heart disease. Non-haem iron, from plant foods, is only absorbed by the body according to your needs.

Good sources of iron include pulses (eg peas, beans, lentils and soya), wholemeal bread, green leafy vegetables, dried fruit (eg apricots and figs), cocoa and pumpkin seeds. Vitamin C can increase the absorption of iron as much as four-fold – yet another reason why fresh fruit and vegetables are so important in the diet!

IODINE

The iodine in cow's milk and dairy products comes from iodine supplements in cattle feed and iodine-containing disinfectant udder washes! A healthy vegan diet containing lots of wholegrains, vegetables and potatoes with skin on, with some occasional seaweed and/or iodised salt (used sparingly) will cover your needs.



Nutrients in a Vegan diet

NUTRIENT Protein

FUNCTION Vital for growth, development and repair of body tissues. Helps enzymes and hormones to function

SOURCES Pulses (eg peas, beans, lentils), soya (eg tofu, soya milk, soya mince, edamame), wholegrains (eg brown rice, oats, quinoa), nuts and seeds (eg nut butters and tahini), beansprouts



NUTRIENT Fats

FUNCTION Carry some vitamins and energy to cells. Essential fats are vital to the brain, eyes and nerves and omega-3s are anti-inflammatory

SOURCES Seeds (eg flaxseed, hempseed and their oils and chia seeds are all omega-3 rich), nuts, soya, avocados, extra virgin olive oil

NUTRIENT Carbohydrates

FUNCTION Main source of energy

SOURCES Wholegrains (eg oats, wholemeal bread, brown rice, wholewheat or buckwheat pasta), potatoes, sweet potatoes, beans, peas, lentils, fruits, vegetables

NUTRIENT Fibre

FUNCTION Keeps bowels healthy and regular; slows sugar and fat absorption and reduces cholesterol

SOURCES Fruit and vegetables, wholegrains, nuts, seeds, beans, peas, lentils

NUTRIENT Vitamin A

FUNCTION (Beta-Carotene) Antioxidant. Healthy vision, bone and teeth development, growth and tissue repair

SOURCES Carrots, sweet potatoes, red/yellow peppers, tomatoes, green leafy vegetables, watercress, mango, apricots, pumpkins, cantaloupe melon, romaine lettuce

NUTRIENT B Group Vitamins

B1 Thiamine, B2 Riboflavin, B3 Niacin, B5 Pantothenic Acid, B6 Pyridoxine, B7 Biotin, B9 Folic Acid

FUNCTION Absorption of energy, protein and fats, cell growth and nerve function

SOURCES Brazil nuts, hazelnuts, almonds, peanuts, green leafy vegetables, nutritional yeast, yeast extract, wholegrains, beansprouts, broad beans, bananas, avocados, mushrooms, wheatgerm, currants, soya, beans, peas



NUTRIENT Vitamin B12

FUNCTION Nerve formation, red blood cell production and allows us to use nutrients such as protein

SOURCES Fortified products, including plant milks and yoghurts, yeast extract (eg Marmite or Meridian), breakfast cereals, margarines, some mock meat products, vitamin B12 supplement

NUTRIENT Vitamin C

FUNCTION Healthy skin, teeth, bones and connective tissue. Aids iron absorption, important in disease resistance and for proper functioning of the immune system

SOURCES Oranges, grapefruit, lemons, broccoli, spinach, cabbage, blackcurrants, kiwi fruit, strawberries, peppers, parsley, potatoes



NUTRIENT Vitamin D

FUNCTION Essential for the absorption of calcium and phosphate. (Sunlight enables the body to make vitamin D in the skin.) Supports the immune system

SOURCES Sunlight on the skin, fortified margarine, fortified breakfast cereals, fortified plant milks, vitamin D mushrooms, vitamin D supplement



NUTRIENT Vitamin E

FUNCTION Antioxidant. Helps protect the skin from UV damage, needed for cell membranes, protects fats in cell membranes against free radical damage

SOURCES Nuts and seeds, avocados, vegetable oils, wheatgerm, wholegrains, tomatoes, asparagus, spinach, apples, carrots, celery



NUTRIENT Vitamin K

FUNCTION Essential for blood clotting and healthy bones. Half our requirements can be made by bacteria in the gut

SOURCES Broccoli, lettuce, cabbage, spinach, watercress, Brussels sprouts, asparagus, peas, raspberries



NUTRIENT Calcium

FUNCTION Bone and teeth structure; muscle contractions; blood clotting and nervous system. Also vital to some hormones

SOURCES Sesame seeds and other seeds, pulses (eg tofu, all types of beans, peas, lentils), broccoli, kale, watercress and other green leafy veg, swede, almonds, Brazil nuts, fortified plant milks and other products, cinnamon, fennel, olives



NUTRIENT Iron

FUNCTION Vital for red blood cell production, to transport oxygen around the body and energy production

SOURCES Beans, lentils, peas, broccoli, spinach, cabbage, wholegrains, dried apricots, prunes, figs, pumpkin and chia seeds, black treacle, cocoa, turmeric, thyme



NUTRIENT Iodine**FUNCTION** Makes thyroid hormones, vital for regulating metabolism**SOURCES** Seaweed* (eg nori sprinkles, sushi sheets), iodised salt, levels vary in plant foods such as green leafy vegetables and strawberries

*kelp can have too much iodine so use sparingly

NUTRIENT Magnesium**FUNCTION** Bone formation, metabolism, production of DNA, energy, muscle and nerve function**SOURCES** Green leafy vegetables, nuts, pulses, wholegrains, bananas, apricots, apples, prunes**NUTRIENT** Potassium**FUNCTION** Fluid balance, muscle and nerve impulse function, heart muscle function**SOURCES** Fennel, Brussels sprouts, broccoli, aubergine, tomatoes, parsley, cucumber, turmeric, apricots, strawberries, bananas, cantaloupe melon, cauliflower, cabbage, almonds**NUTRIENT** Zinc**FUNCTION** Involved in metabolism, wound healing and immunity. Also essential for healthy sperm, skin, taste and smell**SOURCES** Lentils, peas, beans, tofu, wholegrains, green leafy vegetables, nuts and seeds (esp. pumpkin seeds), nutritional yeast, basil, thyme**NUTRIENT** Others: Selenium, Cobalt, Copper, Manganese, Molybdenum**FUNCTION** Dental, bone and skin health, hair and red blood cell growth and metabolism**SOURCES** Spinach, broccoli, peas, beans, lentils, brewer's yeast, almonds, Brazil nuts, bananas, potatoes, wholegrains, seaweed

Official endorsements of Vegan diets

In recent years, the popularity of veganism has risen sharply and many more people are becoming vegan or buying vegan products than ever before. National and international health bodies pay close attention to all health and nutrition issues and have been producing studies and statements on plant-based diets for many years. The public is not always aware but the support for veganism from these institutions is overwhelming. Here's what they say about vegan diets:

Academy of Nutrition and Dietetics, USA (Melina, Craig and Levin, 2016):

"It is the position of the Academy of Nutrition and Dietetics that appropriately planned vegetarian, including vegan, diets are healthful, nutritionally adequate, and may provide health benefits for the prevention and treatment of certain diseases. These diets are appropriate for all stages of the life cycle, including pregnancy, lactation, infancy, childhood, adolescence, older adulthood, and for athletes. Plant-based diets are more environmentally sustainable than diets rich in animal products because they use fewer natural resources and are associated with much less environmental damage. Vegetarians and vegans are at reduced risk of certain health conditions, including ischemic heart disease, type 2 diabetes, hypertension, certain types of cancer, and obesity. Low intake of saturated fat and high intakes of vegetables, fruits, whole grains, legumes, soy products, nuts, and seeds (all rich in fiber and phytochemicals) are characteristics of vegetarian and vegan diets that produce lower total and low-density lipoprotein cholesterol levels and better serum glucose control. These factors contribute to reduction of chronic disease. Vegans need reliable sources of vitamin B-12, such as fortified foods or supplements."

British Dietetic Association (BDA, 2017):

"We want to reassure vegans that their lifestyle choice supports healthy living and give dietitians confidence to deliver reliable vegan-friendly dietetics advice."

Food and Agricultural Organisation of the United States (FAO, 2016):

"Poor dietary habits, rich in meat and foods that are high in sugar and fat and low in whole grains, fruits and vegetables have been closely linked to non-communicable diseases – a leading cause of premature death, not only in high-income countries but also many parts of the developing world. These diets are typically not only unhealthy, but environmentally unsustainable."

Canadian Paediatric Society (Amit, CPS, 2010):

"Well-planned vegetarian and vegan diets with appropriate attention to specific nutrient components can provide a healthy alternative lifestyle at all stages of foetal, infant, child and adolescent growth."

World Health Organisation (WHO, 2018):

"A healthy diet that has a lower environmental impact includes a wide variety of foods – with an emphasis on plant-based foods (fruits, vegetables, whole grains and pulses) and on locally-produced, home-prepared foods – and provides just the right amount of calories."

Italian Society of Human Nutrition (Agnoli et al., 2017):

"Interest in and appreciation of vegetarian [including vegan] diets are growing in Italy and elsewhere. The evidence reviewed in this paper makes it clear that well-planned vegetarian diets that include a wide variety of plant foods, and a reliable source of vitamin B12, provide adequate nutrient intake."

Is a Vegan diet suitable for children?

The health and well-being of our children critically determines their opportunities in life. A healthy diet is vital to reduce the risk of obesity, diabetes, cardiovascular disease and many types of cancer.

There's a lot of misinformation around, but rest assured, a well-planned vegan diet is suitable for all, including pregnant women and children. Research on vegan mothers and children

stresses the importance of good nutrition – they highlight the need for a reliable source of vitamin B12 –

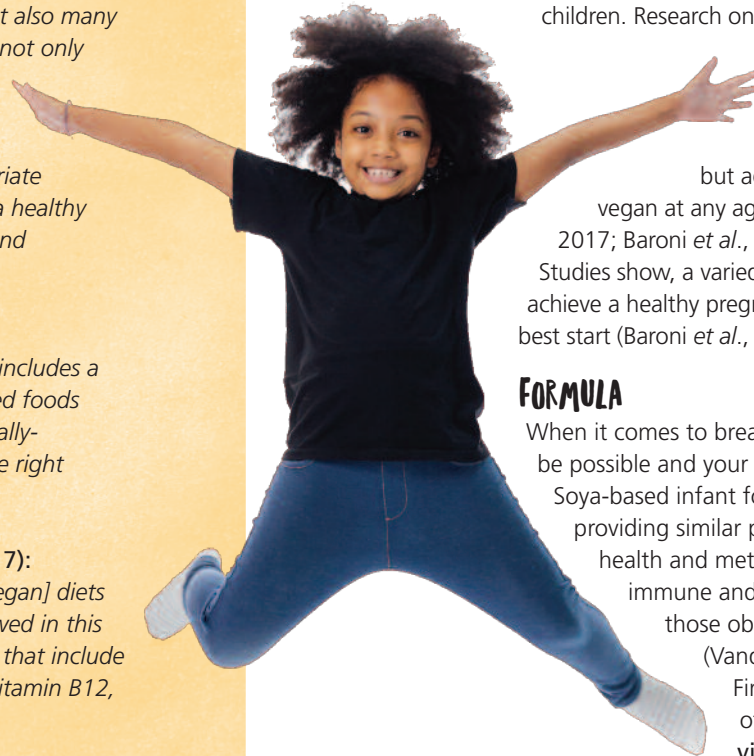
but agree that you can be a healthy vegan at any age and life situation (Pawlak, 2017; Baroni et al., 2018; Sebastiani et al., 2019). Studies show, a varied, vegan diet can help you achieve a healthy pregnancy and give your baby the best start (Baroni et al., 2018; Sebastiani et al., 2019).

FORMULA

When it comes to breastfeeding, it may not always be possible and your baby may need infant formula. Soya-based infant formulas offer a safe alternative, providing similar patterns of growth, bone health and metabolic, reproductive, endocrine, immune and neurological functions to those observed in breast-fed infants (Vandenplas et al., 2014).

Find out more about the safety of soya here:

viva.org.uk/health/healthy-vegan-diet/soya-facts.



FRUIT AND VEGETABLES

Eight out of 10 children in the UK don't get their 5-a-day of fruits and vegetables! Vegan children are much more likely to get the fruit and vegetables they need, vital for ensuring an adequate intake of vitamins, minerals and fibre. Eating ten portions of fruit and vegetables a day may reduce the risk of premature death by 31 per cent (Aune *et al.*, 2017).

PROTEIN

A varied vegan diet including pulses (peas, lentils, beans including soya), wholegrains (wholemeal bread, wholewheat pasta, oats, brown rice and quinoa), nuts and seeds* will provide plenty of protein. Plant-based mince, sausages and burgers are also high in protein, but it is best to limit processed foods and eat mostly wholefoods.

CALCIUM

Fortified soya milk and soya yoghurt, calcium-set tofu, green vegetables (broccoli, pak choi and spring greens), tahini (sesame seed paste in hummus), nut butters* and pulses (peas, lentils, beans including soya) are all excellent sources of calcium.

IRON

Babies are born with their own iron stores, which deplete at around six months of age. From this point iron can be provided by wholegrains (quinoa, wholewheat pasta, wholemeal bread, brown rice and oats), fortified breakfast cereals, pulses (peas, lentils, beans including soya), seed butters* and tahini, dried fruit** (apricots and figs), seaweed (nori) and dark green leafy vegetables.

HEALTHY FATS

Nuts and seeds* are a great source of healthy fats like omega-3s. Try adding some ground flaxseed to breakfast cereals or a small handful of walnuts* to homemade smoothies

*A note on nuts: whole nuts and seeds shouldn't be given to children under five in case they choke.

**Raisins and dried fruits can be a choking hazard for babies and young children. Once your baby becomes proficient at chewing solid foods, at around 9-12 months, dried fruit may be given if it is chopped up into small pieces.

IODINE

Wholegrains, fruit and veg all provide iodine but amounts tend to be low and variable. Seaweed (like the type used in sushi) can be a good source but should be given to children in moderation – no more than once a week as it can contain very high amounts (avoid giving kelp to children as it often contains excessive levels).

DO KIDS NEED SUPPLEMENTS?

Everyone (including children) should take vitamin D in winter due to lack of sunlight. Vegan children should take a daily B12 supplement or consume adequate amounts of fortified foods. A healthy, varied vegan diet will supply all the other nutrients they need.

Healthy eating patterns are established early in life, so following this guidance will help give your child the best start.





Why do we thrive on plants?

Vegan diets provide excellent nutrition from childhood to old age. A well-planned vegan diet is healthier and more nutrient-dense than any other diet (Karlsen *et al.*, 2019). Several recent studies agree that vegans have the healthiest diets – consistently achieving the highest scores in diet quality rating (Rizzo *et al.*, 2013; Clarys *et al.*, 2014; Sobiecki *et al.*, 2016; Parker and Vadiveloo, 2019). But more than that, a vegan diet also lowers the risk of many chronic diseases.

We are well adapted to eating plant foods and all the vital nutrients we need can be found in a vegan diet with a little extra vitamin B12. The more plant-based foods we eat, the lower our risk of major diseases such as cancer, heart disease and type 2 diabetes (Grant, 2013; Chen *et al.*, 2018; Segovia-Siapco and Sabate, 2018).

Vegans tend to eat less saturated fat, no cholesterol, more fibre and antioxidants compared to meat- and fish-eaters and have a generally higher intake of healthy foods, such as fruit and vegetables, pulses, wholegrains, nuts and seeds (Miles *et al.*, 2019).

A vegan diet can help you achieve:

- **Lower blood pressure and cholesterol levels** (Bradbury *et al.*, 2014; Benatar & Stewart, 2018)
- **Lower risk of heart disease and stroke** (Dinu *et al.*, 2017; Freeman *et al.*, 2017; Hemler and Hu, 2019)
- **Lower risk of type 2 diabetes** (Satija *et al.*, 2016; Chen *et al.*, 2018, Hemler and Hu, 2019)
- **Lower risk of cancer** (Tantamango-Bartley *et al.*, 2013; Dinu *et al.*, 2017; Hemler and Hu 2019)
- **Healthy weight** (Clarys *et al.*, 2014; Miles *et al.*, 2019)

A diet based on plant foods means higher antioxidant intake. Antioxidants do not just protect us from everyday damage but can help reduce inflammation too. Many chronic conditions, such as arthritis, asthma, atherosclerosis, diabetes and irritable bowel diseases mean that the affected tissue is inflamed. Diets high in plant wholefoods can help reduce or prevent inflammation, which is yet another way they protect our health and help us thrive (Barnard *et al.*, 2019).

And that's not all! Vegan diets also help protect our kidneys and bones. Plant protein produces much less acid than animal protein when digested. This lower acid load of vegan diets means they are gentler on the kidneys and don't use bone calcium to neutralise the acid (Knurick *et al.*, 2015; Burckhardt, 2016; Cupisti *et al.*, 2017).

Vegan diets containing soya and cruciferous vegetables (broccoli, kale, watercress, rocket, radishes and cabbage) may also offer additional protection from cancer. Soya consumption has been linked to a lower risk of certain types of cancer – breast, prostate, ovarian and bowel cancers (Chatterjee *et al.*, 2018; Rizzo and Baroni, 2018). While cruciferous vegetables contain natural compounds that actively combat cancer and help protect our long-term health (Soundararajan and Kim, 2018). Taken together, a huge body of research shows that a vegan diet can help you achieve a longer, healthier and happier life!



Are we naturally vegan?

Dr William C. Roberts, Editor-in-Chief of *The American Journal of Cardiology* said: “Although most of us conduct our lives as omnivores in that we eat flesh as well as vegetables and fruits, human beings have characteristics of herbivores, not carnivores” (Roberts, 2000).

Our bodies are far more suited to eating plant foods than meat; our blunt little canine teeth and soft fingernails don't put us in the same league as wolves or lions – whose canines can be seven centimetres long! They rip their prey apart, tearing off chunks of raw meat and ‘wolfing’ them down without the aid of a knife and fork!

Research shows, our ancient ancestors ate a much more plant-based diet than Paleo pundits would like you to think. Evidence shows they ate roasted root vegetables, leafy vegetables, celery, figs, nuts, seeds and chenopodium seeds, which are similar to quinoa (Melamed *et al.*, 2016).

Even though we have eaten animals and their eggs during our evolution, they were additions to the diet – fruit, leaves, seeds, nuts and roots have always been the staples relied on for daily energy and nourishment (Milton, 2000; Jenkins *et al.*, 2003; Melamed *et al.*, 2016; Crittenden and Schnorr, 2017; Whiting, 2020). Just like our ancient ancestors and fellow apes, we are more suited to eating fruit, vegetables, nuts, seeds and grains (Jenkins *et al.*, 2003).

“Plants were the staples. They were the foods that formed the basis of our calories in most environments.” Dr Amanda Henry, a paleobiologist and associate professor at Leiden University in the Netherlands (Whiting, 2020).

A TRIP THROUGH THE BODY

From top to bottom, our bodies have evolved to efficiently process plant foods. Digestion begins in the mouth with a salivary enzyme called amylase, which helps start the breakdown of carbohydrates from plant foods into simple sugars. As there are no carbohydrates in meat, true carnivores don't need this enzyme and their salivary glands don't make it.

The human intestine is long and coiled, much like that of apes and other plant-eaters. This makes digestion slow, allowing time to break down and absorb the nutrients from plant foods. In contrast, the intestine of a carnivore, such as a cat, is short, straight and tubular so that flesh can be digested and expelled rapidly before it putrefies (rots).

The difference in transit time (time taken for food to make its way from the mouth to the anus) between humans and carnivores is what really brings the anatomical differences home. Humans usually take 24 to 72 hours – the average is 39 to 51 hours to digest food (Bowen R, 2020). If we ate a large meat meal, like a tiger, we would take the longer time – because we are slow at digesting protein-rich and fatty foods, such as meat and fish, and we tend to take less time digesting high-fibre foods, such as fruits and vegetables. In stark contrast, the shorter digestive system of carnivores means that the average transit time is much less in a tiger and is just two-and-a-half hours in the mink! This means that when people eat meat, it has plenty of time to putrefy and cause the production of cancer-causing agents.

It is well known that too much cholesterol is harmful to the human body. What is less widely known is that cholesterol is only found in animal foods and not plant foods. Meat-eating animals have an unlimited capacity to break down and excrete cholesterol from their bodies. Consider the effects saturated fat has on our arteries, increasing the risk of heart disease and stroke, it's clear we are not designed to eat meat. Wolves and lions have no such problem.

Like other plant-eating animals, our livers have a limited capacity for removing cholesterol so people who eat lots of

animal-based foods tend to have higher cholesterol levels while vegans have lower levels.

Other parts of our anatomy provide clear evidence that we are not natural predators – our canine teeth are short and blunt; our molars square and flattened to crush and grind food; we have soft fingernails not claws; our jaws move sideways unlike those of carnivores which just open and close for strength – and their jaws open much wider than ours (relative to body size) to hold struggling prey.

IS IT NATURAL TO DRINK MILK?

No other mammal consumes milk beyond weaning – and never the milk of a different species! Just like all other mammals, most humans gradually lose the ability to digest lactose (milk sugar) during early childhood – globally, about 70 per cent of adults are lactose-intolerant (Bayless *et al.*, 2017). The fact that some people can digest lactose in adulthood is the result of genetic mutations that occurred in Europe, Central Asia and parts of Africa just a few thousand years ago with the advent of farming and spread among those populations. It means that many people with European heritage, including white populations in North America and Australia, some people with African heritage and certain Asian populations can digest lactose but most people from Asia, South America, Australia and Africa cannot – consuming it causes them great digestive discomfort and makes them ill (Bayless *et al.*, 2017). Nature simply never intended for adults to need breastmilk so being unable to digest lactose in adulthood is normal.

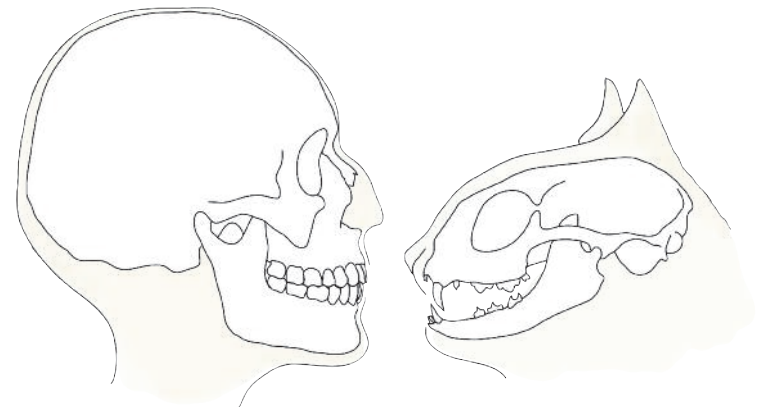
The typical Western diet, packed with meat, dairy and processed food, is linked to a wide range of illnesses and diseases but a Paleo diet is not the answer. All major health bodies recommend reducing meat consumption, not only for your own health but for the planet too, because animal agriculture is having a devastating effect on the environment. A varied vegan diet can meet all your nutritional needs and protect you from all major chronic diseases – we are designed for it!



COMPARATIVE ANATOMY CHART: CARNIVORES, HERBIVORES, OMNIVORES AND HUMANS

| CARNIVORE | OMNIVORE | HERBIVORE | HUMAN |
|--|--------------------------------------|---|---|
| Cheek muscles Reduced to allow wide mouth gape | Reduced to allow wide mouth gape | Well-developed to aid chewing | Well-developed to aid chewing |
| Jaw motion Slicing; minimal side-to-side motion | Slicing; minimal side-to-side motion | No slicing; good side-to-side, front-to-back motion | No slicing; good side-to-side, front-to-back motion |
| Mouth opening vs head size Large | Large | Small | Small |
| Teeth: incisors (front teeth) Short and pointed | Short and pointed | Broad, flattened and spade-like | Broad, flattened and spade-like |
| Teeth: canines Long, sharp and curved | Long, sharp and curved | Dull and short or long (for defence), or none | Short and blunted |
| Teeth: molars (back teeth) Sharp, jagged, and blade-shaped | Sharp blades and/or flattened | Flattened to crush and grind food | Flattened to crush and grind food |
| Chewing Hardly any; swallows food whole | Hardly any or simple crushing | Extensive chewing necessary | Extensive chewing necessary |

| CARNIVORE | OMNIVORE | HERBIVORE | HUMAN |
|---|---|--|--|
| Saliva Mostly mucous saliva, not large volume | Seromucous (mixed) saliva | Mostly serous (watery) saliva, larger volume | Mostly serous (watery) saliva, larger volume |
| No enzyme amylase to pre-digest carbohydrates | Amylase in the saliva to start carbohydrate digestion | Alkaline saliva; amylase to start carbohydrate digestion | Alkaline saliva; amylase to start carbohydrate digestion |
| Colon Simple, short, smooth | Varied | Long, complex, often sacculated | Long and sacculated |
| Nails Claws | Claws or sharp hooves | Hooves or soft nails | Soft nails |
| Body cooling technique Panting | Panting | Sweating | Sweating |



For a fully referenced version go to viva.org.uk/health/physiology-vegan



Diet and disease

A diet based on plant wholefoods is the healthiest possible. It won't make you bulletproof but can reduce your risk of many diseases and can even reverse some of them!

CHOLESTEROL, HEART DISEASE AND STROKE

The links between diet and heart health, blood pressure and cholesterol are well established. Diets high in meat, saturated fat, sugar, processed foods and salt, and lacking in fruit and vegetables, wholegrains, nuts and seeds are bad for the heart and blood vessels (Micha *et al.*, 2017; Korakas *et al.*, 2018). These diets supply the body with too many saturated and trans-fats that increase the amount of cholesterol forming plaques on the inside walls of your arteries and can eventually clog them. The term for this artery narrowing is atherosclerosis and when normal blood flow is blocked, it can lead to heart attacks and stroke.

A large European Prospective Investigation into Cancer and Nutrition (EPIC) study, following 400,000 people in nine European countries for 12 years, found that for every 100 grams of red or processed meat they consumed per day, their risk of heart disease increased by 19 per cent. These results, they said, are consistent with how these foods are associated with higher levels of cholesterol and blood pressure and concluded that substituting other foods for red and processed meat could lower your risk of heart disease (Key *et al.*, 2019).

When it comes to meaty diets, there's another substance making matters worse – L-carnitine, an amino acid found mostly in meat. The crucial part is what happens to it in our guts, depending on our gut bacteria. When meat-eaters and vegans are given L-carnitine, their gut bacteria turn it into an intermediate substance but meat-eaters' bacteria then transform that into the harmful compound TMAO – a dangerous substance that stimulates the build-up of cholesterol plaques in blood vessels which can lead to heart disease (Koeth *et al.*, 2019). Scientists have found that people who eat a diet rich in red meat have triple the TMAO

levels of those eating mostly plant-based proteins. Importantly, they discovered that TMAO increases are reversible; when meat-eaters stop eating meat, their TMAO levels drop (Wang *et al.*, 2019). The fact that vegans tend to have substantially lower levels of TMAO may partly explain why they have much lower rates of heart disease (Koeth *et al.*, 2019).

Research shows that people who eat vegan or mostly plant-based diets have consistently lower blood pressure and cholesterol than all other diet groups and a much lower risk of heart disease – 25-57 per cent lower (Bradbury *et al.*, 2014; Le and Sabaté, 2014; Appleby and Key, 2016; Dinu *et al.*, 2017; Benatar and Stewart, 2018; Kahleova *et al.*, 2018; Korakas *et al.*, 2018; Matsumoto *et al.*, 2019).

A varied, low-fat, wholefood vegan diet does wonders for our heart and blood vessels. All the antioxidants, complex carbohydrates and fibre, healthy protein and fats help to keep our blood vessels healthy, flexible and plaque-free. But even if you're already suffering from heart disease, atherosclerosis or have high cholesterol, a vegan diet can work better than any drug or treatment – as heart health expert Dr Caldwell Esselstyn says: *“it is unconscionable not to inform the cardiovascular disease patient of this option for disease resolution”* (Esselstyn, 2017).

Esselstyn's words are supported by a comprehensive review of diets and their impact on heart health: *“A low-fat, plant-based diet remains the only dietary pattern objectively proven to reverse CHD [coronary heart disease]”* (Kearley, 2018). And yet another review agrees: *“Plant-based diets are the only dietary pattern to have shown reversal of CHD”* (Kahleova *et al.*, 2018).

Wholesome vegan diets help to protect your heart and blood vessels in several ways:

- Lower saturated fat intake leads to lower blood cholesterol levels
- Higher fibre intake helps to lower cholesterol levels and regulates blood sugar
- Higher intake of polyunsaturated fats has beneficial effects on heart health
- Antioxidants from plant foods help to protect blood vessels against damage

CANCER

Meat has been repeatedly linked to cancer and many experts would like to see health warnings on meat products. In 2015, the World Health Organisation (WHO) classified processed meat as carcinogenic and red meat as probably carcinogenic (Bouvard *et al.*, 2015). Even small amounts of red and processed meat have been shown to increase your risk of colon, breast and prostate cancer (Wolk, 2017).

Cooking meat at high temperatures produces dangerous compounds called polycyclic aromatic hydrocarbons (PAH) and heterocyclic amines (HCA). These have a very high potential for causing cancer and one HCA, called PhiP, also has strong hormone-stimulating effects, increasing the risk of hormone-sensitive cancers such as breast, ovarian and prostate cancer (Jariyasopit *et al.*, 2014; Papaioannou *et al.*, 2014). Fried, roast and grilled chicken can contain particularly high amounts – chicken and PhiPs – not so finger-licking good!

Some substances added to processed meat, such as nitrites, can lead to the formation of carcinogenic N-nitroso compounds, which is another reason why processed meat poses a cancer risk.



Then, there are polychlorinated biphenyls (PCBs). These industrial pesticides were banned worldwide more than 30 years ago because of their toxicity but they are still present in our environment. Once in the body, PCBs accumulate in the fat tissue and can cause

serious health issues, including cancer. A review on PCBs revealed that in the food chain, fish, dairy, hamburgers and poultry are the most contaminated foods (Crinnion, 2011).

And there's yet another reason why animal products may increase your cancer risk – insulin-like growth factor 1 (IGF-1). It's a growth hormone naturally produced by your liver, vital to childhood growth and stimulating cell growth and reproduction in adults. However, IGF-1 also promotes cancer cell growth and that's why increased IGF-1 levels may be dangerous (Jenkins *et al.*, 2006). Scientists warn that proteins or peptides (small chains of amino acids) from dairy products can cause a rise in insulin, IGF-1 and growth hormone levels in the human body (Melnik *et al.*, 2011). The association between dairy intake and cancer is the strongest for prostate cancer (Travis *et al.*, 2016) but there is also evidence for the same mechanism and breast cancer (Bradbury *et al.*, 2015). It's worth highlighting that vegans have been found to have significantly lower levels of IGF-1 circulating in the blood than meat-eaters (Allen *et al.*, 2000 and 2002; McCarty, 2014).

All these facts help to explain why vegans have lower cancer rates. According to a large study from Oxford University, British vegans have a one fifth lower risk than meat-eaters for all cancers combined (Key *et al.*, 2014). The results of the US Adventist Health Study II (AHS-2)



were similar; vegans had a 16 per cent lower risk of all cancers combined (Tantamango-Bartley *et al.*, 2013). These results correspond with other scientific studies that show 15-18 per cent lower overall cancer rates in vegans (Huang *et al.*, 2012; Dinu *et al.*, 2017; Segovia-Siapco and Sabaté, 2018).

Perhaps unsurprisingly, since food passes through the stomach, one study found that vegetarians had a whopping 63 per cent lower risk of stomach cancer (Appleby and Key, 2016). Lower down the digestive tract, it's clear why fibre from plant foods is so important – there is a 10-13 per cent decrease in the risk of bowel cancer for each 10 grams of fibre consumed from plant wholefoods (Aune *et al.*, 2011; Murphy *et al.*, 2012). Bowel cancer, also known as colorectal cancer, is the fourth most common cancer in the UK. Fibre protects against it in a number of ways; encouraging 'good' gut bacteria and helping to keep you regular, by increasing and diluting the bulk of stools, so harmful chemicals spend less time in your bowel. If you have the 30 grams of fibre a day recommended, you may be lowering your bowel cancer risk by up to around 40 per cent!

TYPE 2 DIABETES

Type 1 diabetes is caused by the pancreas failing to produce the hormone insulin or producing only a very small amount. However, a more common type of diabetes, called type 2, is caused by insulin resistance – whereby cells in the body stop responding to insulin. This important hormone, produced by the pancreas, acts as a key, letting glucose (sugar) from our blood enter our cells. Glucose is an essential source of energy for every single one of our cells. With insulin resistance, your cells cannot absorb glucose, so blood sugar levels build up. This can damage blood vessels and nerves, leading to serious health problems affecting eyesight, circulation, kidney and heart function.

Despite the common misconception, eating sugar is not a cause of diabetes (although it is not healthy), the main problem lies elsewhere. As many studies demonstrate, diets high in meat, fat and processed foods (Western style diets) cause the accumulation of tiny fat droplets

in your muscle and liver cells. When there are too many of these fatty particles, they interfere with the cell's metabolism so it stops being able to react to insulin correctly, causing insulin resistance (Sparks *et al.*, 2005; Morino *et al.*, 2006; Consitt *et al.*, 2009).

A wholesome vegan diet can prevent this from happening – in fact, vegans have up to 50 per cent lower risk of type 2 diabetes (Appleby and Key, 2016; Salas-Salvadó *et al.*, 2019). A vegan diet can even be used to reverse diabetes (Barnard *et al.*, 2009; Kahleova *et al.*, 2011; McMacken and Shah, 2017). Vegans tend to have better blood sugar control and higher insulin sensitivity than other dietary groups (Cui *et al.*, 2019). There are several reasons for this – plant wholefoods naturally contain less fat, and saturated fat in particular, than animal products; they contain a lot more fibre, helping to regulate blood sugar, and contain many beneficial phytochemicals and complex carbohydrates, which means they induce positive and long-lasting metabolic changes (Chen *et al.*, 2018). It may sound too good to be true, but the evidence that plant-based diets can both prevent and reverse type 2 diabetes is now so strong that many healthcare professionals recommend it as the primary approach to treating this disease.



"A plant-based diet is a powerful tool for preventing, managing, and even reversing type 2 diabetes. Not only is this the most delicious 'prescription' you can imagine, but it's also easy to follow. Unlike other diets, there's no calorie counting, no skimpy portions, and no carb counting. Plus, all the 'side effects' are good ones."

Neal Barnard, MD, FACC, President, Physicians Committee for Responsible Medicine.

OBESITY

Obesity seriously increases your risk of heart disease, type 2 diabetes, some cancers and a host of other health issues. While a little extra weight is usually nothing to worry about, obesity is dangerous. Because a healthy vegan diet is based on wholefoods, it regulates your energy intake in a clever and beneficial way. Plenty of fibre makes you feel fuller for longer and ensures slower energy release from your food, while the lower fat content of plant foods naturally limits your fat intake. It's no coincidence that studies consistently show that vegans have the healthiest weight and are best protected from obesity (Rizzo *et al.*, 2013; Tantamango-Bartley *et al.*, 2013; Le and Sabaté, 2014; Huang *et al.*, 2016). Even without portion restriction, plant-based diets help to reduce body fat and improve your metabolism (Najjar and Feresin, 2019) – it's almost magical! However, with the increasing popularity of vegan treats and junk foods, you may still need to watch what you eat – vegan cakes are delicious but won't help you shed any weight. With wholefoods though, you can fill your boots guilt-free – brown rice risotto, wholewheat pasta, chickpea curry, chili non carne etc – eat up to thrive!



BONE HEALTH AND OSTEOPOROSIS

Healthy and strong bones are vital and there's a lot we can do to nourish them and prevent osteoporosis – brittle bone disease. Dairy is neither necessary nor useful when it comes to bone health. What matters is a diet containing sufficient calcium (see the section on calcium on page 31), vitamins C, D and K, many other minerals (magnesium, potassium, phosphorus etc) and a vegan diet is perfectly adequate in this respect (with a vitamin D supplement for all in winter). In fact, the high content of bone beneficial nutrients in plant foods has been linked to the good bone health of vegetarians and vegans (Knurick *et al.*, 2015; Sahni *et al.*, 2015; Burckhardt, 2016).

Research highlights that plant protein along with fruit and vegetable consumption – more than five a day – is important for healthy bones (Dai *et al.*, 2014; Sahni *et al.*, 2015). These foods provide a wealth of vitamins, minerals and antioxidants crucial for bone maintenance and repair. Perhaps surprisingly, vitamin B12 also plays a role, so a regular intake is a must.

Some plant foods that are rich in calcium also happen to be good sources of protein so making them a part of your daily diet would be a bone-smart decision – almonds, sesame seeds and tahini, chia seeds, tofu, edamame and other beans, dried figs and even wholemeal bread.

Research suggests that weight-bearing exercise (such as walking, dancing and climbing stairs rather than cycling or swimming) is the most critical factor for maintaining healthy bones, followed by improving your diet and lifestyle. So, physical exercise, eating plenty of fresh fruit and vegetables, a good supply of calcium and vitamin D, cutting down on caffeine and avoiding alcohol and smoking is the best way to grow healthy bones and preserve them.





KIDNEY HEALTH

Kidneys are our trusted filtration system, removing waste products from the blood and excreting them in our urine. What we eat determines how hard our kidneys have to work – if we overload them daily, there's a higher chance of them wearing out and of us developing kidney disease. If, on the other hand, we eat foods that are easy on the kidneys, we are insuring our kidney health for the long-term.

Research from a study spanning over 23 years suggests that animal protein from meat – red and processed in particular – is bad news for the kidneys, seriously increasing the risk of kidney disease later in life (Haring *et al.*, 2017). The same study also revealed that plant protein from pulses and nuts has the opposite effect – it lowers the risk and appears to have a kidney-protective effect.

Other studies agree and it's been highlighted that it's not merely the origin of protein that matters – it's the total package of nutrients in plant-based foods that makes them so good for us and our kidneys (Gluba-Brzózka *et al.*, 2017; Kalantar-Zadeh and Moore, 2019). Plant

foods produce less acid in the body than animal foods and they provide the healthy alkaline salts that kidneys like. A wholesome vegan diet is so great for the kidneys that it has been recommended for people with kidney disease to prevent further damage (Gluba-Brzózka *et al.*, 2017).

The same applies to kidney stones – diets based on plant-based foods slash your risk (Tourney *et al.*, 2014). If you already suffer with kidney stones, going vegan can prevent new ones from forming (Heilberg and Goldfarb, 2013).

TRUST YOUR GUT

Our guts are much more than just tubes that digest the food we eat. They are full of bacteria that help us process food. These bacteria, also called the gut microbiome, have a huge influence on our immunity, gut health, inflammation and energy levels.

The foods we eat determine what bacteria live in our guts and these can be either beneficial or harmful. Having bacteria in our intestines is perfectly normal, they consume the foods we eat and produce either beneficial, neutral or toxic by-products. When we eat plant foods, the beneficial bacteria thrive because they feast on fibre and complex carbohydrates, while animal-based foods have the opposite effect – they encourage bacteria that break down rotting flesh and fats, producing toxic, harmful by-products (Glick-Bauer and Yeh, 2014; O'Keefe *et al.*, 2015; Swain Ewald and Ewald, 2018; Tomova *et al.*, 2019).

Having beneficial bacteria in your gut means a better functioning immune system, lower levels of gut inflammation, lower risk of obesity, better blood sugar control and a lower risk of bowel cancer (O'Keefe *et al.*, 2015; Swain Ewald and Ewald, 2018; Rinninella *et al.*, 2019). Chronic gut inflammation is linked to many health issues such as inflammatory bowel disease, metabolic syndrome, immune system disorders and rheumatoid arthritis. Research shows that animal-based foods and diets centred around processed foods significantly contribute to this damaging scenario by encouraging harmful bacteria (Huang *et al.*, 2013; Rinninella *et al.*, 2019).



Animal products – containing no fibre but a lot of fat and protein – promote the unwanted, flesh- and fat-feasting bacteria that release toxins into our bloodstream. For example, the bacteria that use the meat compound carnitine as an energy source, and produce harmful TMAO (associated with heart disease) as a waste product.

Plant wholefoods, on the other hand, provide plenty of fibre and starchy carbohydrates to feed the good bacteria that have a positive effect on our health (Tomova *et al.*, 2019). That's why vegan diets keep your gut wall strong and healthy, lead to lower levels of inflammation in the body and a stronger immune system (Glick-Bauer and Yeh, 2014; Craddock *et al.*, 2019; Rinninella *et al.*, 2019).

The good news is, you can change your gut bacteria simply by changing your diet – a vegan diet starves out the bad and provides what the good ones need to thrive. Studies show that a vegan gut microbiome has the highest proportion of health beneficial, protective bacteria, whilst meat-eaters' has the least (Glick-Bauer and Yeh, 2014; Tomova *et al.*, 2019). Be good to your gut and it will be good to you!

JOINT HEALTH — ARTHRITIS

We all get a bit slower as we age but aching hips, knees and ankles aren't necessarily a normal part of aging. It could be arthritis and there may be something you can do about it.

Osteoarthritis is the most common form of arthritis in the UK and often develops in people over 50. Known as the 'wear and tear' form of arthritis, it is a degenerative disease where cartilage gradually becomes thinner as its renewal does not keep pace with its breakdown.

Even moderate meat consumption is associated with a higher prevalence of degenerative arthritis. The Adventist Health Study found that it was 43 and 49 per cent more likely to occur in men and women, respectively, who ate meat more than once a week compared to those who avoided meat completely (Appleby and Key, 2016). On the other hand, a fibre-rich diet was found to be linked to a lower risk of painful knee osteoarthritis (Dai *et al.*, 2017).



Rheumatoid arthritis is an inflammatory, autoimmune disease of the joints characterised by hot, painful swelling. You may have a genetic predisposition for it but diet plays a big role in whether you develop it or how serious the condition becomes. Although some of the trigger foods in rheumatoid arthritis patients are individualised, scientists say a vegan diet helps improve symptoms by eliminating many of these foods (Alwarith *et al.*, 2019).

Again, meat intake increases the risk of this type of arthritis – one study found it more than doubled the chances of developing it (Patisson *et al.*, 2004). Saturated fat (mostly coming from meat, dairy and eggs) is also bad news and so is obesity. Plant-based diets rich in fibre also lower the risk of this type of arthritis and reduce levels of inflammation in the body, benefiting the joints and other tissues alike (Sutcliffe *et al.*, 2015; Alwarith *et al.*, 2019)

Research shows that rheumatoid arthritis sufferers have inflammation of the gut wall leading to its increased permeability. That means food particles and bacteria can pass into the bloodstream and trigger an immune reaction. The body is merely trying to defend itself but joint lining is sensitive to these inflammatory immune reactions and can be harmed in the process (Alwarith *et al.*, 2019).

One of the causes of gut inflammation and a permeable gut wall are harmful gut bacteria. However, as described above, a vegan diet can entirely transform your bacterial populations, keep your gut wall healthy and help prevent arthritis or significantly reduce the symptoms if you already have it (Wong *et al.*, 2018; Alwarith *et al.*, 2019; Chegade *et al.*, 2019; Häger *et al.*, 2019). In fact, studies show that a plant-based diet can offer significant and long-term relief thanks to the antioxidants, fibre, healthy fats, soya and lack of irritants such as meat and dairy (Badsha, 2018).

EYE HEALTH

As we age, some of us develop cataracts – clouding of the lens in the eye. It develops slowly over time and leads to deteriorating eyesight. In extreme cases it can result in blindness.

A major study comparing people's diets and health revealed that vegans have a 26 per cent lower risk of cataracts compared with meat-eaters (Appleby and Key, 2016).

A Greek study agrees – these researchers found that people whose diets are based on fruit, vegetables, pulses and starchy foods (eg root vegetables and wholegrains) have a much lower risk of cataracts than meat-eaters (Theodoropoulou *et al.*, 2014). These conclusions are in line with other studies from Spain and Sweden (Pastor-Valero, 2013; Rautiainen *et al.*, 2014). They all concur that a high intake of antioxidants and low intake of meat and saturated fats does wonders for our eyes!



Eat yourself healthy - meal plans

To make it easy for you to prepare or buy healthy and balanced vegan meals, we have put together three meals plans. They include main meals and also snack ideas for every day. Of course you can go more fancy, experiment and have fun! These meal plans are fairly simple and inexpensive to suit everyone's budget and cookery skills. They are also a guide to show you what a healthy vegan diet looks like.

There are endless possibilities and everyone has to find their own favourites. Of course, there are many convenience options, such as salad pots, sandwiches, wraps, falafels, soups, sushi, snack bars, biscuits and lots more – you don't have to cook if you don't want to!

If you are new to veganism, we have a free plan just for you – 7 Day Vegan: 7dayvegan.viva.org.uk – it will get you on the right track with one week of daily meal ideas and bite-size information.

And no matter whether you are a new or seasoned vegan, you'll find a lot of inspiration on Viva!'s ever-growing recipe website – Vegan Recipe Club veganrecipeclub.org.uk



MEAL PLAN 1

BREAKFAST

Muesli + plant milk + ground flaxseed + frozen berries

SNACK

Banana + small handful of nuts

LUNCH

Sandwich with hummus/bean pâté/tempeh + tomatoes + green leaves

SNACK

Rye crackers + veggie sticks/apple + pumpkin seeds

DINNER

Tofu and vegetable stir-fry + wholewheat/soba noodles

AFTER DINNER

A couple of squares of dark chocolate + dried fruit

MEAL PLAN 2

Wholemeal bread/toast + miso paste/yeast extract + nut butter + fresh veggies OR nut butter + jam + fresh fruit

Orange + couple of oat biscuits

Moroccan couscous with chickpeas + greens/salad

Plant-based yoghurt + fruit

Kidney bean chilli + potatoes/sweet potatoes + rocket

Low-fat savoury snacks + salsa

MEAL PLAN 3

Smoothie: banana + orange/apple + 2 chunks of frozen spinach + 3 dates + chia seeds + oats

Small handful of dried fruit and nuts

Wholemeal baguette with smoked tofu + veggies + vegan mayo/margarine

Oat cakes + walnuts + pear/kiwi

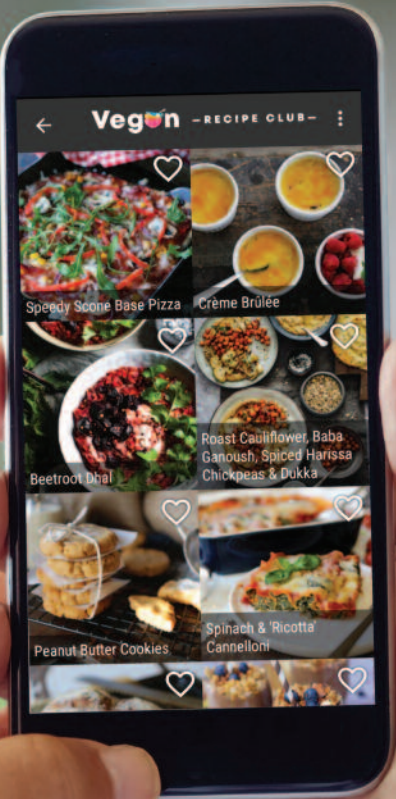
Chickpea/chicken-style pieces curry + brown rice + kale


Digestive biscuits + plant-based yoghurt/ice cream


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Public health and animal farming

Farming billions of animals for food requires many practices that make such large-scale operations possible but they have a heavy impact on the animals, the environment and our health.

PANDEMICs

A pandemic is the global outbreak of a disease. There have been many such outbreaks throughout history, the most recent of which, Covid-19, was declared a pandemic by the World Health Organisation on March 12, 2020.

Although many previous pandemics were caused by influenza (flu) viruses, Covid-19 is caused by a coronavirus, similar to the ones that





cause the common cold, but with more devastating effects. The virus originated in wild bats but is thought to have infected people in a Chinese wet market where thousands of animals were bought and killed on a daily basis (Zhang *et al.*, 2020), possibly via pangolins, the world's most trafficked animal.

The SARS (severe acute respiratory syndrome) 2003 pandemic was also caused by a coronavirus from bats, transmitted to humans via civet cats – also caged in wet markets. However, transmission doesn't always happen via the consumption of wild animals as viruses often infect farmed animals and factory farms provide the ideal breeding ground for a mutating virus.

Animal farming, trading and killing of wild animals for food all significantly increase our exposure to new and dangerous viruses (Kingsley, 2016). Viruses are tiny particles that infect cells, multiply within them and cause damage in the process. They are constantly changing and evolving into new strains, which is why the annual flu vaccine changes every year. Unlike bacterial infections, viruses are not affected by antibiotics so viral infections are difficult to treat and control.

Three out of every four new and emerging infectious diseases come from animals (CDC, 2014), hence the name of Viva!'s campaign, 3 in 4, which exposes human health risks of factory farming and animal exploitation (see viva.org.uk/3in4). The infamous Spanish flu, Asian flu, Hong Kong flu and Swine flu pandemics were all caused by flu viruses that may have originated in wild birds but have since mutated and spread in poultry and pigs which are referred to as mixing vessels for mutating viruses – a perfect storm of our own making. Scientists warn that many other potential disease threats may be poised to emerge from factory farms and wildlife markets.

The best way to prevent a future pandemic is to end wild markets and factory farms and go vegan.

ANTIBIOTIC RESISTANCE

Antibiotics have been helping us fight infection since the 1940s. Before that, giving birth and having surgery were a lot riskier, infections such as syphilis and gonorrhoea could be a death sentence and even a scratch could be fatal.

We rely on antibiotics to treat and prevent infection but they are also widely used in animal agriculture. Soon after they were developed, it was found that they could promote growth when fed to farmed animals at low levels. This led to their widespread use to fatten animals up for the table. The practice was banned in the EU in 2006 but huge quantities continue to be used in livestock, now outweighing human consumption in many countries; in the US, for example, some 80 per cent of antibiotics are used in animals (Martin *et al.*, 2015).

The overuse of antibiotics in livestock and its dangerous consequences are well-documented but with the sheer numbers of animals confined in densely packed sheds, it can be difficult to control disease (Mathew *et al.*, 2007; Manyi-Loh *et al.*, 2018). Fish farming is not the solution to overfishing as it relies heavily on the use of antibiotics to combat infectious diseases and rising sea temperatures are expected to make matters worse (Reverter *et al.* 2020).

The frequent use of antibiotics contributes to antibiotic resistance in bacteria, resulting in an increase in infections that are difficult to treat (Haskell *et al.*, 2018). This happens because rapid random DNA mutations occur naturally in bacteria – these may help, hinder or have no effect. If a mutation helps a bacterium survive antibiotics while all the others die, that one will go on to reproduce, spreading and taking its new resistance gene with it. The more we use antibiotics, the more resistant strains emerge.

One example is a methicillin-resistant *Staphylococcus aureus* (MRSA) that first occurred in Belgian cattle, later at Dutch pig farms and has since spread to farms across Europe, North and South America, Asia and North Africa. The resistant bacteria are found in pigs, cattle, horses, poultry, sheep, rabbits, cats, dogs, many species of wild animals and people (Aires-de-Sousa, 2017). Its direct relevance to antibiotic overuse has been firmly established with one study confirming the presence of resistant bacteria in meat samples from farms using antibiotics, with none or low levels in antibiotic-free samples (Haskell *et al.*, 2018).

If antibiotics fail, chest infections, urinary tract infections, cuts, insect bites and even small scratches can develop into sepsis (blood-poisoning) which can be fatal. In the UK, five people die from sepsis every hour and the number is rising. Chief executive of Antibiotic Research UK, Professor Colin Garner, says: *“Now we are in real danger that we could return to a pre-antibiotic past, where dirty wounds, bites and conditions like TB and typhoid might kill”* (Antibiotic Research UK, 2015).

Due to an increasing global demand for meat, it's predicted that antibiotic use in cattle, chicken and pigs worldwide will increase by 67 per cent by 2030 (Van Boeckel *et al.*, 2015). The WHO say that it is one of the main threats to modern medicine, with growing numbers of infections, such as pneumonia, tuberculosis and gonorrhoea becoming harder to treat (WHO, 2020). Scientists warn that the 700,000 global deaths caused by antimicrobial resistance each year will rise to 10 million by 2050 if no action is taken (O'Neill, 2016).

Colistin is the 'last resort' antibiotic for humans but it is still used in livestock, especially pigs, in some parts of the world. In 2015, colistin-resistant bacteria were found in China and screening where colistin had been routinely used in pigs, revealed resistant *E. coli* in more than 20 per cent of animals, 15 per cent of raw meat samples and one per cent of hospital patients (Liu *et al.*, 2016). Colistin-resistant bacteria have now been found in over 50 countries (Liu and Liu, 2018), including the UK, where its use to treat infection in animals has been voluntarily restricted but not banned. Its use as a growth promoter is banned in the EU, US, Brazil and more recently China and India. This could be too little, too late!

Antimicrobial resistance is a problem of our own making, a direct consequence of the abuse of antibiotics in a drive to produce cheap meat, fish, eggs and dairy foods. The most effective way to tackle it is to change the way we eat; the widespread adoption of a vegan diet would remove the factory farms that are the breeding grounds for these lethal superbugs.



FOOD POISONING

Food poisoning is an illness caused by eating food or drink contaminated with bacteria, viruses, parasites, toxins or other harmful compounds. The onset is usually quick and may include serious digestive upset including diarrhoea and vomiting. The accompanying symptoms can be very severe, such as fever, fainting and dehydration. The Food Standards Agency (FSA) says that in 2018, there were an estimated 2.4 million foodborne disease-related cases in the UK, 16,300 needed hospital treatment and 180 deaths were reported (FSA, 2020). Foodborne norovirus is estimated to cause 56 deaths per year, foodborne *Salmonella* 33 deaths, foodborne *Listeria monocytogenes* 26 deaths, foodborne *Clostridium perfringens* 25 deaths and foodborne *Campylobacter* 21 deaths. Most fatalities occur in those aged 75 years and older.



The most common causes of food poisonings (*Campylobacter*, *Salmonella*, *E. coli*, *Listeria* and norovirus) come from foods of animal origin. Raw meat, in particular chicken, incorrectly stored meat and dairy products, soft cheese and eggs are the main sources of infection (Harding and Knott, 2016).

Campylobacter is a leading cause of food poisoning in Europe and the world. The main source of infection is poultry (with 60-80 per cent of chicken meat contaminated), but it is also found in beef, pork and sometimes game (Brown *et al.*, 2014; Chlebicz and Slizewska, 2018). The presence of meat juice creates an ideal breeding ground for *Campylobacter* in raw chicken products – so much so that it easily contaminates other surfaces it comes into contact with and you can become infected just by touching it (Brown *et al.*, 2014). The Food Standards Agency advises people not to wash raw chicken as the splashes can contaminate clothes, skin and the entire kitchen with infectious bacteria!

E. coli and its many strains are found almost everywhere and some strains cause food poisoning. Major sources of this tummy bug infection are beef and dairy. Cattle carry the bacteria but don't suffer any health issues because of it. However, they take it wherever they go and their faeces spread it even further (Larsen *et al.*, 2014; Stein and Katz, 2017). Undercooked meat and contaminated dairy products are responsible for many *E. coli* food poisoning cases. Plant-foods are not a common cause and when they are, it is because of contamination with infected manure or waste water.

Listeria is another dangerous bacterium causing more than just food poisoning – it's fatal for 20-30 per cent of people who get the infection. The foods responsible are predominantly meat and meat products, milk, butter, soft cheese, cottage cheese, fish and other seafood (Larsen *et al.*, 2014; Chlebicz and Slizewska, 2018). When plant foods are found to carry listeria, it's usually due to contamination from animal products or waste.

Salmonella is a notorious bacterium most commonly linked to eggs. The resulting food poisoning was once so frequent that most egg producers in the UK are now required to vaccinate their flocks.

However, not all UK producers are required to and numerous eggs and egg products are imported into the UK. The failing control over *Salmonella* is demonstrated by repeated outbreaks, with at least one every year for the past few years (Wasley and Heal, 2019). Pigs, poultry and fish can also carry *Salmonella* (Larsen *et al.*, 2014).

Norovirus – known as the winter vomiting bug – is notorious for causing severe cases of vomiting and diarrhoea and is no exception to the animal-origin rule. In most cases, food poisoning caused by it can be traced to raw or undercooked meat and seafood, ready-to-eat products and fruit and vegetables (Tuan Zainazor *et al.*, 2010). However, when fruit and vegetables are contaminated, it's usually due to animal manure used as fertiliser or irrigation water contaminated with animal faeces (Tuan Zainazor *et al.*, 2010).

Scary as the above may sound, there's good news, too. By being vegan, you're dramatically lowering your chances of contracting food poisoning. Professor Emanuel Goldman, a microbiology professor at Rutgers University states that 95 per cent of food poisoning is caused by animal products – either directly or by them contaminating other foods. As a vegan you already don't eat most foods that are linked to these nasty bugs and you don't have to worry about strict cooking rules. If you happen to undercook your meal, the worst scenario is that it may be harder to digest but that's nothing compared to a nasty infection! Yet again, veganism protects our health.

Food facts and fibs

Veganism is gaining ever more popularity but with that comes a plethora of misinformation – both intentional and unintentional – from animal farming industries. Here, we clear up most of the issues.

ALMONDS AND AVOCADOS

Both have been blamed for using up too much water and being transported across vast distances making them less environmentally friendly than other



plant foods. Avocado and almond trees do need more water than many other plants but that's not the end of the story. They are trees and as such they store carbon and release oxygen, which makes them beneficial for the environment. They also don't require much processing and they are transported by boat, not air as some people think. Depending on where you live, you can most likely find almonds and avocados from the same continent – in Europe, both are grown in Spain. If we take all parts of the farm to table process into consideration, these plant foods still have a much lower environmental impact than animal foods (Ritchie and Roser, 2020).

QUINOA AND CHIA SEEDS

A duo of South and Central American highly-nutritious foods that have been consumed by local populations for millennia. Critics say vegans shouldn't rely on foods from far away. However, we only use small amounts of



both, so one pack goes a long way, and they are transported by sea, which doesn't have such a high environmental footprint. But most importantly, quinoa and chia seeds are now grown in the UK by the pioneering company Hodmedod. By consuming them, you're supporting sustainable food production.

Chia cultivation requires only low amounts or no fertilizers and doesn't need too much water so it's a very environmentally friendly crop. Also, there are no major pests or diseases affecting chia plants and essential oils in chia leaves have repellent properties against insects making it ideal for organic farming.

Quinoa popularity has led to rising quinoa prices in South America and this has resulted in more financial gain for the producers and helped to improve their quality of life (Livingstone, 2018). There are also some initiatives to distribute quinoa more widely and ensure that everyone in rural areas has access to it, including making it a part of free school breakfasts.

Animal products are much more resource-intensive than plant foods, even if the plant foods are imported. The reason is simple – instead of using crops directly as food, they are fed to animals to produce meat, fish, eggs and dairy. This is inefficient, wasteful and utterly unsustainable. A landmark study from Oxford University found that going vegan could reduce your greenhouse gas emissions from food by 50-73 per cent (Poore and Nemecek, 2018).

For more information see our report *Envirocidal* or go to viva.org.uk/planet.

SOYA

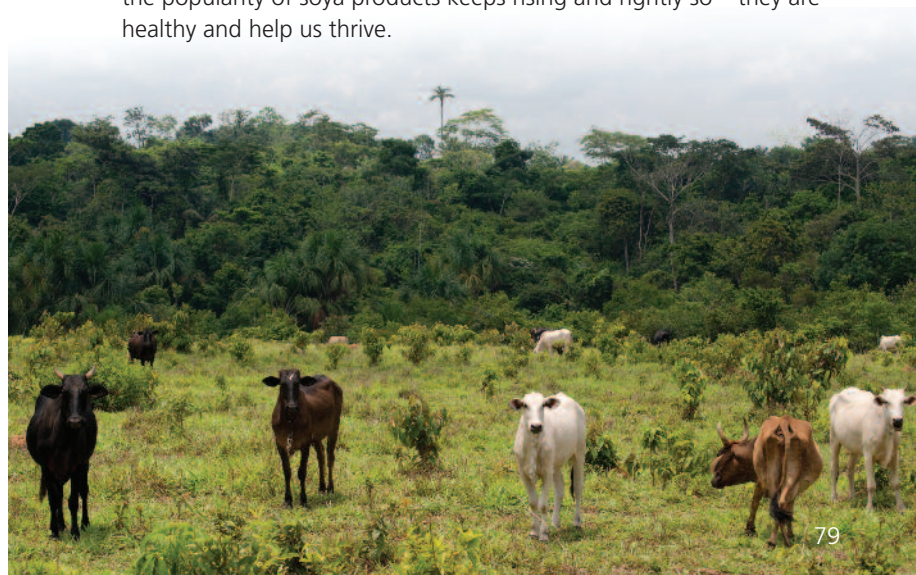
Soya is a superfood for some and a villain for others. It has high quality protein, healthy unsaturated fats, fibre, B vitamins, iron and antioxidants – it may lower the risk of breast and prostate cancers and heart disease, it can lower cholesterol and reduce hot flushes in menopausal women. There is no evidence to suggest traditional soya foods cause adverse effects in healthy people when consumed in amounts consistent with Asian intakes (Messina, 2006). So why the huge difference of opinion?

Soya contains natural compounds called phytoestrogens – similar to the animal hormone oestrogen. This has led some people to believe that it can influence your hormone levels. However, the type of phytoestrogens found in soya, called isoflavones, are considerably weaker than actual oestrogens, so there's either no effect whatsoever or only a negligible one. Cow's milk and dairy products, on the other hand, contain a cocktail of hormones and growth factors including oestrogen – levels may be especially high when the cows are pregnant and lactating simultaneously – a fact often overlooked.

Despite the relentless hunt for negative stories about soya, its safety and its many health benefits have been demonstrated by numerous studies, absolutely reassuring in their positive conclusions (Messina, 2016; Rizzo and Baroni, 2018).

Soya expansion in the Amazon has led to mass deforestation on a huge scale – but it's not the fault of vegans eating tofu. The soya grown there is used for animal feed – if you want to save the forests, don't eat meat!

The meat and dairy industries like to scare people with tabloid stories and even fund studies to tarnish plant-based foods. However, the popularity of soya products keeps rising and rightly so – they are healthy and help us thrive.



VEGAN CONVENIENCE AND JUNK FOODS

We're used to seeing certain products as good or bad but things aren't always so clear-cut. For example, a vegan hot dog – an alternative to meaty junk food – can be a vegan junk food if made from TVP (textured vegetable protein), lots of fat and salt and scooped down with a pile of chips, but it could also be fairly healthy if it's tofu-based and eaten with a wholemeal roll and salad.

A vegan pizza made with traditional, thin base and loaded with vegetables, pine nuts and a small sprinkle of vegan cheese, can be a decent dinner but if it's just a puffy base dripping with vegan cheese and some tomato sauce, well, that's just junk food.

Of course, just as it is not healthy to eat lots of meat, it's not a good idea to eat lots of processed vegan foods as they tend to contain high levels of fat and salt. Perhaps the main difference from a health perspective is the vegan alternatives are not linked to cancer!

There are lots of accidentally vegan products and the range of snacks and ready-made foods that are vegan-friendly keeps on growing. While lots of the convenience options, such as sandwiches, salads, rice pots and curries are a good choice, many snack foods are highly processed, loaded with fat, sugar or salt. A vegan diet can be super healthy but keep the biscuits, cakes, hot dogs and pizzas for an occasional treat!



Hungry for more?

A vegan diet based on wholefoods is the healthiest possible. Living on plants makes us thrive like nothing else and is the most ethical and sustainable lifestyle. This guide contains a brief overview of veganism and your health but there's a lot more we have to offer.

- For more information on health and nutrition issues, the latest news, health features and research, go to viva.org.uk/health
- Our A-Z section contains all you need to know about: Nutrients, Diseases, Foods, Facts and Hidden nasties in food! viva.org.uk/health/a-zs
- If you're new to veganism, we have a free 7-day meal plan 7dayvegan.viva.org.uk
- For hundreds of vegan recipes, visit veganrecipeclub.org.uk
- If you'd like more information on how our food choices impact the environment, see viva.org.uk/vegan-now
- To learn about farmed animal issues and investigations, go to viva.org.uk
- To find vegan-friendly places to shop, eat and stay, pop over to myvegantown.org.uk

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