Oncology and Plant-based Diets


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Are you seeing a rise in plant-based diets in your patient population?

There is a rise in plant-based diet popularity in the UK. Despite there not being a universally recognised definition, it is widely accepted that a diet rich in foods derived from plant sources with lower consumption or exclusion of animal products constitutes a plant-based diet. This article focuses on nutritional management of those following an exclusive plant-based diet (free-from any animal-derived products). According to data from a YouGov tracker, over the last two and a half years around 2-3% of the UK population is vegan and around 5-7% are vegetarian.[1] In 2022, research by Ipsos found that 46% of people aged 16-75 are considering reducing their intake of animal products in the future.[2] 15% of UK consumers say they have cut dairy from their diet completely and a further 42% have reduced their intake.[3] This, combined with growing rates of cancer diagnoses (1 in 2 people in the UK will be diagnosed with cancer in their lifetime),[4] leads to a necessity for knowledge of plant-based diets within oncology dietetics. Whilst data indicate a higher proportion of plant-based diets in younger populations, it should be noted that vegan residents in UK care homes almost trebled in the five years to 2019, with a total of 7,000 vegans and vegetarians within 11,000 care homes.[5] The increase of plant-based alternatives available in supermarkets has not yet been reflected in the 'foods for special medical purposes' market.

In your opinion, what is driving the trend of plant-based diets?

People turn towards plant-based diets for well-documented ethical, health and environmental reasons. These beliefs do not disappear with a cancer diagnosis and as healthcare professionals it is essential to support the choices of our patients.

Sensationalist reporting and misinformation on the internet, combined with desperation, can lead to people dramatically changing their diet with the promises of tumour reduction or cure. Some perceptions can suggest that a plant-based diet may be overly restrictive or fall into the 'fad diet' bracket, however, a well-planned, plant-based diet is nutritionally appropriate from diagnosis. The World Cancer Research Fund (WCRF) advises wholegrains, vegetables, fruit and pulses (legumes) such as beans and lentils, make up a major part of a usual daily diet,[6] with limits suggested on consumption of red and processed meat (such as sausages and cured, smoked and salted meats). Dietitians are perfectly placed to educate on the benefits of nutrition, taking into consideration type and stage of cancer, phase of treatment and individual food preferences, including a plant-based diet.

Should a plant-based diet be recommended in cancer patients?

Without a standardised definition of a plant-based diet, data are difficult to collect to accurately demonstrate the consequences of this dietary pattern. Development and use of systematic methodology across research would support a standardised approach to improve cross-study comparison of data, improving the understanding of plant-based diets role in health.[7] There are a lack of interventional studies assessing the association between plant-based diets and cancer risk, however, there are many observational studies. A summary of these studies indicates an inverse association between plant-based diets and overall cancer risk base.[8] A meta-analysis looking specifically at digestive system cancers concluded that plant-based diets played a protective role in the risk of developing these neoplasms,[9] whilst a meta-analysis demonstrated that red meat and processed meat increases colorectal risk by 20-30%.[10]

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WCRF Cancer Prevention Recommendations[6] are in-line with a healthy, wholefood, minimally processed plant-based diet. Modern plant-based diets may also include ultra-processed foods such as 'meat alternatives' (burgers, sausages, bacon, sausage rolls, pies, kebabs and nuggets) as well as plant-based 'cheese' and 'yoghurt'. Formulations may contain chemical food additives to improve mouth- feel, taste, appearance, stability and shelf-life. Due to increased awareness and popular global campaigns such as 'Veganuary', availability and consumption of these products has risen exponentially. To meet demands, many fast-food outlets have also developed plant-based alternatives to their best-sellers. Ultra-processed products are widely available across the food market and further research is needed to investigate the consequences of health and disease risks from these foods, the additives used and the by-products formed during industrial processing.[11]

Whilst further studies are required to investigate the link between a vegan diet and outcomes in cancer treatment, a well-planned, plant-based diet that contains a variety of different foods can meet the macro-nutrient requirements of this patient group. Appropriate supplementation and consideration of the composition of the diet will enable micronutrient completeness too. This is where the unique role of dietitians and their assessments is essential for people wishing to follow a plant-based diet.

What are the nutritional challenges of following a plant-based diet?

There are many difficulties faced by people with cancer, one of the most significant can be changes in their food intake. There are special considerations for people on a plant-based diet. A systematic review demonstrated vegan diets are typically associated with relatively low intakes of vitamins B2, B12, D, iodine, zinc, calcium and selenium, and can lead to deficiencies of B12, calcium, zinc and selenium.[12] A detailed discussion with the patient about the importance of optimal nutrition, their requirements and how they can be met practically at different points is essential, with honesty about the challenges of achieving nutritional targets from food alone. Various factors affect bio-availability and absorption of micronutrients, and these variables are well documented in plant-based (or vegan diets). Whilst ESPEN discourage the use of high-dose supplements in all people with cancer, the most reliable way to achieve micronutrient intake (on a plant-based diet) in-line with recommended daily allowances is to supplement with a vegan-specific micronutrient preparation.[13] Detailed advice about micronutrient dosing can be found at The Vegan Society or from the British Dietetic Association, which has published a 'Vegetarian, vegan and plant-based diet: Food Fact Sheet'.[14] (See **Table 1**).

Table 1: Specific nutrients of concern

Nutrient	Sources from a plant-based diet	Practical ways to increase intake
B12	Sources of B12 in a plant-based diet are limited to fortified products. • Dairy alternatives (e.g. soya, oat, almond or rice drink) • Breakfast cereals • Yeast extracts	• Choose fortified breakfast cereals with fortified soya drink or 'yoghurt' • Snack on crumpets or toast with yeast extract • Make coffee or hot chocolate entirely with fortified dairy alternative
Iron	• Tahini • Cashew nuts (better absorption if blended into smooth nut butter) • Green and brown lentils • Dried fruits (raisins, figs, apricots)	• Make hummus with extra tahini • Use tahini in dressings for bean salads or swirl into soup • Add cashew nut butter to smoothies or porridge • Add green and brown lentils to chilli and bolognaise made with soya mince • Snack on dried fruits, add to breakfast, use in salads and tagines
Calcium	• Tahini • Ground almonds • Products made with fortified white flour • Kale • Kidney and haricot (baked) beans • Dried apricots • Tofu (calcium set) • Fortified dairy alternatives	• Encourage three portions per day of fortified dairy alternatives. Make into hot drinks, on cereals or have as a snack • Vegan 'cheese' may be fortified (check label), add to beans on toast • Make pesto with added kale and blend in almonds • Choose recipes using ground almonds in baking • Use kidney or haricot beans in chillies and stews • Use calcium set tofu rather than nori set in cooking
Zinc	• Seeds (hulled hemp seeds, ground linseeds or pumpkin seeds) • Cooked quinoa • Wholemeal bread	• Complex absorption issues including phytate content and presence of protein can affect zinc absorption,[15] therefore encourage higher sources frequently • Add seeds to porridge, granola, 'yoghurt' or salads. Blend seeds into 'butters' and use of wholemeal bread • Use quinoa in salads or in place of couscous • Choose wholemeal bread
Selenium	• Brazil nuts • Seeds	• Add chopped Brazil nuts and seeds to breakfast • Use Brazil nut butter on toast or in smoothies • Add chopped Brazil nuts to homemade flapjacks

Protein

Adequate protein is essential for all individuals with cancer. Muscle synthesis is maintained in patients with cancer and remains responsive to dietary supply of amino acids. ESPEN recommends an intake of 1 g protein/kg/day, and if possible, 1.5 g protein/kg/day.[13] This can be particularly challenging in people eating a plant-based diet for numerous reasons:

- Low protein to energy ratio of foods
- Reduced intake secondary to mucositis, poor appetite, pain, nausea, gastrointestinal disturbances (such as constipation and diarrhoea), fatigue and low mood
- Perceptions about protein content of plant-based foods. Although foods such as lentils, beans, chickpeas and quinoa are sources of protein, large quantities are required to meet protein targets, for example, 20 g protein is provided by 465 g beans (two standard cans) compared to 115 g white fish
- Provision of suitable high-protein foods can be limited in healthcare settings
- Variability of protein content of 'meat alternatives', such as sausages or burgers (which can be lower in protein when made from vegetables, mushrooms or grains, or higher with the main ingredients being soya or seitan).

Using common measurements and 'exchanges' of protein, usually 10 or 20 g protein per portion, can be helpful for simplicity. Written information to support discussion is essential. NDR-UK, in collaboration with oncology dietitians, have produced a 'How do I have a nourishing plant-based diet' information sheet which gives practical advice to optimise nutritional intake. Focus should be on encouraging a wide range of protein types for amino acid balance. See **Table 2** for less well-known high-protein products that can be easily incorporated into the diet.

Omega-3

Whilst there are no specific requirement recommendations in people with cancer, research has suggested that there may be beneficial effects of omega-3 fatty acid supplements in patients undergoing chemotherapy and/or radiotherapy, including preservation of body composition.[16] Dietary sources of alpha-linoleic acid (ALA) are walnuts, flaxseeds and rapeseed oil. Non-animal based eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) can be found in algal oil supplements.

What are the nutritional challenges specifically faced by malnourished patients with cancer following a plant-based diet?

Nutrition support in oncology is a challenging area given the complex array of symptoms faced by people due to the disease and associated treatments. The location of the tumour can affect intake, as can toxicities associated with treatments. Standard symptom management advice is still relevant but nutrition support strategies (food fortification, oral nutrition support products and tube feeding) require careful consideration in those following a plant-based diet.

Table 2: Practical ways to increase protein intake (data from Nutrimen and food labels)

Food	Protein/ 100 g	Portion providing 20 g protein	Tips for use
Gram flour (milled chickpeas)	23 g	87 g	Use to make: • Pancakes or flatbreads. Vanilla, cocoa or almond can be added to sweet batters and spices to savoury doughs for extra flavour • Pakora, poppadums and bhajis served with soya 'yoghurt' raita • Vegetable 'frittata' type dish
Tofu (soya bean curd)	8 g	250 g	• Scramble with turmeric and black salt ('eggy' taste due to the sulphurous compounds present) • Add silken tofu to soups, such as miso or sweetcorn and noodle
Peanut flour (peanuts are roasted, the oil extracted and the product milled)	48 g	42 g	• Mix with coconut cream, maple syrup and soy sauce to create a satay-type sauce. Brush onto mushrooms before grilling or thin with coconut milk for use in stir-fries • Add to breakfast, such as porridge, overnight oats and smoothies
Ground almonds	21 g	95 g	• Add to porridge when cooking or overnight oats • As a flour alternative in baking
Seitan (made from wheat gluten)	26 g	77 g	• Use as a meat alternative in stir-fries, curries, fajitas or tacos
Chickpea pasta (made from chickpea flour)	20 g	100 g	• Use in place of wheat pasta or add to soups or stews
Soya mince (textured soya protein)	52 g	38 g	• Add to vegetable chilli, Bolognaise or curries
Foods modified to increase protein	High-protein bread, bagels, breakfast cereals, soya 'yoghurt' and soya drinks are all available. Check labels for nutritional values.		

Adaptation of food fortification techniques

Food fortification traditionally relies on using dairy products such as butter, cream and cheese. Plant-based alternatives will provide a similar energy content, however, composition of some products such as vegan 'cheese', custard and 'yoghurt' may be significantly lower in protein and nutrients. Soya products contain more protein than most oat, rice or almond based dairy alternatives. Encourage micronutrient-fortified varieties of dairy alternatives, noting organic varieties are not usually fortified. Vegan 'cheese' (made from coconut oil, water and emulsifier) provides energy from fat but minimal other nutrients. Nut-based cheese alternatives are nutritionally superior. Soya 'yoghurts' are lower in protein and energy and even the 'Greek-style' alternatives are low in protein compared to 'high-protein' dairy yoghurts. Practical support with recipe adjustments to optimise nutrient content is essential, such as adding chopped or ground nuts or seeds to improve nutritional value of 'yoghurt' and making white sauces with soya alternative 'milk' and 'cream' and adding neutral protein powder and nutritional yeast.

Fat

ESPEN recommend that in people losing weight with insulin resistance, more emphasis should be put on increasing sources of energy from fat rather than carbohydrates, thereby increasing the energy density of the diet whilst reducing glycaemic load.[13] Exercise caution when recommending high saturated fat, low nutrient foods such as vegan cheese made with coconut oil, cakes, biscuits, pastries and ultra-processed products. Consider suggesting mono-unsaturated fat sources such as rapeseed/olive oils, nuts/ nut butters and avocado.

Oral nutrition support products

Milk-based oral nutritional supplement drinks make up the majority of supplements on the market, with few suitable plant-based options available on prescription. Various plant-based protein powders are commercially available. High-protein shakes and smoothies can be created using 300 ml of plant-based drink and one scoop of protein powder (provides around 20 g protein depending on brand and liquid used). These are unlikely to be nutritionally complete, unlike oral nutritional supplement drinks for special medical purposes. Nutritional analysis programmes can be used to assess composition. Plant-based high-protein bars are available and can be a useful snack choice.

Tube feeding

With limited options for providing nutrition for enteral tube feeding, the popularity of a blended plant-based diets via a tube has increased. The BDA have produced a 'Practice Toolkit: The Use of Blended Diet with Enteral Feeding Tubes'[17] to support the use of blended diets. Manufacturers of feeding tubes have guidance for use, with the majority stating that they are only suitable for the administration of enteral feeding products defined as 'foods for special medical purposes' and water. Special consideration is required for vulnerable patients and those at risk of neutropenia. A multi-disciplinary approach should be taken with a risk-assessment completed and discussed with the patient and appropriately documented.

Careful counselling to ensure awareness of the challenges of a plant-based blended diet is vital. Low nutrient density 'blends' are a common problem, as the volume of liquid required to thin the 'blends' can be large. People can be encouraged to add protein powders and use soya drink as the liquid to help with nutrient provision. Nutritional analysis programmes are essential to identify inadequacies so action can be taken to adjust nutrient content accordingly. Micronutrient supplementation remains essential. Seek advice from pharmacy team regarding administration of suitable preparations.

With careful planning and education, a person following a plant-based diet can continue to meet their nutritional requirements following a diagnosis of cancer.

Key points:

- Adequate energy and protein for nutritional needs (this can be challenging in texture modified diets and tube - feeding)
- Recommend high micronutrient foods such as tahini, dried fruits (raisins, apricots and figs), lentils, beans (kidney and haricot in particular), almonds and cashew nuts (ground or as butters for greater nutrient availability) make up a regular part of the diet
- Appropriate micronutrient supplementation
- Consider omega-3 intake and supplementation
- Limit ultra-processed foods
- Follow recommendations of the WCRF for prevention and survivorship.

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